

IMPROVING HEALTH OUTCOMES
OF THE POOR

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IMPROVING HEALTH OUTCOMES OF THE POOR

THE REPORT OF WORKING GROUP 5 OF THE COMMISSION ON
MACROECONOMICS AND HEALTH

Chaired by
PRABHAT JHA *and* ANNE MILLS

Presented to
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FOREWORD

The Commission on Macroeconomics and Health (CMH) was launched in January 2000 by Dr Gro Harlem Brundtland, Director-General of the World Health Organization. Its mission was to analyze the impact of health on development and to examine ways in which health-related investments could spur economic development. The Commission worked to develop specific recommendations that would save lives, reduce poverty, and spur economic growth through a scaling up of investments in the health sector of developing countries. The final report of the Commission, *Macroeconomics and Health: Investing in Health for Economic Development*, was released in December 2001.

The Commission focused its work on the world's poorest people, in the world's poorest countries. Millions of impoverished people die every year of conditions that are readily prevented or treated. Technologies exist to avert millions of deaths due to malaria, TB, HIV/AIDS, diarrhoeal disease, respiratory infection, and other killers. These tragic deaths—and the enormous economic and social costs associated with them—reflect the basic fact that essential life-saving health services are out of reach of hundreds of millions of the world's poor. And yet, without extending these life-saving interventions, poverty is likely to be exacerbated and to be passed to the next generation. The economic costs of ill health, the Commission documented, are enormous and pervasive.

The findings of the Commission are both stark and also encouraging. It will take a lot of money and much more political and organizational effort than has been seen in the past generation to accomplish the tasks at hand. Curbing the HIV/AIDS pandemic, or the resurgence of tuberculosis and malaria, or major killers of children such as diarrhoeal disease and vaccine-preventable diseases, will not happen by itself. Yet the task is possible, with breathtaking achievements possible. The Commission calculates that if the donor countries contribute around 0.1% of their GNP—one penny for every \$10 of income—and if that effort is matched by a suitable increase in effort within the low-income countries themselves, it should prove possible to avert 8 million deaths per year by the end of this decade. As of 2007, the donor contribution would be around US\$ 27 billion per year, or roughly four times the current US\$ 6 billion in official development assistance for health. The reduction in human suffer-

ing would be enormous. The economic gains would also be striking, around the order of US\$ 360 billion per year during the period 2015–2020, several times the costs of scaling up the health interventions themselves, counting both the donor and recipient country efforts.

To arrive at its conclusions, the Commission organized its research and intensive analysis mainly within six working groups, which in turn engaged the energies of a worldwide network of experts in public health, finance, and economics. Each working group held several meetings around the world, commissioned papers, debated alternative approaches, circulated drafts to the policy and scholarly community, and made detailed recommendations to the full Commission in the form of a Working Group Report. Working group members included CMH members, staff of various international agencies, and experts from governments, academic institutions, NGOs, and the private sector. The Working Group Reports, prepared by the working group co-chairs in consultation with the entire working group membership, are a synthesis of the commissioned background papers and the culmination of each working group's detailed review of the literature and intensive deliberations.

The Commission's findings are therefore based heavily on the crucial work of the six working groups, each of which was responsible for taking stock of the existing knowledge base on a particular topic in order to identify implications for policy and for extending that knowledge base as appropriate. The working groups, with their titles, topics, and chairs, are:

- Working Group 1, Health, Economic Growth, and Poverty Reduction, addressed the impact of health investments on poverty reduction and economic growth. Co-Chairs are Sir George Alleyne (Pan American Health Organization, USA) and Professor Daniel Cohen (Ecole normale supérieure, Paris, France).
- Working Group 2, Global Public Goods for Health, studied multi-country policies, programmes, and initiatives having a positive impact on health that extends beyond the borders of any specific country. Co-Chairs are Professor Richard Feachem (Institute for Global Health, University of California-San Francisco, USA) and Professor Jeffrey D. Sachs (Center for International Development at Harvard University, USA).
- Working Group 3, Mobilization of Domestic Resources for Health, assessed the economic consequences of alternative approaches to resource mobilizations for health systems and interventions from domestic resources. Co-Chairs are Dr Alan Tait (former senior IMF

official) and Professor Kwesi Botchwey (Harvard University, USA, and former Minister of Finance, Ghana).

- Working Group 4, Health and the International Economy, examined trade in health services, health commodities, and health insurance; patents for medicines and Trade-Related Intellectual Property Rights; international movements of risk factors; international migration of health workers; health conditions and health finance policies as rationales for protection; and other ways that trade may be affecting the health sector. The Chair of this working group is Dr Isher Judge Ahluwalia (Indian Council for Research on International Economic Relations, New Delhi, India).
- Working Group 5, Improving Health Outcomes of the Poor, examined the technical options, constraints, and costs for mounting a major global effort to improve the health of the poor dramatically by 2015. Co-Chairs for this working group are Dr Prabhat Jha (WHO) and Professor Anne Mills (London School of Hygiene and Tropical Medicine, UK).
- Working Group 6, Development Assistance and Health, reviewed health implications of development assistance policies including modalities relating to economic crisis and debt relief. It focused on the policies and approaches of international developmental agencies. One emphasis was on the appropriate balance between country-specific work and support for activities that address international externalities or provision of international public goods. The Co-Chairs are Mr Zephirin Diabre (United Nations Development Program), Mr Christopher Lovelace (World Bank), and Ms Carin Norberg (Swedish International Development Cooperation Agency).

It is my great pleasure and honour to introduce *Improving Health Outcomes of the Poor: The Report of Working Group 5 of the Commission on Macroeconomics and Health*. The entire Commission is grateful to its Co-Chairs, Prabhat Jha and Anne Mills, and to the members of Working Group 5, for their dedicated work and enormously important Report. The Report of WG5, and the detailed background papers on which it is based, provide a unique financial and epidemiological analysis of the priority health interventions in the low-income countries. The costing analysis carried out by Working Group 5, showing the financial requirements for scaling up essential health coverage in the world's poor countries, is surely the most extensive exercise of its kind ever undertaken. Although there will no doubt be refinements in this kind of analysis in the years ahead, especially as individual countries take up

the costing themselves within their National Commissions on Macroeconomics and Health, the WG5 Report marks a watershed in public health analysis. The Report will stand as a critical input in the global process of helping the world's poor countries to scale up the coverage of health interventions in the years ahead.

The Commission, together with the working groups' co-chairs and members, gratefully acknowledges the financial and technical support provided by the donor community. A particular thank you is due to the Bill and Melinda Gates Foundation, the Government of Ireland, the Government of Norway, the Government of Sweden, the Grand Duchy of Luxembourg, the Rockefeller Foundation, the United Kingdom Department for International Development, and the United Nations Foundation.

Jeffrey D. Sachs

Chair of the Commission on Macroeconomics and Health

April 2002

PREFACE

The desirability of improving the health of the global poor is little in doubt. The dramatic devastation from HIV/AIDS in parts of Africa has brought the enormous gaps in the health prospects of the richest countries and those in the poorest to the newspapers and televisions of people worldwide. But the technical and financial means to address these enormous gaps are less clear. Our Working Group 5 (WG5) of the Commission on Macroeconomics and Health, called “Improving Health Outcomes of the Poor”, had the task of elaborating options, costs, and benefits for mounting a major global effort to improve the health of the poor dramatically over the next two decades.

From the outset, we adopted an evidence-based approach, developing detailed background papers (see Annex 3 and <http://www.cmhealth.org/wg5.htm> or www.hefp.lshtm.ac.uk), subjecting them to vigorous peer review, seeking direction from a sage Steering Committee (see Report Team), and ensuring a wide set of consultations and critical review meetings (see Annex 4).

Our key findings are, in one sense, expected: a few conditions most account for the enormous mortality gap between rich and poor countries; powerful interventions exist against all these conditions; scaling up coverage of these interventions requires priority to be given to a specific set of programmes and a well-functioning delivery system, as well as overcoming a set of constraints; scaling up coverage is costly but highly beneficial in terms of lives saved and disability avoided; and sustained action for at least two decades is required. We have sought to add analytic depth to these points, and to ensure that our findings can be accessible to those outside the health sector.

Three unexpected findings from our work deserve mention. First, maternal mortality, while a relatively small contributor to direct disease burden, constitutes the biggest gap between rich and poor countries. Maternal mortality reductions can be achieved by scaling up skilled birth attendance, and are a good indicator of a well-functioning health system. For these reasons, we place strong emphasis on the near elimination of maternal deaths worldwide as a clear advocacy message from our Report. Second, we were surprised by the dominance of HIV/AIDS in terms of transforming mortality patterns, and in terms of its contribution to total

cost requirements (especially in Africa, where HIV/AIDS accounts for 61% of total 2015 incremental costs). Efforts to increase HIV prevention efforts quickly are urgently required if we hope to improve overall health status. Finally, the usually fractious debate between those focused on disease control and those focused on the health system largely disappears if discussion turns to goal-oriented health outcomes: both pillars are needed in order to achieve the high levels of coverage of interventions. Moreover, the nature of costs is such that improving one aspect of delivery, such as expanding outreach clinics for immunization, has beneficial effects on other interventions, such as access to case management for sick children.

Since our work began in July 2000, considerable progress has already been made in fighting diseases of the poor. The United Nations Millennium Development Goals for 2015 have become a rallying point for several multilateral and bilateral development agencies. There is active talk of increasing developmental assistance in health substantially. The Global Fund to fight AIDS, Tuberculosis, and Malaria is operational. These welcome developments focus renewed attention on the basic questions of *how* to scale up coverage of the highest impact interventions in the poorest populations. Our hope is that this Report and the background papers will help inform policy-makers on these difficult questions, and will help also inform a research agenda to support such a programme.

Prabhat Jha and Anne Mills

Geneva and London

22 March 2002

EXECUTIVE SUMMARY

Despite great improvements in humanity's health, the poorest people in the world still suffer under an intolerable burden of disease. An analysis of avoidable mortality suggests that most of this burden of ill health is due to a relatively limited set of conditions: maternal and perinatal mortality, vaccine-preventable diseases, acute respiratory infection and diarrhoeal disease in children, malnutrition that exacerbates those diseases, malaria, tuberculosis, tobacco-related disease, and HIV/AIDS.

In 1998, almost a third of deaths in low- and middle-income countries were due to communicable diseases, maternal and perinatal conditions, and nutritional deficiencies: this is a death toll of 16 million, equivalent to the population of the Netherlands. All of these conditions are amenable to intervention through the health system or by other means, to a considerable extent. Indeed, in many of these areas—treatment of diarrhoeal disease and tuberculosis, for example, and provision of reproductive health services—there has been significant progress in recent decades, and there is good reason to believe that, given will and resources, this progress could be sustained. There are some areas, however, where progress has stalled. Levels of immunizations worldwide, which rose dramatically between 1970 and 1990, have been stagnant for the past decade. There are also areas where the nature of the problem is changing for the worse. Malaria programmes now have to contend with drug resistance problems. Tobacco control programmes deal with an ageing population of smokers among whom tobacco-related disease is increasing quickly. In areas of high HIV prevalence, hard-won gains in life expectancy are being reversed.

A worldwide effort to increase the access of the populations in poor countries, and of the poorest groups within those countries, to quality health interventions, is both feasible and desirable. Important elements necessary to achieve these goals include:

- Commitment by countries where the poor live and the global donor community to mobilize and budget financial resources over a period of two or more *decades*, including commitment to pay for salaries and operational support.

- Focused efforts to identify, and systematically remove, the key constraints that prevent health systems from increasing the coverage of good quality services.
- A massive effort with donor financial and technical support to increase the number of skilled district-level health managers.¹
- A similar massive effort to put in place reliable surveillance systems to track trends in the health status of the poor, detect and control new epidemics and outbreaks, evaluate the success of control programmes, and improve accountability for expenditures on health.
- A major increase in research on interventions including vaccines, drugs, and behaviour change methods, and on how best to deliver interventions to communities and strengthen service delivery.²

In the context of setting the scene for such global efforts, this Report describes the priority interventions that can do most for the health of the poorest billion of the world's population.³ We analyse the constraints on increasing the provision of those interventions through existing health systems, and measures to overcome or alleviate those constraints. We provide estimates of the costs of increased provision of interventions, and of the benefits that could be expected from such spending. We also discuss the conditions of continued commitment that will be necessary to maintain such levels of effort and maximise their effectiveness. Throughout, we focus on the needs of the poorest billion. However, we believe that the best way of reaching this poorest billion will be through the universal provision of relevant interventions in the low- and middle-income countries where they live.

Among the key interventions identified are skilled birth attendance and focused antenatal care; vaccination services; improved case management of childhood disease, including malaria; measures to control infection with malaria and improve treatment for adults; short-course treatment for tuberculosis in a format that ensures that the drugs prescribed are taken; measures to encourage people to stop smoking; and measures to prevent the spread of HIV—particularly in vulnerable groups—and to treat those infected. These interventions are discussed in Chapter 2 of the Report. Among them all we lay particular stress on reductions in maternal mortality, not just because of their intrinsic value but because they provide a particularly effective indicator of the degree of coverage that a health system provides. Beyond this, the goal of a world in which no woman gives birth without access to a skilled attendant is one that we believe particularly well suited to eliciting a sense of global solidarity.

All these interventions can be delivered through what we have chosen to call the *close-to-client* health system, by which we mean the outreach services, health centres, and local hospitals to which the poor are most likely to have access. The key to success is increasing the capacity of this part of the health system to deliver interventions. However, such scaling up will be made difficult by various forms of constraint. Among these will be constraints on demand—factors that dissuade or prevent people from taking up services; constraints on delivery—factors that limit the capacity of the health system to supply the appropriate degree of intervention; and overall strategic constraints—issues of policy, governance, and the like.

Various approaches exist that can alleviate or “buy out” the problems associated with these constraints by stimulating demand for health services and easing their supply. These approaches, which are discussed in Chapter 3 of the Report, include increasing outreach services, increasing the accountability of health services to communities, increasing the numbers of health workers and facilities, improving the training of health workers and finding ways to increase their capacity to deliver improved quality of services, increasing health workers’ pay in many settings, strengthening health service management, improving the procurement and regulation of pharmaceuticals, and improving policy-making structures and processes. Although there are some highly constrained settings where only a limited subset of these strategies can expect to enjoy success, these settings are the exception, not the rule; even in these settings, it is possible to make some progress.

Our efforts to calculate the costs of scaling the interventions we support up to high levels of global coverage as quickly as feasible suggest that these costs will be high. We arrive at a figure of between US\$ 40 billion and US\$ 52 billion in increased annual expenditure by 2015 for the cost of strengthening the close-to-client portion of health systems enough to achieve high coverage with the priority interventions. The basis of these estimates is discussed in Chapter 4 of this Working Group Report.⁴

The benefits that might flow from such spending, also discussed in Chapter 4 of this Report, are appropriately impressive. We would expect perhaps 100 000 fewer annual deaths in childbirth and between 2 million and 5 million deaths in childhood avoided each year by 2015. About 2 million deaths due to tuberculosis might be avoided in 2015 with appropriate drug treatment, or about 10 million cumulative deaths. Tripling cessation rates among current adult smokers would prevent 60 million premature deaths due to tobacco-related disease by 2050, and perhaps double that number. The HIV epidemic is bound to grow, but properly tar-

geted prevention programmes could prevent over 100 million additional people being infected in 2015 alone, and care programmes can provide humane treatment for those already infected.

It is important to note that, since a great deal of the spending would go into strengthening health systems overall, the relation between cost and benefit is strongly nonlinear. Spending of half the amount envisioned would purchase considerably less than half the benefits described. If the levels of spending are not achievable, it would make sense to focus efforts more narrowly. If forced to pick one set of interventions to prioritize in such circumstances, we would stress prevention of new HIV infections.

To sustain these unprecedented levels of commitment will require political will. It will also require significant new efforts in monitoring the state of the world's health, and it will benefit immensely from research into yet better ways of intervening. There is a need for research on improving treatments and preventive options (notably vaccines against HIV and malaria). There is also a need for research into how best to deliver interventions, whether they be old or new, and especially how best to deliver them to the poorest groups, and how to encourage communities to embrace their use.

Poverty is a complex phenomenon. It cannot be reduced to a matter of health policy. But we believe that priority health interventions offer a peculiarly effective tool in the fight against poverty. Ill health hurts the poor both directly and indirectly: the poor die earlier; they suffer more; they pay more, as a proportion of income, for their treatment (which is often inappropriate); and they shoulder more of the duty of care for the sick because it is in their families that the greatest burdens of sickness are to be found. There are interventions available that could make these burdens drastically lighter, and offer hundreds of millions of people the opportunity to lead more productive and more fulfilled lives.

I. THE CHALLENGE

The second half of the twentieth century saw great improvements in the health of the world. But the poorest billion people still suffer under an intolerable burden of illness. Most of the conditions that afflict them are amenable to health intervention, and interventions aimed at a small number of conditions could make a great difference. Effective public health systems are needed if these interventions are to reach the poor, and in the light of past progress, establishing and maintaining such systems is a feasible goal. However, it will require a new commitment in terms of resources and priorities both within low- and middle-income countries and in the wider global community.

The second half of the twentieth century saw an unparalleled improvement in global public health. Between 1960 and 1995, life expectancy in low-income countries of the world improved by 22 years, as opposed to 9 in the developed countries (Table 1.1). On a global average, the under-five mortality rate declined from 16% in the 1960s to 8% in the 1990s, with marked decreases in every decade. Over the past three decades, various vaccination campaigns and child survival strategies have increased by millions the number of children protected against the predations of common childhood infections, and mortality has also fallen among nonsmoking adults. Overall, these improvements have been much faster than can be accounted for by the growth of income levels and faster than the equivalent changes in mortality in the developed world that took place in the late nineteenth and early twentieth centuries. They have also affected the lives of far more people.

However, despite these impressive achievements, the total burden of preventable disease in developing countries remains shockingly high. In 1998, almost a third of deaths in low- and middle-income countries were due to communicable diseases, maternal and perinatal conditions, and nutritional deficiencies (Table 1.2): this is a death toll of 16 million, equivalent to the population of the Netherlands. A tenth of those deaths—1.6 million—were from measles, tetanus, and diphtheria, all diseases routinely vaccinated against in wealthy countries. Half a million women die in childbirth every year. Tuberculosis is responsible for 1.5 million deaths, and malaria for more than a million (Table 1.3). Twenty-two million people have died of HIV/AIDS, 36 million people are infected with the virus,

Table 1.1 POPULATION, ECONOMIC INDICATORS, AND PROGRESS IN HEALTH

Region			Income per capita		Child mortality		Life expectancy at birth (years)		
	Population, 1998 (millions)	Deaths, 1998 (millions)	Dollars 1998	Growth rate, 1990–98 (per cent per year)	1960–1964	1995–1999	1960	1995–2000	2015 (est)
<i>WHO demographic region</i>									
Africa	602	9.1	598	2.2	222	160	41	50	53
Eastern Mediterranean	474	3.7	1 335	1.9	172	96	45	62	67
Europe	859	9.1	12 415	3.1	52	22	51	73	75
South-East Asia	1 485	12.9	593	5.9	222	97	44	62	68
The Americas	806	5.8	13 180	3.1	101	32	63	72	75
Western Pacific	1 659	12.0	4 693	3.0	169	38	42	71	74
<i>World Bank demographic region</i>									
Sub-Saharan Africa	610	9.4	539	2.4	221	163	40	49	53
South Asia	1 320	11.9	439	5.8	232	108	44	61	67
East Asia and Pacific	1 787	13.2	844	8.5	184	47	39	69	72
Europe and Central Asia	467	5.2	2 184	-2.5	64	31	33	69	72
Latin America and the Caribbean	501	3.2	3 876	3.5	145	42	56	69	73
Middle East and North Africa	291	1.9	1 709	2.5	136	63	47	67	72
High-income OECD	886	7.7	27 644	3.0	39	8	69	78	80
Other high-income	24	0.1	18 044	3.7	50	12	64	78	81
<i>World Bank income region</i>									
Low Income	3 345	31.8	510	7.6	210	103	40	62	66
Lower Middle Income	1 146	9.5	1 624	0.4	121	51	40	67	72
Upper Middle Income	484	3.5	4 701	3.2	132	37	54	69	71
High Income	909	7.8	27 402	3.0	39	8	69	78	80
<i>World</i>	5 885	52.6	5 337	3.1	160	79	47	66	70

Sources: World Bank, 1999; UN Population Division, 1998.

Note: Child mortality is the probability of dying between birth and age 5, expressed per 1000 live births; life expectancy at birth is the average number of years that a person would expect to live at the prevailing age-specific mortality rates.

Table 1.2 CAUSES OF DEATH IN LOW- AND MIDDLE-INCOME COUNTRIES, 1998

Cause	Number of deaths (millions)	
	Male	Female
All causes	24.4	21.5
Communicable diseases, maternal and perinatal conditions, and nutritional deficiencies	8.0	7.9
Noncommunicable conditions	12.9	11.8
Injuries	3.5	1.8

Source: World Health Organization, 1999.

Table 1.3 TOP TEN CAUSES OF DEATH IN LOW- AND MIDDLE-INCOME COUNTRIES, 1999

Rank	Cause	Number of deaths (millions)
1	Ischaemic heart disease	5.5
2	Cerebrovascular disease	4.2
3	Acute lower respiratory infections	3.1
4	Other cardiac diseases	2.6
5	HIV/AIDS	2.3
6	Diarrhoeal diseases	2.2
7	Childhood diseases	1.6
8	Tuberculosis	1.5
9	Malaria	1.1
10	Road traffic accidents	1.0

Source: World Health Organization, 1999.

and its spread continues unabated in many populations; within a decade or so this epidemic will have killed more people than any other in history. On current trends, tobacco-related disease could account for a billion deaths by the end of the twenty-first century.

These problems are terrible in their effects; however, they are not numerous. Most avoidable deaths in developing countries result from a relatively small number of diseases and conditions. And although it is important that better ways of treating and preventing many of these diseases be developed, there are already effective interventions that can reduce the mortality associated with each of them. Progress is limited neither by an intractable complexity inherent in the problem, nor by ignorance of what needs to be done. It is limited by the lack of health systems strong and well funded enough to deliver a relatively small number of relatively cheap interventions to a great many poor people.

The diseases and conditions that account for the burden of disease in developing countries are not evenly spread. They are concentrated in the poorest countries and the poorest populations, though their effects are clearly felt more widely. The people most affected either do not currently have access to effective interventions for treatment or prevention or are not in a position to benefit from such interventions. They are excluded by lack of resources, lack of political empowerment, and pernicious market failure.

Continuing the extraordinary gains made in public health in the past century requires a commitment to helping these people. Such a commit-

ment will demand two courses of action. One involves aggressive research and development efforts aimed at improving and supplementing current interventions, particularly in the areas of HIV and malaria. The other involves improving the health services to which the poor have access and scaling up the availability of the necessary interventions.

Extending the benefits of a variety of current interventions to the poor requires a thoroughgoing approach to the development of health systems. It will require the removal of various constraints—financial, organizational, political, and in some cases societal—that have impeded the widespread application of these interventions in the past, or will impede attempts to increase their reach in the future. Such an extension requires a focused and sustained commitment of resources and an exercise of will both at the political and the managerial levels.

Such an extension of services would also require substantial investment. In the countries for which Working Group 5 has undertaken a costing analysis—all the countries of sub-Saharan Africa and all other countries with a per-capita GNP below US\$ 1200—the spending required to increase the provision of high-priority interventions at the quickest sustainable rate would fall in the range of 40 billion to 52 billion dollars (US\$ 2002) annually by 2015. This money would be spread across a range of interventions and, crucially, would be spent on the part of the health system most vital to their delivery—the part that this Report refers to as the *close-to-client* segment. Details of this costing analysis (along with a discussion of the benefits that could be expected from such spending) form Chapter 4 of this Report.⁵

Much of this money, we imagine, would come from the countries where the interventions are needed. Spending on health in the countries in our costing analysis currently runs at about US\$ 106 billion a year (US\$ 2002). Even if these countries significantly increase their health spending, it is unrealistic to imagine that all of them could meet the entirety of the costs suggested. The main report of the CMH puts the requirement for external funding from donors at a third or so of the total cost, with a requirement in the region of US\$ 22 billion a year by 2007 and US\$ 31 billion by 2015. Most of this would be spent on increasing the capacity of the health system in the least developed countries to help the poor, and on paying for those interventions. This level of effort would need to be maintained for at least 10 years beyond 2015 in order to provide time for the benefits envisioned to become sustainable; it would also be dependant on the existence of practical plans for making effective use of the money.

Such spending represents a massive commitment in the context of a world where the level of official development assistance from rich countries devoted to health programmes in low- and middle-income countries, as estimated by the CMH Report, has recently been a total of about US\$ 5 billion a year for all the rich countries; it would require new commitments from the international community, and in all likelihood would also require new mechanisms through which those commitments might be met. However, no conceptual breakthroughs are required to translate that level of effort into improved health for the world's poor, and the achievable benefits more than measure up to the size of the commitments required. Historic improvements in the state of the world's health are both achievable and necessary.

1.1 THE BURDEN ON THE POOR

Although there is no doubt that a lack of wealth goes hand in hand with a lack of health in much of the world, this does not have to be the case. It is possible for populations with very little money to enjoy high levels of health. That depends, however, on the populations enjoying the benefits of a functioning health service, and this is precisely what far too many of the world's poorest billion lack.

Poor nutrition, poor sanitation, and crowded living conditions combine with a lack of access to care to make the poor peculiarly susceptible to all sorts of disease. In India, the prevalence of tuberculosis, childhood mortality, and tobacco use is three times higher among the lowest-income groups than among the highest. Maternal mortality is one of the health indicators most closely associated with poverty around the world. Increased susceptibility is matched by a lack of options for prevention and treatment. In Mali, 67% of children in the highest quintile of family income receive immunizations for diphtheria, pertussis, and tetanus, while only 17% in the lowest quintile do; in India, the equivalent figures are 83% and 31%. Largely unreached by public health systems, the poor rely heavily on the private sector, by which they are poorly served, and reliance on this sector increases their poverty. Ill health makes people poor, keeps people poor, and often makes them poorer still: the World Bank's *Voices of the poor* report found ill health to be the most frequent trigger of slides into increased poverty.

The plight of the poor demands action of many different types, some of which—such as improved water supply, sanitation, and domestic energy, or improved access to education—will have significant impact on health. However, we believe that investment in health interventions offers

a uniquely powerful way of improving the lives of the poor. The strength and mutually reinforcing nature of the links between ill health and poverty suggest the possibility that building up public health systems to deliver a small number of crucial health interventions to the poor may be peculiarly beneficial. Improved access to health will not only save lives: it will also be a powerful facilitator for more general goals such as promoting opportunity, enhancing security, and facilitating empowerment.

Improved health outcomes contribute to the promotion of opportunity both directly—since healthy people and those with healthy dependants have far greater economic opportunities than do the sick—and indirectly—since good health is a powerful enabler of education, among other things. A system that can provide healthcare to poor people also clearly enhances their security, giving them a new source of resilience in the face of economic or environmental challenge. The process of improving health outcomes is also likely to both require and enhance the empowerment of the poor—to give them voice and choice where now they have neither. The presence of some clearly beneficial interventions will stimulate a demand for more such interventions in a virtuous circle that will involve poor people more directly in the processes that determine their opportunities. Investments in the health of the poor cannot end poverty; but they can make it easier for those born poor to escape poverty, and for those who become poor to restore their prospects.

The benefits of investing in the health of the poor are not all captured by the poor themselves. Interventions that favour the wealthy sometimes have benefits that trickle down to the rest of society; interventions that favour the poor can have benefits that buoy up those above. In the public health field, the practical problems of designing programmes to reach the poor will mean that many, though not all, pro-poor interventions will in fact be universal in distribution. The most obvious example is vaccination. Such universal measures have effects throughout society. Other advantages in public health come from the fact that the poor, more burdened with disease, can in some circumstances act as a reservoir for infection. There are indirect benefits, too. Increases in levels of education and economic potential among the poor will be felt throughout the economy.

This is not to say that a policy designed to help the poor in particular is without opportunity costs; but these costs are relatively small. In countries that are facing drains on their health resources due to the diseases of an ageing population on the other side of the epidemiological transition—which will for the most part be middle-income countries,

rather than low-income countries—only a small proportion of total expenditure will be required to target the diseases of the poor.

1.2 TARGETING THE RESPONSE

According to World Bank figures, in 1998 there were 1175 million people living on the equivalent of less than US\$ 1 a day (in terms of 1993 purchasing-power parity). In sub-Saharan Africa, there were 10 countries where 50% or more of the population lived on less than US\$ 1 per day, and an additional 10 countries where between 30% and 50% of the population lived on the same amount (Figures 1.1a and 1.1b). In South Asia and Latin America, there were 6 countries where between 30% and 50% of the population lived in poverty, though none where the level was over 50%. India alone was home to about 400 million poor people. Though in China the proportion of the people living in poverty was only 19%, the country's poor population of about 235 million people was second in size only to India's.

In the analysis in this Report we will look at all the countries of sub-Saharan Africa and at low- and lower-middle-income countries elsewhere, using a cutoff of US\$ 1200 per capita GNP. The population of these countries, in total, is considerably more than a billion, but these are the countries where the vast majority of the poorest billion live. In our recommendations for action within these countries, we will be bearing in mind the need to reach the poor, whether they are majorities or minorities. This may require specific approaches tailored to women, internally displaced people, migrants, the urban poor, the old, and the excluded.

Though tailored approaches will definitely be needed, the easiest way to reach the poor, and the basis on which to build such approaches, will often be through some form of universal access. Such access will also help people who are not poor; this represents, in some sense, an inefficiency in targeting, but this inaccuracy leads to collateral benefits—lives saved—rather than collateral damage. There are legitimate worries that universalism may crowd out the development of private systems; this possibility should be borne in mind and mitigated, perhaps through use of the private sector as a means of delivery when appropriate. Too narrow a focus on the poor, however, runs the risk of increasing the costs per life saved while forgoing the opportunity to save additional lives at lower cost.

The countries under discussion vary as widely in their governance as in their geography; they include functional democracies with high levels of accountability and extremely dysfunctional autocracies. Countries with low standards of governance and/or high levels of corruption clearly rep-

Figure 1.1a PER CENT OF TOTAL POPULATION LIVING ON LESS THAN US\$ 1 PER DAY

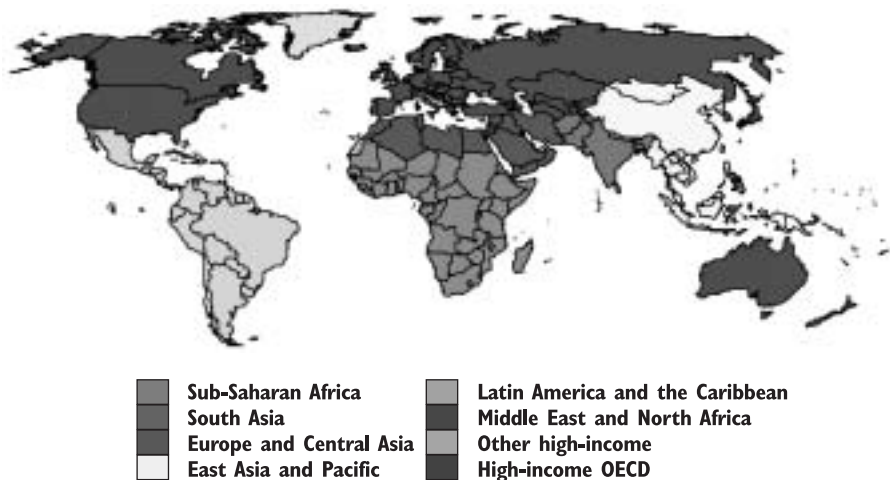
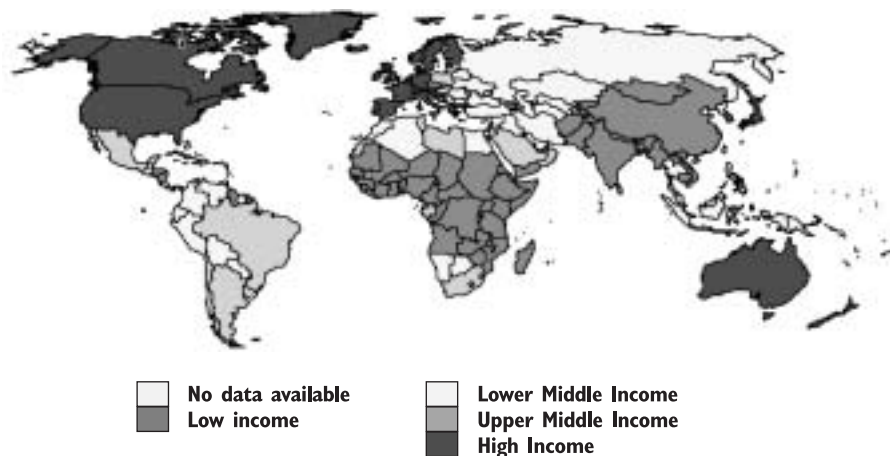


Figure 1.1b PER CENT OF TOTAL POPULATION LIVING ON LESS THAN US\$ 2 PER DAY



Source: World Bank, 2001a.

resent difficult locales for the effective and sustained provision of interventions. In such circumstances, as in countries with extremely poor physical infrastructures, the scope for action is clearly highly constrained. It must always be kept in mind, however, that these countries represent only a relatively small part of the problem. Most of the world's poorest billion

live in countries with sufficient governance, which already have functioning health systems serving large parts of their populations. Eighty per cent of the world's tuberculosis burden, for example, is in such countries.

Even in the lowest-income countries, though, and in the countries where action is most highly constrained, the difficulties entailed in delivering health care interventions are not insurmountable, nor should the current barriers prove unyielding in the face of concerted long-term efforts to reduce their effect. It is encouraging to see that in the most constrained countries, differences in health between the richest and poorest quintiles of the population are less marked for conditions against which concerted global campaigns have been undertaken than they are in other areas. It is also worth noting that in particularly poor and highly constrained countries the room for improvement is typically larger than it is elsewhere, which may make interventions in those countries even more cost effective; lifting an immunization level from 20% to, for example, 50% in a highly constrained country, may achieve more and cost less than lifting the rate from 80% to 90% elsewhere.

Although it is not possible to guarantee that all barriers to implementation can be manoeuvred around, bought out, or removed through political action, it is important from the outset to agree that this is what should be attempted if the aim is to achieve the greatest impact possible.

1.3 A WORLD HALF HEALTHY

Although standards of health in these countries, and in particular among the poor in these countries, are still unacceptably low, it is important to recognize how much better these standards are now than they were 50 years ago. Health improvements in developing countries have been considerably quicker than equivalent progress during the industrialization of the north in the nineteenth century. In the first decades of the twentieth century, when the United States enjoyed a per capita GNP equivalent to about US\$ 5000 in today's terms, the average life expectancy was about 50. Today, countries with GNP per capita levels as low as US\$ 1000 can manage a good bit better than that, and countries with per capita GNPs of US\$ 5000 do far, far better. In Chile, where GNP per capita is US\$ 4700, the life expectancy at birth is 75. All over the world the rate of progress in health outcomes has consistently outstripped the rate of economic growth.

A particularly striking form of progress has been the historically unprecedented ability to move beyond the control of diseases to their elimination or eradication.⁶ The eradication of smallpox stands with landing

on the moon as a paradigm-shift in human achievement, while far outstripping the Apollo missions in terms of practical benefit. Polio, already humbled to such an extent that its contribution to the global burden of disease is minimal, faces eradication in the near future. Such eradications are not merely great public health achievements: they also represent a recurrent saving in the form of vaccinations no longer required. Although it is still a major killer—800 000 deaths in 1998—the elimination of measles is no longer outside the bounds of possibility if global vaccination levels can be raised. Malawi, one of the poorest countries in the world, has recently committed itself to high levels of routine measles immunizations and to campaigns to catch those missed out by routine efforts. In 1999, no child in Malawi died of measles, and only two confirmed cases were reported throughout the country.

Vaccination is not the only success story. Short courses of tuberculosis therapy provided in settings that support adherence to the drug regimen are achieving excellent cure rates in the treatment of tuberculosis. The introduction of directly observed therapy, short course (DOTS) in Peru reduced deaths by 80% in three years and cut incidence of the disease there in half over a decade. In much of Asia and Latin America, deaths due to malaria were reduced spectacularly with the introduction of modern insecticides, and the resurgence of the disease, while worrying, has never threatened to raise the death toll to anything like what it was. Many countries have succeeded in reducing maternal mortality. Widespread promotion of oral rehydration therapy, along with improved sanitation, have made significant inroads into the dreadful toll of diarrhoeal disease among children: death from diarrhoeal disease around the world has dropped from an estimated 4.6 million a year in 1980 to 3.3 million a year in 1990 to 1.5 million a year in 1999.

Impressive as they are, though, these achievements represent a task only half finished: they are at best a work in progress, at worst a duty abandoned. Although one cannot but be impressed that the world has reduced child mortality rates from 160 per thousand to 79 per thousand, one must at the same time realize that in Africa the rate is still 160 per thousand, and that in some African countries the rate may be rising rather than falling. One should celebrate the fact that in India the likelihood of a child dying under five has, on average, declined by 2% every year since the beginning of the 1970s; but not without seeing that the gains have been much greater in some places than in others. If the child survival rates of the third of Indian states that have had the greatest success in reducing

child mortality could be reached by the other two-thirds of the states, 1 million children a year would be saved.

1.4 THE CURRENT CRISIS

The position is not just one of incomplete progress; it is one of incipient backsliding. Improvements in public health worldwide are slowing down. Although child mortality around the world has declined in every decade since the 1950s, it did so at a significantly higher rate in the 1970s and 1980s than it did in the 1990s. The single greatest influence on child survival has been vaccination, and in the 1990s, levels of childhood vaccination reached a plateau for the first time in decades. Although in 1990 it was estimated that four in five of the world's children were reached by programmes offering the six vaccines of the Expanded Programme on Immunisations (those six vaccines are against measles, polio, childhood tuberculosis, diphtheria, pertussis, and tetanus), recent research at WHO and UNICEF suggests the proportion was in fact about 75%; today the proportion is put at 74%. Coverage in sub-Saharan Africa and South-East Asia has declined, and coverage with other valuable and effective vaccines widely used in the developed world is even poorer. It is also the case that, in many countries, the percentage of mothers who receive trained assistance at birth is falling.

The effect of stalled progress and possible regression is felt most keenly by the poor—the last to be reached as access to healthcare expands, the first to be passed over when it contracts. When vaccination levels drop, it is poor children who are more likely to be missed, and poor parents who are thus most likely to have to tend sick children. Such problems add to the more general trends that act to concentrate disease among the poor.

There are various ways of explaining the slow-down or reversal of progress in public health. In some countries, spending on public health has simply declined in absolute terms. This has most notably been the case for countries that are in economic collapse, that are in the process of structural adjustment, and/or that are heavily indebted, but it has also been the case elsewhere. Although public spending has not actually fallen in India, for example, over the 15 years after 1985 public spending declined as a proportion of GDP, falling well below 1%. Declines in spending help account for decaying health systems, poor monitoring, and lack of vaccination capacity, among other things. In some of these countries, and in others where funding has not fallen, changes in the structure of public health systems may also have been a factor. The introduction of user charges has commonly led to a decrease in the uptake of medical services,

especially among the poor, and to a deterioration in outcomes. Structural changes in the organization of the health care system have damaged outcomes in some countries; over-aggressive decentralization, for example, has in some places led to declines in quality of service and a lack of technical support.

Another possible cause of slowed progress might be changes in the level of development aid. Although aid targeted at health rose on average in the 1970s, 1980s, and 1990s, there was a plateau in spending in the late 1980s and early 1990s. During the 1990s, the proportion of bilateral official development assistance going to the least-developed countries fell by 15 percentage points, from 40% to 34%. Another factor in worsening outcomes is that the challenge is actually increasing over time, especially in parts of Africa. The HIV/AIDS epidemic represents an unprecedented challenge to public health systems as well as an unconscionable threat to entire populations. In Botswana, a 15-year-old woman, all risk of childhood disease behind her, now enjoys less than one chance in four of reaching her sixtieth birthday, whereas 15 years ago she had three chances in four of surviving to that age. High levels of HIV infection are contributing not just to death from AIDS but also to the resurgence of tuberculosis. Stressed health care systems are not able to respond to other problems; increasing numbers of orphans are at high risk of many diseases.

At the same time, the effects of smoking are increasing throughout low- and middle-income countries, as more and more smokers are reaching the time in their life when tobacco-related disease becomes more prevalent. Eight out of every 10 of the world's 1.1 billion smokers live in low- and middle-income countries. In the past 50 years, about 70 million smokers died of conditions related to tobacco use, about half of them in middle age, and 15% of them in low-income countries. In the next 50 years, the figure is expected to be about 500 million, with 70% in low-income countries.

There is another possible explanation for the slowdown in progress—one to which we do not subscribe but that is important to discuss. It might be argued that this slowdown is evidence of the fact that the primary determinant of health is economic development. It would be quite consistent with this analysis to argue that specific interventions in the 1960s, 1970s, and 1980s had allowed one-time health improvements that put developing countries ahead of the curve, but that in the long term that curve would reassert itself and further improvement would have to wait for increased wealth. Determinism of this form, however, is unwarranted.

Although it is true that people in richer countries have better health than those in poorer countries, and that statistical analysis suggests that levels of income account for the lion's share of differences in health status, this sort of analysis ignores the overall historical trend towards better understanding of health issues. Knowledge about how disease is spread and how it can be dealt with accounts for most of our success in dealing with it. That knowledge is most easily found and used in wealthier nations, where much of it has been developed—not as a result of the generation of wealth, but as a result of the same process of scientific and technological progress that led, in part, to that generation of wealth. But that knowledge is not rooted in wealth. It can be moved and used elsewhere.

1.5 A NEW COMMITMENT

Global public health is at a critical point. Great gains have been made and great gains are still possible. At the same time, progress is clearly slowing in many fields, and in some areas the burden of some diseases is growing markedly. The time is thus right for a new commitment to international action. This should take the form of a sustained programme aimed specifically at helping health systems in developing countries to control the most serious causes of ill health among the poor. It should make use of interventions that have already proven effective but that are not, at present, being applied as widely as necessary.

Implementing such a programme will neither be quick nor cheap. Due care will have to be given not only to the choice of interventions and the provision of material, but also to the sustainable development of a health system capable of using that material; the lack of such a system is at present a daunting constraint.

In an attempt to map out what might be done to take advantage of this potential turning point, and to change the crisis into an opportunity, the following four parts of our Report examine:

- the range of interventions such a programme might seek to see used;
- the nature of the constraints faced in trying to scale up these interventions and the measures that can be taken to ease those constraints;
- the costs of making the material for such interventions available and building up the capacity for their use, and the impact that such spending could have on meeting the UN millennium development goals; and
- the nature of the continuing commitment involved in seeing the project through to completion over a period of a quarter century.

2. THE OPPORTUNITY

An analysis of avoidable mortality suggests that most of the burden of ill health shouldered by the poor could be alleviated through a relatively small number of interventions aimed at some specific areas. Effective interventions exist in all these areas. The widespread implementation of these interventions depends on a functional close-to-client health system that makes services truly accessible to the poor.

The health prospects of the poorest billion of the world's population could be radically improved by targeting a relatively small set of diseases and conditions responsible for a great deal of mortality. The primary targets are maternal and perinatal mortality; widespread causes of childhood disease including measles, tetanus, diphtheria, acute respiratory infection, and diarrhoeal disease; malnutrition that exacerbates those diseases; malaria; tuberculosis; tobacco-related disease; and HIV/AIDS. This part of our Report examines the importance of these conditions and assesses interventions of proven effectiveness against them.

2.1 AVOIDING DEATH

The value of focusing on a specific group of diseases is borne out by an analysis of avoidable mortality. Although death in old age is unavoidable, death before middle age is largely avoidable. Our definition of *avoidable mortality* is a population's excess risk of dying before age 70 as calculated through comparison with the death rates in another population. Working Group 5 has compared mortality in low- and middle-income countries with that experienced by nonsmokers in the richest countries on an age-adjusted basis. This allows the conditions associated with the greatest excess mortality to be identified.

It should be obvious that not all the "avoidable" mortality identified by this approach can, in fact, be avoided in the near term. Though the process raising health outcomes to the levels enjoyed in the developed world need not be as slow as many might imagine, it cannot be rendered arbitrarily short. It is not unreasonable, however, to think of this level of health (ideally one provided with less of the overtreatment and waste prevalent in the currently rich countries) as an ultimate aspiration. Although comparing mortality in developing countries with that among nonsmokers in rich countries may seem to exaggerate the avoidable mor-

Table 2.1 RISK OF DYING AND AVOIDABLE MORTALITY (AS PER CENT) IN LOW- AND MIDDLE-INCOME COUNTRIES, 1998

Risk of dying	Males at ages			Females at ages		
	0 to 4	5 to 29	30 to 69	0 to 4	5 to 29	30 to 69
Low- and middle-income countries (a)	8.6	6.1	35.0	8.2	5.6	26.7
Nonsmoking high-income population (b)	1.2	2.2	19.2	1.0	0.9	12.6
Excess risk of dying (avoidable mortality) in low- and middle-income countries (c = a – b)	7.3	3.9	15.7	7.2	4.7	14.2
Relative contribution of avoidable mortality to risk of dying in low- and middle-income countries (d = c/a)	86	63	45	88	84	53%

Source: Nguyen *et al.*, 2001.

Note: These countries include countries in Eastern Europe and Latin America with incomes above our US\$ 1200 per capita. Analyses restricted to regions where the latter countries are the majority show even greater risk of death (data not shown).

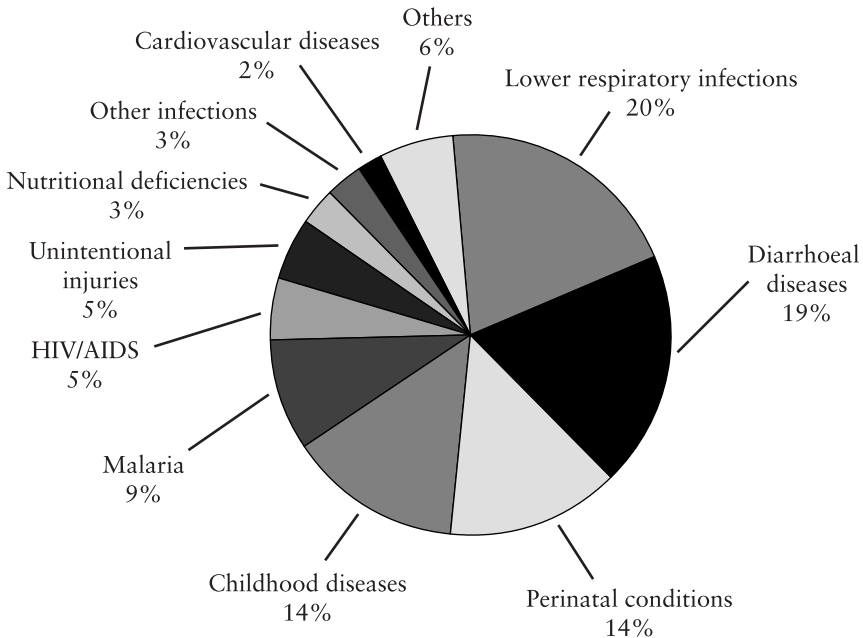
tality, there are known interventions that can substantially reduce smoking; it seems valid to use nonsmokers as the baseline in an attempt to delineate the maximum conceivable improvement.

Breaking the results down into three age groups, the study found that avoidable mortality accounts for about 87% of the deaths among children up to the age of 5 in low- and middle-income countries (Table 2.1). Among males aged from 5 to 29, 63% of total mortality was calculated to be avoidable, while for females in the same cohort the figure was 84%, the higher level largely due to risks incurred through pregnancy and childbirth. Among women from 30 to 69, 53% of the mortality was avoidable; only among men in that age range did avoidable mortality fall to less than half total mortality, at 45%. These are large percentages of large numbers.

Looking at communicable disease alone, the picture is yet sharper in its contrast. Avoidable mortality due to these causes represents around 90% of all mortality in all age/sex classes other than that of middle-aged men, for whom the figure is 80%. These are all average figures for low- and middle-income countries: among poor populations in these countries, the situation is undoubtedly considerably worse.

The analysis of avoidable mortality is important both because it gives a clear sense of the absolute room for improvement and because it reveals that only a handful of conditions are responsible for most of the differences in mortality between rich and poor. Among children under 5, diarrhoea, perinatal conditions, vaccine-preventable diseases, infections of the

Figure 2.1 CONTRIBUTION OF DIFFERENT CAUSES TO THE 7.3% EXCESS RISK OF DYING AMONG MALES OF 0–4 AGE GROUP IN LOW- AND MIDDLE-INCOME COUNTRIES

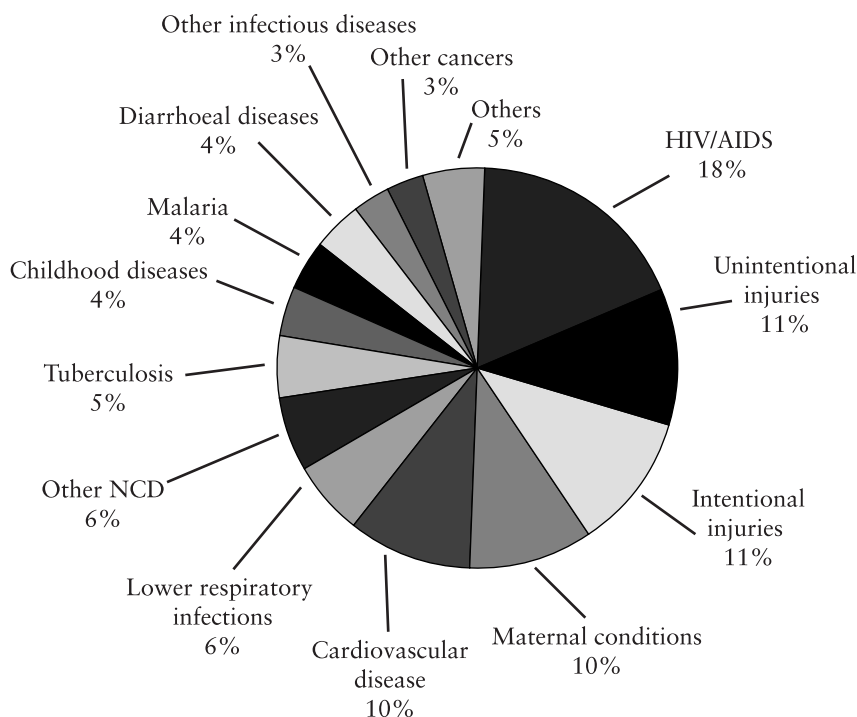


Source: Nguyen et al., 2001.

lower respiratory tract, and malaria are the direct causes of about three-quarters of the total excess mortality (see Figure 2.1 for the contribution of different causes for males aged 0 to 4 years). Between the ages of 5 and 29, the conditions that account for most of the difference are HIV/AIDS, injury, cardiovascular disease, maternal conditions, and tuberculosis (see Figure 2.2 for females aged 5 to 29 years). The spectrum is similar among the middle aged, with the addition of lung diseases including lung cancer (see Figure 2.3 for women aged 30 to 69 years).

Thus, though it underlines the scale of the problem, the avoidable mortality analysis helpfully circumscribes the range of actions to be considered by making it clear that a relatively small number of conditions accounts for most of the problem. A significant reduction in deaths due to these diseases would represent a major reduction in overall avoidable mortality for the poor. It is also important to note that prevention and treatment for most of these conditions can be provided through local health

Figure 2.2 CONTRIBUTION OF DIFFERENT CAUSES TO THE 4.7% EXCESS RISK OF DYING AMONG FEMALES OF 5–29 AGE GROUP IN LOW- AND -INCOME COUNTRIES

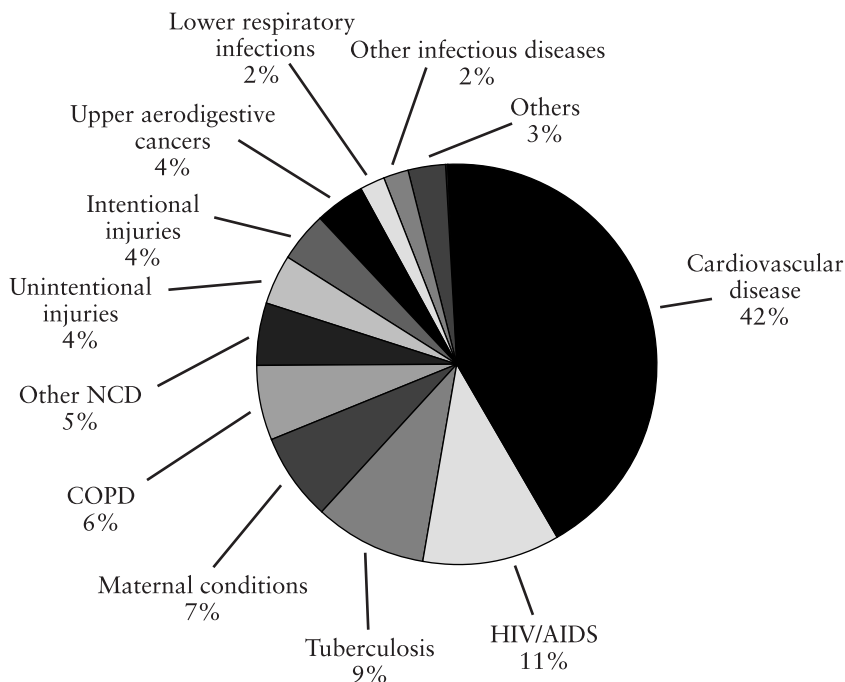


Source: Nguyen et al., 2001.

systems and their outreach services—they do not require systems of great sophistication.

Although focusing on a particular set of diseases defined by means of mortality is a simplification, it is also broadly justifiable. Although for some purposes it is appropriate to use more sophisticated measurements of the burden of ill health that take morbidity into account, such as the disability-adjusted life year (DALY), in terms of planning a broad strategy—the effects of which will be clearly measurable—these possibilities do not diminish the role of mortality as a key indicator. There are three reasons for this. In poor countries, mortality frequently accounts for the bulk of the burden as measured by more sophisticated approaches: in sub-Saharan Africa, 77% of DALYs lost are lost to death; in India the figure is 72%. Morbidity correlates reasonably closely with mortality in the conditions under discussion, so measures to reduce mortality will also reduce

Figure 2.3 CONTRIBUTION OF DIFFERENT CAUSES TO THE 14.2% EXCESS RISK OF DYING AMONG FEMALES OF 30–69 AGE GROUP IN LOW- AND MIDDLE-INCOME COUNTRIES



Source: Nguyen et al., 2001.

morbidity. And although records of deaths are far from perfect, they are much more likely to be reliable than estimates of disability, which typically have errors large enough to mask quite substantial improvements. (The need for much better monitoring of mortality and other health indicators is pressing and will be a vital component of any serious attempts to have an impact on the diseases of poverty; this is discussed further in Chapter 5 of our Report.)

Our stress on mortality should not be seen as minimizing the burden imposed by disabling conditions that we are not discussing, such as injury and psychiatric conditions, for both of which powerful interventions are emerging (see Box 2.1 on mental disorders). This stress on mortality also has the effect of not distinguishing between efforts to prevent disease and to treat it; in general there are often strong reasons to prefer interventions that lower caseload and morbidity as well as mortality.

Box 2.1 REDUCING THE BURDEN OF MENTAL DISORDERS

Mental health problems represent 5 of the 10 leading causes of disability worldwide, amounting to 12% of the total global burden of disease; in both developed and developing countries, the poor are disproportionately affected by these disorders. Further increases in the number of sufferers are likely in view of the ageing of the population and worsening social problems in some areas. Thus the burden in terms of suffering, disability, and economic loss, already large—some 450 million people suffer from a mental or behavioural disorder—will grow yet further. This has implications for physical health, as well: depressed patients are at increased risk of non-adherence to drug regimens, for example.

Effective interventions have been developed for most mental and behavioural disorders: the majority of patients can experience remission of symptoms and be rehabilitated if treated. Symptoms can be successfully controlled in about 70% of cases of depression, schizophrenia, and epilepsy, and with ongoing treatment, the chance of recurrence of symptoms is substantially reduced. Treatment for dependence on opiate drugs is also effective and comparable in its success rate with treatments for other chronic conditions such as asthma and diabetes. Appropriate medications are inexpensive in many countries: schizophrenia (US\$ 5/month), depression (US\$ 2–3/month), and epilepsy (US\$ 5/year). Psychosocial interventions, an essential component of the treatment and rehabilitation of most mental disorders, can be applied cost effectively in many cases. In China, for example, a comprehensive intervention for families of patients with schizophrenia reduced the need for inpatient hospital care, improved employment, and saved an estimated US \$149 per family per year, relative to usual care.

Despite the potential to manage mental disorders successfully, almost half of those in need do not receive even the most basic treatment. A recent WHO survey shows that more than 25% of countries do not have access to basic psychiatric medications at the primary care level, and 71% of the world's population has access to less than one psychiatrist per 100 000 people. This gap between effective and available interventions is due to poor resources, government policy, planning, and service development. All too frequently, mental disorders are not given a priority level commensurate with their burden and their ability to be addressed using affordable treatments.

To improve the mental health of populations, it is essential for governments to formulate and invest in a proactive strategy. The Islamic Republic of Iran, for example, has been at the forefront of integration of mental health treatment into primary health care, with the goal of making essential mental health care available for all. Their national programme on mental health was formulated in 1986, and initially implemented in 1987. As of 2000, roughly 23% of the total population has access to the mental health programme, with further gains expected.

2.2 CHOOSING INTERVENTIONS

For each of the sources of mortality considered, there exist effective interventions that would lower the burden considerably were they to be applied more widely. Though better data would be useful on many of the issues, there has been a great deal of research on the effectiveness of interventions aimed at these conditions; much of this research is reviewed in background papers commissioned by Working Group 5. This research has allowed us to recognize which interventions are most worthwhile to stress

in scaling up attempts to improve the health of the poor. The key features of these interventions are that they are effective and that they are capable of being scaled up relatively quickly and applied widely. Epidemiological issues are also important; in the case of AIDS, for example, it is important to prioritize interventions that do the most to minimize the spread of HIV. Although we recognize that many interventions have non-health benefits—for example, water and sanitation services greatly improve quality of life, and school lunch programmes provide incentive for school attendance—we have not attempted to assess these nonhealth benefits in prioritizing interventions. (The issues surrounding water and sanitation are discussed in Box 2.2.)

Cost effectiveness data form a large part of the work reviewed to identify priority interventions, and were very helpful in guiding the choice of interventions; however, cost effectiveness was not the only factor in making these choices. The purpose of our efforts was to find the good value interventions that will tackle the major causes of the burden and then to calculate costs. Thus for each condition we include a range of interventions, both preventive and curative, with a range of cost effectiveness. This approach reflects the fact that the things that matter in this analysis are the total costs and benefits from the package of interventions taken as a whole.

Demand is also a factor to be borne in mind when choosing interventions. Although demand for ineffective interventions should clearly not be met from the public purse, it is important that the priorities of individuals and communities should be discovered and understood, both as a way of choosing interventions and as a necessary part of community outreach and education. Planners of health projects tend to see the health service as active and informed and treat the public as passive and in need of information. But this should never blind us to the need for dialogue designed to redress the balance. Community involvement in health is pragmatically beneficial in improving the design and uptake of intervention packages. It is also philosophically and politically important—the extent to which the poor and sick are treated as individuals with opinions and autonomy matters if the community is to remain involved.

The following broad assessment of interventions follows the reviews carried out for Working Group 5 by a large number of people at a wide range of institutions (see the Report Team and Annexes 3 and 4); these papers, which were themselves subjected to review, are available on the CMH website (<http://www.cmhealth.org/wg5.htm> or www.hefp.lshtm.ac.uk).

Box 2.2 WATER AND SANITATION

The world's poor live for the most part in want of both a reliable source of clean water and decent sanitation. About 1.1 billion people, two-thirds of them in Asia, are without an adequate water supply; about 2.4 billion, four-fifths of them in Asia, are without adequate sanitation. This severely affects the quality of life of the people concerned, especially the women and young girls whose time is taken up fetching water, and also affects their health.

Around 2.7 million deaths annually are attributable to inadequate water, sanitation, and sanitation-related hygiene; most of these deaths are of children under five suffering from diarrhoea. Improvements in the amount of water available and its quality can reduce deaths from diarrhoea by 16% to 25%, with the quantity being the more important factor, and better access to sanitation can lead to even greater improvements in health outcomes than improved access to water. Indeed, improving sanitation and water supply seems no more efficacious than improving sanitation alone.

However, cost-effectiveness analyses have shown improved water supply and sanitation to be costly ways of improving people's health. Case management of diarrhoeal disease is considerably more cost effective than improvements in sanitation, and relatively cheap measures aimed at encouraging people to wash their hands and making soap available have reduced the incidence of diarrhoeal disease by 32% to 43% in different settings, though the improvements may not always be sustainable.

Not only is improved water and sanitation not particularly cost effective as a health measure, it is also high in total costs. The 1993 *World Development Report* estimated cost of access ranged from US\$ 15 to US\$ 200 per person per year. Between 1981 and 1990, more than US\$ 134 billion was invested in efforts to expand water supply and sanitation services, approximately 34% of the sum coming from donors. Although some regions were able to make considerable progress in improving access, few attained any of the goals set. For example, in Africa rural water supply reached an additional 40 million people but only increased access to safe water from 22% to 32% of the population.

In many places it is the poor themselves, rather than their governments, who are acting to improve their lives by investing in water and sanitation. Household surveys in rural India have found that four times as many households invested their own resources in basic sanitation than were reached by government-funded services. Government roles are shifting from ownership and operation of infrastructure to monitoring and regulation of services provided by the private sector. This role is extremely important from a health perspective. The costs of adding management, regulation, and health promotion where infrastructure exists are comparable to other health interventions, and regulation is an important tool to ensure the delivery of expanded services to the poor.

2.3 MATERNAL AND PERINATAL MORTALITY

Of the half million women who die because of pregnancy or childbirth every year, 99% do so in developing countries. Of the 5 million babies who die in the first month of life every year, 98% are from developing countries. In both cases, the highest rates are in sub-Saharan Africa. The proportions are much the same for the 2 million stillbirths. In the devel-

oped world, a woman's lifetime risk of dying because of pregnancy or childbirth is 1 in 1800; in some poor African countries, the risk is 1 in 7.

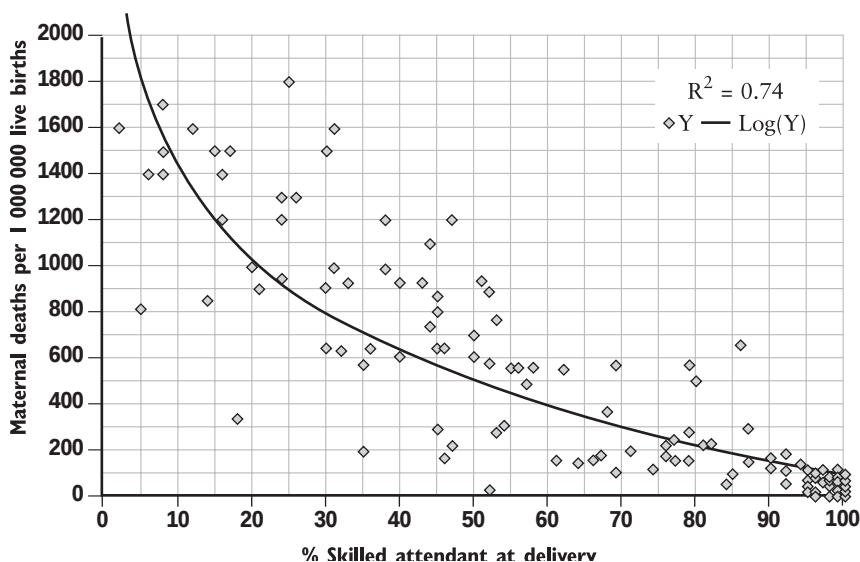
The causes of maternal mortality in the developing world are haemorrhage, which complicates an estimated 10% of full-term pregnancies in low- and middle-income countries and is responsible for one-quarter of the world's maternal deaths; puerperal infection, which also leads to severe subsequent morbidity in women who survive; hypertensive disorders (mainly eclampsia); and obstructed labour, which is almost never a cause of fatalities in developed countries. Unsafe abortions account for 13% of maternal deaths worldwide. Anaemia and concurrent infections are significant factors in exacerbating maternal health problems; in some areas a significant portion of the anaemia is related to malaria infection.

The greatest cause of death among newborns in developing countries is infection, with pneumonia accounting for more than half the infections; tetanus is also a major cause of death, especially in the very poorest countries: 27 countries, of which 18 are in Africa, account for 90% of the tetanus mortality. The likelihood of a case of tetanus proving fatal to a newborn is very high (85% of all cases). Asphyxia is the leading cause of death after infections. Hypothermia, prematurity, and low birthweight, singly or together, are also significant factors in neonatal mortality, exacerbating other conditions or proving fatal in and of themselves.

The key to reducing maternal and perinatal mortality is skilled attendance at birth—a condition that includes the presence of a skilled attendant in an appropriate setting with access to basic supplies and drugs and available and accessible emergency services. Skilled attendants can reduce the risk of death from haemorrhage, and speed and ease some obstructed and prolonged labours and reduce the risk of sepsis; they also play a vital role in referring cases requiring emergency facilities, for example, surgical delivery and blood transfusions. At present, though, almost half of all deliveries in developing countries take place with no skilled attendant at all and emergency services that are inaccessible for a variety of reasons. Skilled attendance at birth explains most of the world's variation in maternal mortality rates (Figure 2.4).

The provision of skilled and equipped midwives and physicians was decisive in the huge drop in maternal mortality in the developed world early in the twentieth century. In the United States, a maternal death rate of 700 per 100 000 births in 1900 was brought below 100 per 100 000 births by 1950. Similar changes—some of which got underway earlier—were seen across the northern hemisphere. This was achieved with little by

Figure 2.4 THE HIGHER THE PROPORTION OF DELIVERIES ATTENDED BY SKILLED ATTENDANTS IN A COUNTRY, THE LOWER THE COUNTRY'S MATERNAL MORTALITY RATIO

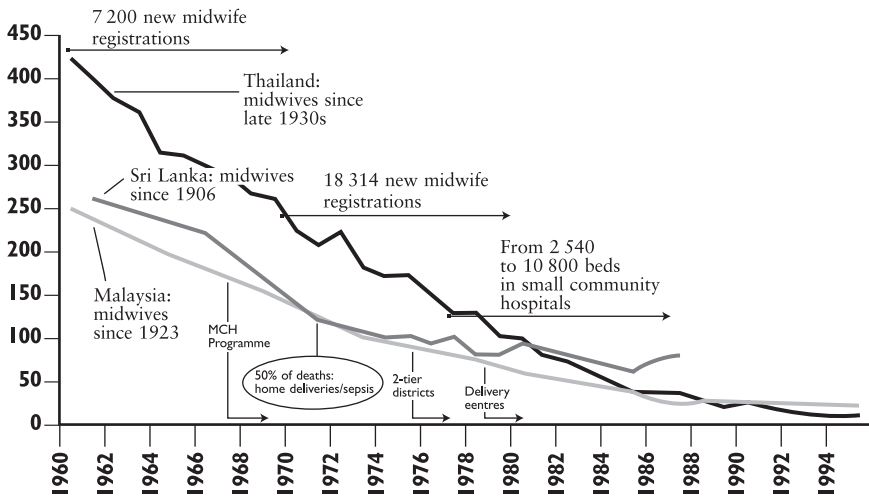


Source: WHO, 2000e.

way of equipment and relatively little by way of training; the crucial factor was access to basic services.

Skilled attendance has also been crucial to more recent and equally dramatic reductions in maternal and perinatal mortality in various countries around the world, such as Costa Rica, Cuba, and Sri Lanka. In Thailand, the number of new midwives was quadrupled in the 1960s and 1970s, and the rate of maternal mortality was quartered, from 400 per 100 000 to 100 (Figure 2.5). Subsequent increases in the number of community hospital beds and doctors have brought the rate down yet further; it is now 44 per 100 000. This last improvement is also clearly dramatic; but by far the greatest part of the improvement seems to be attributable to the build up in midwifery services. Similar successes have been seen in China and Malaysia. Skilled midwives have high levels of commitment to their community—often higher than is the case for doctors—and their training requirements can be met relatively easily. Skilled attendants require appropriate supervision from above as well as support, clear norms, and a recognized system of credentials; with these, the develop-

Figure 2.5 MATERNAL MORTALITY SINCE THE 1960S IN MALAYSIA, SRI LANKA, AND THAILAND



Source: Van Lerberghe and Brouwere, 2001.

ment of a large cadre of birth attendants becomes quite feasible, given financing.

Antenatal interventions are also important, and often extremely cheap if correctly focused. Antenatal care aimed at pre-diagnosis of women likely to suffer difficulties during birth—notably through screening and the treatment of moderate hypertension—has not proven very effective. Inefficient use of resources can also arise through unnecessarily frequent visits to pregnant women—as many as 16 in some countries, when the evidence suggests that 4 or 5 would suffice.

Simple interventions administered over a few visits can be highly effective in improving the outcome for both mother and baby. Two inoculations with tetanus toxoid during pregnancy eliminates the risk of neonatal or maternal tetanus. In concert with iron supplementation, vitamin A supplementation has been shown in Indonesia to be effective in reducing mild anaemia. Though iron supplements clearly improve iron status and reduce the proportion of women with anaemia, they have not so far been shown to have any detectable effect on maternal or fetal mortality. Folate supplementation in pregnancy also appears to reduce anaemia, and before and around the time of conception it has a strong protective effect against neural tube defects in the child. Treatment for malaria is advisable in areas where the disease is endemic, particularly for

women in their first pregnancies (see discussion of malaria below). Presumptive treatment for intestinal worms among women with anaemia may also be advisable in areas of high prevalence. Screening for syphilis, which in some studies has significant effects in half the pregnancies of infected mothers, is cost effective even in populations of low incidence.

Maternal, perinatal, and childhood health also benefit significantly from efforts to improve access to and choice of contraceptives. It is estimated that 120 million married women do not have access to contraception suited to their needs; in large part as a result of this lack of access, 50 million women terminate pregnancies every year, and about 70 000 of these women die during the procedure. Higher maternal age, high parity, and short intervals between pregnancies are all associated both with unmet contraceptive need and with child mortality, and in the case of close spacing the mortality effects are evident in older siblings as well as the newborn. In 1993, the World Bank estimated that meeting unmet contraceptive needs in such situations might prevent 850 000 deaths of children under five annually, and a similar figure probably holds true today. The provision of safe termination of unwanted pregnancies and the proper management of the complications of unsafe abortion have also been shown to play a role in efforts to reduce maternal mortality: it has been estimated that maternal mortality could be reduced by 25% if unwanted high-risk pregnancies could be prevented or safely terminated.

Reproductive health has been recognized as a basic human right, but such rights are of little use without ensured access to quality services. Access, particularly for the rural poor, to family planning and services for the management of pregnancy and its complications is a high priority, and will frequently require government action. Access to family planning is especially important for the young, since adolescent pregnancies are frequently unplanned and particularly prevalent among the poor. There is an important role for the private sector in maximizing the variety of contraceptive methods available and the variety of settings where they can be obtained. Women who fail to get a contraceptive method of choice are much more likely to discontinue contraception.

2.4 CHILDHOOD ILLNESS AND VACCINE-PREVENTABLE DISEASE

In 1910 the life expectancy of a newborn Chilean girl was 33 years. Today it has more than doubled, to 78 years. Of the many factors responsible for this extraordinary progress, the most important is that Chilean girls born in 1910 had a better than one in three chance of dying before their fifth birthday. Today that chance is below 2%. Around the world, progress

against childhood mortality in the twentieth century was strong and steady, with the most pronounced declines in countries with relatively low GNP. Many of these countries have reduced their rates of child mortality more substantially and more quickly than European countries did in the late nineteenth and early twentieth centuries. If worldwide child mortality rates today were the same as the European rates of 1900, 30 million children would die of preventable disease every year. As it is, the total is only about a third of that: 10 million a year.

However, if child mortality rates worldwide were the same as the European rates in 2000, the total would be just 1 million. Twentieth-century achievements suggest that a reduction to this level should be possible. However, the progress that characterized the 1970s and 1980s has slackened off. Rates of improvement in child survival have slowed in India and China; there is evidence of stagnation in parts of Africa, perhaps due to the effects of HIV but also possibly due to deterioration in health care infrastructure.

Progress against child mortality is clearly linked to increases in wealth, decreases in family size, improved maternal mortality, and many other factors, as well as interventions targeted at children themselves. But specific health interventions—such as vaccination, oral rehydration therapy, and improved case management—have an unmatched ability to drive the speed of progress regardless of general levels of economic development.

The most impressive recent results have been due to a particular set of interventions in the field of vaccination. In the 1970s, the Expanded Programme on Immunisations (EPI) was launched to make use of and expand the capacities developed for the Smallpox Eradication Programme, which achieved its goal in 1976. The EPI chose to focus on vaccines for measles, tetanus, pertussis (whooping cough), diphtheria, and polio, along with the BCG vaccine for childhood tuberculosis. Between 1977 and 1990, EPI raised the proportion of the world's children receiving all these vaccines from 5% to 75%, a difference that has been calculated to represent at least 3 million fewer deaths every year.

Unfortunately this progress has not been sustained; during the 1990s the worldwide level of immunizations with the six basic vaccines had not increased. Of the 30 million children not being vaccinated, 25 million live in low-income countries. This population suffers 1.6 million deaths every year due to measles, tetanus, and pertussis. Improvements in the reach of vaccination services could drastically reduce this number, as has been

shown in many countries with successful aggressive efforts against measles.

In attempting to scale up coverage, it is important to note that there can be a useful synergy between vaccination campaigns—which instantaneously reduce the number of susceptible children in the population—and routine vaccination coverage, which reduces the rate at which new susceptibles join the population. Vaccination campaigns can thus help diminish mortality, especially as routine vaccination efforts are scaled up. This sort of approach has worked well in Latin American countries and also in some other countries, such as Malawi, where measles mortality has been reduced spectacularly.

Although expanding coverage presents a challenge, the polio eradication initiative has supplied proof that it is possible for vaccination programmes to access all children in specific target areas; there have been successful polio campaigns in Angola and Afghanistan. It is worth noting that the cold chain required to keep vaccines cool, and on which health systems rely for the storage and distribution in viable form of many vaccines, is an area where the private sector can make a contribution.

If the vaccination effort can usefully be extended to reach more children, it can also usefully be deepened to attack more diseases. It is estimated that about one-quarter of the 2.1 million children who die of acute lower respiratory tract infection each year succumb to *Haemophilus influenzae* type b (Hib), and perhaps twice as many to *Streptococcus pneumoniae*. A vaccine against Hib is widely available in the developed world, but has yet to be widely used in low-income countries, where it seems likely to have a significant effect on childhood pneumonia: a trial in the Gambia has found that Hib vaccination reduces severe pneumonia episodes by over a fifth. Similar vaccines in development and recently introduced against *Streptococcus pneumoniae* may be expected to have an even greater effect; a majority, perhaps a large majority, of childhood deaths due to pneumonia might eventually be avoided through vaccination against these two organisms. Vaccines might also soon be able to offer protection against shigella and rotavirus, responsible for a significant proportion of 1.8 million childhood deaths due to diarrhoeal disease that occur each year.

Estimates by the Global Alliance for Vaccines and Immunization (GAVI) suggest that the addition of Hib and pneumococcal vaccines to vaccination programmes could save 300 000 lives a year by 2005 and 800 000 lives a year by 2010. Further GAVI estimates suggest that

rotavirus and shigella vaccines might save 250 000 lives by 2005 and 600 000 by 2010.

Another effective intervention is childhood vaccination against hepatitis B. Although this infection is not a major cause of death among children, the liver cancer it can give rise to in later life is a significant source of mortality, killing 470 000 a year in low- and middle-income countries. In all, more than 3 million deaths in low-income countries every year might be averted through widespread use of vaccines either in or close to production. Future advances, such as vaccines against HIV or malaria, could more than double the total.

Despite the promise of vaccination as a way of preventing ever more childhood disease, there is also a need for treatment of those who will nevertheless become ill. Between them, the use of basic antibiotics for acute respiratory infections and oral rehydration therapy for diarrhoeal disease has revolutionized the ability of poor communities with limited access to health care to deal with childhood illness. Expanding the capacity for case management and making it simpler to diagnose and treat children, often at home, is now a high priority being championed by the WHO/UNICEF programme on Integrated Management of Childhood Illness (IMCI), an attempt to bring together best practice in the treatment of a variety of conditions under straitened circumstances.

IMCI tackles pneumonia, diarrhoea, malaria, measles, and malnutrition with simple procedures designed to assess the child, diagnose the condition or conditions, treat the child, and counsel the mother or caregiver on care and precautions against further illness. It also targets some forms of anaemia, ear infections, and severe febrile diseases. Diagnosis is made on the basis of clinical signs rather than laboratory testing, and IMCI aims to increase the sensitivity of diagnosis to multiple concurrent conditions. Treatments included in IMCI include a range of antibiotics given presumptively for some pneumonias and for dysentery, antimalarials, and oral rehydration therapy for diarrhoeal diseases. Care is in the home, clinic, or hospital, depending on severity. IMCI requires that mothers and other caregivers be able to look after sick children at home—something that can carry significant costs in terms of time. It also requires that they be helped to learn to recognize when care needs to be sought beyond the home. Encouraging people to seek out care when they and their children require it is an important task in areas where people's experience gives them little reason to try: it should never be overlooked. In one Tanzanian study, 40% of child deaths occurred without a trip to any medical establishment.

Implementation of IMCI had begun in 74 countries as of June 2000. There is evidence that the IMCI approach to case management, where implemented, has led to a higher proportion of well-managed cases, more rational drug use (including less use of ineffective diarrhoea treatments), improved provider morale, and improved perceptions of the quality of care by mothers. The total number of lives on which improved case management can have an impact, however, will remain comparatively small until a greater proportion of cases of severe illness reach health facilities. It is important that outreach designed to make care in the home available be supported while at the same time access to the necessary health facilities be improved.

As infant and child mortality decreases, the relative importance of different conditions will change, as has been seen in various Latin American and Asian countries. Successful programmes for refocusing efforts following this change, such as those in Chile and Cuba, should be learned from. Finally, an emerging area of attention is indoor air pollution, which contributes to child respiratory mortality (see Box 2.3).

2.5 MALNUTRITION

A lack of proper and sufficient nutrients is the direct proximate cause of death for 300 000 children a year in low- and middle-income countries, and its indirect effects are larger still. Malnutrition has been estimated to play a role in half of childhood deaths due to infectious disease, thus accounting for about 2.5 million deaths (Figure 2.6). The causal links run in both directions: malnutrition weakens resistance to disease; disease, particularly diarrhoeal disease, can result in malnutrition. Even moderate levels of malnutrition are associated with increased risk of mortality due to infectious disease. Attacking malnutrition is thus a vital complement to other approaches to limit childhood mortality. It also has important implications for reducing other undesirable outcomes: stunting due to poor nourishment in early childhood is a widespread problem, the repercussions of which continue throughout an individual's life.

Perhaps the most important single factor in childhood nutrition is breastfeeding: it is estimated that 1.5 million childhood deaths could be averted each year by improved breastfeeding and complementary feeding practices. Efforts to improve the duration and exclusivity of breastfeeding are associated with marked declines in mortality. Good nutrition as the child is weaned on to complementary foods is also crucial, and this is an important area for maternal education. IMCI programmes stress the importance of exclusive breastfeeding and appropriate complementary

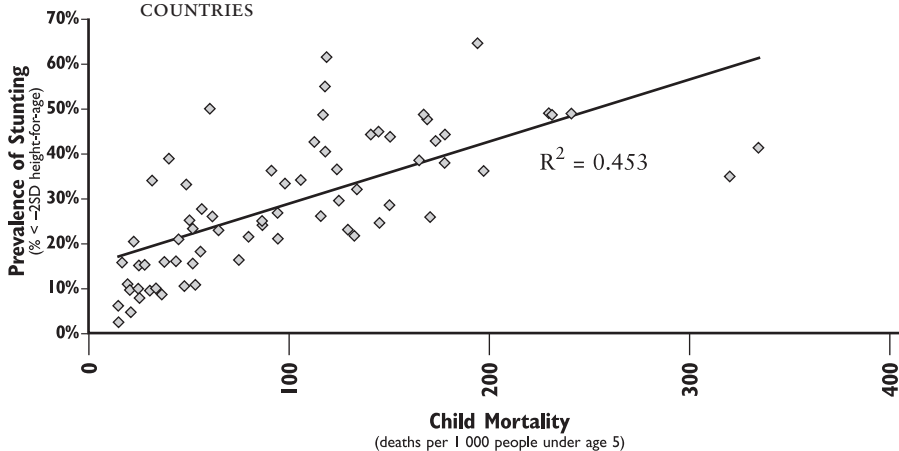
Box 2.3 INDOOR AIR POLLUTION

Smoking is not the only avoidable challenge to the lungs of the poor. Nearly 3 billion people still rely on traditional biomass—wood, charcoal, animal dung, crop wastes—and/or coal for their household energy needs. This reliance leads to high levels of indoor air pollution in the form of particulates. Poor women and young children have the greatest exposure to this pollution, with important consequences for their health, increasing the risk of a range of childhood and adult diseases, including pneumonia and other acute lower respiratory infections (ALRI) in childhood, chronic respiratory disease and lung cancer. The 53 million DALYs associated with indoor air pollution on an annual basis, most of them due to ALRI in children, amount to around 4% of the global total.

A wide range of interventions is available that can reduce the impact of indoor air pollution on human health. These include changes to the source (improved stoves, cleaner fuels), home environment (better ventilation), and user behaviour (keeping children away from smoke during peak cooking times). These interventions can be delivered through policies operating at national level (supply and distribution of improved stoves, cleaner fuels) and local level (through community development). Several hundred improved stove programmes are in place in over 50 countries ranging from entirely local, nongovernmental advocacy efforts—such as the ceramic stoves programme in Kenya—to national initiatives reaching millions of households like that aimed at reducing indoor air pollution in rural China. Initial cost/benefit studies conducted on interventions to reduce indoor air pollution indicate that for mortality, benefits may outweigh costs by a factor of around ten or more.

Well-targeted and locally relevant interventions that include financial support for technical development and production, as well as for infrastructure for marketing and transport (through income generation and/or micro-credit), accompanied by “joined up” decision-making by international players and national governments, are likely to have a major impact. Successful implementation, however, will require participation by local people; collaboration between sectors with responsibility for health, energy, housing, planning, and so on; and an emphasis on market sustainability.

Figure 2.6 CHILD MORTALITY AND PREVALENCE OF STUNTING IN DEVELOPING COUNTRIES



Note: Stunting data for each country based on most recent national survey.

Source: Yu et al., based on WHO data on maternal mortality; De Onis et al., 2000; Ahmed et al., 2000.

feeding; while encouraging breastfeeding, though, it is important to bear in mind the opportunity costs it imposes on the mother, which can be a considerable burden.

There is evidence for the efficacy of specific micronutrient supplementation of various sorts, which can often be combined with vaccination efforts. Vitamin A supplementation offers by far the best example, reducing overall mortality in children under five by 23%. It also dramatically reduces the incidence of vitamin A-associated blindness, which affects some 250 000 children a year. In areas where iodine-poor soils lead to iodine deficiency, supplementation for pregnant women drastically reduces cretinism, and also leads to decreased infant mortality.

Although anaemia is a widespread problem throughout the developing world, it is hard to point to iron supplementation programmes that have proved effective in terms of reduced mortality; in the case of iron, unlike the cases of vitamin A or iodine, the body's metabolism requires that the supplementation be at least weekly and ideally daily. However, new approaches may prove effective. In areas of high malaria incidence there is a synergy between anti-malarial treatments and iron supplementation. The control of helminth infections (worms), which account for a significant fraction of childhood anaemia in some places as well as causing low body weight, lacks clear evidence of effectiveness, though some trials have been encouraging.

An alternative to supplementation through the health system or some other external route is to increase micronutrient levels in the diet, either through encouraging the local production and consumption of micronutrient-rich foods or through the fortification of foods with micronutrients. Fortification has proved highly successful in the developed world; the fortification of staple foods would undoubtedly improve levels of nutrition in much of the developing world.

Most generalized malnutrition, especially when mild or moderate, is best relieved through interventions designed to change the behaviour of families; the problem is not, normally, an absolute lack of food, but the lack of an understanding of how best to use the food available. In various studies in poor countries, the proportion of families with malnourished children in which behaviour change was not sufficient to deal with the problem has been found to be well under 20%, though in some places the figure will undoubtedly be higher. The behaviour changes are not necessarily easy to bring about, though; successful strategies require a great deal of planning and often some degree of individual counselling for mothers and families.

In cases of severe malnutrition, improved clinic- or hospital-based case management can dramatically reduce case-fatality rates. However, interventions aimed at primary prevention of generalized malnutrition, rather than micronutrient deficiencies, show mixed evidence of effectiveness. General feeding programmes or food subsidies tend neither to be effective nor reach those who need them the most. The evidence suggests that the efficacy of school feeding programmes in reducing the effects of malnutrition is low, though these programmes can have significant other advantages, such as increasing attendance. However, short-term supplemental feeding targeted at the clearly malnourished is effective, the more so when coupled with education about nutrition for mothers and other caregivers.

2.6 MALARIA

Though the total number of countries afflicted with endemic malaria has fallen from 140 in the 1950s to about 100 today, more than 2.4 billion people remain at risk. Today's best estimates put the annual incidence of clinical cases at somewhere between 300 million and 500 million a year; annual mortality is estimated at least 1.1 million, and may be considerably higher. Most of these deaths are in sub-Saharan Africa, and most of those deaths are among young children. Perhaps a fifth or a quarter of child mortality in sub-Saharan Africa is due to malaria. Elsewhere in the world, malaria deaths are much less concentrated among the young, and occur among people of all ages in places where treatment and diagnosis are inadequate.

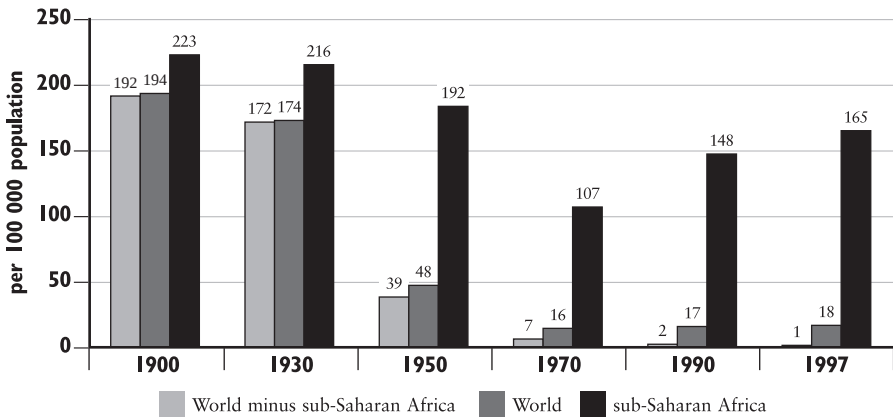
The differences in the burden of malaria across the world reflect the complexity of the disease's natural history and the range of different human responses. The four malarial parasites are transmitted via a number of species of mosquito, the populations of which change in response to climate, ecological setting, and human action. Climatic differences, patterns of land use, and the prevalence of different species of mosquito mean that in some areas the disease is endemic while in other areas it appears sporadically in the form of epidemics. There is concern that actual and anticipated climate change will affect the epidemiology of malaria, but it is not yet clear that such effects are occurring, though changes in the distribution of various insect species certainly are. Malaria's various interactions with the ecological setting and the human environment contribute greatly to the complexity of efforts to prevent infection and to treat those infected.

Outside Africa, the twentieth century saw huge progress in the control of malaria, largely through the combined use of insecticides (mostly sprayed indoors) and chemotherapy within structured eradication campaigns that benefited from adequate surveillance. Such campaigns could be hugely effective; Sri Lankan malaria cases fell from over a million a year in the middle of the century to less than 20 in 1963. To some extent such successes have continued. In Viet Nam, mortality was halved between 1992 and 1996, perhaps as a result of greatly improved access to drugs and a reduction in the forest habitat of the mosquitoes that spread the infection.

However, the dream of eradication is now faded, and in many areas malaria has staged a comeback, though thankfully not to its early twentieth-century levels. Major factors in the resurgence include drug resistance in the parasites and poorly applied prevention measures. The control of malaria in these areas was to some extent a victim of its own success; as the disease became less fearsome the reasons to expend effort on its control became less obvious. International aid for malaria control reduced steadily in the 1970s and 1980s, and campaigns against the use of DDT reduced funding for insecticides.

Despite these factors, overall the story outside sub-Saharan Africa is one of success; deaths from malaria were reduced by something on the order of 90% in the rest of the world over the course of the twentieth century (Figure 2.7). In Africa, on the other hand, considerably less progress was made. In 2000, deaths due to malaria in Africa were estimated as close to 1 million, representing perhaps 90% of the world total. Since the 1970s, *Plasmodium falciparum*, which is both the most common parasite in Africa and the most dangerous, has become increasingly resistant first to chloroquine and then to sulfadoxine-pyrimethamine drugs. Eradication campaigns in Africa never reached anything like the level of coverage that was reached in Asia and Latin America. Effective control programmes, which require a high degree of organization and investment, have been lacking in many African countries.

Africa's biological heritage, geographical setting, and patterns of land use make malaria a particularly intractable problem in much of the continent. However, experience elsewhere in the world is clearly applicable to Africa as well. The most widely discussed effective preventive intervention is the use of insecticide-treated nets (ITNs) to protect children while they sleep. ITNs are clearly effective under trial conditions in reducing mortality and morbidity, and surveillance data suggest that they are effective under real-world conditions, too. At high levels of use they may start pro-

Figure 2.7 MALARIA MORTALITY ANNUAL RATES SINCE 1900

Source: Carter, 2000.

tecting the entire community by cutting down on feeding opportunities for the mosquito population. There is increasing experience of how best to encourage people to use ITNs, and some success in using social marketing approaches to stimulate demand. The best ways to ensure that poor and vulnerable groups use nets still need further exploration, however.

Indoor residual spraying (IRS), a key to reductions in malaria across much of Asia, has been practised comparatively rarely in Africa except in southern African countries (Mozambique, Namibia, South Africa, and Zimbabwe) and in Ethiopia. It is now time to reconsider the role that IRS should play in control programmes elsewhere in the continent. There may be places where IRS could play a greater role in Africa, just as there are some places in Asia—notably those where the vector mosquitoes are species found mostly out of doors—where it is not necessarily an effective intervention. Residual spraying is a reasonably expensive strategy in that it requires functional transport, procurement, training, supervision, and reporting capacities; this expense is one of the reasons it has not been widely practised in Africa. Its implementation also requires careful planning and surveillance, both epidemiological and entomological.

Case management remains the key to helping those who have not been successfully protected from the parasite. The availability of relatively cheap antimalarial drugs has undoubtedly limited the burden of the disease. However, resistance to the cheapest antimalarials is rising; in many countries in southern and eastern Africa chloroquine is no longer usable as a first-line drug. Alternatives such as artemisinin derivatives, the use of

which proved very effective in Viet Nam, are more expensive, as are combination therapies. There is concern, though, that using the most effective drugs now may reduce their efficacy in the future unless the drug development pipeline can be kept full. At present, health systems in much of Africa are sorely stretched by the requirements of case management for malaria, and drug resistance seems likely to drive up both the costs of treating the disease and the deaths associated with the disease unless systems for malaria treatment can be established that are comprehensive, efficient, accessible, and acceptable to the communities in need of them.

Malaria is a particular concern during pregnancy. General chemoprophylaxis is widely recommended for pregnant women in malarial regions, but there are significant adherence issues and the most popular drugs are, in some parts of Africa, decreasingly effective. In areas of high infection, a regimen of intermittent treatment, requiring only two doses during pregnancy, has proven effective in randomized trials and is much easier for women to complete.

Highly endemic malaria is the largest part of the problem in Africa, but over 100 million Africans (and many millions elsewhere in the world) live in areas where the disease strikes in the form of epidemics. Unlike those in the highly endemic areas, these people have low levels of acquired immunity, which makes epidemics a significant risk for adults as well as children. The key to epidemic control is early warning and rapid response aimed at preventing further spread. This means that epidemic-prone areas have a higher than normal reliance on good surveillance and logistics systems that allow rapid expansion in the supply of drugs (such as stockpiling systems). Their early warning systems need data collection for indicators of vulnerability (e.g. low immunity, population movement, and drug resistance), transmission risk (climatic factors), and early detection of increased cases. Rapid response is also the key to dealing with malaria outbreaks when complex emergencies, such as those attendant on conflict, have dislocated the health system. In these situations, as was recently seen in the Democratic Republic of the Congo, malaria can be a huge problem, justifying special approaches to control and the provision of rapid access to effective treatment and prevention.

Both in endemic and epidemic settings, malaria is particularly sensitive to local conditions, and the definition and application of an effective anti-malarial campaign must reflect those conditions. National and local operational research capacity is therefore vital, as are information systems to track progress and monitor resistance to drugs and insecticides.

New approaches to controlling malaria are under development. Interventions show promise to make the case management of infected children at home easier (for example, with pre-packaged drugs); novel uses of insecticide (for example, application to the skin of farm animals) may also help in some areas. Although it is still some way into the future, the development and deployment of effective anti-malarial vaccination might make a great contribution, especially in the light of increased drug resistance and especially in Africa. In the absence of effective vaccination, though, strengthened commitment to the infrastructure necessary for malaria control could permit considerable progress.

2.7 TUBERCULOSIS

It is estimated that 32% of the world's population is infected with tuberculosis (TB), with something like 8 million new cases a year. Modern therapy has proved highly effective in the treatment of tuberculosis, and yet there are still 1.5 million annual fatalities.

The greatest caseloads of tuberculosis currently occur in Asia, but the highest levels of mortality are in sub-Saharan Africa, as is the greatest growth: on current trends, Africa will have the highest caseloads in the near future. Tuberculosis is not evenly spread, but rather concentrated in lower-income countries: 80% of the caseload is in 22 low- and middle-income countries that represent 60% of the world's population. Within these countries, tuberculosis is most common in low-income groups. The tuberculosis situation is exacerbated where high levels of HIV infection exist. In developing countries, the incidence of tuberculosis in HIV-infected people is typically about six times higher than in people uninfected with HIV: in India, tuberculosis constitutes about 60% of opportunistic infections among AIDS sufferers.

Directly observed treatment, short-course (DOTS) is the heart of the global campaign to control tuberculosis. DOTS aims to increase survival of those treated and to decrease transmission to others. It involves treating tuberculosis with multiple-drug therapy in conditions where adherence to the regimen can be supported through direct observation, and monitoring the effectiveness of that treatment. It is worth noting that the form of direct observation through the health system, which has become the norm in DOTS, is not necessarily a uniquely effective way of supporting adherence. Observation by community members—cured patients, community leaders, perhaps shopkeepers—holds great promise as the basis of more acceptable and successful programmes. As long as there is high adherence, shortened and community-based regimens may prove impor-

tant in extending and entrenching the success of today's tuberculosis treatments, and their development should be an area for active research.

Current DOTS can reduce death rates for drug-susceptible, smear-positive patients from 60% to 70% of cases down to about 5% of cases. It can also reduce the number of transmitted infections per case by about 75% in good conditions, but this figure is highly dependent on the cure rate. If only 50% of the patients treated are cured, there is no effect on transmission; and if cure rates are less than that, transmission is increased, since there are more infectious people around than there used to be. Where diagnosed, treatment of smear-negative individuals is also common, especially in areas of high HIV prevalence. Treating HIV-infected people with tuberculosis improves their quality of life and may prolong survival; it also reduces transmission.

Most current programmes rely on passive case finding—that is, treating symptomatic people who come to the health service for treatment and who are diagnosed as smear positive. In areas where the cure rate for treated patients is high and the case detection rates low, though, active case finding, involving specific attempts to find people with the disease, may be effective. In many countries, control of HIV infection will have a strong positive impact on the prevalence of tuberculosis; HIV prevention can thus be an effective control on TB.

The world's burden of tuberculosis is to a large extent a function of lack of effective treatment in many of the places where it is needed, exacerbated in recent years by the spread of HIV. By 1999, 127 countries had adopted DOTS, including all of the 22 countries where tuberculosis is concentrated. However, within these countries effective treatment is far from universal. Although the countries implementing DOTS represent 87% of the world's population, it is estimated that only 23% of world-wide tuberculosis cases are treated under DOTS. Though this figure represents progress—it is more than twice the 10% figure for 1990—it also represents significant room for improvement. The WHO goal is to detect 70% of cases, which on current trends might be achieved by 2012. With 70% access to DOTS and high cure rates, new cases might be reduced from about 10 million to about 5 million per year by 2015.

Although extending the reach of today's effective treatment approaches can provide much of that improvement, a continuing effort to find simpler regimes and ways to increase adherence to treatment is clearly a priority.

2.8 SMOKING

About 80% of the world's 1.1 billion smokers live in low-income and middle-income countries. Worldwide, about 4 million people died in 1998 of tobacco-related disease—lung and other cancers, vascular and respiratory diseases, and other medical conditions. Emerging evidence suggests that smoking is an important cause of tuberculosis deaths, particularly in India. Given what is known about the epidemiology of tobacco-related illness, deaths are expected to rise to 10 million annually by 2030, with most of the additional deaths in the developing world. A billion tobacco-related deaths over the course of the twenty-first century are quite conceivable on current trends, about half of them before 2050. Tobacco-related illness is, with HIV infection, one of the only two large-scale causes of death growing rapidly in significance worldwide.

Tobacco use in developing countries is growing as incomes grow; at the same time it is more common among the poor than the rich almost everywhere, accounting for a significant part of the mortality gap between rich and poor. In developing countries, tobacco use is currently considerably more common among men than women, though in developed countries the gender balance is more equal, representing a worrying possible development for women in developing countries.

Tobacco use is clearly unlike the other major sources of morbidity in that it entails an element of personal choice: people can choose not to start smoking and can choose to try and stop, though the addictive nature of the habit renders the latter choice problematic. However, the fact that people choose to smoke does not make reductions in tobacco-related disease undesirable, and there are a number of interventions of proven effectiveness with which governments can make such reductions. To make near-term reductions, the essential strategy must be to increase quitting; in many parts of the world, the idea of being a former smoker is still as alien as it was in Britain in the 1940s. Indeed, only about 5% of Chinese men are ex-smokers, with many quitting only when they became ill from smoking. Although preventing adolescents from starting to smoke may be a worthy goal, its effects on mortality would not show up until the middle of the century; to reduce mortality before then means focusing on the already addicted.

Information campaigns, including specific advice from doctors and health workers, can increase cessation and reduce initiation, especially where the base level of knowledge is low; declines in cigarette use in developed countries seem coupled to increasing awareness of the true scale of the health risk—a one in two chance of death due to a condition associat-

ed with long-term smoking—entailed through being a smoker. Studies in a number of countries show that complete advertising bans can reduce tobacco consumption, while partial bans show little effect. However, the most clearly effective intervention is to raise prices through taxation. In developed countries, taxes account for about two-thirds of the retail price of a cigarette, while in less-developed countries the rate is well below half the total price.

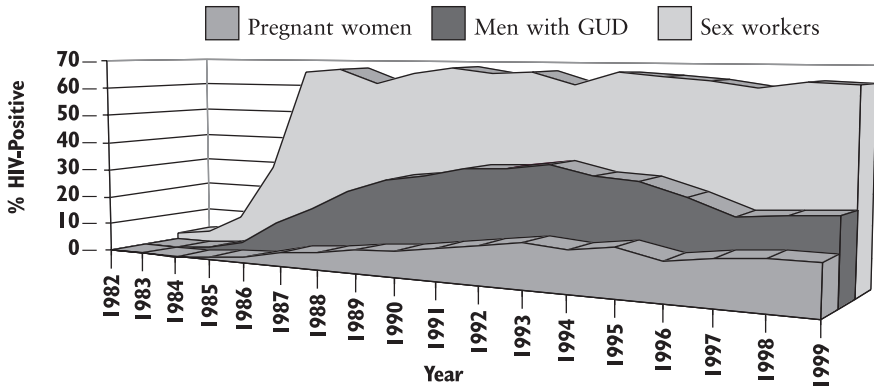
A review of empirical studies suggests that a 10% increase in price can reduce smoking by 8% in low- and middle-income countries. Young people, people on low incomes, and people with less education are more responsive than others to increases in price. Though it is possible that increased prices will lead to increased smuggling, empirical studies suggest that other factors, notably overall corruption levels and price differentials between neighbouring countries, are paramount in determining the level of smuggling.

2.9 HIV/AIDS

Of all the health problems facing the poorest people of the world, the HIV/AIDS epidemic is undoubtedly the most dramatic. The epidemic has reached every country in the world, and in many it is worsening rapidly. In southern and eastern Africa, infection is running at levels unprecedented for any disease so reliably fatal. The damage done already in these countries, and the potential for deaths on a scale never seen in any previous pandemic over the coming decade, make HIV/AIDS a unique challenge to health systems on a global scale.

Although HIV/AIDS is a global problem, the epidemic looks very different in different places. The dominant form of transmission worldwide is heterosexual, though other modes—the use of injected drugs and sex between men—being important in several regions. Three broad epidemiological patterns can be discerned. In eastern and southern Africa, the disease has spread quickly and widely throughout the population. HIV prevalence in antenatal clinic attendees doubled from 18% to 35% in Botswana from 1994 to 1999; in South Africa this increased from 3% to 20% over the same time period. A few other countries in Africa have shown substantial but less dramatic increases to prevalence rates over 3%. The remaining African countries, and almost every other country in the world, have rates of prevalence below 3%.

The reasons for the variations in prevalence between countries are not entirely clear and poorly researched. High levels of genital ulcer disease (GUD) and low levels of male circumcision may help to explain the high

Figure 2.8 RAPID SPREAD OF HIV IN NAIROBI POPULATIONS

Source: Plummer et al., unpublished data from the CIDA Project, *Strengthening STI services in Kenya*, 2000.

levels seen in southern and eastern Africa. However, conditions rife for rapid growth exist in many places. These conditions include high levels of paid sex and partner change, common sexually transmitted infections (STIs), low condom use rates, male mobility and migration, and low rates of male circumcision. In India, for example, 18% of males living in Orissa report paying for sex, and STIs are prevalent in about 10% of adults living in Tamil Nadu.

The key challenge for HIV/AIDS policy is to prevent HIV growth. In the absence of prevention or a vaccine, even a modest epidemic in the most populous countries, such as China, India, and Indonesia, would imply enormous absolute burdens. Simply keeping the epidemic to lower bounds still implies about 55 million infected people in 2015 (see discussion in Chapter 4 and Table 4.7 for details). Even in Africa, there remains an enormous agenda for prevention. Many countries, including the most populous country of Nigeria, have early epidemics.

The best long-term solution to prevent HIV transmission is an effective HIV vaccine. Efforts such as those by the International AIDS Vaccine Initiative must be accelerated to bring a vaccine into reality. But in the absence of a vaccine, several interventions can block transmission. The most clearly effective preventive interventions against HIV are those targeting groups that—because of high rates of partner change, increased susceptibility to infection, or both—are highly vulnerable. Peer interventions among sex workers to teach them high levels of condom use, control of STIs, and client negotiation skills are highly effective. Sex workers and their clients represent an important vulnerable group who are central to

the spread of HIV in most populations, as shown for Nairobi, Kenya (Figure 2.8). Vulnerable groups are particularly important at the early stages of the epidemic seen in most countries today. Less than one sex worker would need to be covered in a programme for one year to prevent one infection.

A few countries in Asia with conditions for rapid growth in HIV-1 infections acted early by scaling up vulnerable group interventions. Their common principles were to work with the commercial sex industry, map where it occurs, aim for high coverage, and base action on solid epidemiological information. The results are impressive. Thailand is the most famous example, where HIV-1 peaked in the early 1990s and has stayed at below 2% seroprevalence since. Less known is Cambodia, which copied the Thai “100% condom” programme in commercial sex in 1997 in one state, and has shown impressive declines in HIV-1. The Indian state of Tamil Nadu has achieved relatively high coverage of enrolled sex workers and truck drivers, and general HIV-1 levels appear to show some attenuation. Scaling up to high coverage of often-marginalized groups is not easy, and it requires considerable local sensitivity and participation. The key pillars of a successful intervention programme are participatory mapping to identify those groups with high rates of partner change (which likely extends beyond sex workers and their clients in many settings), peer education and negotiation skills, provision of condoms, and treatment of STIs.

Other interventions that complement vulnerable group interventions are required. Despite controversy, STIs remain important as risk markers and risk factors for HIV growth. STI treatment for vulnerable and general populations is probably effective for HIV control. Voluntary counselling and testing (VCT) has led to some reduction in unsafe behaviour in some studies, though the duration of the change is not clear. However, such testing is not necessarily a cost-effective form of prevention in all or even most settings, especially where prevalence is low. Voluntary testing is, however, a necessary prerequisite to some forms of treatment. Although the transmission of HIV from mother to child (MTCT) is not of great epidemiological importance, since the infected children are very unlikely to transmit the disease, it is a mode of transmission that can be blocked, and which currently accounts for perhaps half a million deaths a year. Short courses of single anti-retrovirals can halve transmission risk from about 40% to 20%. To be fully effective, replacement feeding is also required, given that breast milk is a source of transmission. But the net benefits of not breastfeeding in high HIV prevalence settings remain unclear. Finally,

needle-exchange programmes and blood-safety programmes can reduce these less common modes of transmission. Other interventions need urgent research to establish their efficacy. There is little reliable information on the efficacy of interventions with adolescents, and a large ongoing trial of youth-friendly STI services and peer counseling in Tanzania should provide important results in the next 2 years. Occupational interventions among higher-risk males may be promising—a randomized trial of peer behaviour interventions among males in a workplace in Zimbabwe found a 30% reduction in HIV-1 incidence.

More broadly, prevention efforts appear to work best when there is national leadership and efforts to reduce stigmatization of vulnerable groups. Increasing the availability of condoms for the wider population can enable more focused action by public and nongovernmental agencies. For example, the proportion of Senegalese women easily able to procure condoms rose from below 30% to 80% between 1992 and 1997. Focused information campaigns aimed at building public support and awareness are also seen to be important, although these are not likely to change behaviour by themselves.

In those sub-Saharan countries with generalized epidemics that have spread far beyond vulnerable groups, the national approach is a necessity. The reasons for the sharp decline in HIV prevalence in Uganda, from about 20% in 1990 to 10% in 1999, are widely debated. It may be due, at least in part, to a broad-based prevention strategy addressed at the population as a whole. This programme is credited with the increasing proportion of young men abstaining from sex or from sex outside marriage. The widespread availability of testing and concomitant counselling has been an important part of the Ugandan approach. It has been argued that such broad prevention approaches are highly applicable in other hard-hit African countries. However, the replicability of the Ugandan experience to lower-prevalence settings is not established.

A primary focus on prevention strategies in the global response to HIV/AIDS reflects the fact that the future of the epidemic lies with those not yet infected. However, this cannot be taken as a reason to neglect the 36 million people currently living with the infection, 95% of them in low- and middle-income countries. Prophylaxis or treatments for some of the opportunistic infections that contribute to HIV/AIDS mortality are cost-effective (most notably antibiotics effective against tuberculosis). Since 1996, highly active anti-retroviral therapy (HAART), which acts directly on the virus, has increased the life expectancy of people on treatment con-

siderably. In developed countries, HAART has dramatically reduced but not eliminated AIDS mortality.

Until recently, it was widely assumed that the cost of HAART meant that it would be basically unavailable to any but the élite in low- and middle-income countries, though there have been some exceptions, such as Brazil and, more recently, Costa Rica. This acceptance of massive mortality among the HIV-infected in poor countries has now been widely challenged on grounds of equity, and a mixture of lower drug prices and new commitment by donor nations seems likely to make the provision of the drugs necessary for HAART possible in many more low- and middle-income countries. In the worst-hit countries of southern and eastern Africa, the provision of HAART may well prove a necessary component in efforts to avoid the profound falls in economic outputs and an explosion in the number of orphans that can be expected with generalized AIDS epidemics.

There are substantial challenges to making HAART practicable in low-resource settings, including concerns about when to treat, resistance issues, and delivery capacity (see Box 2.4). The strongest rationale for HAART is that it delays mortality among the infected, and can help restore individuals to normal functional lives, including caring for their children. It has been suggested recently that HAART will also tie together prevention and treatment options: the possibility of treatment is held to make it likely that more people will be tested for the virus and that after testing and counselling they will change their behaviour. However, there is little evidence to support this. Several studies show consistent increases in risky behaviours in HAART-treated gay men in developed countries. Early data from Kenya suggest that condom use among sex workers dropped each time a quack cure was announced in the press, with a significant increase in HIV the first time (see Figure 2.9). In Benin, men who self-treat with antibiotics have lower rates of condom use during paid sex. In Tamil Nadu, the use of condoms by male factory workers dipped recently after several years of steady increases. Male truck drivers are showing some reversal of previous declines in number of nonregular sex partners. Both changes appear partly due to advertising by Indian pharmacies for AIDS treatments.

HAART availability, if perceived as access to a cure, could undercut prevention efforts. Specific strategies to counter this effect will therefore need to be put in place. These early findings of adverse impact on prevention are not reasons to deny treatment, and more careful study is required of the impact of HAART use on population behaviour. Models of how to

Box 2.4 KEY ISSUES IN INCREASING ACCESS TO HAART

There is growing consensus that access to highly active anti-retroviral therapy (HAART) is required for moral and humane reasons, especially in the African countries hardest hit by HIV/AIDS. The Government of Botswana has committed to providing free access to HAART for its citizens. WHO has recommended a goal of 5 million people under HAART in low-income settings by the end of 2006. This calls for treatment under *late* HAART, which concentrates on patients who already have symptoms. Thus, treatment would initially be more restricted than under *early* HAART, the criteria for which might apply to all the infected.

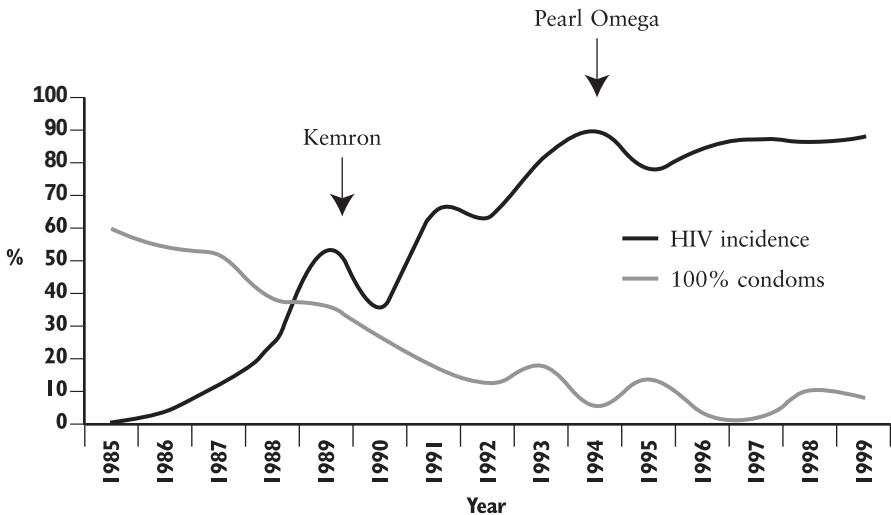
Costs have been a major limiting factor in access to HAART in low-income settings. However, other key bottlenecks exist. Many African countries do not have laboratory facilities for monitoring therapy except in a few capital cities. Thus, introducing HAART would require significant overall strengthening of health systems, particularly because current HAART regimens are complex and demanding in terms of adherence. Increased VCT facilities are required in order to deliver HAART to the population.

Since HIV mutates readily, the widespread availability of HAART is certain to lead to an increase in drug-resistant strains of HIV, and it is vital that HAART interventions be managed in such a way as to minimize this development. In Kenya, a study found about a third of those on anti-retroviral treatments used only a single drug, increasing the risk of resistance. It has been suggested that the directly observed treatment approach used in tuberculosis control might be applied to HAART. The challenge would be qualitatively different, however, since HAART requires lifetime adherence to a more complex regimen. The benefits from any single-regimen HAART programme can thus be expected to decline due to resistance, though the rate of decline is not immutable. An ongoing commitment to HAART will require the introduction of new drugs over time, treatment regimens to decrease resistance, and drugs requiring simpler regimens.

There is an urgent need for clinical and operational research to guide implementation. Taking the tuberculosis analogy, it is worth noting that it took over two decades of sound research to develop a standardized programme (DOTS) that could be implemented everywhere by nonexperts. A recent meeting hosted by the Rockefeller Foundation in Kampala, Uganda, called for vastly accelerated clinical research to guide health providers and patients on practicable approaches for HAART use. One promising partnership between the pharmaceutical industry and academics will offer HAART to 40 000 people in southern Uganda through improved clinical training. Another approach is “MTCT Plus”, which aims to treat infected mothers while also offering nevirapine to reduce mother-to-child transmission, and to expand access to VCT. The operational basis for this effort builds on antenatal clinics throughout Africa where some HIV testing capabilities are in place. The programme engages the women/reproductive health community and achieves wider “public” buy-in through the focus on mothers and children. Other models of care for targeted populations are also emerging rapidly, and their lessons will inform the scale up of AIDS care in coming years.

increase prevention effectively within the care setting are required. For policy purposes, it is worth noting the experience of Brazil. Brazil acted early to implement a set of prevention activities, and its epidemic has been contained below 1% of the general population. In fact, AIDS deaths started falling after 1995, before HAART was scaled up, probably as a result

Figure 2.9 IMPACT OF “QUACK” CURES FOR HIV ON CONDOM USE AND HIV INCIDENCE BY SEX WORKERS IN NAIROBI



Source: Willbond et al., background paper; Jha and Nguyen, background paper.

of earlier prevention efforts. After HAART was introduced, death rates from AIDS in Brazil fell even faster.

The AIDS epidemic clearly represents an exceptional, unprecedented challenge, and its potential to devastate the worst-hit countries may require heroic measures incommensurate with other health interventions. Although HAART has a role in these efforts, it is important that its provision not usurp funding that would otherwise be available for more clearly cost-effective interventions that might have greater effects. There is an urgent need both for wider provision of prevention interventions of types already known to work—such as peer education of commercial sex workers—and for a major increase in funding for new studies of other interventions and studies of potential synergies between interventions. A multifaceted response is clearly needed to come to grips with such a complex problem. But while prevention and treatment interventions are important, they are highly unlikely to bring the epidemic under full and lasting control. This is why research on possible vaccines remains of the highest priority.

2.10 THE CLOSE-TO-CLIENT HEALTH SYSTEM

The great majority of the interventions highlighted above are not technically exacting. Few of them require hospitals; most can be delivered at

health centres, in smaller facilities that we call *health posts*, or through outreach services based at those facilities. This latter tier, consisting of health centres, health posts, and outreach, is the tier of the health care system that needs to be prioritized if these interventions are to be as accessible as possible within a given area (Table 2.2).

What this set of services should be called has been a minor but persistent concern to us. *Primary health care*, although undoubtedly a concept of great importance, carries extra connotations not necessarily helpful in this discussion. *District health system* is problematic because the term *district* has different meanings in different places. To call this segment the *peripheral health system* enshrines in language a view of the world where a small number of people in a ministry and in teaching hospitals constitute the centre, and the vast majority of health workers and clients—the system’s reason for being—are marginalized to the periphery, a view that we consider unhelpful. So instead we have opted for the term *close-to-client*, on the basis that it captures the defining aspect of this part of the health system.

We see the close-to-client health system as consisting of relatively simple hospitals not necessarily capable of the full range of interventions expected at teaching hospitals, of health centres, and, in some circumstances, smaller health posts and their outreach services, along with the infrastructure and personnel directly responsible for the delivery of interventions through categorical programmes. Though medical supervision will be necessary, a great deal of the work in this close-to-client part of the health system can be carried out by people other than doctors: by nurses and paramedical staff with various degrees of training, including midwives.

Hospitals within the close-to-client system will need to be staffed by doctors and a range of paramedical staff, nurses, and midwives. These hospitals might typically be capable of offering in-patient care to at least 100 people at a time. The purpose of these hospitals is to deal with acute and peculiarly dangerous or complicated cases. In the area of maternal health, they would be the referral destinations for eclampsia, postpartum haemorrhaging, puerperal sepsis, and complications associated with poorly performed terminations. They would be the appropriate setting for case management of severe cases of childhood disease and malaria, and for the treatment of complicated tuberculosis cases. If HAART is introduced for HIV/AIDS patients, it might be managed at this level. Such hospitals should have at least one operating theatre and the necessary facilities for

Table 2.2 EXAMPLES OF INTERVENTION DELIVERY BY LEVEL OF CARE

Level of care	TB	Malaria	HIV/AIDS	Childhood diseases	Maternal/perinatal	Smoking
Hospital	DOTS for complicated TB cases	Tx of complicated malaria	Blood transfusion for HIV/AIDS HAART Tx of severe OI for AIDS Palliative care	IMCI: severe cases	Emergency obstetric care	
Health centre/health post	DOTS	Tx uncomplicated malaria Intermittent treatment of pregnant women for malaria	Antiretrovirals plus breast-milk substitutes for mother-to-child transmission Prevention of OI, and Tx of uncomplicated OI VCT Tx of STIs	IMCI Immunization Tx of severe anaemia	Skilled birth attendance Antenatal and postnatal care Family planning post partum	Cessation advice; pharmacological therapies for smoking
Outreach services		Epidemic planning and response Indoor residual spraying	Peer education for vulnerable groups; needle exchange	Specific immunization campaigns Outreach IMCI: home management of fever Outreach for micronutrients and deworming		
Outside health sector or not involving direct service delivery		Social marketing of ITNs	Condom social marketing School youth programs for HIV	Improving quality of private drug sellers School deworming and micronutrients Policies to reduce indoor air pollution, information, regulation Food fortification laws with iodine, iron, folate, potentially zinc		Higher tobacco taxes, bans on advertising and promotion, clean air laws, counter advertising

Abbreviations: OI = opportunistic infection; IMCI = integrated management of childhood illnesses; STIs = sexually transmitted infections; Tx = treatment; VCT = voluntary counselling and testing

Note: Interventions are allocated to the level that will be the predominant service provider; other levels will often also provide specific interventions (e.g. skilled birth attendance at hospital).

anaesthesia, some laboratory capacity and X-ray facilities, and all-purpose dispensaries.

It is important that the management of health care in the surrounding area should be operationally independent from the medical management of the hospital. The local management team has a crucial role in planning services for the whole population, ensuring an appropriate balance between preventive and curative care, and ensuring also that broader issues of public health are not neglected. Although the team must ensure that services are provided, it need not necessarily rely only on public provision. For example, church and NGO providers may form part of the service network, receiving subsidies to help them perform their role; training for local drug sellers may also have a role.

A well-functioning close-to-client health system will require at least one and possibly two forms of facility-based access beyond the hospital setting; although it is common to find more layers than this, a more elaborate structure may promote inefficiencies. The principal requirement is for a set of health centres staffed primarily by nurses and trained paramedical staff. It is at the health centre that most DOTS treatment for tuberculosis and most diagnosis and treatment of uncomplicated childhood disease should take place, with rapid diagnosis and referral of severe cases. The health centre is probably also the best site for treatment of malaria, though a significant amount of malaria treatment appears possible in the home, given training and appropriately packaged materials. This is also the appropriate setting for the treatment of most STIs, the treatment and prophylaxis of most opportunistic infections in HIV/AIDS cases, and HIV testing with related counselling. Advice on family planning may be appropriate at the health centre level, as may advice on quitting smoking and pharmacological interventions against tobacco addiction. Health centres should provide appropriate settings for some births and for the administration of nevirapine or another retroviral to block mother-to-child transmission of HIV.

In some situations, for example where people are widely scattered, it will make sense to provide a further level: what we are choosing to call the *health post*. This will provide services such as routine immunizations, postpartum and antenatal care, and treatment with antimalarials. However, in areas where population density is high, these services may be provided only in health centres; amongst highly scattered or nomadic populations, they may be provided only through peripatetic means. A close-to-client health system will also include a penumbra of outreach services taking health interventions into the community. These activities can

include, in the case of mother and child health, antenatal visits, vaccination campaigns, micronutrient programmes, presumptive treatment for worms, and training in the home management of fever and of diarrhoeal disease through oral rehydration. In the case of malaria, outreach can include indoor spraying and planning for coping with epidemics. Outreach work is also important in the supervision of needle-exchange programmes.

Interventions also need to be delivered outside the health sector. Social marketing activities to stimulate demand for condoms and ITNs can be organized on a national or regional basis, with delivery through private retail outlets, for example. The quality of treatments purchased from the retail sector can be improved through measures such as the training of shopkeepers and the social marketing of drugs, including pre-packaging and provision of easily understood treatment advice. In the area of HIV/AIDS, action outside the health sector is required to reach vulnerable groups with peer education initiatives, which are the key to controlling the epidemic in areas of low prevalence. School health programmes can target particular conditions such as parasitic infections, or provide education on HIV/AIDS.

The connection of all these activities to the health system as a whole may be quite complex. Although some outreach is clearly a continuation and extension of the activities mounted within facilities, with paramedical staff going out on foot or by bike to reach pregnant mothers, for example, or to support and supervise community-based workers, other forms of outreach (such as some HIV prevention activities) are not necessarily closely tied to facilities and some activities may well be best organized as part of a categorical programme managerially integrated into the health system only at higher levels. This complexity is not necessarily a problem, as long as communication between the various parties is adequate to the task of coordination: a lack of communication, as discussed in Chapter 3 of this Report, can be a significant constraint on the ability of the close-to-client health system to build up its capabilities.

3. SCALING UP SUCCESS

Expanding access to successful interventions will, in most settings, require the removal of a variety of constraints. Among these will be constraints on demand—factors that dissuade or prevent people from taking up services; constraints on delivery—factors that limit the capacity of the health system to supply the appropriate degree of intervention; and overall strategic constraints—issues of policy, governance, and the like. There are strategies that can alleviate the problems associated with the constraints, stimulating demand for health services and easing their supply. Although there are some highly constrained settings where only a limited subset of these strategies can expect to enjoy success, these settings are comparatively rare; and even in these settings, it is possible to make some progress.

The interventions already to hand are capable of drastically reducing mortality in the poorest countries. Though research is needed to improve the prospects further—particularly in the field of vaccines—a significant increase in the availability and uptake of the interventions already shown to be effective would cut mortality rates among the poor handsomely. Most of these interventions have already been used in most of the countries of the world where they are needed. The problem is that almost nowhere have these interventions been made as widely available as they should be.

The challenge to public health systems the world over is to scale up their successes. This part of our Report examines the constraints that make such scale-up difficult, and also examines what can be done to avoid, relax or, overcome those constraints. We focus mainly on the constraints within the countries where the interventions are needed, but we acknowledge that there are other constraints beyond the purview of individual governments. Constraints engendered by the countries' terms of trade, by the influence of transnationals (particularly in the area of tobacco supply), by international treaties, and by received wisdom and so on are being addressed by other working groups within the commission. We shall, however, give some consideration to the constraints concerned with donor participation in health programmes.

Our conception of constraints is simple: they are conditions that hamper efforts to scale up the provision of effective interventions. The most obvious such constraint is money. The huge burden of avoidable disease

resting on the poorest billion sits there because no one with the power to do so has been willing to spend the money required to alleviate the problem. Any attempt to scale up will require significant increases in expenditure, as the analysis of costs in the next part of our Report makes clear. Without money to buy vaccines and medicines, to build and equip health posts and district hospitals, and to pay staff adequately, there will be no significant progress.

Lack of money is often a governing constraint. However, the fact that progress is not possible without money does not mean that it is ensured if money becomes available. One also requires the ability to make use of money, and it is on that ability that we are focusing in this part of our Report. Without a health system that can use money well, spending will not merely be inefficient—it may be useless, or conceivably counterproductive. One does not provide water to a building simply by filling storage tanks in the roof. There have to be pipes into which the water can flow, there must be valves that will direct it to where it is needed, there must be no large leaks. The delivery system has to be adequate to the supply and to the requirements of its users.

Most of the poorest billion lack access to an adequate health system. The pipes down which funds and materials might be poured are either too narrow, or clogged up, or full of holes; they may not go to the places where they are needed, or not be under the control of the health sector. There may be no pipes at all. This state of affairs—the lack of an effective and capable health delivery system—limits all efforts to scale up the provision of effective interventions. In many cases these systemic problems will become governing restraints if spending is quickly increased, driving the marginal benefit of spending on materials or staff to zero. In some places this is already the case, with workers sitting idle due to dysfunctional systems.

We believe that the removal of structural constraints and the building of new capacity will often be necessary precursors to the scaling up of the interventions we are advocating. But we do not take this to mean that the need for a commitment to greatly increased funding is deferred or lessened. Instead, money must be found straight away so that it can be used to remove constraints as quickly as possible. Many constraints, we believe, are susceptible to what can be termed *buy-out*, in that significant extra spending can reduce the problems they cause. We accept that *buy-out* is far from perfect as a term, carrying as it does the implication that the requirement is merely money. Although money is often a necessary condi-

tion for the relief of these constraints, it is rarely a sufficient one. The way the constraints are to be relieved and in what order, and the incentives for workers and managers to relieve them, are also crucial factors. Nevertheless, we have stuck with the term *buy-out* because it is a robust reminder that significant investments will frequently have to be made in order to increase a health system's ability to absorb more spending on specific interventions.

The idea that there must be system-wide spending on the removal of constraints from health systems in order to make progress is not one that has historically been popular with some of the donors financing health interventions in less developed countries; indeed, there is a widespread distrust of such approaches. There is a belief—perhaps a self-serving one—that the absorptive capacities of health systems develop over time and that it is best to leave them to do so while concentrating resources on what is achievable today. Spending aimed at saving lives immediately has generally been considered much more attractive than spending aimed at allowing future spending to save lives on a larger scale. If large changes in mortality worldwide are to be delivered, though, this attitude and the self-imposed restraints that go with it—such as the unwillingness of some donors to meet recurring costs such as salaries—must be challenged.

Historically, one way of avoiding the problems of limited capacity within health systems has been to adopt a “vertical” or categorical approach to a particular disease—such as malaria—or family of interventions—such as childhood vaccination. Such approaches have attracted a great deal of interest from outside donors, who appreciate both the centralized technical and financial control that characterizes them as well as their tendency to be more easily assessed. There is a great value to the concentration of expertise and commitment that drives such approaches when they are successful. However, such approaches are an adjunct to the broader health service rather than an alternative to it, and, in the context of the greatly increased coverage of a significant number of interventions, the benefits of overall strengthening become readily apparent. When spread across a number of interventions, the costs of improving the health system's physical infrastructure, of improving the training and performance of its workers and managers and strengthening its connections to the communities that it serves—the main requirements for enhanced ability to deliver the interventions in question—should become smaller than the costs of trying to work around it.

3.1 ADDRESSING THE CONSTRAINTS

Attending to the plumbing requires that the most severe constraints on the scaling up of interventions be clearly recognized, and that strategies for dealing with them be developed on the basis of evidence for what works. It requires that the problems that money can be used to solve—the constraints that can be most simply bought out—be identified and made a priority. It requires that issues of phasing be carefully thought through: the things that are best done first should be singled out.

In Working Group 5 we focused our thinking on these matters by developing a typology of the constraints that thwart efforts to scale up coverage and examining evidence for strategies that can buy out or otherwise ameliorate constraints where possible. In addition, case studies have been prepared on Chad, the Indian states of Karnataka and Tamil Nadu, and Tanzania, where well-monitored experiments such as those of the Igunga Community Health Fund and Dar es Salaam Urban Health Project provide useful data on interventions, problems, and possibilities.

It should be acknowledged at the start that our knowledge on how best to scale up, particularly in the most constrained countries, is limited, and that research in this field is badly needed. It is quite possible that many successful experiences are being ignored by experts simply because the settings in which they take place are not well served by mechanisms for communicating and disseminating results. There is a need not just for further research, but also for better ways of exchanging ideas on best practice easily and simply between low- and middle-income countries. The roads to success will be laid down all over the world, and the entire world should be able to share in their appreciation and application.

Our classification of the factors constraining the expansion of services puts them in five different categories according to the realm in which they operate: the community and household level, the health services delivery level, the health sector policy and strategic management level, overall public policy issues, and environmental characteristics (Table 3.1). The principal objective of this classification structure is to identify the areas where the constraints are most amenable to buy-out, and it is not surprising that most of these areas are within the first two categories, as they are factors that operate at the level of the community and the system that delivers the communities' health services. This is a further justification for the stress that this Report places on the close-to-client health system.

Table 3.1 CATEGORIZATION OF CONSTRAINTS

Levels	Constraints
Community and household level	Lack of demand for effective interventions Barriers to use of effective interventions: physical, financial, social
Health services delivery level	Shortage and distribution of appropriately qualified staff Weak technical guidance, programme management and supervision Inadequate supplies of drugs and medical supplies Lack of equipment and infrastructure (including labs and communications) and poor accessibility of health services
Health sector policy and strategic management level	Weak, overly centralized systems for planning and management Weak drug policies and supply systems Inadequate regulation of pharmaceutical and private sector and improper industry practices Lack of intersectoral action and partnership for health between government and civil society Weak incentives to use inputs efficiently and respond to user needs and preferences Reliance on donor funding that reduces flexibility and ownership Donor practices that damage country policies
Public policies cutting across sectors	Government bureaucracy Poor availability of communication and transport infrastructure
Environmental characteristics	A. Governance and overall policy framework Corruption, weak government, weak rule of law and enforceability of contracts Political instability and insecurity Low priority attached to social sectors Weak structure for public accountability Lack of free press B. Physical environment Climatic and geographic predisposition to disease Physical environment unfavourable to service delivery

Source: Hanson et al., 2001.

3.2 CONSTRAINTS AT THE GRASS ROOTS LEVEL

The first constraints to be considered are those at the *community and household level*. The uptake of effective interventions offered by a public health service can be constrained by a number of factors on the demand side. Demand for effective interventions is extraordinarily low in many parts of the developing world. This is often because knowledge of the very existence of interventions is low; for example, in eastern Chad, only 27% of mothers knew of the existence of oral rehydration therapy. Not being aware of treatment possibilities, and thus not being able to assess your

own needs, is, at a personal level, perhaps the most invidious of constraints.

In cases where those in need are unaware of possible interventions, demand can be stimulated to a certain extent through information campaigns. Those campaigns that involve true community participation—and that reflect the community's perceived health needs—are likely to be more effective than one-size-fits-all approaches. The potential for outreach and effective information campaigns will be limited in constituencies with low levels of education; increased levels of education, and especially primary education for girls, will help remove constraints on demand.

Social marketing has an important role in some cases: in Tanzania, social marketing played a role in increasing condom use from 15% to 42% between 1993 and 1996; in some areas it has significantly increased the ownership of both treated and untreated nets for protection against mosquitoes, in one study, anaemia and parasitaemia in children under two was reduced by 20% as a result of the social marketing of nets. Scaling up such success is obviously worthwhile. However, social marketing raises problems for access among the very poor, who will require some sort of discounting or subsidy. Another possibility, applicable in the main to middle-income countries, is to tie financial transfers to the poor to uptake of health interventions. For example, the Progresa system in Mexico and similar programmes in other Latin American countries have made transfers of financial subsidies to households dependent on the use of services such as antenatal care.

However, we believe that the most important factor in generating demand is providing visibly effective levels of intervention; once people see that intervention is available and effective, uptake for services will increase. In a situation such as that of Guinea in the early 1990s, when fully a third of the country's health centres lacked trained health providers or drugs or both, it is hardly surprising that people do not seek treatment they are unlikely to get. Improving the infrastructure for the Urban Health Project in Dar es Salaam proved to be a necessary precondition for all other interventions; it enhanced the users' perception of quality and helped motivate the personnel. The implementation of IMCI in rural Tanzania, which has strengthened clinic services for children, has led to a marked increase in use of these services. Increased success for interventions provided through the public health sector is likely to reduce recourse to inappropriate treatment through the private sector—which may be poorly regulated—or ineffective traditional practices. Increased success is also likely to reduce, though not eliminate, the lack of demand that stems

from the opportunity costs of seeking treatment. However, increased success will not necessarily stimulate the demand for interventions whose benefits are neither short-term nor obvious.

It is worth noting in passing that stimulating demand can, in some circumstances, be seen as controversial: a management culture (or an economic policy) in which the highest priority is containing costs will hardly see this as an obvious strategy. If one accepts, though, that the purpose of a health system is to obtain outcomes, the stimulation of demand becomes crucial.

Another crucial factor in generating demand is the creation of platforms of exchange and communication that allow the community being served a say in the services offered. Some communities, such as that of the nomadic people in Chad, hardly consult health services at all because the interventions they offer are poorly suited to the nomads' lives. Local communities will not be rich in health expertise, but they will be peerless in their understanding of their local setting and their own wants and needs. A willingness on the part of the health system to acknowledge and understand the community's agenda—and to take issue with it respectfully, when appropriate—should allow services to be designed in such a way that people will want them and use them. It should also serve as a basis for the sense of ownership and partnership that underlies a successful relationship between the health service and its clients.

Two further factors reducing demand for health interventions among the poor are the distance to the appropriate point of interaction with the health service, and high user costs. The physical difficulties of accessing health care can be a significant problem, especially in the poorest countries: in many parts of Chad and countries with similarly low levels of wealth, health services are underused because people cannot get to them. One way to deal with this problem is to extend the reach of the health system, for example, from town level to village level, with the use of health posts or of temporary "health camps", which have proved effective outreach settings among tribal and disadvantaged groups in the Indian state of Karnataka.

Another way to increase outreach is through community-based health workers. Studies of a community health worker programme in Bangladesh showed decreased overall mortality of 17% among neonates, 9% among infants, 30% among children aged 6 to 35 months, and 19% among women compared with mortality in a control area. Greater emphasis on household management of some cases of illness—with the education and provision of treatment materials that that requires—can help here, with

access to the necessary materials through depots of pre-packaged drugs in schools or in the care of community health workers.

An important indicator of the effective reach of the health system—to make it as close-to-client as it needs to be—is the provision of trained assistance at births. If the health system is dense enough to assure pregnant women of trained assistance and referral to hospital if necessary, it may be judged reasonably accessible. If the health system is not offering this level of accessibility, then it needs more people and facilities. Experience has shown that reasonably quick scaling up of birth attendance is quite feasible: in Indonesia, the number of midwives available to village populations was increased by a factor of 10 between 1986 and 1996.

Another approach to the problems of actually getting to health facilities is to improve access to transportation. This has extra non-health benefits, in that it also extends the sphere within which the poor can seek employment and education as well as health care. But it is effective only when there is unused capacity at the end of the journey.

Financial barriers in the form of user fees and drug costs have a significant impact on access. Government expenditure on drugs in the poorest countries is actually decreasing, and the poor often need to pay for medicines out of pocket at the time of illness. These are clearly problems that can be alleviated through the provision of additional funding, though often only through changes in policy at higher levels and with the implementation of new financial systems. The practice of informal charging, often prevalent where health worker salaries are very low, requires a package of interventions and most notably an increase in salaries (requiring extra funding) and improved supervision and control (requiring stronger human resource management systems and greater accountability of health workers to communities).

Not surprisingly, there is evidence that user fees, both formal and informal, can be particularly harmful to the health of the poor and can limit their access to the health system much more than it does for richer groups. Although exemption policies offer a way to protect the poor in theory, in practice they often do not work well. This does not mean that there will not be countries where user fees will be a valid approach in some cases, if people's attitudes to fees make this acceptable and if the poorest are protected from exclusion. If in such cases fees help patients assert their entitlements, they can act as demand stimulants.

Although some of these household and community level constraints can be bought out in the short term, others may not be so tractable. There

may be social factors that reduce the uptake of interventions and are resistant to change. The position of women may make it impossible for them to access the health care system or make decisions about health care for their children. Certain treatments may be held to be unacceptable in some circumstances (the anti-malarial drug chloroquine is seen in some areas as an abortifacient and thus not suitable for pregnant women). Treatment for sexually transmitted infections, especially at specialist clinics, may be avoided due to stigma. Outreach to marginalized communities with particular needs, such as commercial sex workers, may be hard if those communities are stigmatized; some of these target groups may not constitute communities in any usual way.

However, while specific attitudes that are clearly causing harm are worthwhile targets for education and information programmes, it is wrong to see the cultural concerns of communities as constraints. As previously mentioned, communities are best seen as the health service's active partners, and they are quite capable of using their cultural practices and values to maximize the effectiveness of interventions. For example, community-based insurance can liberate women to seek care for their children when they would otherwise have to ask their husbands for money to cover the costs. The Igunga Community Health Fund in Tanzania has created something like a health insurance scheme in which mothers and children do not have to wait for their husbands to give them money to go to the health units. Disadvantaged women can be encouraged to come together and organize themselves, and make use of health and educational services, as the experience of the Self Employed Women's Association (SEWA) in India shows. Effective drugs for STIs can be marketed through shops or bars frequented by men and hence reach their target population more easily than clinics in some situations.

3.3 LOCAL DELIVERY CONSTRAINTS

The second level of constraint is at the *health services delivery level*. These constraints are perhaps the most obviously susceptible to buy-out, though again it must be stressed that buy-out is not a simple transaction. Among the key issues are the availability, distribution, and motivation of appropriately skilled staff, technical guidance, and programme management; the availability of drugs, medical supplies, and equipment; and the upkeep and location of the health-service infrastructure.

The most important thing is the staff. Health workers have to be where they are needed in the numbers they are needed. They have to have been educated and to have been trained appropriately. They need to have

the materials they require for their work, and they have to have a workplace that is satisfactory. If they have to move around they need transport. They need to be able to make themselves valued and trusted by the communities that they serve; they need to be managed well enough to do their jobs effectively; and they need to be paid well enough to make their choice to be health workers a sensible one to stick with. To want or expect anything less than this is to fall into a self-fulfilling trap of low expectations and poor results.

These people will mostly be nurses, midwives, and paramedical workers rather than doctors, though of course doctors will play key supervisory roles. The needed interventions will be delivered through the health centres, health posts, and outreach programmes that these people create and work in. There is a well-known tendency for governments to under-resource this close-to-client part of the system, to the benefit of the tertiary hospital sector. For example, in one survey of 29 developing countries, over two-thirds were found to spend more than half of their recurrent health budget on hospitals. Teaching hospitals have vital functions to fulfil as destinations for referral, as centres for the development of appropriate protocols, and as providers of certain forms of training. But this does not justify the levels of funding they frequently receive due to their links to political élites and the urban rich.

In most settings, increasing the supply of trained workers is vital to relaxing constraints. But training should not be limited to the beginning of people's working lives. Improving the skills of existing staff must also be a priority. Well-run training programmes can dramatically improve outcomes even in the absence of net growth in the level of staffing, and this must be considered when looking at optimum staffing levels. For example, a six-week on-the-job training programme stressing the improvement of supervision and the importance of coordinated follow-up work is credited with increasing the tuberculosis cure rate among survivors to the end of treatment from 29% to 92% in Malawi. (It should be noted that this is exactly the form of training that categorical programmes should be well positioned to provide.)

It is always important to remain focused on the purpose of such activities. Training is not an end in itself; it should not be used as a way of topping up low salaries, nor should it come to take up a disproportionate amount of workers' time. It must be undertaken with a clear understanding of the skills needed, and monitoring the outcomes of training is an important part of the overall training package.

Another difficulty in targeting spending to the close-to-client health service is the previously mentioned predilection among donors for spending on centrally managed categorical programmes, rather than spending on local generalized services. Although this predilection needs to be challenged, that challenge is most fruitfully seen in terms of building up generalized services rather than dismantling categorical programmes, and of integrating the two where desirable. Strong technical programmes at the national and regional level have a role to play in the scaling up of many interventions. Categorical campaigns of various sorts—vaccination, diarrhoeal disease control, malaria control—were responsible for some of the most significant improvements in the health of the poor during the later parts of the twentieth century. It would be ridiculous to deny ourselves the power of such approaches in the future: where the technical capacity vital to such programmes exists it must be fostered, and where it is lacking it must be created. Yet it is also the case that a functioning close-to-client health system is necessary to build on and sustain the gains such campaigns may make, as well as to provide interventions ill suited to the categorical format. It is furthermore the case that categorical campaigns have largely failed to lead to the creation of such a system; this is their greatest failing.

It is important to bear in mind that programmes are never entirely general or entirely categorical—they exist along a spectrum between the two extremes. Thus the Polio Eradication Initiative is more categorical than the EPI, and concepts of comprehensive primary healthcare are more generalized than IMCI packages. A given intervention may be provided by a categorically organized management but still delivered by the local generalized service. It is also important to remember that, though some donors may have a predilection for categorical programmes, there are categorical programmes that pre-date the advent of the modern donor community; India's categorical programmes on malaria and tuberculosis provide examples.

The strengthening of local services may allow them to take a larger part in the delivery side of categorical programmes, and also to move some programmes further towards the generalized end of the spectrum of interventions. We would hope that strengthened close-to-client services would provide some of the benefits now seen in categorical programmes, such as an orientation towards improved outcomes and increased accountability, though that accountability needs to be towards local communities. Most importantly, strengthened local services should over time

develop a sustainability that for the most part eludes categorical programmes, especially those dependent on donors.

Categorical programmes can, in principle, be used to strengthen generalized services in various ways, promoting social mobilization and intersectoral collaboration; strategies that maximize this strengthening are obviously a high priority. Without such strategies, strengthening is not particularly likely; and even with such strategies it will be much more readily achievable in middle-income countries than in low-income countries, where the problems of competition between the two approaches can outweigh possible synergies. When categorical programmes have serious impacts on the health system—when national immunization days lead to the closing of health posts in a number of districts, as has been reported in Madagascar, or come to dominate the day-to-day functioning of the health service—it is clear that the situation requires redress. The priority in such situations should be to avoid competition for scarce human resources by increasing the stock of trained staff. Support for technical programmes at national levels should not be seen as an alternative to support for general services but as an adjunct to it. Again, there is a need for enough staff, and enough paid positions, to maintain both aspects of the health system.

Quality assurance methods have proved effective in improving both the efficiency of health systems and the satisfaction of clients. They work largely by increasing communication across teams and bringing people together to analyse problems such as the flow of patients. They help to turn general policies about what might be done into ways of actually doing it. The sense of ownership that this can bring tends to have a positive effect on the health workers' morale. A general feature of efforts to assure quality is that they require enhanced communication both within the health system and between health workers and the communities that they serve.

Management strengthening is also a crucial step in building up delivery systems. Increased management capacity is a necessary prerequisite for effective decentralization and the local strengthening such steps aim to provide. Management training, even in the quite simple form of workshops and seminars, has proved effective at strengthening management in a number of settings. In Ghana workshops, programmes aimed at helping managers prioritize problems, think through action plans, and then review those plans led to improved financial management, improvements in confidence on the part of managers and morale on the part of the staff, and increased community involvement. Management strengthening pro-

grammes in Guinea Bissau have improved the adaptation of national policies to local needs and also increased the flow of knowledge horizontally and vertically through the health system. A common factor in all the reports on such activities that we reviewed was that attempts to improve management, such as improving training, have wider effects on morale and team spirit. Effective training and management that make workers better at their jobs make them feel better about the health system—an important facilitator of further change and help in the retention of skilled personnel.

A crucial facilitator for better management is better information about the situation that is being faced. Systems for health monitoring are poor to nonexistent in many developing countries. Systems for recording treatment and outcomes are often unnecessarily complex and time consuming—archaic information systems eat up time that could be spent in treatment. Improvements in communications within the close-to-client system will help with some of this, but a large-scale investment in appropriate monitoring is necessary if management improvements are to deliver as much as they might. Systems that attempt to monitor equity, as well as outcomes, will be important in keeping the focus on the needs of the poorest; the support of civil society and community involvement will facilitate such monitoring. There is more consideration of monitoring requirements in Chapter 5 of this Report.

Investment to remove delivery constraints will need commitment from those who set health policy as well as those who implement it. Levels of pay, which may need to be improved to encourage staff training, retention, and performance, will frequently be controlled by government-wide regulations. In some cases, interventions by donors and NGOs may offer ways to work around this problem, if donors are willing to make commitments to paying ongoing salaries. Changing the distribution of staff and resources to favour the delivery of health care to the poor will require changes in policy and in management structure: the movement of resources to the non-metropolitan portion of the system will frequently require changes in management culture, too. Chad has fewer than 700 nurses for its 7 million people, and yet they are disproportionately concentrated in the capital city, N'Djamena.

Implementation of an integrated drugs policy, one that pulls together drug and vaccine selection, procurement, distribution, dispensing, and adherence policies, is also an important step towards scaling up key interventions. Although this is mostly a policy matter, there is evidence that the

deployment of quality assurance methods within the health service can be a significant help in drugs policy as in other areas of improving delivery.

All these changes require political commitment. They may also require an irreducible period of time. A certain level of in-service training for existing staff may be relatively easily bought, but the question of who trains the trainers is always apposite. Convincing existing health care workers to move to places where they are needed may be hard; training people who are happy to work where they are needed may be time consuming. The removal of such constraints is a complex business, accomplished over numerous iterations rather than all at once. It requires sustained commitment and sustained funding.

Given that this process will take place over time, significant thought should be given to the question of the order in which interventions should be scaled up. It will in all likelihood make sense to scale up first those interventions least dependent on increased capacity in the everyday health services, for example supplies of antimalarial drugs at the village level, marketing of ITNs, and vaccination campaigns. Managing all scale-ups in such a way as to maximize the benefits they offer subsequent programmes should be a high priority. Correct phasing of scale-ups across the spectrum of interventions will maximize the effects of the various buy-out initiatives involved. These issues are discussed further in Chapter 5 of this Report.

The fact that substantial strengthening of the public delivery system will frequently be a protracted task is one of the reasons why efforts must be made to improve the quality of the private sector. In most parts of the world, the private sector is more widely accessible than public sector health care, and in the form of drug sellers and other less qualified practitioners it is widely used by the poor. Experience of ways that users and providers can be encouraged to buy and sell more effective treatments is increasing. For example, social marketing techniques can be used to raise awareness of ITNs or the correct drug to treat malaria, and encouragement can be given to the private sector to stock these products. Advice on packaging can help ensure that both seller and buyer are well informed about how the product should be used.

Some countries have a substantial not-for-profit private sector, often with an emphasis on delivering services in rural areas. In many countries, local and international NGOs are playing a very important role in service delivery in areas such as maternal and child health and HIV prevention. There is considerable scope for contracting out service delivery to these bodies. Many receive government subsidies already, as in the case of church health services in Ghana, Malawi, Tanzania, Zambia, and

Zimbabwe, and additional funding could enable them to expand. Tanzania has used church-owned units as designated district hospitals, providing subsidies to improve equity and access in remote districts. Increasing funding through channels such as these will be a fairly rapid means of scaling up in certain settings. There is also scope for specifying contracts that encourage good performance: for example, retaining a small share of the budget and paying it only if certain targets are met. However, this will require that the capacity to make contracts and to monitor outcomes be in place. In the most highly constrained settings this is unlikely to be the case for some time to come.

For all these various forms of constraint there are factors that facilitate relief: we present them in a tabular form in Table 3.2. It is worth noting that in many cases—improved teamwork, improved communication—these facilitators of constraint relief are themselves the product of constraint relief. This suggests the possibility of virtuous circles continually enhancing the climate for improvement.

3.4 TOP-LEVEL CONSTRAINTS

We recognize three types of higher level constraint: *health sector strategic management and policy making*, *public policy across sectors*, and *envi-*

Table 3.2 CATEGORIZATION OF FACILITATING FACTORS

Levels	Facilitating factors
Community and household level	Community involvement
Health services delivery level	Staff motivation Team work Frequent communication Supervision and feedback mechanisms
Health sector policy and strategic management level	Liaison units or group of facilitators for driving and maintaining change processes Frequent communication Effective technical and managerial support to strengthen the capacity of community health workers, staff, and NGOs Participative, bottom-up approaches involving community, managers, and staff
Public policies cutting across sectors	Decentralization and autonomy at regional and local levels Intersectoral collaboration, partnerships (with clear definition of roles of each partner and democratic involvement)
Environmental characteristics	Political and macroeconomic stability Commitment, leadership, and ownership of all partners (government, staff, community)

Source: Oliveira-Cruz et al., 2001a.

ronmental characteristics, which we divide into issues of governance and issues pertaining to the physical environment. The relaxation of these high-level constraints is not necessarily enough in itself to improve delivery. They tend to be second-order constraints, in that they may in large part account for the continued existence of the primary constraints discussed above.

Among possible constraints in the health sector proper are weak planning and management systems, weak drug policy, poor procurement processes, inappropriate centralization, and weak regulation of and/or poor links with the private sector. Weak planning, it should be noted, is often tied to the problem of poor monitoring and surveillance—with the present poorly known, the future is hard to design. Although external resources can help build up regulatory systems, management systems, and planning capacities, at this level in particular true political commitment is necessary. The same applies to issues beyond the health sector, such as civil service rules and remuneration, the development of communications and transport infrastructure, and actions to limit the availability of tobacco. In these cases, though, financial resources must match political will.

It is worth noting that the policies of decentralization that will often be necessary to help in the process of building capacity in the close-to-client health system may encounter various political difficulties. Depending on the political structure of the nation, some regions may be under the control of parties other than those forming the central government, and this may dissuade the government from investing in close-to-client systems in some of the regions that most require the investment. Even in the absence of partisan issues, it is still the case that the regions where the poorest members of the population are to be found will often be represented weakly at a national level.

Regulation of the private sector is one of the key duties of ministries of health, all the more so if the private sector is to be a trusted partner. At the moment, the capacity for such regulation is often weak, as is the capacity for effective partnership: the two weaknesses may not be unconnected. Many countries remain vulnerable both to poor practices in the local private sector and to undesirable marketing practices of foreign companies. It is not difficult to specify what regulations countries should enact, but enforcement of regulation is extremely difficult, especially of the highly dispersed, numerous, small-scale providers. The implementation of regulatory measures will therefore need to be complemented by information designed to increase consumer awareness of what drugs to use for common conditions and when to seek advice from a trained prac-

tioner: the household module of IMCI includes information aimed at helping mothers make these decisions.

The very highest levels of constraint—those due to overall governance and geography—are among the most important and the least susceptible to buy-out or indeed short-term amelioration of any sort. These constraints include corruption; weak rule of law; political instability; the possibility, presence, or aftermath of armed conflict; and the lack of a free press and other structures of accountability. Many countries have a massive problem with internally displaced peoples, who have very high disease and death rates. For example, in the eastern portion of the Democratic Republic of Congo there were an estimated 1.7 million excess deaths between January 1999 and May 2000, of which only 200 000 were due to direct violence. These are conditions about which little can be done from outside, though it may be possible to support NGOs that can help deal with the needs of internally displaced peoples, to support activities in the area of training and education, and to take measures to promote the growth of civil society.

There is one crucial class of constraint not yet mentioned: constraints due to donors. One problem faced throughout the health sector in the developing world is the fact that donor funds are not spent in ways that necessarily help improve the long-term performance of the health sector or increase capacity to improve local decision making. As noted above, many donors have traditionally tended to prefer quite intensively funded projects with short-term results that are beyond the sustainable capacity of the local health system, though the advent of sectorwide approaches is beginning to change this. Funding is often neither truly predictable nor reliable. Although it is inevitable that donors will fund projects and withdraw from projects according to their priorities, the ways in which they do so can be actively harmful. This is particularly true in less-developed countries with particularly weak health systems. Donors are of much less importance in a country such as India than they are in a country such as Chad.

The creation of parallel delivery structures, the recruiting of scarce skilled personnel with impressive incentives, and the diversion of resources from other uses due to donor pressure—or the perception of such pressure—are all real problems. The management of external resources is not necessarily efficient or stable. Although these problems are familiar to most who work in international public health, they need to be taken much more seriously by the international community; there is little that the poor or those who govern them can do about these problems. Working Group 6 addresses these matters in greater detail.

3.5 BUYING OUT AND WALKING AROUND

Listed one after another in this way, the constraints seem almost insurmountable. However, it is important to remember that the easing of constraints is not an all-or-nothing business, that a great deal can be achieved by relaxing only those constraints at the demand and delivery levels, and that significant relief of this sort can be achieved without large-scale changes at higher levels, though political will is the most useful of facilitators. The key requirements are that there be money, trained workers, competent managers, decently equipped health centres, and the technical capacity to implement national programmes in areas such as vaccination, malaria control, tuberculosis treatment, and HIV prevention.

Equipment, supply, and infrastructure issues are all clearly susceptible to focused buy-out. Staff shortages should be susceptible to buy-out in the form of increases in wages and increases in the amount of training available; investments in improving procurement systems are also an important way to improve access to drugs, material, and equipment. The possibilities for buy-out in most settings are manifest.

However, while our typology of constraints was conceived in such a way as to be generally applicable, the situations in different low-income countries vary widely. Using a variety of indicators that can be taken as measures of particular constraints, Working Group 5 attempted to stratify low- and lower-middle-income countries in such a way as to see which were most constrained and which were least constrained. On the premise that scale-up will be hardest in the most constrained countries, and opportunities for buy-out may be harder to come by there, it was important to discover how many of the countries under discussion were, indeed, highly constrained.

This analysis was hampered by the availability of proxy-data by which to measure constraints: in the end, the indicators chosen were female literacy, nurses per 100 000 citizens, DTP3 coverage, a UNICEF measure of access to health services, World Bank measures of control of corruption and government effectiveness, and the Harvard Center for International Development's measure of the proportion of the population living in the tropics.

The analysis revealed these indicators vary a great deal. In low-income countries, for example, the number of nurses per 100 000 varies from 5 to 874, and the proportion of people classed as having access to healthcare from 18% to 95%. Encouragingly, the two low-income countries where the majority of the poorest billion live, China and India, were firmly in the least-constrained quartile.

Of particular interest, though, are the low-income countries placed in the lowest quartile using these proxy markers for constraint. These countries were Angola, Burundi, Cambodia, Central African Republic, Chad, Democratic Republic of Congo, Eritrea, Guinea-Bissau, Haiti, Republic of Yemen, Liberia, Mauritania, Niger, Nigeria, and Somalia. These countries are mostly in sub-Saharan Africa, and many are now or recently have been in conflict (internal or external). Many have grievous governance shortfalls. We observe a qualitative difference between these countries and those in the higher quartiles; in other countries, specific indicators of constraint are much less highly correlated with each other than they are in these most highly constrained countries.

These most constrained countries represent the hardest cases for intervention. They have health indicators significantly worse than those for the other three quartiles (see Table 3.3): they have a third as many nurses per capita, almost twice the infant mortality, more than twice the maternal mortality. The proportion of their population living on less than US\$ 1 a day is twice that in the other quartiles. However, it is important to note that, in absolute terms, these countries represent a relatively small part of the problem. These are for the most part small countries (more than half have populations below 10 million), and their total population is about 260 million. Despite the fact that they have high rates of poverty, they represent only 13% of the total population living on less than US\$ 1 a day in low-income countries. To put it another way, 87% of the people living on less than US\$ 1 a day in low-income countries do not live in the most highly constrained settings.

This finding—that 87% of the people living on less than US\$ 1 a day in low-income countries do not live in the most highly constrained settings—is very important. It is common in some circles to argue that nothing can be done for the poorest billion because they live in countries where governance is too poor, civil society too weak, levels of education too low, and investment in infrastructure too nugatory for outside assistance to achieve any sustainable good. However, though there are indeed places that appear too constrained for hope in this way, most of the poor—almost 90% of the poorest billion—do not live there. They live in countries where the situation is appreciably better.

That having been said, local and regional settings can still be highly constrained in countries where overall levels of constraint are not too high. Indeed, considerably more people live in highly constrained regions of less constrained countries than in highly constrained countries. The Indian states of Bihar, Chhatisgarh, Jharkand, and Uttar Pradesh would all

Table 3.3 HEALTH INDICATORS BY LEVEL OF CONSTRAINT IN THE POOREST COUNTRIES

Indicator (median values, unless otherwise stated)	Unit	Highly constrained countries (lowest quartile; n = 16)	Less constrained countries (other three quartiles)
Total population	Millions	258	3 373
Population living on less than US\$ 1 per day	%	45.1	22.9
Population living on less than US\$ 2 per day	%	83.0	56.3
Physicians	per 100 000 people	28.1	121.9
Nurses	per 100 000 people	50.1	150.9
Hospital beds	per 1 000 people	1.0	2.6
Maternal mortality	per 100 000 births	869.5	394.1
Births with skilled attendant	%	28.1	57.9
Low-birth-weight infants	%	19.5	17.5
Infant mortality	per 1 000 live births	91.3	52.7
Under-5 mortality	per 1 000 live births	130.5	70.3
Measles immunizations coverage	%	53.1	65.0
DPT3 immunizations coverage	%	48.7	73.7
DOTS detection	%	20.1	25.7
DOTS treatment success	%	69.2	84.1
Insecticide-treated net coverage	%	1.4	2.1

Source: Data from Hanson et al., 2001.

Note: Full data were not available for all countries in each of the quartiles, thus analyses are restricted to the 59 countries listed in the background paper by Hanson et al., 2001.

qualify as highly constrained by the metrics we are using and have a combined population of 293 million. The Chinese province of Sichuan, with a population of 100 million, would also qualify, and there are similar, smaller examples in less populous countries. However, the presence of structures under federal control means that these pockets (very large pockets in some cases) have a greater possibility for action than isolated highly constrained countries do; in Bihar, both polio and leprosy have been brought close to elimination.

Moreover, even in the most constrained countries there is reason to believe that effective interventions are still possible. The fact that it will be easier to scale up interventions in other countries is no reason not to attempt to scale up interventions in the most constrained countries. Many constraints that operate at the health delivery level and as barriers to

Table 3.4 RELAXING CONSTRAINTS: PRIORITY ACTIONS BY TYPE OF COUNTRY

Level of constraint	Highly constrained countries	Least constrained countries
Community and household level	Encourage community mobilization through NGOs Use social marketing and retail sector to make effective drugs available to households	Use incentives to stimulate demand
Health services delivery level	Build up health care delivery infrastructure through public services and/or agreements with NGO and church providers Use outreach services and NGOs where public sector difficult to extend	Improve human resource management policies in order to ensure better staff performance Strengthen local management
Health sector policy and strategic management level	Increase degree of management decentralization Strengthen drug supply and distribution system through public and/or private sector Greater donor coordination	Increase degree of management decentralization Greater donor coordination Strengthen regulation of private sector
Public policies cutting across sectors		Give greater autonomy to health sector
Environmental characteristics: <i>A. Governance and overall policy framework</i> <i>B. Physical environment</i>	Prepare for possible scale up under improved conditions; maintain links with NGOs; support education and training	Encourage more pluralist policy process

access will be at least partially amenable to buy-out whatever the overall level of constraint. Tactics, though, may differ in different terrains (see Table 3.4). Interventions that can be delivered outside the public health sector—through NGOs, through parallel categorical programmes with management at least partially independent of any existing public health system, and through the private sector—will take on a particular importance in such situations. Cambodia provides a recent example of success in such a situation. Although it is a very highly constrained setting, a mixture of government policy and NGO activity has greatly increased condom use in the setting of commercial sex work, and as a result HIV seroprevalence rates appear to be falling in the general population. It has also

had some success in drawing on NGOs to help manage general health services.

There is an argument to be made, in fact, that a poor climate for development in general—poor governance, a weak economy, rampant corruption, and so on—is less of a hindrance to targeted health programmes than to any other form of development assistance. Although it remains the case that, in general, aid is most effectively spent in countries with sound governance and policy, it may also be the case that, in places where those conditions do not apply, well-planned health interventions retain their efficacy to a far greater degree than other forms of aid. Smallpox eradication required effective interventions in all countries regardless of constraint; more recently the West African Onchocerciasis Control Programme has achieved significant goals in highly constrained settings.

Another consideration is that conditions of high constraint are often transitory. Had our analysis been carried out some years earlier, countries such as Mozambique and Uganda would probably have been found among the most constrained. Today they have considerable successes to boast of. What we are identifying as highly constrained countries are in many circumstances what others would refer to as countries with complex emergencies, and this alternative approach stresses the fact that, for the most part, the high constraints are due to exceptional circumstances. Complex emergencies are not permissive environments for health interventions, but they are environments that require them, especially in terms of epidemic control, for malaria and for other diseases. Given the transitory nature of at least some such emergencies, money spent on categorical health programmes in such situations may serve as a useful basis for more generalized improvements in the health system when the emergency is resolved.

4. COSTS AND BENEFITS IN CONTEXT

Strengthening the close-to-client health systems that serve the poor and using them to increase the availability of priority interventions will necessarily be costly. Working on a country-by-country and intervention-by-intervention basis, we have estimated the costs for a number of scenarios involving different target coverage levels and different degrees of system strengthening. In order to reach target levels of coverage that are ambitiously but appropriately high, incremental spending on priority interventions and the close-to-client system necessary for their delivery might be expected to reach the region of US\$ 40 billion to US\$ 52 billion annually by 2015. The benefits that might flow from such spending are appropriately impressive. We would expect perhaps 100 000 fewer annual deaths in childbirth and between 2 million and 5 million deaths in childhood avoided each year by 2015. Two million deaths due to tuberculosis might be avoided in 2015 with appropriate drug treatment, or about 10 million cumulative deaths. Tripling cessation rates among current adult smokers could avert 60 million premature deaths due to tobacco-related disease by 2050, and perhaps double that number. The HIV epidemic is bound to grow, but properly targeted prevention programmes could prevent over 100 million additional people being infected in 2015, and care programmes can provide humane treatment for those already infected.

The constraints on scaling up the close-to-client health system's ability to deliver successful interventions are pervasive and in some places severe, but nowhere are they utterly insurmountable. However, the ability to scale up is worthless without the ability to procure the necessary materials, to train the necessary staff, to build the necessary health posts, and to manage the necessary monitoring systems. Even in the best-functioning systems, where no buy-out of structural constraints is necessary, significantly increasing the delivery of interventions means significantly increasing the amount of money being spent on them and increasing the capacity to deliver them; where increases do require buy-outs of structural constraints, the spending requirements will be even greater. Improving the health of the world's poorest billion is not just about money. But it will require money in abundance.

Vastly increasing the provision of key interventions to the poorest billion is an undertaking that will undoubtedly involve unprecedented spend-

ing on health in low-income countries. Detailed questions about the source of this spending—in particular, about how much of it should come from donors—are outside the province of Working Group 5. However, we have been charged with making estimates of what those total costs might be, and these estimates are the subject of this part of our Report. As a part of estimating the costs of scaling up the delivery of key interventions, we made estimates of the coverage that might be achieved; combined with estimates of the effectiveness of the various interventions, this allows the calculation of the health benefits that might be achieved in such scaled-up systems. To provide a context for the costs, we go on to discuss estimated health outcomes in the context of the Millennium Development Goals (MDGs) that have been adopted by the UN.

The costing exercise is based on maximum plausible increases in the coverage of the interventions that we have identified as having the greatest potential impact. These increases cannot be expected to be instantaneous. They will take time. What is more, they will take longer for countries with less existing capacity. Thus at the heart of our costing efforts are assumptions about the maximum possible rate of such scaling-up under different levels of infrastructure investment. The annual costs thus represent the costs of providing the best coverage we see as possible in that year, given optimum growth in the years before, while also investing the most that can be usefully invested in increasing the capacity to deliver in subsequent years. The costs are thus model dependent and path dependent; they represent the costs of building a health system and using it properly, rather than the costs of particular outcomes.

This distinction is crucial. The sums of money that would be spent in these scenarios will buy the outcomes we discuss only if used properly. Because of this, it is important that all spending be evaluated according to the likelihood that it will be spent in an effective, constraint-conscious way. To say that a country might improve access to effective tuberculosis treatment by so many percentage points for US\$ 10 million is not to say that US\$ 10 million is in itself going to achieve the aim. Only if there is a credible plan for achieving the higher level of coverage—a plan that takes into account the relevant constraints to scale-up—should either a country's government or the donor community commit to spending the money. The discussion of constraints in Chapter 3 is thus as central to this Report as the cost estimates: the degree to which there are realistic plans that take constraints into account should be a crucial factor in any decision to invest in health on the scale discussed below.

4.1 CALCULATING THE COSTS

A detailed discussion of the methodology used to estimate the costs is presented in a background paper available on the web, and further information is provided in Annex 5 of this document. The cost analysis covers a set of 83 countries that includes all the countries of sub-Saharan Africa and all other countries with per capita GNP below US\$ 1200. The analysis looked at scaling-up coverage of 49 priority health interventions (and 65 treatment lines) within the close-to-client health system in these countries. The interventions were classified according to the lowest level of service delivery required to provide these interventions (hospital, health centre, outreach services, or outside health sector).

Whereas methodology exists to attribute the burden of disease to specific illnesses or health problems, the practical implementation of most of the programmes for these diseases cannot be separately packaged within a health system. Indeed, achieving widespread coverage for these key interventions will require substantial strengthening and upgrading of existing health systems.

Every attempt was made to estimate the full cost of providing services at the close-to-client level. Costs include capital components and requirements for complementary management and institutional support, as well as investments in new facilities and the recruitment and training of new personnel. The analysis includes estimates of the cost of addressing various constraints, specifically the costs of addressing a shortage of appropriately qualified staff; poor distribution of staff; weak technical guidance, programme management, and supervision; inadequate drug and medical supplies; lack of equipment and infrastructure; and poor accessibility of health services.

Three costing scenarios were used for the analysis, distinguishable by their time frames, their assumptions about investments in capacity and infrastructure, and their levels of target coverage. Scenario 2007A looked at the possible levels of delivery within 5 years, with an emphasis on expanding the lower levels of the close-to-client health system (e.g. health centre and outreach services). Scenario 2007B estimates the costs assuming substantial investments in existing health systems at all levels of service delivery needed for the interventions, but limited by the extent to which these investments can take place over 5 years. Scenario 2015 estimates the costs of achieving implementation of priority interventions at increased levels of coverage, and with investment in existing health systems, over a 13-year period, and is consistent with scenario 2007B.

Table 4.1 CURRENT BURDENS, COVERAGE BASELINE,¹ AND GOALS FOR MAJOR SCALE UP OF SELECTED INTERVENTIONS

Condition (millions of deaths in low- and middle-income countries in 1999) and interventions ²	2002 baseline	2007A minimum target	2007B minimum target	2015 minimum target
<i>Maternal mortality (0.5) and perinatal conditions (2.4)</i>				
Refocused antenatal care	65%	70%	80%	90%
Skilled birth attendance	45%	60%	80%	90%
<i>Childhood mortality (1.6 from vaccine preventable diseases, 1.8 from diarrhoea, and 2.1 from acute respiratory infection)</i>				
Immunization services: BCG, OPV, DPT, Hepatitis B & HiB ³)	75%	80%	90%	90%
Immunization services: Measles	68%	70%	80%	80%
IMCI: ARI	59%	60%	70%	80%
IMCI: diarrhoea	52%	60%	70%	80%
<i>Malaria (1.1)</i>				
Insecticide-treated nets and residual indoor spraying	2%	30%	50%	70%
Treatment of malaria	31%	50%	60%	70%
<i>Tuberculosis (1.5)</i>				
Short-course treatment for smear-positive and smear-negative patients	44% ⁴	50%	60%	70%
<i>Tobacco-related diseases (2.7)⁵</i>				
Tax greater than 80% of retail price, advertising and promotion bans, consumer information, cessation programs	20%	80%	80%	80%
<i>HIV/AIDS and STIs (2.5)</i>				
Interventions outside the health sector (interventions working with sex workers and clients, condom social marketing and distribution, workplace interventions, youth interventions, focused media campaigns, sexually transmitted infections treatment)	10–20%	40%	70%	80%
Other interventions (voluntary counselling & testing, prevention of mother-to-child transmission, mass media campaigns)	<1–10%	20%	40%	70%
Palliative care, clinical management of opportunistic illnesses, prevention of opportunistic illnesses, home-based care	6–10%	25%	40%	70%
HAART	< 5%	10%	45%	65%

Source: Authors.

Table 4.1 NOTES

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- 1 Calculated for all sub-Saharan Africa countries plus all other countries with per capita GNP below US\$ 1200.
 - 2 Interventions that are epidemiologically appropriate are specified for each country. For example, malaria control measures are not included in countries where malaria does not significantly contribute to the burden of disease, and residual spraying is costed only where it is an appropriate intervention.
 - 3 Hepatitis and HiB are not included in the calculation of coverage for 2002. Immunization services include provision of Vitamin A in deficient areas.
 - 4 The actual coverage calculated is substantially higher than the WHO estimate for DOTS coverage (about 23% in 2000), since the cost analysis estimated a wider set of patients treated for TB in programmes.
 - 5 Not included in costing, as higher tobacco taxes can finance tobacco control: on average, a 10% excise tax increase raises revenue by 7% (Sunley et al., 2000).
-

Table 4.1 presents baseline coverage and minimum target levels for each intervention area. The target coverage levels come from best judgments made by consulting experts in the relative fields with some account taken of country-specific knowledge of the constraints to scaling up; where adequate target rates have been set by the international community, our target rates reflect them. Coverage levels reported over recent years served as an approximation for the baseline of the analysis. As the cost exercise is based on country-specific data, the data presented for baseline coverage reflect an average for the countries included. The target coverage levels represent the minimum coverage rates achieved in each scenario. However, the actual performance of some countries is higher than these levels. Thus, the average resulting coverage is higher. This is particularly noticeable in scenarios 2007A and 2007B, as the target levels of coverage are lower.

In order to obtain estimates of the costs of scaling up, available demographic, behavioural, and epidemiological data were used to determine the size of the population-in-need on a country-by-country and intervention-by-intervention basis. The difference between estimates of the current level of coverage and the scenario's target levels of coverage was then used to define the size of the population in need of additional coverage (PAC). Cost data for the interventions were then used to estimate the cost of serving the PAC in each country, with similarly scaled estimates for required new investments in training staff and facilities, and for management and institutional support.

Costs for required investments in training and facilities were calculated on the basis of required contact time with health service staff and use of inpatient or ambulatory facilities. Calculations for staff and facility requirements were estimated on the basis of required nursing time; once the requirement for nursing was fixed, desirable ratios of nurses to other health facility staff such as physicians and to infrastructure requirements such as hospital beds were used to calculate these requirements. The management and institutional support component of the costs included estimates of the administrative and support functions, and of monitoring, supervision, and institutional strengthening within the close-to-client health system. All costs were scaled to the appropriate PAC.

The cost analysis was designed to estimate the additional resources that would be required for a large-scale expansion of activities. The costs reported thus reflect incremental expenditure over and above what is being spent today, and are referred to as *incremental costs*. Given the uncertainty regarding the costs of different interventions, a likely low–high range of costs was estimated. In order to make the costs comparable between countries, nontraded components of costs were adjusted for purchasing-power parity.

It is important to note that these estimates are vulnerable to problems in the underlying data. Despite the valiant efforts of many researchers, in many places figures for the costs of interventions and for their coverage are either sparse, unreliable, or both. As we discuss in Chapter 5 of this Report, better data are vital if money is to be spent wisely, and improving systems for gathering data must be a high priority. Since the analysis proves to be quite sensitive to its assumptions, particularly those about coverage data, consideration of the data problems should be seen as constituting a caveat against an over-literal reading of the estimates. Furthermore, it has not proved practical to model the effects of interventions that take place in the near term on the need for the same or other interventions further downstream; in particular, the substantial increase that we model in HIV/AIDS prevention efforts does not, within the confines of our model, have an impact on the level of prevalence. The use of unit costs rather than marginal costs means that costs of scale-up in situations of already high coverage or very low coverage may be underestimated, but this source of uncertainty is probably not large compared with others in the analysis.

Table 4.2 provides the estimates for costs, stratified by country income level and region, for the three cost scenarios, presented in total US dollars, in cost per capita and as a percentage of GNP (further details in

Table 4.2 ANNUAL INCREMENTAL COSTS OF SCALING UP BY REGION (US\$ 2002)¹

	2007A		2007B		2015	
<i>Total dollars (billions of US dollars)</i>						
All countries	13	(11–14)	26	(23–29)	46	(40–52)
All low-income countries	10	(8–11)	19	(17–22)	33	(28–37)
All middle-income countries	3	(3–3)	6	(6–7)	13	(11–14)
Sub-Saharan Africa	6	(5–7)	13	(11–15)	23	(20–26)
East Asia and Pacific	3	(2–3)	5	(5–6)	10	(9–11)
South Asia	4	(3–4)	7	(6–7)	11	(9–12)
Eastern Europe and Central Asia	0.2	(0.2–0.2)	0.4	(0.4–0.4)	1	(1–1)
Latin America and Caribbean	0.2	(0.2–0.3)	0.4	(0.4–0.5)	1	(1–1)
<i>Per capita (US dollars)</i>						
All countries	3	(3–3)	6	(5–7)	10	(8–11)
All low-income countries	3	(3–4)	7	(6–8)	10	(9–12)
All middle-income countries	2	(2–2)	4	(4–5)	8	(7–9)
Sub-Saharan Africa	8	(7–9)	16	(14–18)	24	(21–27)
East Asia and Pacific	1	(1–2)	3	(2–3)	5	(5–6)
South Asia	2	(2–3)	4	(4–5)	7	(6–7)
Eastern Europe and Central Asia	2	(2–2)	4	(3–4)	7	(6–7)
Latin America and Caribbean	5	(4–6)	10	(9–11)	16	(14–19)
<i>Percentage of GNP</i>						
All countries	0.4	(0.3–0.4)	0.7	(0.6–0.8)	0.9	(0.8–1.0)
All low-income countries	0.7	(0.6–0.7)	1.3	(1.1–1.5)	1.6	(1.4–1.8)
All middle-income countries	0.2	(0.1–0.2)	0.3	(0.3–0.3)	0.4	(0.4–0.5)
Sub-Saharan Africa	1.4	(1.1–1.4)	2.7	(2.4–3.0)	3.7	(3.1–4.2)
East Asia and Pacific	0.1	(0.1–0.1)	0.3	(0.2–0.3)	0.3	(0.3–0.4)
South Asia	0.4	(0.3–0.4)	0.8	(0.6–0.8)	0.9	(0.8–1.0)
Eastern Europe and Central Asia	0.2	(0.2–0.2)	0.4	(0.4–0.5)	0.7	(0.6–0.7)
Latin America and Caribbean	0.6	(0.4–0.6)	0.9	(0.8–1.0)	1.3	(1.2–1.6)

Note: Data are presented in terms of averages, the midpoint between the top and bottom of the low–high range. Figures in parentheses are the rounded low–high range estimates for scaling up the interventions. The average estimate was calculated before numbers were rounded, so it does not necessarily coincide with the midpoint of the low–high range presented. Costs for smoking control not included.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

¹ Calculated for all sub-Saharan Africa countries plus all other countries with per capita GNP below US\$ 1200.

Annex 5). Table 4.3 breaks down the costs by intervention. Although the set of interventions chosen has been broadly characterized by disease or condition, in reality the nature of health service delivery means that there are overlaps between these interventions. For example, malaria prophylaxis for pregnant women could be included under malaria prevention or maternity-related interventions. The latter was chosen, as this was the nature of the delivery mechanism.

Table 4.3 ANNUAL INCREMENTAL COSTS OF SCALING UP BY INTERVENTION AREA
(US\$ 2002)¹

	2007A	2007B	2015
<i>Total dollars (billions of US dollars)</i>			
All interventions	13 (11–14)	26 (23–29)	46 (40–52)
1 Maternity-related illnesses	2.1 (1.6–2.5)	3.6 (2.8–4.5)	5.5 (4.3–6.7)
2 Childhood disease-related illnesses: Immunization	0.8 (0.7–0.9)	0.9 (0.8–1.1)	1.2 (1.0–1.6)
3 Childhood disease-related illnesses: Treatment	1.7 (1.5–1.9)	3.7 (3.3–4.1)	10.7 (9.4–12.0)
4 Malaria prevention	1.2 (0.9–1.4)	2.0 (1.6–2.4)	3.4 (2.8–4.0)
5 Malaria treatment	0.3 (0.3–0.4)	0.5 (0.4–0.6)	1.0 (0.8–1.2)
6 TB treatment	0.4 (0.3–0.4)	0.5 (0.5–0.6)	0.9 (0.8–1.0)
7 HIV prevention	3.6 (3.5–3.8)	6.5 (6.2–6.8)	8.3 (8.0–8.7)
8 HIV care	1.6 (1.4–1.7)	2.8 (2.8–2.9)	6.4 (5.8–7.1)
9 HIV treatment (HAART)	1.0 (0.9–1.2)	5.0 (4.3–5.8)	8.0 (6.9–9.2)
<i>Per capita (US dollars)</i>			
All interventions	3 (3–3)	6 (5–7)	10 (8–11)
1 Maternity-related illnesses	0.5 (0.4–0.6)	0.8 (0.7–1.0)	1.1 (0.9–1.4)
2 Childhood disease-related illnesses: Immunization	0.2 (0.2–0.2)	0.2 (0.2–0.3)	0.3 (0.2–0.3)
3 Childhood disease-related illnesses: Treatment	0.4 (0.4–0.4)	0.9 (0.8–1.0)	2.2 (2.0–2.5)
4 Malaria prevention	0.3 (0.3–0.3)	0.5 (0.4–0.6)	0.7 (0.6–0.8)
5 Malaria treatment	0.1 (0.1–0.1)	0.1 (0.1–0.1)	0.2 (0.2–0.3)
6 TB treatment	0.1 (0.1–0.1)	0.1 (0.1–0.1)	0.2 (0.2–0.2)
7 HIV prevention	0.8 (0.8–0.9)	1.5 (1.4–1.6)	1.7 (1.7–1.8)
8 HIV care	0.4 (0.3–0.4)	0.6 (0.6–0.7)	1.3 (1.2–1.5)
9 HIV treatment (HAART)	0.2 (0.2–0.3)	1.2 (1.0–1.3)	1.7 (1.4–1.9)
<i>Percentage of GNP</i>			
All interventions	0.4 (0.3–0.4)	0.7 (0.6–0.8)	0.9 (0.8–1.0)
1 Maternity-related illnesses	0.06 (0.04–0.07)	0.10 (0.08–0.12)	0.11 (0.08–0.13)
2 Childhood disease-related illnesses: Immunization	0.02 (0.02–0.03)	0.03 (0.02–0.03)	0.02 (0.02–0.03)
3 Childhood disease-related illness: Treatment	0.05 (0.04–0.05)	0.10 (0.09–0.11)	0.21 (0.18–0.23)
4 Malaria prevention	0.03 (0.03–0.04)	0.06 (0.05–0.07)	0.07 (0.05–0.08)
5 Malaria treatment	0.01 (0.01–0.01)	0.01 (0.01–0.02)	0.02 (0.01–0.02)
6 TB treatment	0.01 (0.01–0.01)	0.02 (0.01–0.02)	0.02 (0.02–0.02)
7 HIV prevention	0.10 (0.10–0.11)	0.18 (0.17–0.19)	0.16 (0.15–0.17)
8 HIV care	0.04 (0.04–0.05)	0.08 (0.08–0.08)	0.12 (0.11–0.14)
9 HIV treatment (HAART)	0.03 (0.02–0.03)	0.14 (0.12–0.16)	0.15 (0.13–0.18)

Note: Data are presented in terms of averages, the midpoint between the top and bottom of the low–high range. Figures in parentheses are the rounded low–high range estimates for scaling up the interventions. The average estimate was calculated before numbers were rounded so it does not necessarily coincide with the midpoint of the low–high range presented. Costs for smoking control not included.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

¹ Calculated for all sub-Saharan Africa countries plus all other countries with per capita GNP below US\$ 1200.

The estimates of costs for all the scenarios are presented in US\$ 2002. They give an idea of the magnitude of resources that need to be spent annually, if one hopes to achieve the target coverage levels. The data reflect the principle of universal access referred to in Chapter 1. Both public and, where appropriate, private and NGO delivery strategies are considered for the implementation of priority interventions.⁷

These tables make amply clear the unprecedented scale of the commitment involved. The total cumulative spending would be of the order of US\$ 500 billion over 13 years. For purposes of comparison, it may be noted that the International Decade for Water and Sanitation from 1980 to 1990 represented an expenditure of US\$ 134 billion. Even adjusting this sum for inflation, the \$500 billion represents resource mobilization considerably greater in amount, but the health benefits that would accrue would far exceed those gained from the water decade.

4.2 ESTIMATING BENEFITS

What do these possible expenditures buy us? Table 4.1 showed the coverage targets from which the costs in Tables 4.2 and 4.3 are derived. As will be seen from the following discussion, this level of coverage corresponds to averting at least five million deaths a year, and possibly considerably more.

To guide us in producing the most relevant estimates of the health impacts of these coverage figures, we have tried to relate them to the MDGs adopted by the UN (Table 4.4). The MDGs include several health-specific targets, among them to reduce by two-thirds, between 1990 and 2015, the under-five mortality rate; to reduce by three-quarters, between 1990 and 2015, the maternal mortality rate; to have begun to reverse, by 2015, the spread of HIV/AIDS; and to have begun to reduce, by 2015, the incidence of malaria and other major diseases.

Health-specific measurements are also used as indicators in other goals: the prevalence of underweight children is an indicator for assessing attempts to halve the number of people suffering from hunger. The health-specific MDG indicators overlap, for the most part, with the priority interventions we have chosen in WG5. Although the water and sanitation targets might be seen as health related, we have argued (see Box 2.2) that, given the high cost of water and sanitation projects in relation to their effectiveness in delivering health benefits, and given the other value in such projects, this would be a mis-classification, though such projects would have desirable health benefits. The most noticeable health-related lack in the MDGs is a target for the reduction of tobacco-related illness,

Table 4.4 HEALTH-RELATED MILLENNIUM DEVELOPMENT GOALS
(with key health-related goals in *italics*)

Goals and Targets	Indicators
<i>Goal 1: Eradicate extreme poverty and hunger</i>	
Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than US\$ 1 per day	Proportion of population living on less than US\$ 1 per day Poverty gap ratio Share of poorest quintile in national consumption
Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Prevalence of underweight children (under 5 years of age) Proportion of population below minimum level of dietary energy consumption
<i>Goal 2: Achieve universal primary education</i>	
Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	Net enrolment ratio in primary education Proportion of pupils starting grade 1 who reach grade 5 Literacy rate of 15- to 24-year-olds
<i>Goal 3: Promote gender equality and empower women</i>	
Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015	Ratio of girls to boys in primary, secondary, and tertiary education Ratio of literate females to males of 15- to 24-year-olds Share of women in wage employment in the nonagricultural sector Proportion of seats held by women in national parliament
<i>Goal 4: Reduce child mortality</i>	
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-old children immunized against measles
<i>Goal 5: Improve maternal health</i>	
Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality rate	Maternal mortality rate Proportion of births attended by skilled health personnel Contraceptive prevalence rate
<i>Goal 6: Combat HIV/AIDS, malaria, and other diseases</i>	
Target 7: Have halted by 2015, and begun to reverse, the spread of HIV/AIDS	HIV prevalence among 15- to 24-year-old pregnant women Number of children orphaned by HIV/AIDS Contraceptive prevalence
Target 8: Have halted by 2015, and begun to reverse, the incidence of malaria and other major diseases	Prevalence and death rates associated with malaria Proportion of population in high-malaria-risk areas using effective malaria prevention and treatment measures Prevalence and death rates associated with tuberculosis Proportion of TB cases detected and cured under DOTS

Source: OECD, DAC, 2000.

despite the fact that most of 500 million cumulative smoking-related deaths over the next five decades will occur in low-income countries.

To compare our 2015 scenario with these goals, we examined trends for indicators for which data were available from 1960 onwards, chiefly child and maternal mortality. Then we created scenarios for growth of child, maternal, malaria, tuberculosis, and smoking deaths over the next 20 years for the following regions: Africa, China, India, and other low-income countries. We also used projections made for 2020 by the Global Burden of Disease (GBD) project. The GBD projection model relies on demographic change, income growth, smoking intensity, and education as inputs to determine possible changes in the level and structure of death by World Bank region (see Annex 2). We adjusted the GBD values for 2020 to 2015 population structures, using the UN Population Division medium projections for population. We also took the 1998 age- and sex-specific rates and adjusted these for the population size in 2015 using UN population data. These various approaches gave us a range of estimates of what the mortality due to various conditions would be in 2015, ranging from “best cases” (optimistic GBD estimates) and “worst cases” (scenarios where there was little change in death rates from the present day). The impact of interventions was simply the product of coverage goals identified earlier and conservative estimates of the effectiveness of the scaled-up interventions, derived mostly from the Working Group 5 background papers.

The following synopses look at five specific areas in this context: maternal and child mortality, malaria, tuberculosis, smoking, and HIV/AIDS.

4.2.1 *Maternal mortality and child mortality*⁸

Our analysis suggests that the costed scale up would meet the MDG target for maternal health in almost every region. Even in pessimistic scenarios of low-income growth, expanding skilled birth attendance to 80% of the African population would avoid at least 65% of maternal deaths, and reduce maternal deaths to below 200 per 100 000 live births (from the current level of about 1000). In other regions, the picture is equally promising—acceleration of improvements in skilled birth attendance could result in each region we examined achieving the reduction set out in the MDGs. All told, such an expansion would mean that in 2015 the world would avoid between 29 000 maternal deaths (if the optimistic GBD trend is preferred) and 133 000 maternal deaths (if, as we consider

reasonable, the pessimistic GBD trend is thought more likely). (See Table 4.5.)

In contrast, the MDG target of reducing child mortality by two-thirds appears to be more daunting. Child mortality has fallen by about 2% per year for the last 40 years, but declines in Africa have stagnated, partly due to falling immunization rates and the early effects of the HIV epidemic. In the light of this we looked at two possible 2015 baselines, the one described in the GBD optimistic scenario and one derived simply by extrapolating current rates. Worldwide, a major scale up in interventions aimed at children, including accelerated measles control and efforts to introduce appropriate Hib, streptococcal pneumonia, and other antigens would yield huge gains: between 1.9 million and 4.9 million childhood deaths avoided in 2015. Though spectacular in their absolute magnitude, these figures represent only 44% or 53% of the childhood deaths that

Table 4.5 MATERNAL DEATHS IN DEMOGRAPHICALLY DEVELOPING COUNTRIES IN 2015 UNDER DIFFERENT SCENARIOS

Scenario	Current no. of deaths (thousands)	No. of deaths in 2015	
		<i>Global Burden of Disease optimistic</i>	<i>Global Burden of Disease pessimistic</i>
	389		
Baseline, no intervention		43.7	203.2
With skilled birth attendance and 80% coverage		15.1	70.2
Deaths avoided in thousands, low-high		28.6	133.0
Deaths avoided, as percentage		65%	65%

Source: Authors.

Note: The above excludes about 100 000 maternal deaths in other, predominantly middle-income, countries.

Table 4.6 CHILDHOOD DEATHS IN 2015 UNDER DIFFERENT SCENARIOS

Scenario	Current no. of deaths (M)	No. of deaths in 2015	
		<i>Global Burden of Disease optimistic</i>	<i>Current rates</i>
	8.6		
Baseline, no intervention	—	4.3	9.3
With interventions and 70% coverage	—	3.1	6.5
With accelerated vaccination package	—	2.4	4.3
Deaths avoided in millions	—	1.9	4.9
Deaths avoided, as percentage	—	44%	53%

Source: Authors.

would have otherwise occurred, falling short of the two-thirds reduction that is the aim of the MDGs (Table 4.6).

Part of the difficulty in reducing child mortality is dealing with conditions that are tougher to address, such as acute respiratory infection and perinatal diseases. Only with considerably expanded efforts against measles, acute respiratory infections, malaria mortality in children, and the prevention of HIV transmission from mother to child will the goal be approached. Given the growing absolute numbers of children, vastly increased access to high-quality IMCI will also be required to reach the MDG goals. Finally, child mortality is very sensitive to income growth, but we have not assumed that this will be any faster than that seen over the last two decades.

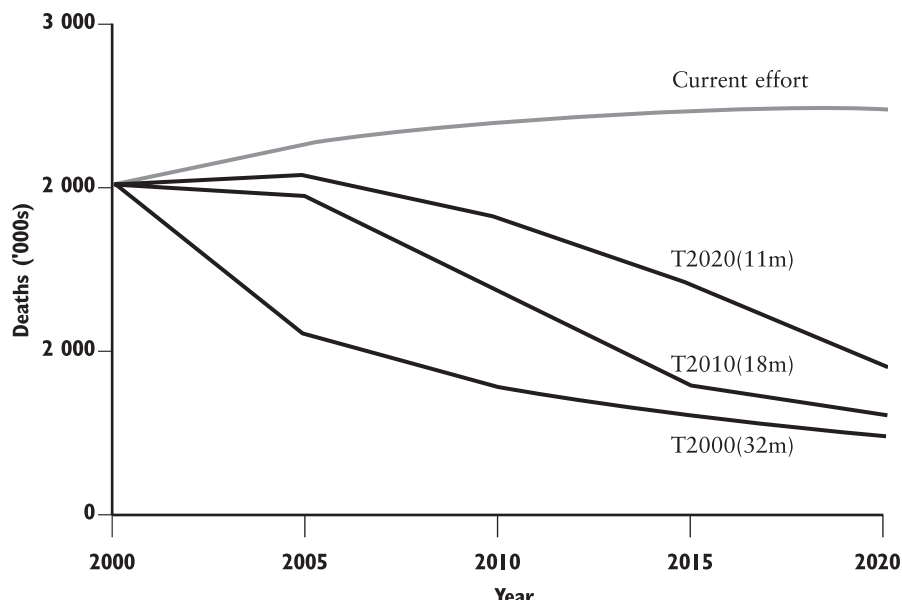
4.2.2 *Malaria*

As outlined in Chapter 2, the key to reducing death due to malaria is to reduce deaths among children in Africa. Unfortunately, it is not at present possible to ascertain with sufficient accuracy how many direct and indirect malarial deaths there are, and thus it is hard to reach firm conclusions. Morbidity from malaria is even harder to measure. Halving of malaria-associated childhood deaths may well be possible with the expanded package, avoiding somewhere between 100 000 to 500 000 deaths in 2015; improved case management and home treatment could also be expected to contribute to an overall lowering of mortality. It is thus plausible that mortality could be halved by 2015 under the costed scenario. It is, however, very hard to estimate what the effect on incidence might be.

4.2.3 *Tuberculosis*

Using the estimate from our cost scenario of 70% access by 2015, and assuming that high cure rates (85% or higher) continue, new cases of tuberculosis might be reduced from about 10 million to about 5 million per year by 2015. The combined effect of more treatment and fewer cases would avoid about 2 million tuberculosis deaths that would have otherwise occurred in 2015, or about 10 million cumulative deaths (Figure 4.1). The key factor in reducing deaths from tuberculosis is how quickly such coverage can be established. About 7 million deaths might be avoided if the targets were achieved by 2010 versus 2020.

Figure 4.1 PROJECTED TUBERCULOSIS DEATHS, WITH VARIOUS CONTROL SCENARIOS



Source: Dye *et al.*, 1998.

Note: T represents the time when 70% case detection and 85% cure rates are achieved. The numbers in brackets represent the number of deaths avoided.

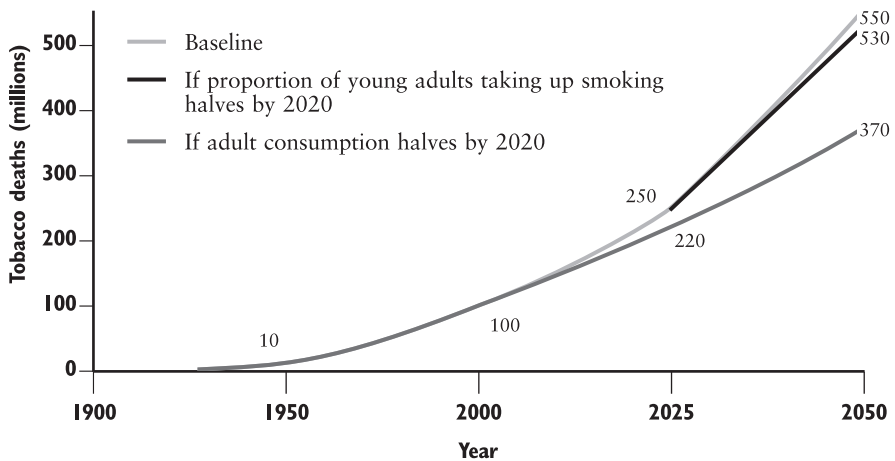
4.2.4 Smoking

The interventions in the costed scenario for 2015—higher prices, with taxes exceeding 80% of the retail price in all countries; complete bans on advertising and promotion; reliable information for consumers; and access to cessation therapies—might be expected to dramatically quadruple quit rates. This is based on the assumption that this tax increase would roughly double the retail price of cigarettes in developing countries. Conservatively, we have taken a value of quit rate rising threefold in response, up to 30%. This is comparable with the increase in quitting seen in the United Kingdom over the last 40 years, and with more recent trends in Poland. A 30% ex-smoking prevalence achieved by 2020 would imply per capita cigarette consumption falling about one-third, and would be congruent with avoiding somewhere between 60 to 120 million deaths between now and 2050 (Figure 4.2).

4.2.5 HIV/AIDS

Our 2015 scenario foresees a massive increase in coverage of HIV prevention efforts, much of which would be accomplished between 2002

Figure 4.2 ESTIMATED CUMULATIVE TOBACCO DEATHS 1900–2050 (WITH DIFFERENT INTERVENTION STRATEGIES)



Sources: Jha and Chaloupka, 2000b; Peto and Lopez, 2001.

and 2007. Although we are confident that this would have an impact on the course of the epidemic, estimating that impact with any reliability is extremely challenging. We thus offer a largely qualitative discussion.

It is possible to categorize countries according to their HIV prevalence; for the purpose of this discussion we would draw lines of distinction at 1%, 5%, 10%, 15%, and 35%. A plausible outcome of massively increased spending on the prevention of HIV is that it might keep prevalence in a given country in 2015 within the band it is in at the moment, rather than increasing to the next level. This would imply that most countries—including China and India—would keep their prevalence at or close to 1% rather than letting it increase to 5%. This alone would mean 84 million fewer HIV-infected individuals in 2015 (Table 4.7). In Africa, the largest group of countries, including Nigeria, would stay near 5% rather than rise to 10%, avoiding about 12 million HIV-infected individuals in 2015. In the handful of African countries with more advanced epidemics—chiefly Botswana, South Africa, Zambia, and Zimbabwe—reductions in HIV prevalence should be the goal. Uganda was able to reduce its prevalence from about 20% to 8% through major efforts. For the countries with more advanced epidemics, lowering prevalence to between 10% and 15% versus higher levels would avoid about 18 million HIV infections in 2015.

Table 4.7 HIV/AIDS PREVALENCE SCENARIOS, 2015
(RATES FOR REGION OR SUBREGION)

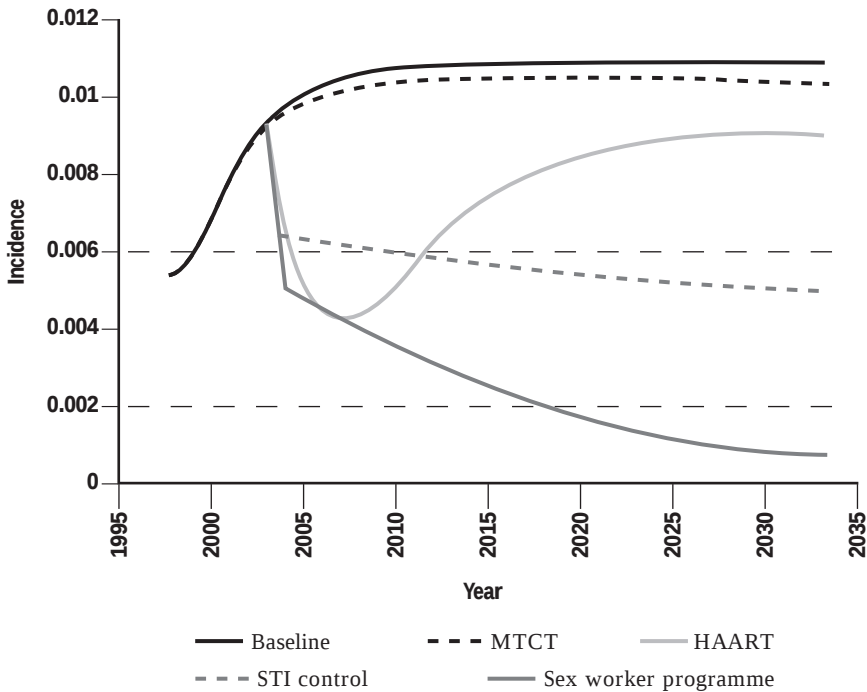
Region or Country Grouping (adult population in millions)	Infections Avoided*				
	1%	5%	10%	15%	35%
Africa (446.1)					
Group A (50.8)				7.6 to 17.8	10.2
Group B (150.7)			15.1 to 22.6		7.5
Group C (244.7)		12.2 to 24.5			12.2
China (752.6)	7.5 to 37.6				30.1
India (666.3)	6.7 to 33.3				26.7
Other (679.2)	6.8 to 34.0				27.2
Total (2 544.2)	55.9 to 169.7 million (2–7% of total population)				113.8

Source: UN Population Division 1998 Revision; UNAIDS, 2000. Note: In sub-Saharan Africa, Group A countries are those countries with adult prevalence rates at ages 15 to 49 over 15% in 1999 (Botswana, Lesotho, Malawi, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe); Group B countries have intermediate prevalence rates (5–15%) and include Burundi, Cameroon, Central African Republic, Côte d'Ivoire, Djibouti, Ethiopia, Kenya, Mozambique, Rwanda, Tanzania, and Uganda; and Group C are the remaining countries with prevalence rates below 5% (Angola, Benin, Burkina Faso, Cape Verde, Chad, Comoros, Dem. Rep. Congo, Equatorial Guinea, Eritrea, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Somalia, Sudan, and Togo); see UNAIDS, 2001.

**Infections avoided in 2015, assuming countries remain at the low versus high end of the estimated prevalence range.*

Mathematical models suggest that high coverage through vulnerable group interventions that reduce the proportion of unprotected contacts to 25% (a conservative goal) and lower HIV-1 transmission through STI programmes by 30% could reduce HIV-1 incidence in India by over 80% (Figure 4.3). In higher-prevalence settings such as Botswana, efforts to expand STI programmes or reduce transmission by 30% in other ways appear to be more effective. But in neither case are interventions as effective as in lower-prevalence settings (Figure 4.4). Mother-to-child transmission is also important for a small minority of the population and for decreasing child mortality, but itself will not make a major impact on the epidemic. Finally, HAART, as mentioned above, is unlikely to prevent the spread of HIV, and is chiefly meant to help the infected have a better and longer life. Conclusions drawn from modelling are uncertain and underline the need for a better understanding of HIV epidemiology nearly everywhere. The findings reinforce the need to obtain high coverage of targeted prevention efforts, particularly in lower-prevalence settings. Broader efforts may be required to reduce prevalence in high-prevalence settings.

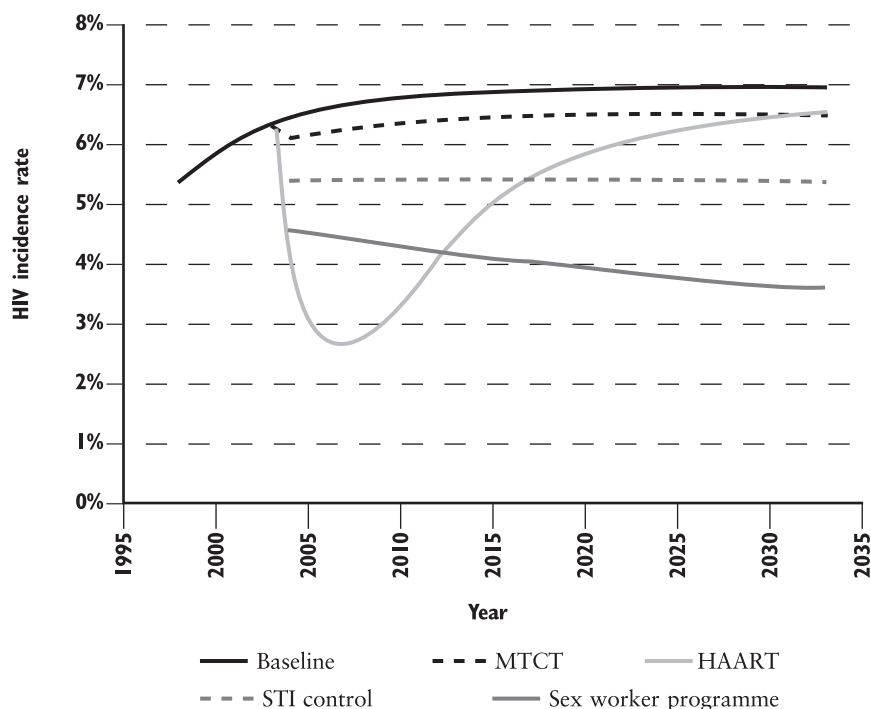
Figure 4.3 HIV-1 INCIDENCE (NEW INFECTIONS PER YEAR) IN INDIA UNDER ALTERNATIVE INTERVENTION SCENARIOS



Source: Nagelkerke et al., 2001.

Note: MTCT implies mother-to-child transmission programmes that reduce the vertical transmission rate by 50%. STI control implies a little less than the effect seen in Mwanza study, or about 30% reduction in transmission parameters. HAART implies everybody is recruited into highly active antiretroviral therapy (HAART), but with a detection rate of 0.5. Of those recruited, 25% develop resistance annually. Susceptible (nonresistant) patients are assumed not to transmit. For those who are resistant to HAART, transmission is 50% lower than untreated HIV-1 positives. Sex worker programme implies interventions that reduce the rate of unprotected sex between sex worker and client to 25%.

Reducing prevalence in low-prevalence settings would clearly be advantageous as well, but it is not entirely clear how this can be done. Efforts in countries with low prevalence have so far been aimed more at avoiding rises—or, as in the case of Cambodia, curtailing them before they get too far—than at engineering declines. That said, a reduction in prevalence in high-prevalence countries and no growth in prevalence in low-prevalence countries would go a long way to meeting the MDG target of halting and beginning to reverse the epidemic. (In passing, it should be noted that the MDG indicator of number of AIDS orphans is a poor

Figure 4.4 HIV-1 INCIDENCE (NEW INFECTIONS PER YEAR) IN BOTSWANA UNDER ALTERNATIVE INTERVENTION SCENARIOS

Source: Nagelkerke et al., 2001.

Note: MTCT implies mother-to-child transmission programmes that reduce the vertical transmission rate by 50%. STI control implies a little less than the effect seen in Mwanza study, or about 30% reduction in transmission parameters. HAART implies everybody is recruited into highly active antiretroviral therapy (HAART), but with a detection rate of 0.5. Of those recruited, 25% develop resistance annually. Susceptible (nonresistant) patients are assumed not to transmit. For those who are resistant to HAART, transmission is 50% lower than untreated HIV-1 positives. Sex worker programme implies interventions that reduce the rate of unprotected sex between sex worker and client to 25%.

choice; indeed, it would seem to argue against the blocking of transmission from mother to child.)

4.3 LONG-TERM IMPACTS

The 2015 scenario raises the possibility that by 2025 the state of health around the world could be transformed. If child death rates were brought down to below 40 per 1000 worldwide, then absolute gaps in child death rates between low- and middle-income countries and rich countries would

narrow from about 7% to 4%. For deaths at ages 5 to 29 and 30 to 69, control of the major causes of death would reduce the gap from about 4% to 2% and 15% to 9%, respectively. This may sound extremely optimistic, but such gaps are already seen between different low-income countries, and are chiefly a function of health spending, quality of programmes, and access to health services.

Life expectancy rose worldwide from 47 to 66 over the past 40 years, an average rate of about 0.5 years every year. Gains were fastest in East Asia, rising about 1 year per year, and slowest in Africa, where life expectancy rose only about 0.25 years per year (and where in some places it is now falling dramatically because of the HIV/AIDS epidemic). South Asia was intermediate at about 0.43 years per year.

With an expansion of priority interventions such as that described in the 2015 scenario, life expectancy growth over the next 15 years might be as follows. First, Africa as a whole could see life expectancy rise to values between South Asian and East Asian rates, namely an additional 8 to 12 years cumulative between now and 2015, reaching life expectancy values of between 56 and 61 by 2015. Rates in India and several other Asian countries could accelerate to close to East Asian rates, namely adding about 6 to 11 years, reaching the early 70s. Low-income Latin American, East Asian, and other countries could be expected to see increases by about 6 to 8 years, approaching 75 to 77 or levels seen in the 1970s in rich countries.

The above analyses suggest that a worldwide commitment to significantly increased coverage for a small number of health interventions could have a truly profound effect over the first quarter of the twenty-first century. It could save the lives of more than a million mothers and make the death of a child a rare event in almost all the countries of the world. It could more than halve the incidence of TB and triple the cure rate for those who are infected. It could finally begin to make significant reductions in the number of Africans dying of malaria, and greatly reduce young people's risk of developing liver cancer when older. It could avert hundreds of millions of deaths due to HIV and smoking.

More important than any specific effect on any particular disease, it could make access to effective health care part of the lives of almost all the people of the earth. New levels of security and opportunity would be provided to a billion people or more—people who, without an effort on this scale, are unlikely to know either.

5. CONTINUING COMMITMENT

To mobilize resources on this scale will require significant political will, a will that must carry through not for years but for decades. This will be sustainable only if a new level of importance is accorded to the health of the poor, both within countries and in the world as a whole. Experience in other fields, such as environmental awareness, suggests that this may be possible, but it will certainly not be easy. Success will also require greatly improved systems for monitoring health outcomes, which in many places are currently even less capable than the systems for preserving the health of the poor. It will also be made easier by research into yet better ways of intervening. There is a need for research on improving treatments and preventive options (notably vaccines against HIV and malaria). But there is also a need for research into how best to deliver interventions, whether they be old or new interventions, and especially how to deliver them to the poorest groups, and how to encourage communities to embrace their use.

An effort to attack the diseases of poverty such as the one outlined in this Report would preserve tens of millions of lives. It would radically change the prospects of hundreds of millions more, saving them from their own ill health, from the burden of caring for the ill health of others, and from the sorrows of bereavement. By providing access to reliable and effective health care, it would transform the material circumstances of more than a billion people in less-developed countries, greatly increasing their well being and allowing them more opportunities to create wealth and fulfil their desires than ever before. By removing the most striking inequality that divides humanity—inequality in the face of death—it would ennoble the world as a whole.

Such an effort would thus be unprecedented in its potential for good. It would also be unprecedented in its programmatic ambition and in the financial and organizational demands it would make of both the governments of less-developed countries and international donors. There is no easy way to do this; there is no way around the requirement for a very high level of commitment.

The scale of the programme that would follow our findings is vast, with the potential for annual expenditures by 2015 to have increased by US\$ 40 to US\$ 52 billion, with spending by donor countries of around US\$ 31 billion. Though this expenditure is very large, it also brings

immense benefits, as discussed in Chapter 4 of this Report. Furthermore, it is our belief that, given the capacity building needed and incorporated into the costing model, the relationship of costs to benefits is nonlinear: we would expect only somewhat lesser expenditures to be considerably less effective. Spending a quarter or a tenth of the amount envisioned will typically deliver considerably less than a quarter or a tenth of the benefit. This is not to say that spending at levels lower than tens of billions of dollars a year would be useless, but it would not be sufficient for the across-the-board improvements we are advocating. If only a fraction of the resources described is available, it would probably be better to target it narrowly. Given that HIV/AIDS is the burden with the most devastating potential effects, we would suggest that, at significantly lower levels of spending, prevention against HIV infections should be the highest priority. In particular, regional programmes to counter the spread of HIV in Asia and Africa are of paramount importance.

If the size of the commitment is daunting, so is its duration: the demands would continue for decades. Therefore it is vital to the prospects of any such project that ways be found not only to create the commitment to undertake such a project, but also to sustain that commitment for at least two decades. Without sustained commitment, there is a much higher likelihood of failure. And failure in such an undertaking has costs beyond lost opportunities. When a huge effort fails, the faith that drives smaller efforts to the same end can easily be crushed by its fall. Failure on this most ambitious of scales might well engender the perception that no progress is possible, and that might poison future efforts at scaling up coverage for a generation.

The repercussions of failure reinforce the need to find ways not just to generate commitment but also to sustain it. A prerequisite for this is that effective health services should become seen as a high, even paramount, national priority in both developing countries and among their international partners. Nations are capable of working towards set goals for decades, but such steadfastness is possible only if those goals are clearly and convincingly enunciated as priorities for the nation as a whole, rather than just treated as targets for the ministry of health. The ability to improve health systems and outcomes needs to become something on which politicians pride themselves, and according to which their citizens judge them.

Political commitment must begin in rhetoric and advocacy, but it must extend to spending decisions. In some finance ministries, health spending seems to be seen as an obligation to be met through minimal

expenditure rather than as a tool to be assessed on the basis of the good that can be achieved with it, a view that some internationally sponsored health reform programmes seem to have fostered and reinforced. This attitude is one of the reasons why health budgets are regularly cut during times of austerity, precisely the junctures when the logic of this Report suggests they should rise. It is at times of economic hardship that ill health and poverty are tied most tightly into their mutually supporting cycle of harm.

Commitment must extend beyond the governments of the countries where the poorest billion live. It must be seen also in the richest countries, whose donations will be vital to transforming the health of the poor, and in international organizations such as the World Bank; the report of Working Group 6 develops these ideas. Perhaps most importantly, commitment to improvements in health for the poorest billion must become and remain a priority among opinion makers and civil society worldwide. The startling growth of environmental awareness over the past decades, which is due largely to nongovernmental advocacy, has led to a number of long-term commitments, some of them truly global in extent. Efforts towards debt forgiveness have borne fruit even faster, and without the supporting self-interest that underlies some (but not all) environmental concern. If a similar globalization of compassion could consistently focus the same attention on the health of the poor, the battle for commitment might be half won.

However enthusiastic commitment may be at the outset, though, its sustenance requires results. Though the drastic reduction in the diseases of poverty is a long-term global aim, progress towards it will be made in short-term, local steps. Understanding and recording these elements of progress will be vital to sustaining support and commitment at many different levels. Assessing areas where progress is not happening will also be vital. It is for these reasons that the effort to reduce the diseases of poverty must be developed correctly and monitored accurately.

5.1 SCALING UP THROUGH TIME

The idea that different interventions can be scaled up at different rates follows on from our discussion of constraints and buy-outs in Chapter 3 of this Report. Even given levels of funding that have never previously been enjoyed, there remain constraints of time: buildings cannot be built instantly, nor can systems spring fully functional into being. Most importantly of all, people must be educated and trained. It is therefore sensible to concentrate first on interventions that require relatively little infra-

structure, while at the same time investing in improvements in that infrastructure and in developing the capacity for training health workers.

In practice, this means raising the coverage and achievement goals of the programmes that are least constrained by insufficient infrastructure more quickly than those of others. A clear example would be a renewal of efforts to universalize current vaccination programmes. The aim should be to increase both the proportion of children these programmes reach and the range of vaccinations on offer, with the addition of *Haemophilus influenzae* type b vaccine where there is a need for it, appropriate streptococcal pneumonia vaccines, and, when available, rotavirus vaccines. An explicit goal of global measles elimination might be a useful target for such an exercise, at least in some countries or regions. In many places, increased levels of vaccination will demand increased personnel and increased infrastructure in the form of more health posts and more robust supply chains. Thus, meeting ambitious vaccination goals could, if properly managed, also increase the capacity for further interventions. Micronutrient interventions could also be expanded as appropriate.

Another set of interventions that should be prioritized in the early stages are HIV prevention efforts focused on vulnerable groups. Given the profound impact that even a modest HIV epidemic can have on mortality, reducing HIV transmission is an absolute priority in countries around the world, and as yet intensive peer-based interventions to change behaviour in various groups have simply not been tried in enough places. Too few countries have gone to the trouble of even locating their vulnerable groups; too many have said that such groups are not important to transmission. However, evidence from Cambodia, the Indian state of Tamil Nadu, and Thailand shows that high coverage of commercial sex workers with education, condom provision, and the treatment of other sexually transmitted diseases is effective in limiting the spread of the epidemic. The delivery of such programmes tends to be done best by NGOs, and though normally these NGOs will lack some of the skills needed to manage behaviour modification programmes, it seems likely that with the addition of a relatively small number of experts and managers to help organize interventions and train workers, such efforts could be scaled up quickly without too much stress on weak health systems.

Other strategies that can be scaled up without too much demand on the health system proper include efforts to support the home treatment of children with malaria and other childhood diseases: maternal education and the distribution of suitable pre-packaged drugs, in part through the local private sector, can achieve a great deal. The distribution of insecti-

cide-treated nets for malaria is similarly amenable to rapid scale up, given funding, both through social marketing and through direct subsidy in specific areas and among specific groups. Some aspects of reproductive health care also fit into this category, and it is important to include them in HIV/AIDS prevention strategies.

Interventions aimed at reducing tobacco-related mortality demand almost nothing of the health system infrastructure. Raising taxes to about 80% of retail price, a typical level in rich countries with comprehensive antismoking strategies, and implementing complete bans on advertising and promotion are interventions that can be achieved by the stroke of a pen, given political will. They both make young people less likely to start smoking and, crucially, give adults a reason to quit. Increased taxes will not only cut consumption; they will also generate revenue that might be used in the health sector. Earlier analyses suggest a 10% increase in cigarette tax will raise revenue by 7% on average. It has been suggested that raising Chinese tobacco taxes by 10% would finance basic care for one-third of the country's 100 million rural poor. The greatest difficulty here is that such measures will be vigorously opposed by the transnational companies that cater to the addictions of most of the 800 million smokers in poor countries.

At the same time as these interventions are being rapidly scaled up and implemented, investment will also be necessary to allow growth in the close-to-client health system, increasing its capacity to scale up more staff- and facility-intensive interventions in the future. Although this capacity-building requirement will limit the rate of scale up, it will not stop it. It is important that interventions be continuously scaled up at the most ambitious rate consistent with the health system's capacity to turn funding into treatment—a capacity that, it must always be remembered, is itself a function of other forms of investment over a slightly longer term. In the most highly constrained countries, this scale up of staff- and facility-intensive interventions can be expected to be slower than elsewhere; this makes the scaling up of the other early interventions in these countries all the more important, not least as a way of generating a popular and political perception that progress is possible.

Among the major health system-based interventions—treatment of tuberculosis, malaria, and HIV/AIDS, as well as the case management of childhood diseases that require more than home care—it may be wise to put a particular focus on those aimed at reducing maternal mortality. It is our belief that no other condition can be better used as a test of the overall capacity of the close-to-client health system. A health system capable

of dramatically reducing high levels of maternal mortality needs to be capable of providing trained personnel, outreach services, health centres, and first-referral hospitals; it can thus be judged *prima facie* capable of handling most of the rest of the package of interventions discussed in this Report.

What is more, maternal mortality is an area where the emotional case for sustained commitment is unusually strong. It is not just that it remains outrageous that so many mothers die in childbirth when trained birth attendance and the possibility of referral could save so many of them; it is also that these deaths may resonate with the experience of the rich more deeply than other deaths among the poor. Only a small minority of people in the rich nations have lost a child, or suffered a life-threatening infection; but a large majority have either given birth or assisted a partner giving birth. The universality of the experience could be made a global bond.

Sustaining the capacity to act on this level will require major long-term increases in the number of trained health workers and managers available to systems around the world. The need here is not medical schools *per se*, but training for nurses, midwives, paramedics, and managerial staff. A self-sustaining system capable of training these people is crucial to any effort to meet and keep meeting scaled-up goals for coverage and effectiveness of health interventions in the poorest countries. Models for effective and rapid training of field-level health managers exist. The Field Epidemiology Training Program initiated by the US Centers for Disease Control and Prevention has trained nearly 1200 entry- or mid-level health specialists from over a dozen countries in applied epidemiology and enhanced public health practice. WHO has hired about 1000 polio control officers in India, and provides ongoing training and vehicles; they work within the government health systems and control programmes. A global health management training effort would require major support from schools of public health, public administration, and business administration worldwide. Experience from the information technology industry, however, does suggest that thousands of people can be trained in a short period of time.

There is a worry that personnel trained in poor countries may migrate to richer countries, where their skills will attract higher pay from an ageing population. This is a greater problem for highly trained personnel—doctors and nurses—than for the paramedical workers who will actually carry out most of the work described in this Report. However, especially in the case of nurses, the scarcity of whom is normally a greater constraint

than the scarcity of doctors, migration may be an issue. The problem can be mitigated by various strategies, such as cost recovery for trainees who leave the country's health system or periods of compulsory service. Perhaps the most equitable and ambitious goal would be for developing countries to aim to produce enough qualified personnel to meet both their own requirements and those of the richer countries, thus gaining both trained personnel at home and remittances from abroad. Such an ambitious aim might coax investment from the health sector in rich countries into training in poor countries.

At every stage in the process of reducing avoidable mortality among the poor, it will be important to balance short-term and long-term goals. Short-term goals are extremely important for sustaining commitment; without short-term goals, focus is lost and the project expands out of the realm where any given government can reap political benefit from it. It is important that realistic but challenging goals be set on two- to five-year time scales. When those goals are met, that fact should be celebrated, but celebration must not be allowed to become complacency. One way to achieve this is to overlap goals in different interventions, so that each success can be immediately used as a reason for continuing commitment to the already-on-going efforts towards the next goal.

In general, we see phasing issues as additive; at each stage, more interventions achieve greater coverage. In the long run, however, we have to hope that some things may be phased out rather than in. If vaccination against HIV, malaria, and adult tuberculosis became possible in the next decade or so, the overall need for interventions against those diseases would be drastically changed. The subsequent refocusing of health systems might conceivably cause problems; such problems we should be so lucky to face.

5.2 CREATING KNOWLEDGE

A crucial ingredient to most sustained efforts is feedback: to keep doing well you need to know how you are doing. This applies strongly to efforts to improve health. Data on current health status and on what changes are being effected are vital, with different types of data needed at different levels. In many poor countries the systems for gathering data are inadequate to this task; their improvement is an integral part of improving the health system overall.

One of the reasons that this Report has focused on mortality data is that they are more reliable than other species of data in less-developed countries. However, even mortality data are far from robust. The very fact

of death is frequently not recorded in many poor countries; in sub-Saharan Africa, the cause of death is almost never recorded. In order for policy-makers to have access to better information, investments to improve the recording of deaths are urgently needed. Similarly, it will be necessary to have aggregated data on the coverage of priority interventions, pooled from locally derived data used by district managers.

Health measurement or surveillance systems are key to tracking trends in health conditions of the poor, detecting new epidemics and outbreaks (such as HIV/AIDS and the recent cases of Anthrax), evaluating the success of control programmes, and improving accountability for expenditures on health. Public health in western countries was transformed when vital statistics on age, sex, and socioeconomic distribution of births and deaths became available in the late nineteenth century and early twentieth century. Vital statistics have been key to documenting the large declines in tuberculosis and under-five mortality during the twentieth century. They have also sounded the alarm, most recently by identifying the increase in immune system-related deaths among young men in San Francisco in the early 1980s (the start of the North American HIV epidemic). Surveillance of new cases of smallpox and polio has been central to their eradication programmes.

Surveillance can be thought of as supporting four objectives: monitoring health status (the most important of which is mortality) to guide policy choices; efficiency in use of resources; disease surveillance to aid control programmes; and epidemic alert to enable rapid response and containment (see Figure 5.1). Unfortunately, complete systems covering these four functions are rare in poor countries. Several innovative and low-cost models have worked well in several countries (see Box 5.1). As with training, effective global leadership and finance, perhaps through something like a Global Health Surveillance Facility, managed by a network of public health and statistical agencies and academic centres (see Box 5.1), should be a priority within the first 5 years of any major global programme to improve health of the poor. This would aim to build simple systems that can be sustained, and it would reduce reliance on complex and expensive periodic surveys done by outside groups.

Transparently collected and reliable data on what is actually being achieved by the health system are important not just to health system managers and the politicians responsible for them. They are also important to the community as a whole, in that they can form the basis for social auditing of the service being provided, a particularly powerful form of feedback. If communities can see improvements and failures, they can

Box 5.1 A MASSIVE EFFORT FOR GLOBAL HEALTH SURVEILLANCE

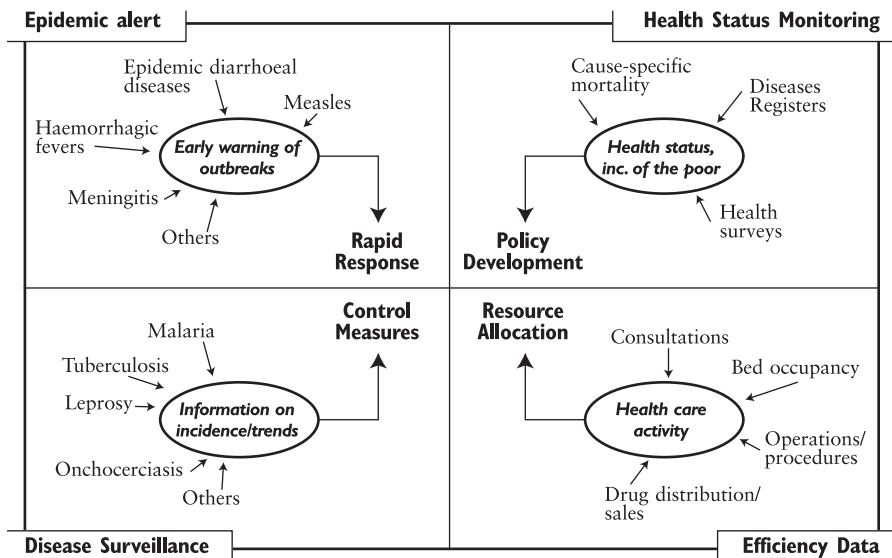
A sine qua non of any global programme to improve the health of the poor would be routine, reliable, low-cost, and long-term reliable health surveillance systems. Currently, no low-income country has adequate coverage of the four, often quite different, surveillance functions shown in Figure 5.1. The very fact of death is frequently not recorded in many poor countries; in sub-Saharan Africa the cause of death is almost never recorded.

Effective models have been implemented successfully in some countries, often at low cost. In India, the Registrar General is adding a “verbal autopsy” instrument to its Sample Registration System so as to obtain cause-of-death data by age, socioeconomic status, occupation, and region from about 7 million Indians from every state. The overall system costs less than US\$ 1 per person annually. The International Network of field sites with continuous Demographic Evaluation of Populations and their Health in Developing Countries has 17 field sites in 13 countries providing utilization and outcome data at a district level. Data from such sites in Tanzania led, for example, to re-directing many more resources to malaria control. A similar system in Karnataka, India, tracks a handful of priority conditions among 5 million people using various methods, including a mailed postcard for data collection from private and public providers. Annual costs for the Indian and Tanzanian systems are less than 1 to 3 cents per capita. In southern Sudan, an Early Warning and Response System (EWARS) system uses a simple radio network to link field staff at over 100 reporting sites, and covers eight syndromes. Prior to EWARN, an outbreak of relapsing fever in 1998–1999 killed over 2600 people. It took six months for the disease to come to the attention of authorities and a further three months to establish a diagnosis. After EWARS, when relapsing fever hit again, a local lab identified the disease within three days. The outbreak was held to 142 cases, and only 11 people died.

Donor support for surveillance has been limited in the past, but is increasing. Most funding has been directed to health status monitoring, such as the Demographic and Health Surveys (DHS). These are conducted about every 2 years in about 50 countries, and typically use nationally representative samples of about 5000 households. DHSs tend to be strong on family planning and child survival, but include few useful questions on infectious or noncommunicable diseases or their risk factors. They cost an average of US\$ 20 to US\$ 50 per person per round. A Global Health Surveillance Facility could be created to establish surveillance systems rapidly and support all surveillance functions. It would require easily accessible funding, backed with ongoing technical support from universities, schools of public health, and international agencies. It would monitor the performance not just of single countries but also of international donors and organizations such as the WHO and the World Bank. Such an effort would be complex, but precedents in other sectors exist. Starting in the 1960s, the World Bank and the International Monetary Fund provided substantial technical support and funding to enable countries to implement UN standards for National Income Accounting, and their own standards for external debt reporting. Acceptance and adherence to these standards has been obtained by making access to finance (aid, debt restructuring relief, market access, etc.) dependent on compliance. Compliance is intensively monitored by independent, outside reviews.

call those responsible to account; they can use their knowledge to understand and influence the setting of priorities. This form of accountability can operate at many levels, and can be very powerful. For example, the requirement that every maternal death be reported directly to the prime

Figure 5.1 COMPONENTS OF A WELL-FUNCTIONING SURVEILLANCE SYSTEM



Source: WHO, 2001e.

minister's office has been a strong inducement in Sri Lankan attempts to improve the safety of childbirth.

Oversight and accountability operate not just at a local and regional level. It is important that the international efforts be transparent to scrutiny so that their effectiveness can be assessed and the mistakes that will surely be made rectified. There will be a need for an independent body to gather and assess data on coverage, spending, and outcomes in the health field as a way to monitor progress towards the MDGs. Such a body would monitor the performance not just of single countries but also of international donors and of organizations such as the WHO and the World Bank.

It might be effective to have an international audit day—one day a year in which progress was feted and failures noted. There are already many days set aside to mark various aspects of health, and many are routinely ignored; but if a day dedicated to providing simple facts and tracking trends over time could be regularly marked at the highest level, sustaining commitment might be made easier. The need here would not be for lengthy reports and analyses but rather for headline figures comparing improvements with what had been hoped for; if it became expected that senior politicians would announce these figures and accord them impor-

tance, their release might make every television news programme in the world.

Knowing what is going on is not, however, just a matter of comparing achievements with targets. It is also one of various tools for finding out what works best. Throughout this Report we have stressed that knowledge—specifically, the knowledge of interventions that work and how they may be scaled up—is the key to success. It was knowledge that led to the great advances made in health in the twentieth century, and it is knowledge that will do the same in the twenty-first. In accordance with this belief, it is vital that efforts as large as those under discussion here should not just use prior knowledge but also produce new knowledge.

There is still a great deal that we do not know about how to implement and improve on the interventions and therapies discussed in this Report. How can home management of childhood illness be made most effective? Does adult male circumcision work as an intervention against HIV? What are the best approaches to combination therapy for malaria? What are the best interventions to protect adolescents from HIV infection? How can the DOTS regimen for tuberculosis be simplified? Knowledge about what works in these cases, and about how the interventions that work best can be scaled up, is something that must be found out as part of the expansion of interventions around the world.

It will be possible to extract some of this knowledge from routine monitoring, but it should also be deliberately sought through randomized trials and operational research. Once available, it should be actively disseminated around the world. Many of the most effective interventions against the diseases of the poor, and of the best strategies for making those interventions available, have originated in developing countries; examples are oral rehydration treatment for diarrhoea, the 100% condom use programme for vulnerable groups, and DOTS. With greatly increased investment, it is to be hoped that this will be ever more the case. Making sure that this knowledge is widely disseminated will be a crucial part of improving the efficacy and cost-effectiveness of interventions around the world.

Other forms of knowledge creation will also be vital. There needs to be investment in new drugs that will improve or make easier the treatment of tuberculosis, HIV, and malaria. New interventions against anaemia should also be given a high priority. Vaccine development is perhaps the highest priority of all. There need to be clear incentives to perform such research, in terms of international funding and possibly in terms of guar-

anteed markets for the products. There may also need to be some sort of centralized planning and coordination in some fields.

The products of this research will require large-scale clinical testing, plans for which should be built into the research programmes from early on, so that testing can be fast and appropriate when needed. Of particular importance is testing interventions in the countries that need them, in which their cost effectiveness may be very different from cost effectiveness in the developed world.

5.3 MAKING HISTORY

The key to long-term success is having enough trained personnel with salaries, facilities, and a drug supply they can rely on, and with confidence in their training and their managers. This requires the governments that employ many of these people to have made a long-term commitment to the importance of their work. It also requires money beyond that available to many of these governments, which will mean that money is fed into the entire health system by donors. The current reluctance to support the salaries of health workers must be overcome: without salaried health workers, other investments in health are unlikely to bring the benefits that might be expected, and while in general most countries may be able to spend more on health than is currently the case, even comparatively wealthy low-income countries will not necessarily be able to free those resources quickly. In the most highly constrained countries, long-term assistance will undoubtedly be necessary, but again two basic truths need to be emphasized. It is possible to spend money effectively on some health interventions (such as vaccination) even in conditions of low education, poor governance, and scarce local resources. And most of the world's poor do not live in the most constrained settings.

Not all the new health workers required will be employed by governments. Nongovernmental not-for-profit providers and commercial sources of care also have important roles to play. But to make sure that such services truly serve the needs of the poor, it is important that the poor should have access to them, and this something that the government alone can ensure. In many cases, guaranteeing access to services, and the uptake of those services, among the poor will mean direct government provision free of user fees. Only sometimes will it be possible to target such provision, and thus efforts to guarantee access and uptake for the poor will result in benefits to the less poor as well. To a great extent, intervention for the poor will entail some form of universalism in health provision.

There are risks that such universalism may “crowd out” the private sector. Attention should be paid to this issue, because in much of the world the private sector plays an important role in the provision of health. One approach to the possible conflict is to use the private sector for delivery but to centralize payment, an approach that might be seen as an application of the “new universalism” in which government functions as leader, regulator, and primary source of funds in the health sector but welcomes private sector involvement. It will always be important, however, that efforts to make use of and safeguard the private sector be seen in the context of the damage done by attempts to focus subsidized services only on the poor. This damage is frequently substantial.

The investments required in order to make these things happen are daunting. They require hitherto unseen levels of commitment. But everything we know about the history of improved health worldwide in the twentieth century suggests that a focused attempt to target the diseases of the poor using, for the most part, relatively cheap interventions of proven efficacy, is possible. The most important part is knowing what to do; without this knowledge, improved income and education levels can contribute relatively little. For the most part, we know what to do. What is required is the will to find ways of doing it—ways of managing it, and ways of financing it.

The poor are not deprived only of wealth. They are deprived of security, of opportunity, and of power. All these depredations are worsened by disease. The risk of disease removes their security, the burden of illness blights their opportunities—and they do not have the power to rectify these things. Today we have a chance to reduce the burden of disease that falls upon them to a shadow of what it is today—a chance to lend them the power they lack, to offer them the security they crave, and to give them new opportunities no one should be without. This is a chance to make a decisive intervention into human history.

NOTES

1. This and the following surveillance initiative could be modelled after the Global Environmental Facility administered by the World Bank, which provides countries with money and technical support to reduce environmental harm and meet their obligations to reduce emissions under global protocols or treaties.
2. Additional, more specific recommendations on the broad area of public goods, including research, are provided by Working Group 2 of the CMH.

3. According to The World Bank, 1175 million people lived on the equivalent of less than US\$ 1 a day in 1998 (in terms of 1993 purchasing-power parity) (see also Figure 1.1a). Throughout the text we refer to these people as the *poorest billion*.
4. An additional analysis undertaken for the CMH Report estimated the total costs of scaling up. In addition to the close-to-client health system costs reported here, this additional analysis included costs at higher management levels of the health system, adjustments to salaries and quality improvements in current coverage (see Annex 5). Total scaling up costs are roughly double the close-to-client health system costs. On the basis of assumptions about feasible increases in domestic resource mobilization, the CMH Report estimates development assistance needs by 2015 at around US\$ 31 billion a year, most of which would flow to low-income countries (see Table A2.11, CMH Report, p 173).
5. Taking into account costs of providing higher management with the capacity to support this expansion, quality improvements in current coverage, and increases in public sector salaries, estimates in the CMH Report suggest a total increased expenditure of US\$ 57 billion in 2007 and US\$ 94 billion in 2015 would be required.
6. *Eradication* refers to global removal, thereby making it possible eventually to cease vaccination. *Elimination* means the disappearance of a disease in a geographically defined area. After elimination, public health measures are still required. So, where measles is eliminated, there still needs to be immunization against measles.
7. The incremental costs presented in this section represent estimates of the incremental costs of scaling up at the close-to-client level. Further analysis for the CMH Report considered the implication of scaling up for required total health expenditure at the national level, making four adjustments to these incremental costs: a higher level management cost, costs for increasing absorption capacity, costs of improving current quality, and costs of increasing staff salaries. The CMH analysis suggested that including these costs would increase the annual costs of scaling up to US\$ 57 billion for the 2007b scenario and US\$ 94 billion for the 2015 scenario. Further details are provided in Annex 5, Table A5.12.
8. Sixteen countries (population 120 million, 2015) from Eastern Europe and Central Asia and Latin America that were included in the cost analysis were excluded from this benefits analysis, as the data for demographically developing regions did not match our cut-off of per capita income. This represents less than 3% of the total population in our definition of the poorest countries.

BIBLIOGRAPHIC NOTE

The primary sources for this document are the various working papers developed under the aegis of Working Group 5, and this work would not have been possible without them. These papers are listed in Annex 3. Coverage figures are, wherever possible, most recent WHO and WG5 estimates.

CHAPTER 1: THE CHALLENGE

The discussion on improvement of global public health draws on World Bank, 1998; Jha and Nguyen background paper; Ahmad and others, 2000; World Health Organization and World Bank, 1998; Kumaranayake and others background paper. The section on the burden on the poor draws on Gwatkin and Guillot, 2000. The discussion on targeting the response draws on World Bank, 2000; World Health Organization, Global tuberculosis control report, 2001. A world half healthy section draws upon WG5 background papers, in particular England and others, 2001; and Gelband and others, 2001. The discussion of the current crisis draws on WHO, 1999; OECD report on DAC Official Assistance, 2000; Simms and others, 2000; Jha and Chaloupka, 2000a, 2000b; Easterlin, 1999.

CHAPTER 2: THE OPPORTUNITY

The discussion of avoidable mortality draws on the background paper by Nguyen and others; Jamison and others, 1993; and on Murray and Lopez, 1996; the condition-specific sections all draw primarily on the relevant WG5 working papers as listed in Annex 3. Additional material for maternal mortality, perinatal, infant and child mortality, including vaccine preventable diseases and malnutrition is from Van Lerberghe and de Brouwere, 2000; Hill and others, 2001; Royston and Armstrong 1989; Ahmad and others, 2000. The discussion in the mental illness box was provided by JoAnne Epping-Jordan from WHO and draws on DiMatteo et al., 2000; Xiong et al., 1994; and WHO, 2001. The discussion in the water and sanitation box draws on a background paper by Lara Vaz and on Esrey, 1996; Esrey and others, 1985, 1991; and Varley and others, 1998. The box on indoor air pollution was provided by Yasmin Von Schirnding, based on her background paper. The box on treatment of

AIDS was drafted with input from Ariel Pablos-Mendez and Mike Merson.

The section on Malaria draws on Bradley, 1991; Carter, 2000; Snow et al., 1999. The section on Tuberculosis draws on Dye and others, 1998; WHO TB Report, 2001. The section on Smoking draws on Peto and Lopez, 2001; Jha et al., 2001; Jha and Chaloupka, 2000a and 2000b. The section on HIV/AIDS draws on Jha et al., 2001; UNAIDS, 2001; Ministry of Health, Cambodia, 2001, Nelson and others, 1996; and background papers by Jha et al., Willbond et al., Nagelkerke et al., Ramasundaram et al. The discussion of the close-to-client system comes from a number of discussions within WG5 and Hanson et al. and Oliveira-Cruz et al., background papers.

CHAPTER 3: SCALING UP SUCCESS

Part three draws on the work of the WG5 constraints team as found in Hanson and others, 2001; Oliveira-Cruz and others, 2001a, 2001b; and the case study papers Wyss et al., 2001; Rao Seshadri, 2001; and Munishi, 2001. Additional insights were taken from Perry et al., 1999; Eloundou-Enyegue et al., 1998; Abdulla et al., 2001; Faveau et al., 1990; Frankenberg and Thomas, 2000; Kelley, 2001; Kanlisi, 1991; Ribeiro, 1994; Conn et al., 1996; personal communication, De Savigny, 2000; Cassels and Janovsky, 1998; Walt et al., 1999; Soeters and Griffiths, 2000. The discussion on internally displaced people was provided by Anne Kern and Andre Griekspoor.

CHAPTER 4: COSTS AND BENEFITS IN CONTEXT

The costing work described here is dealt with in more detail in Annex 5 and draws on the WG5 paper by Kumaranayake and others, 2001. Cost of water and sanitation decade from WHO, 1992. The benefits work draws on Murray and Lopez, 1996a and 1996b and unpublished background analyses by Jha and Yu, 2001; Dye et al., 1998; Peto and Lopez, 2001; the UN Population Division, 1998; and Nagelkerke et al., background paper and 2002.

CHAPTER 5: CONTINUING COMMITMENT

This section draws mainly on WG5 background papers and discussion; material on monitoring systems draws from John, 1998; Van Lerberghe and de Brouwere, 2000; Jha 2001; and WHO, 1999. The discussion on surveillance was drafted with input from Mary Kay Kindhauser, Guanael Rodier, Mike Ryan, and Heinz Vergin.

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ANNEX I LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ALRI	Acute lower respiratory infection
ARI	Acute respiratory tract infection
BCG	Bacillus Calmette Guerin
CMH	Commission on Macroeconomics and Health
DAC	Development Assistance Committee of the OECD
DALYs	Disability-adjusted life years
DFID	Department for International Development
DOTS	Directly observed treatment, short course
DPT	Combination vaccine against diphtheria, pertussis and tetanus
EAP	East Asia and Pacific (World Bank classification)
EEC	Europe and Central Asia (World Bank classification)
EPI	Expanded Programme on Immunisation
EWARS	Early Warning and Response System
GAVI	Global Alliance for Vaccines and Immunization
GBD	Global Burden of Disease
GNP	Gross National Product
GUD	Genital ulcer disease
HAART	Highly Active Anti-Retroviral Therapy
Hib	<i>Haemophilus influenzae</i> B
HIV	Human Immunodeficiency Virus
IMCI	Integrated Management of Childhood Illness
IRS	Indoor residual spraying
ITNs	Insecticide-treated nets
LAC	Latin America and the Caribbean (World Bank classification)
LLDC	Least-developed countries (DAC-based classification)
LMIC	Lower-middle-income countries (DAC-based classification)
LSHTM	London School of Hygiene and Tropical Medicine
MDGs	Millennium Development Goals
MENA	Middle East and North Africa (World Bank classification)
MTCT	Mother-to-child transmission
NGO	Nongovernmental organization
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OI	Opportunistic infection

OLIC	Other low-income countries (DAC-based classification)
OPV	Oral polio vaccine
PAC	Population in need of additional coverage
SA	South Asia (World Bank classification)
SEWA	Self Employed Women's Association
SSA	Sub-Saharan Africa (World Bank classification)
STIs	Sexually transmitted infections
TB	Tuberculosis
Tx	Treatment
UMIC	Upper-middle-income countries (DAC-based classification)
UN	United Nations
UNICEF	United Nations Children's Fund
VCT	Voluntary Counselling and Testing
WHO	The World Health Organization

ANNEX 2 DEFINITIONS AND LISTS OF COUNTRIES

Table A2.1 THE WORLD BY INCOME AND REGION (WORLD BANK CLASSIFICATION)							
East Asia and Pacific (EAP)	Europe and Central Asia (EEC)	Latin America and the Caribbean (LAC)	Middle East and North Africa (MENA)	South Asia (SA)	Sub-Saharan Africa (SSA)	High-income OECD	Other high income
LOW INCOME							
Cambodia Indonesia Korea, Dem.Rep. Lao PDR Mongolia Myanmar Solomon Islands Viet Nam	Armenia Azerbaijan Georgia Kyrgyz Rep. Moldova Tajikistan Turkmenistan Ukraine Uzbekistan	Haiti Nicaragua	Yemen, Rep.	Afghanistan Bangladesh Bhutan India Nepal Pakistan	Angola Benin Burkina Faso Burundi Cameroon Central African Rep. Chad Comoros Congo, Dem. Rep. Congo, Rep. Côte d'Ivoire Equatorial Guinea Eritrea Ethiopia Gambia, The Ghana Guinea Guinea-Bissau Kenya Lesotho	Liberia Madagascar Malawi Mali Mauritania Mozambique Niger Nigeria Rwanda São Tomé and Príncipe Senegal Sierra Leone Somalia Sudan Tanzania Togo Uganda Zambia Zimbabwe	
LOWER MIDDLE INCOME							
China Fiji Kiribati Korea, Dem. Rep Marshall Islands Micronesia Fed. Sts.	Albania Belarus Bosnia and Herzegovina Bulgaria Kazakhstan	Belize Bolivia Colombia Costa Rica Cuba Dominican Rep.	Algeria Djibouti Egypt, Arab Iran, Islamic Rep. Iraq Jordan	Maldives Sri Lanka	Cape Verde Namibia Swaziland		

Table A2.1 (continued)						
East Asia and Pacific (EAP)	Europe and Central Asia (EEC)	Latin America and the Caribbean (LAC)	Middle East and North Africa (MENA)	South Asia (SA)	Sub-Saharan Africa (SSA)	High-income OECD
LOWER MIDDLE INCOME (continued)						
Papua New Guinea	Latvia	Ecuador	Morocco			
Philippines	Lithuania	El Salvador	Syrian Arab Rep.			
Samoa	Macedonia, FYR	Guatemala	Tunisia			
Thailand	Romania	Guyana	West Bank and Gaza			
Tonga	Russian Fed. Turkey	Honduras				
Vanuatu	Yugoslavia, FR.	Jamaica				
		Paraguay				
		Peru				
		St. Vincent & the Grenadines				
		Suriname				
UPPER MIDDLE INCOME						
American Samoa	Croatia	Antigua and Barbuda	Bahrain		Botswana	
Korea Rep.	Czech Rep.	Argentina	Lebanon		Gabon	
Malaysia	Estonia	Barbados	Libya		Mauritius	
Palau	Hungary	Brazil	Malta		Mayotte	
	Poland	Dominica	Chile		Seychelles	
	Slovak Rep.	Grenada	Oman		South Africa	
		Mexico	Saudi Arabia			
		Panama				
		Puerto Rico				
		St. Kitts and Nevis				
		St. Lucia				
		Trinidad and Tobago				
		Uruguay				
		Venezuela				

Table A2.1 (continued)

East Asia and Pacific (EAP)	Europe and Central Asia (EEC)	Latin America and the Caribbean (LAC)	Middle East and North Africa (MENA)	South Asia (SA)	Sub-Saharan Africa (SSA)	High-income OECD	Other high income
HIGH INCOME							
						Australia Austria Belgium Canada Denmark Finland France Germany Greece Iceland Ireland Italy Japan Luxembourg Netherlands New Zealand Norway Israel Portugal Spain Sweden Switzerland United Kingdom United States	Andorra Aruba Bahamas, The Bermuda Brunei Cayman Is. Channel Islands Cyprus Faeroe Islands French Polynesia Greenland Guam Hong Kong, China Kuwait Liechtenstein Macao, China Monaco Netherlands Antilles New Caledonia Northern Mariana Islands

Table A2.1 (continued)							
East Asia and Pacific (EAP)	Europe and Central Asia (EEC)	Latin America and the Caribbean (LAC)	Middle East and North Africa (MENA)	South Asia (SA)	Sub-Saharan Africa (SSA)	High-income OECD	Other high income
HIGH INCOME (continued)							
							Qatar Singapore Slovenia Taiwan, China United Arab Emirates Virgin Islands (US)

Source: World Bank, 2000.

Table A2.2 CLASSIFICATION OF COUNTRIES BY DAC-BASED CATEGORIES

Country	DAC-based classification	Country	DAC-based classification
<i>Least-Developed Countries (LLDC)</i>		Georgia	OLIC
Afghanistan	LLDC	Ghana	OLIC
Angola	LLDC	India	OLIC
Bangladesh	LLDC	Indonesia	OLIC
Benin	LLDC	Kenya	OLIC
Bhutan	LLDC	Kyrgyzstan	OLIC
Burkina Faso	LLDC	Mongolia	OLIC
Burundi	LLDC	Nicaragua	OLIC
Cambodia	LLDC	Nigeria	OLIC
Central African Rep.	LLDC	Pakistan	OLIC
Chad	LLDC	Republic of Moldova	OLIC
Comoros	LLDC	Senegal	OLIC
Dem. Rep. of the Congo	LLDC	Tajikistan	OLIC
Eritrea	LLDC	Turkmenistan	OLIC
Ethiopia	LLDC	Ukraine	OLIC
Gambia	LLDC	Uzbekistan	OLIC
Guinea	LLDC	Viet Nam	OLIC
Guinea-Bissau	LLDC	Zimbabwe	OLIC
Haiti	LLDC		
Lao People's Dem. Rep.	LLDC	<i>Lower-Middle-Income Countries (LMIC)</i>	
Lesotho	LLDC	Albania	LMIC
Liberia	LLDC	Bolivia	LMIC
Madagascar	LLDC	Cape Verde	LMIC
Malawi	LLDC	China (excluding Hong Kong SAR and Macau)	LMIC
Mali	LLDC	Cuba	LMIC
Mauritania	LLDC	Djibouti	LMIC
Mozambique	LLDC	Equatorial Guinea	LMIC
Myanmar	LLDC	Guyana	LMIC
Nepal	LLDC	Honduras	LMIC
Niger	LLDC	Maldives	LMIC
Rwanda	LLDC	Namibia	LMIC
Sierra Leone	LLDC	Papua New Guinea	LMIC
Somalia	LLDC	Philippines	LMIC
Sudan	LLDC	Samoa	LMIC
Togo	LLDC	Solomon Islands	LMIC
Uganda	LLDC	Sri Lanka	LMIC
United Rep. of Tanzania	LLDC	Swaziland	LMIC
Yemen	LLDC	Syrian Arab Republic	LMIC
Zambia	LLDC	Vanuatu	LMIC
<i>Other Low-Income Countries (OLIC)</i>		<i>Upper-Middle-Income Countries (UMIC)</i>	
Armenia	OLIC	Botswana	UMIC
Azerbaijan	OLIC	Gabon	UMIC
Cameroon	OLIC	South Africa	UMIC
Congo	OLIC		
Côte d'Ivoire	OLIC		

Source: OECD, 2000.

Table A2.3 THE WORLD HEALTH ORGANIZATION'S MEMBER STATES

African Region	Region of the Americas	Eastern Mediterranean Region	European Region	South-East Asia Region	Western Pacific Region
Algeria	Antigua	Afghanistan	Albania	Bangladesh	Australia
Angola	Argentina	Bahrain	Andorra	Bhutan	Brunei
Benin	Bahamas	Cyprus	Armenia	India	Cambodia
Botswana	Barbados	Djibouti	Austria	Indonesia	China
Burkina Faso	Belize	Egypt, Arab Rep.	Azerbaijan	Korea, Dem. Rep.	Cook Islands
Cameroon	Bolivia	Iran, Islamic Rep.	Belarus	Maldives	Fiji
Cape Verde	Brazil	Iraq	Belgium	Myanmar	Japan
Central African Republic	Canada	Jordan	Bosnia and Herzegovina	Nepal	Kiribati
Chad	Chile	Kuwait	Bulgaria	Sri Lanka	Korea, Rep.
Comoros	Colombia	Lebanon	Croatia	Thailand	Lao PDR
Congo Dem. Rep.	Costa Rica	Libya Arab Jamahiriya	Czech Republic		Malaysia
Côte d'Ivoire	Cuba	Morocco	Denmark		Marshall Islands
Equatorial Guinea	Dominica	Oman	Estonia		Micronesia, Fed. Sts.
Eritrea	Dominican Republic	Pakistan	Finland		Mongolia
Ethiopia	Ecuador	Qatar	France		Nauru
Gabon	El Salvador	Saudi Arabia	Georgia		New Zealand
Gambia, The	Grenada	Somalia	Germany		Niue
Ghana	Guatemala	Sudan	Greece		Palau
Guinea	Guyana	Syrian Arab Republic	Hungary		Papua New Guinea
Guinea-Bissau	Haiti	Tunisia	Iceland		Philippines
Kenya	Honduras	United Arab Emirates	Ireland		Samoa
Lesotho	Jamaica	Yemen, Rep.	Israel		Singapore
Liberia	Mexico		Italy		Solomon Islands
Madagascar	Nicaragua		Kazakhstan		Tonga
Malawi	Panama		Kyrgyzstan		Tuvalu
Mali	Paraguay		Latvia		Vanuatu
Mauritania	Peru		Lithuania		Viet Nam
Mauritius	St. Kitts and Nevis		Luxembourg		
Mozambique	St. Lucia		Macedonia, FYR		
Namibia	St. Vincent & the Grenadines		Malta		
Niger	Suriname		Moldova, Rep.		
Nigeria	Trinidad & Tobago		Monaco		
Niger	United States		Netherlands		
Mozambique	Uruguay		Norway		
Namibia	Venezuela, RB		Poland		
Rwanda			Portugal		
São Tomé and Príncipe			Romania		
Senegal			Russian Federation		
Seychelles			San Marino		
Sierra Leone			Slovakia		
South Africa			Slovenia		
Swaziland			Spain		
Tanzania			Sweden		
United Republic of Togo			Switzerland		
Uganda			Tajikistan		
Zambia			Turkey		
Zimbabwe			Turkmenistan		
			Ukraine		
			United Kingdom		
			Uzbekistan		
			Yugoslavia, FR		

Source: World Health Organization, 2000.

ANNEX 3 BACKGROUND PAPERS PREPARED FOR WORKING GROUP 5

Paper 1: Avoidable Mortality in India (Jha P, Nguyen S)

Paper 2: The Evidence Base for Interventions to Prevent HIV Infection in Low and Middle Income Countries (Jha P, Vaz LME, Plummer F, Nagelkerke N, Willbond B, Ngugi E, Prasado Rao JVR, Moses S, John G, Nduati R, MacDonald KS, Berkley S)

Paper 3: The Evidence Base of Interventions for Care and Management of AIDS in Low and Middle Income Countries (Willbond B, Thottingal P, Kimani J, Vaz LME, Plummer FA)

Paper 4: Modelling the HIV/AIDS Epidemics in India and Botswana: The Effect of Interventions (Nagelkerke N, Jha P, de Vlas S, Korenromp E, Moses S, Blanchard J, Plummer F)

Paper 5: Maternal and Neonatal Mortality in Low and Middle Income Countries (Gelband H, Liljestrand J, Nemer L, Islam M, Zupan J, Jha P)

Paper 6: The Evidence Base for Interventions to Reduce Malaria Mortality in Low and Middle Income Countries (Meek S, Hill J, Webster J)

Paper 7: The Evidence Base for Interventions to Reduce Smoking-Related Mortality in Low and Middle Income Countries (Chaloupka FJ, Jha P, Corrao MA, Costa e Silva V, Ross H, Czart C, Yach D)

Paper 8: The Evidence Base for Interventions to Reduce Tuberculosis Mortality in Low and Middle Income Countries: Effectiveness, Cost-Effectiveness, and Constraints to Scaling Up (Borgdorff MW, Floyd K, Broekmans JF)

Paper 9: The Evidence Base for Interventions to Reduce Under Five Mortality in Low and Middle Income Countries (Gelband H, Stansfield S, Nemer L, Jha P)

Paper 10: The Evidence Base for Interventions to Mortality from Vaccine-Preventable Diseases in Low and Middle Income Countries (England S, Loevinsohn B, Melgaard B, Kou U, Jha P)

Paper 11: The Evidence Base for Interventions to Reduce Malnutrition in Children under Five and School Age Children in Low and Middle Income Countries (Nemer L, Gelband H, Stansfield S, Jha P)

- Paper 12:** Addressing the Impact of Household Energy and Indoor Air Pollution on the Health of the Poor — Implications for Policy Action and Intervention Measures (Von Schirnding Y, Bruce N, Smith K, Ballard-Tremeer G, Ezzati M, Lvovsky K)
- Paper 13:** Constraints to Scaling Up Health Interventions: a Conceptual Framework and Empirical Analysis (Hanson K, Ranson MK, Oliveira-Cruz V, Mills A)
- Paper 14:** Approaches Overcoming Health Systems Constraints at the Peripheral Level: A Review of the Evidence (Oliveira-Cruz V, Hanson K, Mills A)
- Paper 15:** Constraints to Scaling Up Health Interventions: Country Case Study: India (Rao Seshadri S)
- Paper 16:** Constraints to Scaling Up Health Interventions: Country Case Study: Tanzania (Munishi G)
- Paper 17:** Constraints to Scaling Up Health Interventions: Country Case Study: Chad (Wyss K, Moto DD, Callewaert B)
- Paper 18:** Costs of Scaling Up Priority Health Interventions in Low-Income and selected Middle-Income Countries: Methodology and Estimates (Kumaranayake L, Kurowski C, Conteh L)
- Paper 19:** Study on Costs of Scaling Up Health Interventions for the Poor in Latin American Settings: Final Report (Cahuana L, Corcho A, Rely K, Aracena B, Bertozzi S)
- Paper 20:** Indirect Estimates of Avoidable Mortality in Low Income and Middle Income Countries (Nguyen S, Jha P, Yu S, Paccaud F)
- Paper 21:** Note on the Health Impact of Water and Sanitation Services (Vaz LME, Jha P)
- Paper 22:** Constraints to the Scale-Up of Priority Interventions Factoring in Quality of Governance and Policy Framework (Vergin H)
- Paper 23:** HIV/AIDS Control in India – Lessons from Tamil Nadu (Ramasundaram S, Allaudin K, Charles B, Gopal K, Krishnamurthy P, Poornalingam R, Warren D)
- Paper 24:** Preliminary Estimates of the Cost of Expanding TB, Malaria and HIV/AIDS Activities for Sub-Saharan Africa (Kumaranayake L, Conteh L, Kurowski C, Watts C)

(Most papers are available on <http://www.cmhealth.org/wg5.htm> or www.hefp.lshtm.ac.uk)

ANNEX 4 CONSULTATION PROCESS

Working Group 5 involved a substantial consultation and critical review process. Their collective aim was to provide critiques of the specific issues in the background papers and to provide input into the overall report. The overall consultation process was managed by Dr Fred Paccaud at the University of Lausanne, with special support from the Bill and Melinda Gates Foundation. The following conferences and meetings were held to discuss the draft background papers and work in progress:

1. PLANNING MEETING FOR WORKING GROUP 5

8 June to 9 June 2000, in London, United Kingdom

Co-chairs: Prabhat Jha and Anne Mills

Participants: Orvill Adams, Olusoji Adeyi, Dyna Arhin-Tenkorang, Nimal Attanayake, Stefano Bertozzi, Ruairi Brugha, Andrew Cassels, Andres de Francisco, Don de Savigny, David Evans, Mick Foster, Helen Gelband, Duff Gillespie, Kara Hanson, Charles Hongoro, Lilani Kumaranayake, Bruce Mackay, Sylvia Meek, Omer Mensah, Jeff O'Malley, Fred Paccaud, Ok Pannenburg, Peter Poore, Kent Ranson, Bernhard Schwartlander, Sergio Spinaci, Heinz Vergin, Charlotte Watts

2. CONCEPTS AND PLANS IN IMPROVING HEALTH OUTCOMES OF THE POOR

5 July 2000, in Geneva, Switzerland

Co-chairs: Dean T. Jamison and Anne Mills

Participants: Orville Adams, Olusoji Adeyi, Chris Dye, David Evans, Sarah England, Tore Godal, Robert Hecht, David Heymann, Quazi Islam, Prabhat Jha, Arata Kochi, Lilani Kumaranayake, John Martin, Bjorn Melgaard, David Nabarro, Son Nguyen, Jonathan Quick, Sergio Spinaci, Hans Troedsson, Eva Wallstam, Lara Vaz, Derek Yach

3. CONSULTATION ON HIV/AIDS CONTROL OPTIONS

6 October 2000, in Rome, Italy

Chair: Dean T. Jamison

Participants: Sevgi Aral, James Blanchard, Robert Brunham, John Changelucha, Josef Decosas, Antonio Gerbase, Prabhat Jha, Marie Laga, Stephen Moses, Jeckoniah Ndinya-Achola, Mead Over, Donald Sutherland, Judith Wasserheit

4. IMPROVING HEALTH OUTCOMES OF THE POOR

31 October 2000 to 2 November 2000, in Bagamoyo, Tanzania

Co-chairs: Fred Paccaud, Marcel Tanner, Peter Kilima, Ayanda Ntsaluba, and Phil Gowers

Participants: Mohamed Amri, Howard Barnum, Lesong Conteh, Helen Gelband, Nancy Godfrey, Phil Gowers, Kara Hanson, Prabhat Jha, Harun Kasale, Peter Kilima, Andrew Kitua, Lilani Kumaranayake, Christoph Kurowski, Evarist Manumbu, Franziska Matthies, Julie McLaughlin, Anne Mills, Haji Mponda, Phare Mujinja, Nico Nagelkerke, Hamisi Nanjenu, Leda Nemer, Ayanda Ntsaluba, Valeria Oliveira-Cruz, Fred Paccaud, Pierre Pichette, Francis Plummer, Ram Ramasundaram, Shreelata Rao Seshadri, Philip Setel, Sally Stansfield, Marcel Tanner, Martin Taylor, Renata Testaz, Lara Vaz

6. TECHNICAL MEETING OF LEAD AUTHORS AND
STEERING COMMITTEE

27 March to 29 March 2001, in Lausanne, Switzerland.

Co-chairs: Michael Merson and Fred Paccaud

Participants: Nathan Bakyyaita, Stefano Bertozzi, Martien Borgdorff, Mushtaque Chowdhury, Lesong Conteh, Sarah England, Majid Ezzati, Helen Gelband, Jorge Jimenez de la Jara, Prabhat Jha, Peter Kilima, Jeff Koplan, Lilani Kumaranayake, Christoph Kurowski, Sylvia Meek, Mark Miller, Anne Mills, Oliver Morton, Gaspar Munishi, Phil Musgrove, Nico Nagelkerke, Leda Nemer, Son Nguyen, Ayanda Ntsaluba, Valeria Oliveira-Cruz, Francis Plummer, Alexander Preker, Ram Ramasundaram, Kent Ranson, Shreelata Rao Seshadri, Jaime Z Galvez Tan, Renata Testaz, Lara Vaz, Kaspar Wyss, Shengchao Yu

7. CONSULTATION MEETING ON DRAFT WG5 REPORT

11 July 2001, in London, United Kingdom.

Chair: Andy Haines

Participants: Gerald Bloom, David Bradley, Mushtaque Chowdhury, Lesong Conteh, Val Curtis, Peter Godfrey-Faussett, Andrew Green, Dean Jamison, Jorge Jimenez de la Jara, Prabhat Jha, Peter Kilima, Betty Kirkwood, Lilani Kumaranayake, Christoph Kurowski, David Libatique, Julian Lob-Levyt, Bruce Mackay, Sylvia Meek, Barbara McPake, Anne Mills, Saul Morris, Oliver Morton, Ayanda Ntsaluba, Valeria Oliveira-Cruz, Fred Paccaud, Peter Poore, Ram Ramasundaram, Kent Ranson, Peter Smith, Sally Stansfield, Hannmaria Sudarshan, Marcel Tanner, Jaime Z Galvez Tan, Wendy Thorne, Patrick Vaughan, Lara Vaz, Gill Walt, Charlotte Watts

8. STEERING GROUP MEETING

12 July 2001, in London, United Kingdom

Chair: Fred Paccaud

Participants: Mushtaque Chowdhury, Jorge Jimenez de la Jara, Prabhat Jha, Peter Kilima, Anne Mills, Oliver Morton, Ayanda Ntsaluba, Ram Ramasundaram, Sally Stansfield, Jaime Z Galvez Tan

ANNEX 5 COSTING METHODS¹

The purpose of this analysis is twofold. First, the annex provides further information about the cost estimates presented in Chapter 4. Second, it provides elaboration of the analysis of total health expenditures required for scaling up. This analysis was undertaken for the CMH Report and was based on the cost estimates undertaken for this Working Group Report.

A5.1 ANALYSIS OF INCREMENTAL COSTS

A detailed discussion of the costing methodology is found in Kumaranayake, Kurowski, and Conteh (2001).

A5.1.1 Choice of Interventions

The analysis estimates the cost of scaling up the coverage of 49 priority health interventions (and 65 treatment lines) within a close-to-client health system in 83 poor countries. These interventions have been identified as key in addressing the major sources of disease burden among the poor and are described in Table A5.1.

A5.1.2 Method of Estimation

The expansion of these activities is based on reaching target levels of coverage for 2007 and 2015, relative to estimates of coverage levels in the year 2002, described in Table 4.1. The incremental cost analysis focuses on selected interventions at the close-to-client level, and so does not include all the services needed for the expansion of the entire local health system. The analysis assesses the full economic price of providing services. Costs include capital components and related requirements for complementary management and institutional support, as well as the investments in training new personnel and expanding facilities in order to deliver services at these higher levels of coverage.

The cost analysis was designed to estimate the volume of additional or *incremental* resources that would be required for a large-scale expansion of activities from existing levels of services. The costs of expanding activities are presented as the cost additional to current levels of health expenditure. Thus these cost estimates reflect the additional expenditure that is required over and above current patterns of expenditure.

Table A5.1 SELECTED SETS OF INTERVENTIONS FOR COST ANALYSIS

Disease Area	Nature of Interventions
1. Maternity-related interventions	Antenatal care Treatment of complications during pregnancy Skilled birth attendance Emergency obstetric care Postpartum care (including family planning)
2. Childhood disease-related interventions (Immunization)	Vaccinations (BCG, OPV, DPT, Measles, Hepatitis B, HiB)
3. Childhood disease related-interventions (Treatment of childhood illnesses)	Treatment of various conditions (acute respiratory infections, diarrhoea, causes of fever, malnutrition, anaemia)
4. Malaria prevention	Insecticide-treated nets Residual indoor spraying
5. Malaria treatment	Treatment for malaria
6. Tuberculosis treatment	Directly observed short course treatment for smear positive patients Directly observed short course treatment for smear negative patients
7. HIV/AIDS prevention	Youth focused interventions Interventions working with sex workers and clients Condom social marketing and distribution Workplace interventions Strengthening of blood transfusion systems Voluntary counselling and testing Prevention of mother-to-child transmission Mass media campaigns Treatment for sexually transmitted diseases
8. HIV/AIDS care	Palliative care Clinical management of opportunistic illnesses Prevention of opportunistic illnesses Home-based care
9. HIV/AIDS HAART	Provision of HAART

Note: Not all interventions have been scaled up in each country. Instead, the costs of scaling up include the interventions for each country that are epidemiologically appropriate. For example, malaria control measures are not included in countries where malaria does not significantly contribute to the burden of disease. Smoking is not included in the costing, as higher tobacco taxes can finance tobacco control: on average, a 10% excise tax increase raises revenue by 7% (Sunley et al., 2000).

Source: Kumaranayake, Kurowski, and Conteh, 2001.

The costs of expanding services will vary by country according to the extent and type of illness, and demographic and socioeconomic factors. Hence the costs of scaling up have been modelled on a country-specific

basis for each intervention, taking into account complementarities between interventions. Poor countries have been defined as those having a GNP per capita of less than US \$1200 (1999 US dollars). Given the substantial disease burden in sub-Saharan Africa, all countries of this region have been included in the analysis, independent of their economic performance.

The costs of expanding services were prepared for three scenarios, reflecting the level of investment and ability to expand services, and involving different assumptions about the time-frame, investments in capacity and infrastructure, and feasible levels of target coverage, required to achieve health benefits. The incremental cost estimates provide an *annual average* cost of implementing these activities in year 2002 constant US dollars.² These estimates have also been translated into projected budget flows on annual an basis. Analysis is also undertaken of the relative share of tradeables and nontradeables in Kumaranayake et al. (2001).

Estimation of the country-specific population in need for a particular service rests principally on two parameters: the population size and the incidence or prevalence of a condition or risk. Current estimates and future prospects of the population size are available. However, country-specific information on current morbidity or risks is limited. Due to this substantial lack of data, the incidence and prevalence of disease or risk have been assumed to be constant over time. Consequently, this approach ignores any potential changes in disease prevalence or incidence and any effect of the increased service coverage on patterns of disease. Whereas this is of little or no relevance for conditions such as obstructed labour, it is a more severe limitation for transmittable diseases—in particular HIV/AIDS and TB—where an impact would be expected. However, there may also be increases in the incidence or prevalence of these diseases over time, and so the direction of the bias attributable to the assumption of constant incidence or prevalence is not clear.

Tables 4.2 and 4.3 provided the estimates of the costs of scaling up by region and intervention area. The classification of countries by region is presented in Table A5.2. The following tables (Tables A5.3 through A5.11) provide a breakdown by income group and region for each intervention area. The figures are presented in per capita and GNP terms. Per capita figures were calculated on the basis of projected population estimates for the years 2007 and 2015.³ GNP figures were estimated by assuming between 1% to 5% annual growth for per capita GNP.⁴

Table A5.2 REGIONAL BREAKDOWN FOR COST ANALYSIS

Region	Countries
Sub-Saharan Africa (SSA)	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Cape Verde, Chad, Comoros, Congo, Côte d'Ivoire, Dem. Republic of the Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Syrian Arab Republic, Togo, Uganda, United Rep. of Tanzania, Yemen, Zambia, Zimbabwe.
East Asia and Pacific (EAP)	Cambodia, China (excluding Hong Kong SAR and Macau), Dem. People's Republic of Korea, Indonesia, Lao People's Dem. Republic, Mongolia, Myanmar, Papua New Guinea, Philippines, Samoa, Solomon Islands, Vanuatu, Viet Nam
South Asia (SA)	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
Eastern Europe and Central Asia (EEC)	Albania, Armenia, Azerbaijan, Georgia, Kyrgyzstan, Republic of Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
Latin America and Caribbean (LAC)	Bolivia, Cuba, Guyana, Haiti, Honduras, Nicaragua

Note: These are based on the World Bank classification of regions, but Middle East and North Africa countries have been included in sub-Saharan Africa.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.3 DISTRIBUTION OF MATERNITY-RELATED CONDITIONS COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	1 582	2 534	2 804	4 478	4 272	6 724
All low-income countries	1 482	2 377	2 553	4 082	3 664	5 782
All middle-income countries	100	157	251	396	608	942
Sub-Saharan Africa	686	1 101	1 159	1 853	1 738	2 743
East Asia and Pacific	162	255	372	587	836	1 301
South Asia	709	1 138	1 221	1 956	1 616	2 557
Eastern Europe and Central Asia	7	10	13	21	23	30
Latin America and Caribbean	18	29	39	62	59	92
<i>Per capita (\$)</i>						
All countries	0.36	0.58	0.65	1.03	0.89	1.40
All low-income countries	0.53	0.86	0.92	1.47	1.17	1.85
All middle-income countries	0.06	0.10	0.16	0.25	0.37	0.57
Sub-Saharan Africa	0.87	1.39	1.46	2.34	1.84	2.90
East Asia and Pacific	0.09	0.14	0.20	0.32	0.42	0.66
South Asia	0.46	0.75	0.80	1.28	0.96	1.51
Eastern Europe and Central Asia	0.06	0.09	0.11	0.18	0.19	0.25
Latin America and Caribbean	0.41	0.64	0.86	1.37	1.16	1.82
<i>% of GNP</i>						
All countries	0.04	0.07	0.08	0.12	0.08	0.13
All low-income countries	0.04	0.07	0.07	0.11	0.07	0.11
All middle-income countries	"	"	0.01	0.01	0.01	0.02
Sub-Saharan Africa	0.02	0.03	0.03	0.05	0.03	0.05
East Asia and Pacific	"	0.01	0.01	0.02	0.02	0.03
South Asia	0.02	0.03	0.03	0.05	0.03	0.05
Eastern Europe and Central Asia	"	"	"	"	"	"
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.4 DISTRIBUTION OF CHILD IMMUNIZATION COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	655	934	785	1 133	1 044	1 556
All low-income countries	529	740	638	903	840	1 220
All middle-income countries	126	195	146	230	204	335
Sub-Saharan Africa	208	355	246	422	328	571
East Asia and Pacific	141	213	168	258	245	398
South Asia	290	343	354	426	447	547
Eastern Europe and Central Asia	10	15	11	17	15	25
Latin America and Caribbean	5	8	6	10	9	16
<i>Per capita (\$)</i>						
All countries	0.15	0.22	0.18	0.26	0.22	0.33
All low-income countries	0.19	0.27	0.23	0.33	0.27	0.39
All middle-income countries	0.08	0.12	0.09	0.15	0.12	0.20
Sub-Saharan Africa	0.26	0.45	0.31	0.53	0.35	0.60
East Asia and Pacific	0.08	0.11	0.09	0.14	0.12	0.20
South Asia	0.19	0.22	0.23	0.28	0.26	0.32
Eastern Europe and Central Asia	0.08	0.13	0.09	0.14	0.13	0.20
Latin America and Caribbean	0.11	0.19	0.13	0.22	0.17	0.31
<i>% of GNP</i>						
All countries	0.02	0.03	0.02	0.03	0.02	0.03
All low-income countries	0.01	0.02	0.02	0.03	0.02	0.02
All middle-income countries	"	0.01	"	0.01	"	0.01
Sub-Saharan Africa	0.01	0.01	0.01	0.01	0.01	0.01
East Asia and Pacific	"	0.01	"	0.01	"	0.01
South Asia	0.01	0.01	0.01	0.01	0.01	0.01
Eastern Europe and Central Asia	"	"	"	"	"	"
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.5 DISTRIBUTION OF CHILDHOOD DISEASE-RELATED TREATMENT COSTS
BY REGION (US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	1 513	1 897	3 260	4 128	9 414	11 987
All low-income countries	1 063	1 307	2 010	2 491	5 470	6 816
All middle-income countries	450	589	1 250	1 637	3 944	5 171
Sub-Saharan Africa	844	1 041	1 424	1 770	3 391	4 249
East Asia and Pacific	295	387	999	1 305	3 417	4 456
South Asia	280	348	675	845	2 227	2 794
Eastern Europe and Central Asia	10	12	19	24	49	61
Latin America and Caribbean	84	108	143	184	329	427
<i>Per capita (\$)</i>						
All countries	0.35	0.44	0.75	0.95	1.97	2.50
All low-income countries	0.38	0.47	0.72	0.90	1.75	2.18
All middle-income countries	0.29	0.38	0.80	1.05	2.38	3.12
Sub-Saharan Africa	1.07	1.32	1.80	2.23	3.58	4.49
East Asia and Pacific	0.16	0.21	0.54	0.70	1.73	2.26
South Asia	0.18	0.23	0.44	0.55	1.32	1.65
Eastern Europe and Central Asia	0.08	0.11	0.17	0.21	0.40	0.50
Latin America and Caribbean	1.87	2.39	3.19	4.10	6.51	8.44
<i>% of GNP</i>						
All countries	0.04	0.05	0.09	0.11	0.18	0.23
All low-income countries	0.03	0.04	0.06	0.07	0.11	0.13
All middle-income countries	0.01	0.02	0.03	0.05	0.08	0.10
Sub-Saharan Africa	0.02	0.03	0.04	0.05	0.07	0.08
East Asia and Pacific	0.01	0.01	0.03	0.04	0.07	0.09
South Asia	0.01	0.01	0.02	0.02	0.04	0.05
Eastern Europe and Central Asia	“	“	“	“	“	“
Latin America and Caribbean	“	“	“	0.01	0.01	0.01

Note: < = less than US\$ 0.01 per capita; “ = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.6 DISTRIBUTION OF MALARIA PREVENTION COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	949	1 377	1 640	2 384	2 763	4 028
All low-income countries	909	1 310	1 567	2 261	2 617	3 776
All middle-income countries	40	67	73	123	146	252
Sub-Saharan Africa	307	404	522	689	929	1 245
East Asia and Pacific	116	187	222	355	405	646
South Asia	514	764	873	1 298	1 386	2 063
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	13	23	23	41	42	75
<i>Per capita (\$)</i>						
All countries	0.22	0.32	0.38	0.55	0.58	0.84
All low-income countries	0.33	0.47	0.56	0.82	0.84	1.21
All middle-income countries	0.03	0.04	0.05	0.08	0.09	0.15
Sub-Saharan Africa	0.39	0.51	0.66	0.87	0.98	1.31
East Asia and Pacific	0.06	0.10	0.12	0.19	0.21	0.33
South Asia	0.34	0.50	0.57	0.85	0.82	1.22
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	0.29	0.50	0.52	0.91	0.83	1.48
<i>% of GNP</i>						
All countries	0.03	0.04	0.05	0.07	0.05	0.08
All low-income countries	0.03	0.04	0.04	0.06	0.05	0.07
All middle-income countries	“	“	“	“	“	“
Sub-Saharan Africa	0.01	0.01	0.01	0.02	0.02	0.02
East Asia and Pacific	“	0.01	0.01	0.01	0.01	0.01
South Asia	0.01	0.02	0.02	0.04	0.03	0.04
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	“	“	“	“	“	“

Note: < = less than US\$ 0.01 per capita; “ = less than 0.01% of GNP; — = costs were not calculated for this region because malaria is not a major problem.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.7 DISTRIBUTION OF MALARIA TREATMENT COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	263	399	374	565	772	1 239
All low-income countries	247	368	344	508	678	1 042
All middle-income countries	16	30	30	57	93	198
Sub-Saharan Africa	217	332	301	456	602	943
East Asia and Pacific	32	46	49	75	118	215
South Asia	13	17	20	28	44	66
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	2	4	3	6	8	15
<i>Per capita (\$)</i>						
All countries	0.06	0.09	0.09	0.13	0.16	0.26
All low-income countries	0.09	0.13	0.12	0.18	0.22	0.33
All middle-income countries	0.01	0.02	0.02	0.04	0.06	0.12
Sub-Saharan Africa	0.27	0.42	0.38	0.58	0.64	1.00
East Asia and Pacific	0.02	0.02	0.03	0.04	0.06	0.11
South Asia	<	<	<	<	<	<
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	0.05	0.08	0.07	0.13	0.15	0.31
<i>% of GNP</i>						
All countries	0.01	0.01	0.01	0.02	0.01	0.02
All low-income countries	0.01	0.01	0.01	0.01	0.01	0.02
All middle-income countries	"	"	"	"	"	"
Sub-Saharan Africa	0.01	0.01	0.01	0.01	0.01	0.02
East Asia and Pacific	"	"	"	"	"	"
South Asia	"	"	"	"	"	"
Eastern Europe and Central Asia	—	—	—	—	—	—
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP; — = costs were not calculated for this region because malaria is not a major problem.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.8 DISTRIBUTION OF TUBERCULOSIS CONTROL COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	336	444	471	621	783	1 036
All low-income countries	169	233	222	307	389	538
All middle-income countries	167	211	249	314	395	499
Sub-Saharan Africa	65	89	92	127	179	245
East Asia and Pacific	210	271	302	390	462	595
South Asia	58	79	70	97	130	180
Eastern Europe and Central Asia	0	1	1	1	1	2
Latin America and Caribbean	3	4	5	7	11	15
<i>Per capita (\$)</i>						
All countries	0.08	0.10	0.11	0.14	0.16	0.22
All low-income countries	0.06	0.08	0.08	0.11	0.12	0.17
All middle-income countries	0.11	0.14	0.16	0.20	0.24	0.30
Sub-Saharan Africa	0.08	0.11	0.12	0.16	0.19	0.26
East Asia and Pacific	0.11	0.15	0.16	0.21	0.23	0.30
South Asia	0.04	0.05	0.05	0.06	0.08	0.11
Eastern Europe and Central Asia	<	<	<	0.01	0.01	0.01
Latin America and Caribbean	0.07	0.09	0.12	0.16	0.22	0.29
<i>% of GNP</i>						
All countries	0.01	0.01	0.01	0.02	0.02	0.02
All low-income countries	"	0.01	0.01	0.01	0.01	0.01
All middle-income countries	"	0.01	0.01	0.01	0.01	0.01
Sub-Saharan Africa	"	"	"	"	"	"
East Asia and Pacific	0.01	0.01	0.01	0.01	0.01	0.01
South Asia	"	"	"	"	"	"
Eastern Europe and Central Asia	"	"	"	"	"	"
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.9 DISTRIBUTION OF HIV/AIDS PREVENTION COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	3 486	3 809	6 184	6 758	7 975	8 685
All low-income countries	2 264	2 474	4 017	4 389	5 180	5 641
All middle-income countries	1 222	1 335	2 168	2 369	2 795	3 044
Sub-Saharan Africa	1 172	1 280	2 079	2 271	2 680	2 919
East Asia and Pacific	1 204	1 316	2 136	2 334	2 755	3 000
South Asia	985	1 076	1 747	1 909	2 253	2 454
Eastern Europe and Central Asia	78	85	138	151	178	194
Latin America and Caribbean	47	52	84	92	109	118
<i>Per capita (\$)</i>						
All countries	0.80	0.88	1.43	1.56	1.67	1.81
All low-income countries	0.82	0.89	1.45	1.58	1.66	1.80
All middle-income countries	0.78	0.86	1.39	1.52	1.69	1.84
Sub-Saharan Africa	1.48	1.62	2.63	2.87	2.83	3.08
East Asia and Pacific	0.65	0.71	1.15	1.26	1.39	1.52
South Asia	0.64	0.70	1.14	1.25	1.33	1.45
Eastern Europe and Central Asia	0.66	0.72	1.17	1.28	1.46	1.59
Latin America and Caribbean	1.04	1.16	1.87	2.05	2.15	2.33
<i>% of GNP</i>						
All countries	0.10	0.11	0.17	0.19	0.15	0.17
All low-income countries	0.06	0.07	0.11	0.12	0.10	0.11
All middle-income countries	0.03	0.04	0.06	0.07	0.05	0.06
Sub-Saharan Africa	0.03	0.04	0.06	0.06	0.05	0.06
East Asia and Pacific	0.03	0.04	0.06	0.07	0.05	0.06
South Asia	0.03	0.03	0.05	0.05	0.04	0.05
Eastern Europe and Central Asia	“	“	“	“	“	“
Latin America and Caribbean	“	“	“	“	“	“

Note: < = less than US\$ 0.01 per capita; “ = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.10 DISTRIBUTION OF HIV/AIDS CARE COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>(Total dollars ('000 000, millions of dollars)</i>						
All countries	1 446	1 686	2 775	2 853	5 817	7 063
All low-income countries	972	1 150	1 908	1 982	3 974	4 875
All middle-income countries	474	537	868	871	1 843	2 188
Sub-Saharan Africa	1 052	1 233	2 048	2 116	4 250	5 176
East Asia and Pacific	115	131	210	211	448	537
South Asia	156	181	298	308	648	783
Eastern Europe and Central Asia	104	119	183	182	397	476
Latin America and Caribbean	19	23	36	37	74	91
<i>Per capita (\$)</i>						
All countries	0.33	0.39	0.64	0.66	1.22	1.48
All low-income countries	0.35	0.41	0.69	0.71	1.27	1.56
All middle-income countries	0.30	0.34	0.56	0.56	1.11	1.32
Sub-Saharan Africa	1.33	1.56	2.59	2.67	4.49	5.47
East Asia and Pacific	0.06	0.07	0.11	0.11	0.23	0.27
South Asia	0.10	0.12	0.20	0.20	0.38	0.46
Eastern Europe and Central Asia	0.88	1.01	1.56	1.55	3.25	3.89
Latin America and Caribbean	0.42	0.51	0.80	0.82	1.46	1.80
<i>% of GNP</i>						
All countries	0.04	0.05	0.08	0.08	0.11	0.14
All low-income countries	0.03	0.03	0.05	0.06	0.08	0.09
All middle-income countries	0.01	0.01	0.02	0.02	0.04	0.04
Sub-Saharan Africa	0.03	0.03	0.06	0.06	0.08	0.10
East Asia and Pacific	"	"	0.01	0.01	0.01	0.01
South Asia	"	0.01	0.01	0.01	0.01	0.02
Eastern Europe and Central Asia	"	"	0.01	0.01	0.01	0.01
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.11 DISTRIBUTION OF HIV/AIDS TREATMENT (HAART) COSTS BY REGION
(US\$ 2002)

	2007A		2007B		2015	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
<i>Total dollars ('000 000, millions of dollars)</i>						
All countries	855	1 157	4 275	5 783	6 846	9 190
All low-income countries	691	937	3 454	4 683	5 646	7 597
All middle-income countries	164	220	822	1 100	1 201	1 593
Sub-Saharan Africa	720	970	3 598	4 850	5 818	7 784
East Asia and Pacific	34	46	169	231	255	348
South Asia	87	120	437	602	665	911
Eastern Europe and Central Asia	6	8	29	39	39	53
Latin America and Caribbean	9	12	44	60	70	94
<i>Per capita (\$)</i>						
All countries	0.20	0.27	0.99	1.33	1.43	1.92
All low-income countries	0.25	0.34	1.25	1.69	1.80	2.43
All middle-income countries	0.11	0.14	0.53	0.70	0.73	0.96
Sub-Saharan Africa	0.91	1.23	4.54	6.13	6.14	8.22
East Asia and Pacific	0.02	0.02	0.09	0.12	0.13	0.18
South Asia	0.06	0.08	0.29	0.39	0.39	0.54
Eastern Europe and Central Asia	0.05	0.07	0.25	0.33	0.32	0.43
Latin America and Caribbean	0.20	0.27	0.98	1.33	1.38	1.86
<i>% of GNP</i>						
All countries	0.02	0.03	0.12	0.16	0.13	0.18
All low-income countries	0.02	0.03	0.10	0.13	0.11	0.15
All middle-income countries	"	0.01	0.02	0.03	0.02	0.03
Sub-Saharan Africa	0.02	0.03	0.10	0.14	0.11	0.15
East Asia and Pacific	"	"	"	0.01	"	0.01
South Asia	"	"	0.01	0.02	0.01	0.02
Eastern Europe and Central Asia	"	"	"	"	"	"
Latin America and Caribbean	"	"	"	"	"	"

Note: < = less than US\$ 0.01 per capita; " = less than 0.01% of GNP.

Source: Kumaranayake, Kurowski, and Conteh, 2001.

Table A5.12 INCREMENTAL ANNUAL COSTS ADJUSTED FOR SCALING-UP PROCESS
BY DAC-BASED CLASSIFICATION (US\$ 2002)

	2007B Average Estimate	2015 Average Estimate
<i>Total dollars ('000 000 000, billions of dollars)</i>		
All countries	57	94
All low-income countries (Least-developed countries + Other low-income countries)	40	66
Least-developed countries	17	29
Other low-income countries	23	37
Lower-middle-income countries	14	24
Upper-middle-income countries	3	4
<i>Per capita (\$)</i>		
All countries	13	20
All low-income countries (Least-developed countries + Other low-income countries)	14	8
Least-developed countries	22	32
Other low-income countries	12	17
Lower-middle-income countries	9	15
Upper-middle-income countries	57	91
<i>% of GNP</i>		
All countries	1.6	1.8
All low-income countries (Least-developed countries + Other low-income countries)	2.7	3.3
Least-developed countries	6.9	8.8
Other low-income countries	1.9	2.2
Lower-middle-income countries	0.7	0.8
Upper-middle-income countries	1.3	1.8

Source: Kumaranayake L, Kurowski C, Conteh L. (2001). Analysis of the Costs of Scaling Up Priority Health Interventions in Low- and Selected Middle-Income Countries. Appendix 2, In Macroeconomics and Health: Investing in Health for Economic Development. Commission on Macroeconomics and Health. Geneva: WHO.

Table A5.13 REQUIRED ANNUAL TOTAL HEALTH EXPENDITURE BY DAC-BASED CLASSIFICATION (US\$ 2002)

	2002 Baseline	2007B Average Estimate	2015 Average Estimate
<i>Total dollars ('000 000 000, billions of dollars)</i>			
All countries	106.1	162.8	200.3
All low-income countries (Least-developed countries + Other low-income countries)	53.3	93.5	119.3
Least-developed countries	8.5	25.3	37.2
Other low-income countries	44.8	68.2	82.1
Lower-middle-income countries	41.1	55.0	65.1
Upper-middle-income countries	11.7	14.3	16.0
<i>Per capita (\$)</i>			
All countries	26	38	42
All low-income countries (Least-developed countries + Other low-income countries)	21	34	38
Least-developed countries	13	34	41
Other low-income countries	24	34	37
Lower-middle-income countries	28	36	40
Upper-middle-income countries	266	315	339
<i>% of GNP</i>			
All countries	3.7	4.5	3.9
All low-income countries (Least-developed countries + Other low-income countries)	4.4	6.3	5.9
Least-developed countries	4.3	10.4	11.4
Other low-income countries	4.4	5.5	4.9
Lower-middle-income countries	2.8	2.9	2.2
Upper-middle-income countries	6.8	7.3	6.8

Source: Kumaranayake L, Kurowski C, Conteh L. (2001). *Analysis of the Costs of Scaling Up Priority Health Interventions in Low- and Selected Middle-Income Countries*. Appendix 2, In *Macroeconomics and Health: Investing in Health for Economic Development*. Commission on Macroeconomics and Health. Geneva: WHO.

A5.2 ANALYSIS OF TOTAL HEALTH EXPENDITURES

The analysis of *total* health expenditures required for scaling up has been undertaken for the CMH Report (for details see Appendix 2 of the CMH Report). The incremental costs presented in Chapter 4 of this WG5 Report represent estimates of the incremental costs of scaling up at the close-to-client level. In order to consider the implication for required total health expenditures at the national level, four further adjustments were undertaken.

In addition to the costs of scaling up interventions at the close-to-client level, the process of scaling up itself will require a range of other forms of support to ensure effective implementation. Four adjustments were undertaken to reflect additional expenditures: first, a higher level management cost of 15% was estimated based on total incremental costs, to reflect the necessary input in the implementation of scaled-up interventions from institutions above the close-to-client level (e.g. the Ministry of Health); second, an additional 15% was judged to be required to improve the absorptive capacity for the magnitude of resources required to scale up; third, a quality adjustment was introduced to reflect the fact that it would be necessary to undertake expenditures to improve quality (e.g. ensuring adequate supply of drugs) for current levels of coverage; this ranged from 10% to 25% of estimated 2002 expenditures, depending on the income level of the country; fourth, a 100% increase in salaries for all staff was factored in as current public sector wages are generally too low to attract staff and ensure good performance, as reflected in high attrition rates (for example to the private sector) and poor motivation. Table A5.12 provides the estimates for the adjusted package in terms of total dollars, dollars per capita, and per cent of GNP. The average cost estimate of the low-high range is presented.

In order to estimate total health expenditure required, a distinction was made between domestic health expenditure and donor expenditure in the form of ODA. Data were available on the extent of Official Development Assistance (ODA) spent on health for the 1997 to 1999 period, and it was assumed that this reflected the average in 1998.⁵ It was also assumed that between 1998 and 2002, ODA in the health sector grew at an annual rate of 5%. Total health expenditure in 1999 was calculated based on the 1999 total health expenditure as a percentage of GNP.⁶ By subtracting the ODA component from 1999 total health expenditure, total domestic resources spent on health in 1999 were estimated. Total health expenditure in 2002 was then estimated as the sum of estimated

ODA flows in 2002 and domestic resources in 2002. The latter was derived by using the 1999 share of domestic resources relative to 1999 GNP multiplied by 2002 GNP.

Total health expenditure required in the 2007B and 2015 scenarios were then estimated as the addition of the total health expenditure in 2002 and the scale-adjusted costs from Table A5.12. Table A5.13 presents the estimates for total health expenditure required annually, in order to achieve the 2007B and 2015 target coverage levels.

NOTES

1. This annex was prepared by Lilani Kumaranayake, Christoph Kurowski, and Lesong Conteh.
2. An average annual inflation rate of 3.2% was used to derive constant US dollars in terms of 2002 prices.
3. Population projections were taken from *The World Population Prospects, 1998 Revision* published by the UN Department of Social and Economic Affairs, Population Division.
4. The GNP data are taken from the *World Development Report 2000/2001* published by the World Bank. Note that the GNP figures for the Democratic People's Republic of Korea were not available. A 5% annual per capita GNP growth rate was assumed for China. A 3% annual per capita GNP growth rate was assumed for Bangladesh, Bhutan, India, Indonesia, Lao People's Democratic Republic, Sri Lanka, and Viet Nam. A 2% annual per capita GNP growth rate was assumed for Albania, Armenia, Azerbaijan, Bolivia, Botswana, Cambodia, Cameroon, Cape Verde, the Congo, Côte d'Ivoire, Cuba, Gabon, Georgia, Ghana, Guyana, Honduras, Kyrgyzstan, Maldives, Mongolia, Nepal, Nicaragua, Pakistan, Papua New Guinea, the Philippines, the Republic of Moldova, Samoa, Solomon Islands, South Africa, the Syrian Arab Republic, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and Vanuatu. A 1% annual per capita GNP growth rate was assumed for the remaining countries.
5. DAC Report 2000 published by the OECD.
6. Data taken from *The World Health Report 2000* published by WHO.

ANNEX 6 SUMMARY ARTICLE REPRINTED FROM *Science*

IMPROVING THE HEALTH OF THE GLOBAL POOR

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We analyzed the technical basis for a major global program to reduce disease among the poor. Effective interventions exist against the few diseases which most account for excess mortality among the poor. Achieving high coverage of effective interventions requires a well-functioning health system, as well as overcoming a set of financial and nonfinancial constraints. The annual incremental cost would be between \$40 billion and \$52 billion by 2015 in 83 low-income and sub-Saharan African countries. Such a program is feasible and would avoid millions of child, maternal, and adult deaths annually in poor countries.

Improvements in global health in the second half of the twentieth century have been enormous, but remain incomplete. Between 1960 and 1995, life expectancy in low-income countries improved by 22 years as opposed to 9 in high-income countries. Mortality of children under 5 years of age in low-income countries has been halved since 1960. Even so, 10 million child deaths occur annually, and other enormous health burdens remain. In 1998, almost a third of deaths in low- and middle-income countries (LMICs)¹ were due to communicable diseases, maternal and

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perinatal conditions, and nutritional deficiencies: a death toll of 16 million, equivalent to the population of Florida. A tenth of those deaths—1.6 million—were from measles, tetanus, and diphtheria, diseases routinely vaccinated against in wealthy countries.^{2,3} Of the half million women who die annually due to pregnancy or childbirth, 99% do so in LMICs. About 2.4 billion people live at risk of malaria and at least one million died from it in 1998; there are eight million new cases of tuberculosis every year and 1.5 million deaths. On the basis of current smoking trends, tobacco-attributable disease will kill about 500 million people over the next five decades.⁴ Over 20 million people have died already of HIV/AIDS, 40 million people are infected currently, and its spread continues unabated in many countries.⁵ The burden falls most heavily on poor countries and on the poorest of the people within those countries. Of the 30 million children not receiving basic immunizations, 27 million live in countries with GNP below \$1200 per capita. In India, the prevalence of childhood mortality, smoking, and tuberculosis is three times higher among the lowest income or education groups than among the highest.⁶

The availability of effective interventions that could improve the health of the poor, and the realization that this could dramatically reduce poverty and increase economic growth, has led to a growing number of calls for a major global program to greatly reduce ill health among the poor,^{7,8} the most recent of which is the report of the WHO's Commission on Macroeconomics and Health (CMH).⁹ Working Group 5 of the CMH was charged with providing an independent assessment of the focus and costs of a comprehensive program to reduce ill health of the poor. Here, we summarize key findings of Working Group 5⁹) on the range of interventions such a program might seek to scale up; the nature of the constraints that need to be tackled in scaling up; the potential costs and benefits of such a program; and the feasibility of action. In these analyses, we focus on 83 worst-off countries: those with a per capita gross national product (GNP) of \$1200 and below (in 1999 US\$), plus the few countries in sub-Saharan Africa with GNPs over this cutoff. These countries are expected to have a population of 4.8 billion in 2015¹⁰ and include almost all of the world's people living on less than \$1 a day.

A FEW HEALTH CONDITIONS MATTER MOST

In high-income countries, death below the age of 30 is rare, and among nonsmokers, death between the ages of 30 and 69 is becomingly increasingly uncommon. Age-adjusted comparisons of 1998 LMIC death rates to

Table 1 RISK OF DYING AND AVOIDABLE MORTALITY (AS %) IN LOW AND MIDDLE-INCOME COUNTRIES, 1998.

Risk of dying	Females at ages			Males at ages		
	0 to 4	5 to 29	30 to 69	0 to 4	5 to 29	30 to 69
LMIC (a)	8.2	5.6	26.7	8.6	6.1	35.0
Nonsmoking high-income population (b)	1.0	0.9	12.6	1.2	2.2	19.2
Excess risk of dying (avoidable mortality) in LMIC (c 5 a 2 b)	7.2	4.7	14.2	7.3	3.9	15.7
Relative contribution of avoidable mortality to risk of dying in LMIC (d 5 c/a)	88	84	53	86	63	45

Source: (11).

Note that LMIC countries include those in Eastern Europe and Latin America with incomes above our US\$1200 per capita GNP cut-off for the poorest countries. Analyses that are restricted to regions where low-income countries are the majority show even greater risk of death (not shown).

nonsmoker death rates in high-income countries reveal large amounts of avoidable mortality, in the sense of premature mortality that would not occur at death rates seen in high-income countries (Table 1).¹¹ The primary causes of this avoidable mortality are maternal and perinatal mortality, vaccinepreventable diseases, acute respiratory infection and diarrhea, protein-energy and micronutrient malnutrition¹², malaria, tuberculosis, tobacco-attributable disease, and HIV/ AIDS. Together, these causes account for nearly 90% of the excess death rates at younger ages in LMICs.

Effective interventions exist against these diseases, as shown in Table 2. Their widespread implementation requires a functioning "close-to-client" health system¹² that ensures delivery of services of good technical quality. Historic experience suggests that three elements are required: local delivery structures (such as health centers and first-line hospitals) that are adequately equipped and staffed by well-trained and well-motivated health workers; categorical programs to provide technical and financial support against priority diseases (such as malaria); and strengthened management of the health system, including surveillance and monitoring. The Expanded Program of Immunization, Integrated Management of Pregnancy and Childbirth, and Integrated Management of Childhood Illness illustrate the approach to service delivery that is needed.¹⁴

TABLE 2 CURRENT COVERAGE AND MINIMUM COVERAGE GOALS

Condition and interventions*	Coverage		
	Current	2007	2015
Maternal mortality and perinatal conditions †			
Refocused antenatal care	65	80	90
Skilled birth attendance	45	80	90
Childhood mortality			
Immunization services — against polio, diphtheria, pertussis, tetanus, hepatitis B, and Hemophilus B‡	75	90	90
Immunization services — Measles§	68	80	80
Treatment of childhood illnesses — Acute respiratory infection	59	70	80
Treatment of childhood illnesses — Diarrhea	52	70	80
Malaria			
Insecticide treated nets and residual indoor spraying	2	50	70
Treatment for clinical episodes of malaria	31	60	70
Tuberculosis			
Short course treatment of smear positive and smear negative patients	44	60	70
Tobacco-attributable diseases			
Tax greater than 80% of retail price, complete advertising and promotion bans, consumer information, cessation programs	20	80	80
HIV/AIDS and sexually-transmitted infections			
Interventions to decrease sexual transmission	10–20	70	80
Other preventive interventions¶	<1–10	40	70
Palliative care**	6–10	40	70
Highly active antiretroviral therapy	<5	45	65

Source: Expert opinion; see (9, 22) for details, and background papers at www.cmhealth.org/hwg5.htm

* Interventions, which are epidemiologically appropriate, are specified for each country. For example, malaria control measures are included only in countries where malaria significantly contributes to the burden of disease, and residual spraying is only costed where it is an appropriate intervention. †Family planning is an important component of maternal care and also reduces maternal morbidity and mortality from unwanted pregnancies.

‡ Hepatitis and hemophilus B are not included in the calculation of coverage for 2002. Immunization services include provision of vitamin A in deficient areas.

§ There is an argument for 90% or greater measles coverage, but we have based our more conservative goal on current expert opinion.

|| Interventions with sex workers and clients, condom social marketing, workplace and youth interventions, focused media campaigns.

¶ Voluntary counseling and testing, prevention of mother-to-child transmission.

**Prevention and clinical management of HIV-related illnesses, home-based care.

CONSTRAINTS TO SCALING UP COVERAGE

In rich countries, there is almost 100% coverage of childhood vaccinations, skilled attendance at delivery, and widespread access to effective treatments. In contrast, coverage of the most effective interventions is low in the poorest countries. However, a few have achieved major success in one or more areas. For example, at an incremental cost of about \$5 million annually, Malawi has adopted accelerated measles control, and no child measles death has been reported in the last 2 years.¹⁵ However, widespread coverage of all priority interventions is low in most of the poorest countries (Table 2). Table 2 also shows the CMH coverage targets for 2007 and 2015. These come from best judgements made by experts, with some country-specific adjustments; where the international community has set adequate target rates, these are reflected. Country-specific coverage levels reported over recent years provided the baseline of the analysis.

The most obvious barrier to expanding coverage is the currently low level of expenditure on health. Average annual per capita expenditure on health is \$26 (in 2002 US\$) in countries under \$1200 per capita GNP and all those in sub-Saharan Africa.¹⁶ In the 48 poorest countries within this list, it is only \$13. Moreover, only a minority of these expenditures come from public budgets. The rest are mainly paid out-of-pocket by the poor households, who spend more as a proportion of income on health care than do richer groups.¹⁷

Expanding access to successful interventions will thus require additional funds. In most settings it will also require removal of a variety of constraints.¹⁸ Many, but not all, of these constraints can be “bought out.” For example, community- and household-level constraints can be addressed through education of mothers, reducing physical distance to facilities, eliminating user fees, and increasing accountability of health services to communities. A community health worker program in Bangladesh resulted in 30% lower child mortality and 19% lower female mortality versus a control area.¹⁹ More money can also relieve many local delivery constraints through increasing salary and nonsalary incentives to health workers; increasing staff numbers; improving drug supply, procurement, and logistics; introducing quality assurance methods; strengthening management; and improving regulation of and cooperation with the private sector. In Africa, training of existing staff has tripled cure rates from tuberculosis treatment.²⁰

In contrast, the very highest levels of constraint, those due to overall governance (including corruption, poor rule of law, and armed conflict), are among the most important and the least susceptible to buy-out or

short-term amelioration. Overall public policy and governance constraints have been identified as hugely important predictors of the success of developmental assistance.²¹ On the basis of available indicators, which can act as proxies for various kinds of constraints, we categorized countries into four quartiles. Countries in the most constrained quartile have almost twice the child mortality, more than twice the maternal mortality, a third lower immunization coverage, a third as many nurses per capita, and a greater proportion of their population living in poverty. However, only about 260 million people currently live in these highly constrained countries; the rest, more than two billion people, live in places with better governance.¹⁸

COSTS AND BENEFITS OF A MAJOR SCALE-UP

In calculating the costs of a major effort to scale up services, it is thus vital to allow not just for the costs of the interventions themselves, but also for the increased delivery capacity required. On the basis of our disease- and condition- specific costs, plus adjustments to allow for overall system expansion and support, the CMH report estimated total costs of achieving the target 2015 coverage levels as \$42 per capita in 2002 US\$.⁹ The CMH report argues that by 2015, around \$6 per capita per year would be required in development assistance, most of which would flow to the 48 poorest countries (amounting to \$23 per capita for these countries).

Our detailed cost analysis estimated the costs for 2007 and 2015 of expanding coverage of 49 priority interventions (summarized in Table 2) within a close-to-client health system in the 83 worst-off countries. The costs of expanding activities reflect additional expenditure over and above what is being spent today. Costs include both intervention costs and system costs at the local level such as new facilities, management, institutional support, and training (Table 3). Overall additional annual financial needs are \$8 to \$11 per capita or between \$40 billion and \$52 billion by 2015 in these countries, if 2015 target levels of coverage are to be reached.²²

HIV/AIDS dominates the total incremental costs, constituting a full 49% of the high range of 2015 costs (and 61% for sub-Saharan Africa²²). HIV prevention (17% of the total costs) will be key to curbing growth of the epidemic. Care and support (14% of the total costs) and highly active antiretroviral therapy (18% of the total costs) can prolong life, improve quality of life, and reduce the number of AIDS orphans, but are unlikely to reduce the spread of the virus. Given that a 10% increase in cigarette tax would raise about 7% additional excise revenue,⁴ smoking control is

Table 3 ANNUAL INCREMENTAL COSTS IN BILLIONS (AND PER CAPITA) BY DISEASE TYPE, IN 2002 US\$

	2007		2015		Percent of 2015 high cost estimate
	Low	High	Low	High	
Maternity-related conditions	2.80 (0.65)	4.48 (1.03)	4.27 (0.89)	6.72 (1.40)	13.0%
Child immunization (including measles)	0.78 (0.18)	1.13 (0.26)	1.04 (0.22)	1.56 (0.33)	3.0%
Treatment of childhood illnesses	3.26 (0.75)	4.13 (0.95)	9.41 (1.97)	11.99 (2.50)	23.3%
Malaria prevention	1.64 (0.38)	2.38 (0.55)	2.76 (0.58)	4.03 (0.84)	7.8%
Malaria treatment	0.37 (0.09)	0.57 (0.13)	0.77 (0.16)	1.24 (0.22)	2.4%
Tuberculosis treatment	0.47 (0.11)	0.62 (0.14)	0.78 (0.16)	1.04 (0.22)	2.0%
HIV prevention	6.18 (1.43)	6.76 (1.56)	7.98 (1.67)	8.69 (1.81)	16.9%
HIV/AIDS care	2.78 (0.64)	2.85 (0.66)	5.82 (1.22)	7.06 (1.48)	13.7%
High-active anti-retroviral therapy	4.28 (0.99)	5.78 (1.33)	6.85 (1.43)	9.19 (1.92)	17.8%
All interventions	22.57 (5.21)	28.70 (6.62)	39.69 (8.29)	51.52 (10.76)	100.0%

Source: (22).

Notes: (i) smoking control is considered self-financing given that higher taxes raise revenue in most settings (4), (ii) sixteen countries (population 120 million in 2015) which were included in this cost analysis were excluded from the benefits analysis, as the data for demographically developing regions did not match our cut-off for per capita income. The excluded population represents less than 3% of the total population in our definition of the poorest countries.

largely self-financing. There is a strong argument for scaling up the full set of interventions, because often they are complementary (for example, malaria control reduces childhood anemia) and because they share infrastructure costs. For example, access to treatment of childhood illnesses would require extra facilities to meet the needs of the 450 million children below age five in 2015. These facilities would also be used for other interventions.

We compared our coverage goals and expenditures with the health goals within the United Nations (UN) Millennium Development Goals (MDGs). These goals aim to reduce by two-thirds, between 1990 and 2015, the under-five mortality rate; reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio; reverse, by 2015, the spread of HIV/AIDS; and have begun to reduce, by 2015, the incidence of malaria and other major diseases. We analyzed the MDG variables for demo-

graphically developing countries using WHO projections,³ under optimistic and pessimistic income growth assumptions, adjusting for population growth using the UN Population Division medium projections.¹⁰ Smoking cessation indicators among the 0.8 billion smokers in low-income countries were added, given that cessation among adults (versus initiation among children) is the chief determinant of reductions in tobacco-attributable mortality over the next few decades.⁴

Somewhat surprisingly, our analyses suggest that even in the pessimistic scenarios of slow income growth, all regions would reach the MDG goal for maternal mortality. For example, expanding skilled birth attendance to 80% of the population would avoid about 65% of maternal deaths and reduce deaths to below 200 per 100,000 live births (from the current level of about 800) in Africa, and avoid between 29,000 and 133,000 deaths in 2015 worldwide. In contrast, the MDG target for reducing child mortality appears to be more daunting. Worldwide, a major scale-up of interventions aimed at children would yield huge gains: between 1.9 million and 4.9 million childhood deaths avoided in 2015. However, these figures represent only 44% or 53%, respectively, of the childhood deaths that would otherwise have occurred, falling short of the two-thirds goal of the MDG. Additional efforts to expand access to treatment of childhood illnesses, reduce protein-energy malnutrition, and introduce newer antigens (such as those for streptococcal pneumonia and rotavirus) into immunization services are required to accelerate mortality reductions.

Assuming 70% detection and high cure rates (85% or higher) for tuberculosis, about two million tuberculosis deaths would be avoided in 2015.²³ For malaria, improved case management and home treatment, and use of insecticide-treated nets and residual spraying, would avoid between 100,000 to 500,000 childhood deaths in 2015. Increasing cigarette tax to four-fifths of the retail price would roughly double the price of cigarettes in low-income countries, which, along with complete bans on advertising and promotion,⁴ could quadruple smoking cessation rates to about 30%. This would avoid somewhere between 60 to 120 million premature deaths between now and 2050. For HIV/AIDS, even if countries stayed at their current prevalence levels, about 55 million people would be infected with HIV-1 in 2015. But properly targeted prevention programs could prevent this from rising dramatically higher and could thus avoid more than 100 million additional people being infected in 2015.

CAN IT BE DONE?

Early reaction to the CMH plan has included widespread enthusiasm about the desirability of a major program, but also questions about its technical feasibility and concerns about wasting aid money.^{24–27} Our careful review concluded that a worldwide effort to increase the access of populations in poor countries to the priority health interventions is both desirable and feasible. There are numerous individual success stories for various conditions, such as the reduction in Thai maternal mortality by three-quarters in the 1960s and 1970s by quadrupling the number of new midwives, the millions of children saved by immunization and case management, and doubling of appropriate tuberculosis treatment. The challenge today is to achieve high coverage of all of the relatively small number of interventions, delivered through a close-to-client health system, and backed up by specific categorical programs offering technical support and by strengthened health systems management.

The second concern, about wasting money, is a real one especially where corruption and poor governance are rife. Most of the burden of ill health, however, lies in countries with fewer severe constraints in their ability to scale up coverage and better governance structures (notable examples are Ghana, India, Senegal, and Uganda). It is true that there are subnational regions that suffer from grievous governance failings, such as several populous states of India and provinces of China; including these would more than double the population living in highly constrained settings. However, the federal structures of those countries enable action in such places: in Bihar, India, federal programs have been able to curtail dramatically both polio and leprosy. Cambodia has been a country noted for poor governance. Yet, it appears to have reduced HIV-1 prevalence by about one-third through scaling up prevention programs for vulnerable groups, and treating sexually transmitted infections.⁵ Moreover, political conditions of high constraint are often transitory. Some years ago, countries such as Uganda and Mozambique would have been found among the most constrained because of civil strife and poor political governance. Today they are not.

A global program would require a large and sustained increase over current levels of expenditure. The CMH calls on poor and rich countries to share the burden. The low-income countries would be responsible for more than half of the increased expenditures for improved health by 2015, whereas donors are called upon to provide \$27 billion annually by 2007 and \$38 billion annually by 2015, compared with an estimated \$6 billion for health in 2001. Such donor funding would need to continue for two

or more decades and must include payment for salaries and systems support. The sums also include \$4 billion by 2015 for research and development.

Although \$27 billion by 2007 is a large amount, it would represent around one-tenth of 1% of the GNP of the donor countries. Overseas developmental assistance is now around \$53 billion or just 0.2% of GNP of the donor countries, compared with a long-standing international target of 0.7% of GNP established by the UN General Assembly in 1970, so there is ample room to increase funding for health. Sustained donor financing is needed to remove the trap of too little money being available to identify and solve constraints to achieving wide population coverage. Recipient governments and leaders must demonstrate the capacity to mobilize more money domestically, channel funds to the poorest within their societies, use funds transparently, and monitor and report outcomes in an accountable way.

To spend money well and achieve desired outcomes, we recommend four specific actions: (i) focused efforts to identify and systematically remove the key constraints that prevent health systems from increasing the coverage of good quality services; (ii) a massive effort with donor financial and technical support to increase the number of skilled health managers; (iii) a similar massive effort to put in place reliable surveillance systems to track trends in the health status of the poor, detect and control new epidemics and outbreaks, evaluate the success of control programs, and improve accountability for expenditures on health; and (iv) a major increase in research on interventions including vaccines, drugs, and behavior change, and on how best to deliver interventions to communities. Within the broad goal of improving health, we emphasize dramatically reducing the half million deaths among women due to pregnancy or childbirth as a particularly effective indicator of a strengthened close-to-client health system.

Such a global program focusing on lifting the poor out of ill health would require extraordinary and sustained popular and political will. For all its challenges, such a program would have a truly profound beneficial effect over the first quarter of the 21st century.

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28. This paper draws extensively on the background papers, consultations, and report of Working Group 5 of CMH. The views represented are of the authors and not those of WHO or the World Bank. Financial support from the WHO, the Bill and Melinda Gates Foundation, the World Bank, and the London School of Hygiene and Tropical Medicine is kindly acknowledged. We thank H. Barnum, M. Claeson, D. T. Jamison, P. Musgrove, and L. Nemer for helpful comments, and I. Sinha for assistance.

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