Overview

Over the past forty years life expectancy has improved more than during the entire previous span of human history. In 1950 life expectancy in developing countries was forty years; by 1990 it had increased to sixty-three years. In 1950 twenty-eight of every 100 children died before their fifth birthday; by 1990 the number had fallen to ten. Smallpox, which killed more than 5 million annually in the early 1950s, has been eradicated entirely. Vaccines have drastically reduced the occurrence of measles and polio. Not only do these improvements translate into direct and significant gains in well-being, but they also reduce the economic burden imposed by unhealthy workers and sick or absent schoolchildren. These successes have come about in part because of growing incomes and increasing education around the globe and in part because of governments’ efforts to expand health services, which, moreover, have been enriched by technological progress.

Despite these remarkable improvements, enormous health problems remain. Absolute levels of mortality in developing countries remain unacceptably high: child mortality rates are about ten times higher than those in the established market economies. If death rates among children in poor countries were reduced to those prevailing in the rich countries, 11 million fewer children would die each year. Almost half of these preventable deaths are a result of diarrheal and respiratory illness, exacerbated by malnutrition. In addition, every year 7 million adults die of conditions that could be inexpensively prevented or cured; tuberculosis alone causes 2 million of these deaths. About 400,000 women die from the direct complications of pregnancy and childbirth. Maternal mortality ratios are, on average, thirty times as high in developing countries as in high-income countries.

Although health has improved even in the poorest countries, the pace of progress has been uneven. In 1960 in Ghana and Indonesia about one child in five died before reaching age 5—a child mortality rate typical of many developing countries. By 1990 Indonesia’s rate had dropped to about one-half the 1960 level, but Ghana’s had fallen only slightly. Table 1 provides a summary of regional progress in mortality reduction between 1975 and 1990. (Figure 1 illustrates the demographic regions used in Table 1 and frequently throughout this Report.)

In addition to premature mortality, a substantial portion of the burden of disease consists of disability, ranging from polio-related paralysis to blindness to the suffering brought about by severe psychosis. To measure the burden of disease, this Report uses the disability-adjusted life year (DALY), a measure that combines healthy life years lost because of premature mortality with those lost as a result of disability.

There is huge variation in per person loss of DALYs across regions, mainly because of differences in premature mortality; regional differences in loss of DALYs as a result of disability are much smaller (Figure 2). The total loss of DALYs is referred to as the global burden of disease.

The world is facing serious new health challenges. By 2000 the growing toll from acquired immune deficiency syndrome (AIDS) in developing countries could easily rise to more than 1.8 million deaths annually, erasing decades of hard-won reductions in mortality. The malaria parasite’s increased resistance to available drugs could lead to
The first six regions named in the key are at intermediate stages of the demographic transition.

Figure 1 Demographic regions used in this Report

Table 1 Population, economic indicators, and progress in health by demographic region, 1975–90

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<tr>
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<td>510</td>
<td>7.9</td>
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<td>7.4</td>
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<td>5.5</td>
<td>4.6</td>
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<td>97</td>
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<td>Latin America and the Caribbean</td>
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<td>3.0</td>
<td>-0.1</td>
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<tr>
<td>Middle Eastern crescent</td>
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<td>4.4</td>
<td>-1.3</td>
<td>174</td>
<td>111</td>
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<td>3.8</td>
<td>0.5</td>
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<td>22</td>
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<tr>
<td>Established market economies (EME)</td>
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<td>7.1</td>
<td>2.2</td>
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<td>11</td>
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<tr>
<td>Demographically developing groupa</td>
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<td>3.0</td>
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<td>106</td>
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<tr>
<td>FSE and EME</td>
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<td>14,690</td>
<td>1.7</td>
<td>25</td>
<td>15</td>
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<tr>
<td>World</td>
<td>5,267</td>
<td>50.0</td>
<td>4,000</td>
<td>1.2</td>
<td>135</td>
<td>96</td>
</tr>
</tbody>
</table>

Note: Child mortality is the probability of dying between birth and age 5, expressed per 1,000 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.
a. The countries of the demographic regions Sub-Saharan Africa, India, China, Other Asia and islands, Latin America and the Caribbean, and Middle Eastern crescent.

Source: For income per capita, World Bank data; for other items, Appendix A.
a doubling of malaria deaths, to nearly 2 million a year within a decade. Rapid progress in reducing child mortality and fertility rates will create new demands on health care systems as the aging of populations brings to the fore costly noncommunicable diseases of adults and the elderly. Tobacco-related deaths from heart disease and cancers alone are likely to double by the first decade of the next century, to 2 million a year, and, if present smoking patterns continue, they will grow to more than 12 million a year in developing countries in the second quarter of the next century.

Health systems and their problems

Although health services are only one factor in explaining past successes, the importance of their role in the developing world is not in doubt. Public health measures brought about the eradication of smallpox and have been central to the reduction in deaths caused by vaccine-preventable childhood diseases. Expanded and improved clinical care has saved millions of lives from infectious diseases and injuries. But there are also major problems with health systems that, if not resolved, will hamper progress in reducing the burden of premature mortality and disability and frustrate efforts to respond to new health challenges and emerging disease threats.

- Misallocation. Public money is spent on health interventions of low cost-effectiveness, such as surgery for most cancers, at the same time that critical and highly cost-effective interventions, such as treatment of tuberculosis and sexually

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The disease burden is highest in poor countries, but disability remains a problem in all regions.

Figure 2 Burden of disease attributable to premature mortality and disability, by demographic region, 1990

![Figure 2](image_url)

Source: Appendix B.
transmitted diseases (STDs), remain under-funded. In some countries a single teaching hospital can absorb 20 percent or more of the budget of the ministry of health, even though almost all cost-effective interventions are best delivered at lower-level facilities.

- Inequity. The poor lack access to basic health services and receive low-quality care. Government spending for health goes disproportionately to the affluent in the form of free or below-cost care in sophisticated public tertiary care hospitals and subsidies to private and public insurance.

- Inefficiency. Much of the money spent on health is wasted: brand-name pharmaceuticals are purchased instead of generic drugs, health workers are badly deployed and supervised, and hospital beds are underutilized.

- Exploding costs. In some middle-income developing countries health care expenditures are growing much faster than income. Increasing numbers of general physicians and specialists, the availability of new medical technologies, and expanding health insurance linked to fee-for-service payments together generate a rapidly growing demand for costly tests, procedures, and treatments.

World health spending—and thus also the potential for misallocation, waste, and inequitable distribution of resources—is huge. For the world as a whole in 1990, public and private expenditure on health services was about $1,700 billion, or 8 percent of total world product. High-income countries spent almost 90 percent of this amount, for an average of $1,500 per person. The United States alone consumed 41 percent of the global total—more than 12 percent of its gross national product (GNP). Developing countries spent about $170 billion, or 4 percent of their GNP, for an average of $41 per person—less than one-thirtieth the amount spent by rich countries.

In the low-income countries government hospitals and clinics, which account for the greatest part of the modern medical care provided, are often inefficient, suffering from highly centralized decision-making, wide fluctuations in budgetary allocations, and poor motivation of facility managers and health care workers. Private providers—mainly religious nongovernmental organizations (NGOs) in Africa and private doctors and unlicensed practitioners in South Asia—are often more technically efficient than the public sector and offer a service that is perceived to be of higher quality, but they are not supported by government policies. In low-income countries the poor often lose out in health because public spending in the sector is heavily skewed toward high-cost hospital services that disproportionately benefit better-off urban groups. In Indonesia, despite concerted government efforts in the 1980s to improve health services for the poor, government subsidies to health for the richest 10 percent of households in 1990 were still almost three times the subsidies going to the poorest 10 percent of Indonesians.

In middle-income countries governments frequently subsidize insurance that protects only the relatively wealthy—a small, affluent minority in the case of private insurance in South Africa and Zimbabwe and, in Latin America, the larger industrial labor force covered by compulsory public insurance (so-called social insurance). The bulk of the population, especially the poor, relies heavily on out-of-pocket payments and on government services that may be largely inaccessible to them. In Peru, for example, more than 60 percent of the poor have to travel for more than an hour to obtain primary health care, as compared with less than 3 percent of the better-off. The quality of care is also low: drugs and equipment are in short supply; patient waiting times are long and medical consultations are short; and misdiagnoses and inappropriate treatment are common.

In the formerly socialist economies, where governments have historically been responsible for both the financing and the delivery of health care, health care is free in principle, and wide coverage of the population has been achieved. This has led to greater apparent equity. But in reality, better-off consumers make informal out-of-pocket payments to get better care: about 25 percent of health costs in Romania and 20 percent in Hungary, for example, are under-the-table payments for pharmaceuticals and gratuities to health care providers. Inefficiency is also widespread because the government-run health system is highly centralized, bureaucratic, and unresponsive to citizens. Governments have been slow to regulate workplace safety and environmental pollution and have failed to mount effective campaigns against unhealthy personal behaviors—especially alcohol consumption and cigarette smoking. In recent years real government spending for health has fallen dramatically in the course of the transition to more market-oriented economies. The public sector has suffered from serious shortages of drugs and equipment and a lack of skills to manage changing health institutions. The consequences have been declining staff morale and falling quality of care.
The roles of the government and of the market in health

Three rationales for a major government role in the health sector should guide the reform of health systems.

- Many health-related services such as information and control of contagious disease are public goods. One person's use of health information does not leave less available for others to consume; one person cannot benefit from control of malaria-carrying mosquitoes while another person in the same area is excluded. Because private markets alone provide too little of the public goods crucial for health, government involvement is necessary to increase the supply of these goods. Other health services have large externalities: consumption by one individual affects others. Immunizing a child slows transmission of measles and other diseases, conferring a positive externality. Polluters and drunk drivers create negative health externalities. Governments need to encourage behaviors that carry positive externalities and to discourage those with negative externalities.

- Provision of cost-effective health services to the poor is an effective and socially acceptable approach to poverty reduction. Most countries view access to basic health care as a human right. This perspective is embodied in the goal, "Health for All by the Year 2000," of the conference held by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) at Alma-Ata in 1978, which launched today's primary health care movement. Private markets will not give the poor adequate access to essential clinical services or the insurance often needed to pay for such services. Public finance of essential clinical care is thus justified to alleviate poverty. Such public funding can take several forms: subsidies to private providers and NGOs that serve the poor; vouchers that the poor can take to a provider of their choice; and free or below-cost delivery of public services to the poor.

- Government action may be needed to compensate for problems generated by uncertainty and insurance market failure. The great uncertainties surrounding the probability of illness and the efficacy of care give rise both to strong demand for insurance and to shortcomings in the operation of private markets. One reason why markets may work poorly is that variations in health risk create incentives for insurance companies to refuse to insure the very people who most need health insurance—those who are already sick or are likely to become ill. A second has to do with "moral hazard": insurance reduces the incentives for individuals to avoid risk and expense by prudent behavior and can create both incentives and opportunities for doctors and hospitals to give patients more care than they need. A third has to do with the asymmetry in information between provider and patient concerning the outcomes of intervention; providers advise patients on choice of treatment, and when the providers' income is linked to this advice, excessive treatment can result. As a consequence of these last two considerations, in unregulated private markets costs escalate without appreciable health gains to the patient. Governments have an important role to play in regulating privately provided health insurance, or in mandating alternatives such as social insurance, in order to ensure widespread coverage and hold down costs.

If governments do intervene, they must do so intelligently, or they risk exacerbating the very problems they are trying to solve. When governments become directly involved in the health sector—by providing public health programs or financing essential clinical services for the poor—policymakers face difficult decisions concerning the allocation of public resources. For any given amount of total spending, taxpayers and, in some countries, donors want to see maximum health gain for the money spent. An important source of guidance for achieving value for money in health spending is a measure of the cost-effectiveness of different health interventions and medical procedures—that is, the ratio of costs to health benefits (DALYs gained).

Until recently, little has been done to apply cost-effectiveness analysis to health. This is, in part, because it is difficult. Cost and effectiveness data on health interventions are often weak. Costs vary between countries and can rise or fall sharply as a service is expanded. Some groups of interventions are provided jointly, and their costs are shared. Nonetheless, cost-effectiveness analysis is already demonstrating its usefulness as a tool for choosing among possible health interventions in individual countries and for addressing specific health problems such as the spread of AIDS.

Just because a particular intervention is cost-effective does not mean that public funds should be spent on it. Households can buy health care with their own money and, when well informed, may do this better than governments can do it for them. But households also seek value for money, and governments, by making information about cost-effectiveness available, can often help im-
Box 1  Investing in health: key messages of this Report

This Report proposes a three-pronged approach to government policies for improving health.

Foster an environment that enables households to improve health

Household decisions shape health, but these decisions are constrained by the income and education of household members. In addition to promoting overall economic growth, governments can help to improve those decisions if they:

- Pursue economic growth policies that will benefit the poor (including, where necessary, adjustment policies that preserve cost-effective health expenditures)
- Expand investment in schooling, particularly for girls
- Promote the rights and status of women through political and economic empowerment and legal protection against abuse.

Improve government spending on health

The challenge for most governments is to concentrate resources on compensating for market failures and efficiently financing services that will particularly benefit the poor. Several directions for policy respond to this challenge:

- Reduce government expenditures on tertiary facilities, specialist training, and interventions that provide little health gain for the money spent.
- Finance and implement a package of public health interventions to deal with the substantial externalities surrounding infectious disease control, prevention of AIDS, environmental pollution, and behaviors (such as drunk driving) that put others at risk.
- Finance and ensure delivery of a package of essential clinical services. The comprehensiveness and composition of such a package can only be defined by each country, taking into account epidemiological conditions, local preferences, and income. In most countries public finance, or publicly mandated finance, of the essential clinical package would provide a politically acceptable mechanism for distributing both welfare improvements and a productive asset—better health—to the poor.
- Improve management of government health services through such measures as decentralization of administrative and budgetary authority and contracting out of services.

Promote diversity and competition

Government finance of public health and of a nationally defined package of essential clinical services would leave the remaining clinical services to be financed privately or by social insurance within the context of a policy framework established by the government. Governments can promote diversity and competition in provision of health services and insurance by adopting policies that:

- Encourage social or private insurance (with regulatory incentives for equitable access and cost containment) for clinical services outside the essential package.
- Encourage suppliers (both public and private) to compete both to deliver clinical services and to provide inputs, such as drugs, to publicly and privately financed health services. Domestic suppliers should not be protected from international competition.
- Generate and disseminate information on provider performance, on essential equipment and drugs, on the costs and effectiveness of interventions, and on the accreditation status of institutions and providers.

Increased scientific knowledge has accounted for much of the dramatic improvement in health that has occurred in this century—by providing information that forms the basis of household and government action and by underpinning the development of preventive, curative, and diagnostic technologies. Investment in continued scientific advance will amplify the effectiveness of each element of the three-pronged approach proposed in this Report. Because the fruits of scientific benefit all countries, internationally collaborative efforts, of which there are several excellent examples, will often be the right way to proceed.

Improve the decisions of private consumers, providers, and insurers.

Government policies for achieving health for all

This Report focuses primarily on the relation between policy choices, both inside and outside the health sector, and health outcomes, especially for the poor. Box 1 summarizes the Report's three key messages for government policy and notes the importance of continued investment in scientific advance.

- Since overall economic growth—particularly poverty-reducing growth—and education are central to good health, governments need to pursue sound macroeconomic policies that emphasize reduction of poverty. They also need to expand basic schooling, especially for girls, because the way in which households, particularly mothers, use information and financial resources to shape their
dietary, fertility, health care, and other life-style choices has a powerful influence on the health of household members.

- Governments in developing countries should spend far less—on average, about 50 percent less—than they now do on less cost-effective interventions and instead double or triple spending on basic public health programs such as immunizations and AIDS prevention and on essential clinical services. A minimum package of essential clinical services would include sick-child care, family planning, prenatal and delivery care, and treatment for tuberculosis and STDs. Low-income countries would have to redirect current public spending for health and increase expenditures (by government, donors, and patients) to meet needs for public health and the minimum package of essential clinical services for their populations; less reallocation would be needed in middle-income countries. Tertiary care and less cost-effective services will continue, but public subsidies to them, if they mainly benefit the wealthy, should be phased out during a transitional period.

- Because competition can improve quality and drive down costs, governments should foster competition and diversity in the supply of health services and inputs, particularly drugs, supplies, and equipment. This could include, where feasible, private supply of health care services paid for by governments or social insurance. There is also considerable scope for improving the quality and efficiency of government health services through a combination of decentralization, performance-based incentives for managers and clinicians, and related training and development of management systems. Exposing the public sector to competition with private suppliers can help to spur such improvements. Strong government regulation is also crucial, including regulation of privately delivered health services to ensure safety and quality and of private insurance to encourage universal access to coverage and to discourage practices—such as fee-for-service payment to providers reimbursed by a “third-party” insurer—that lead to overuse of services and escalation of costs.

**Improving the economic environment for healthy households**

Advances in income and education have allowed households almost everywhere to improve their health. In the 1980s, even in countries in which average incomes fell, death rates of children under age 5 declined by almost 30 percent. But the child mortality rate fell more than twice as much in countries in which average incomes rose by more than 1 percent a year. Economic policies conducive to sustained growth are thus among the most important measures governments can take to improve their citizens’ health.

Of these economic policies, increasing the income of those in poverty is the most efficacious for improving health. The reason is that the poor are most likely to spend additional income in ways that enhance their health: improving their diet, obtaining safe water, and upgrading sanitation and housing. And the poor have the greatest remaining health needs, as Figure 3 illustrates for Porto Alegre, Brazil. Government policies that promote equity and growth together will therefore be better for health than those that promote growth alone.

In the 1980s many countries undertook macroeconomic stabilization and adjustment programs.
designed to deal with severe economic imbalances and move the countries onto sustainable growth paths. Such adjustment is clearly needed for long-run health gains. But during the transitional period, and especially in the earliest adjustment programs, recession and cuts in public spending slowed improvements in health. This effect was less than originally feared, however—in part because earlier expenditures for improving health and education had enduring effects. As a result of this experience, most countries’ adjustment programs today try to rationalize overall government spending while maintaining cost-effective expenditures in health and education. Despite these improvements, much is still to be learned about more efficient ways of carrying out stabilization and adjustment programs while protecting the poor.

Policies to expand schooling are also crucial for promoting health. People who have had more schooling seek and utilize health information more effectively than those with little or no schooling. This means that rapid expansion of educational opportunities—in part by setting a high minimum standard of schooling (say, six full years) for all—is a cost-effective way of improving health. Education of girls and women is particularly beneficial to household health because it is largely women who buy and prepare food, maintain a clean home, care for children and the elderly, and initiate contacts with the health system. Beyond education, government policies that support the rights and economic opportunities of women also contribute to overall household well-being and better health.

Investing in public health and essential clinical services

The health gain per dollar spent varies enormously across the range of interventions currently financed by governments. Redirecting resources from interventions that have high costs per DALY gained to those that cost little could dramatically reduce the burden of disease without increasing expenditures. A limited package of public health measures and essential clinical interventions is a top priority for government finance; some governments may wish, after covering that minimum for everyone, to define their national essential package more broadly.

Public health

Government action in many areas of public health has already had an important payoff. Immunizations are currently saving an estimated 3 million lives a year. Social marketing of condoms to prevent transmission of human immunodeficiency virus (HIV) has proved highly successful in Uganda, Zaire, and elsewhere. Information on the risks of smoking, and taxes on both tobacco and alcohol, are changing behavior in some countries—although mostly, so far, in the richer countries.

Governments need to expand these efforts and to move forward with other promising public health initiatives. Several activities stand out because they are highly cost-effective: the cost of gaining one DALY can be remarkably low—sometimes less than $25 and often between $50 and $150. Activities in this category include:

- Immunizations
- School-based health services
- Information and selected services for family planning and nutrition
- Programs to reduce tobacco and alcohol consumption
- Regulatory action, information, and limited public investments to improve the household environment
- AIDS prevention.

Intensified government support is required to extend the Expanded Programme on Immunization (EPI), which currently protects about 80 percent of the children in the developing world against six major diseases at a cost of about $1.4 billion a year. Expanding EPI coverage to 95 percent of all children would have a significant impact on children in poor households, who make up a disproportionately large share of those not yet reached by the EPI. Other vaccines, particularly those for hepatitis B and yellow fever, could be added to the six currently included in the EPI, as could vitamin A and iodine supplements. In most developing countries such an “EPI Plus” cluster of interventions in the first year of life would have the highest cost-effectiveness of any health measure available in the world today.

A second high priority for governments should be to provide inexpensive and highly efficacious medications to treat school-age children afflicted with schistosomiasis, intestinal worm infections, and micronutrient deficiencies. Treatment of these conditions through distribution of medications and micronutrient supplements in schools would greatly improve the health, school attendance, and learning achievement of hundreds of millions of children, at a cost of $1 to $2 per child per year. In addition to treatment, schoolchildren can be taught by their teachers or by radio about the hu-
man body and about avoiding risks to health—for example, from smoking or unsafe sex.

Governments need to encourage healthier behaviors on the part of individuals and households by providing information on the benefits of breastfeeding and on how to improve children’s diets. Programs in Colombia, Indonesia, and elsewhere show the potential for success. Information on the benefits of family planning and on the availability of family planning services is also critical. Government dissemination of this information can take a number of creative forms, as the effective use of radio drama and folk theater in Kenya and Zimbabwe demonstrates.

Measures to control the use of tobacco, alcohol, and other addictive substances—through information campaigns, taxes, bans on advertising, and, in certain cases, import controls—can help substantially to reduce chronic lung disease, heart disease, cancer, and injuries. Unless smoking behavior changes, three decades from now premature deaths caused by tobacco in the developing world will exceed the expected deaths from AIDS, tuberculosis, and complications of childbirth combined.

Governments must do more to promote a healthier environment, especially for the poor, who face greatly increased health risks from poor sanitation, insufficient and unsafe water supplies, poor personal and food hygiene, inadequate garbage disposal, indoor air pollution, and crowded and inferior housing. Collectively, these risks are associated with nearly 30 percent of the global burden of disease. To help the poor improve their household environments, governments can provide a regulatory and administrative framework within which efficient and accountable providers (often in the private sector) have an incentive to offer households the services they want and are willing to pay for, including water supply, sanitation, garbage collection, clean-burning stoves, and housing. The government has a vital role in disseminating information about hygienic practices. It can also improve the use of public resources by eliminating widespread subsidies for water and sanitation that benefit the middle class. Government legislation and regulations to increase security of land tenure for the poor would encourage low-income families to invest more in safer, healthier housing.

A special challenge for concerted public health action is to reduce the spread of AIDS. The AIDS epidemic has already become a dominant public health concern in many countries. Although HIV, the virus that causes AIDS, has only recently be-

gun to spread through human populations, it has so far caused 2 million deaths and infected about 13 million individuals. Some parts of the developing world are already heavily infected: in Sub-Saharan Africa an average of one in forty adults has the virus, and in certain cities the rate is one in three. In Thailand one adult in fifty is infected. More than 90 percent of the infected individuals are in their economically most productive years, ages 15–40. They will be developing AIDS and dying over the next decade. Projections of the future course of the epidemic are gloomy; conservative estimates from WHO are that by 2000, 26 million individuals will be HIV-infected and 1.8 million a year will die of AIDS. By destroying individuals’ immune systems, HIV will also vastly worsen the spread of other diseases, especially tuberculosis. In highly affected areas demand for AIDS treatment will overwhelm capacity for clinical treatment and cause a deterioration of care for other illnesses.

What governments need to do is clear: intervene early, before a major epidemic gets under way. Countries as diverse as Bangladesh, Ghana, and Indonesia share the preconditions for rapid transmission of HIV—substantial numbers of prostitutes and high rates of prevalence of other STDs, such as syphilis, gonorrhea, and chancroid, which facilitate the spread of the AIDS virus. Strong public action is required to reduce HIV transmission. Particularly important are efforts targeted at high-risk groups: information to promote change in sexual behavior; distribution of condoms; and treatment for other STDs. Early reduction in HIV transmission by high-risk individuals is very cost-effective, but later in an AIDS epidemic the cost-effectiveness of interventions declines substantially. Current expenditures on AIDS prevention in developing countries—totaling less than $200 million a year—are woefully inadequate. Five to ten times this level of spending is needed to deal with the emerging epidemic.

**Essential clinical services**

The components of a package of essential clinical services of high cost-effectiveness will vary from country to country, depending on local health needs and the level of income. At a minimum, the package should include five groups of interventions each of which addresses very large disease burdens. The five groups are:

- Services to ensure pregnancy-related (prenatal, childbirth, and postpartum) care; strength-
ened efforts could prevent most of the almost half-
million maternal deaths that occur each year in
developing countries.

- Family planning services; improved access to
  these services could save as many as 850,000 chil-
dren from dying every year and eliminate as many
as 100,000 of the maternal deaths that occur
annually.

- Tuberculosis control, mainly through drug
  therapy, to combat a disease that kills more than 2
million people annually, making it the leading
cause of death among adults.

- Control of STDs, which account for more than
250 million new cases of debilitating and some-
times fatal illness each year.

- Care for the common serious illnesses of
young children—diarrheal disease, acute respira-
tory infection, measles, malaria, and acute malnu-
trition—which account for nearly 7 million child
deaths annually.

These clinical interventions are all highly cost-
effective—often costing substantially less than $50
per DALY gained.

A minimal package of essential clinical services
would also include some treatment for minor in-
fec tion and trauma and, for health problems that
cannot be fully resolved with existing resources,
advice and alleviation of pain. The provision of
hospital-based emergency care other than the in-
terventions mentioned above would depend on
day-to-day capacity and availability of resources.
This emergency care includes, for example, treat-
ment of most fractures, as well as appendec-
tomies. Depending on resource availability and so-
cial values, some countries may define their
essential clinical package to include a much
broader range of interventions than this mini-
mum. At modest increases in spending, relatively
cost-effective measures for the treatment of some
common noncommunicable conditions could be
included. Examples are low-cost protocols for
treatment of heart disease using aspirin and anti-
hypertensive drugs; treatment for cervical cancer;
drug treatment of some psychoses; and removal of
cataracts.

Many health services have such low cost-effect-
iveness that governments will need to consider
excluding them from the essential clinical package.
In low-income countries these might include heart
surgery; treatment (other than pain relief) of
highly fatal cancers of the lung, liver, and stom-
ach; expensive drug therapies for HIV infection;
and intensive care for severely premature babies.
It is hard to justify using government funds for
these medical treatments at the same time that
much more cost-effective services which benefit
mainly the poor are not adequately financed.

Widespread adoption of an essential clinical
package would have a tremendous positive impact
on the health of people in developing countries. If
80 percent of the population were reached, 24 per-
cent of the current burden of disease in low-
inecome countries and 11 percent of that in middle-
inecome countries could be averted (Table 2). The
estimated impact of implementing the minimum
clinical services is more than twice that for the
public health package outlined above; when com-
bined with the public health package, the share of
current illness that could be eliminated rises to
perhaps 32 percent for low-income countries and
15 percent for middle-income countries. This re-
duction in disease is equivalent, in terms of DALYs

<table>
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<tbody>
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<td>Low-income countries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Income per capita = $350)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public health</td>
<td>4.2</td>
<td>1.2</td>
<td>8</td>
</tr>
<tr>
<td>Essential clinical services*</td>
<td>7.8</td>
<td>2.2</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>12.0</td>
<td>3.4</td>
<td>32</td>
</tr>
<tr>
<td>Middle-income countries</td>
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<td></td>
</tr>
<tr>
<td>(Income per capita = $2,500)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public health</td>
<td>6.8</td>
<td>0.3</td>
<td>4</td>
</tr>
<tr>
<td>Essential clinical services*</td>
<td>14.7</td>
<td>0.6</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>21.5</td>
<td>0.9</td>
<td>15</td>
</tr>
</tbody>
</table>

a. The estimated costs and benefits are for a minimum essential package of clinical services, as defined in the text. Many countries may wish, if they have the resources, to define their essential clinical package more broadly.

gained, to saving the lives of more than 9 million infants each year.

Paying for the package

The most sophisticated facility required to deliver the minimum elements of the essential clinical package is a district hospital. Providing services in lower-level facilities allows costs to be contained at modest levels for minimal versions of the essential clinical package. The cost is about $8 per person each year in low-income countries and $15 in middle-income countries. The cost differences are the result of distinct demographic structures, epidemiological conditions, and labor costs in the two settings. When the cost of the public health interventions described above is added, total costs rise to $12 per capita in low-income countries and $22 per capita in middle-income countries.

Adoption of the package in all developing countries would require a quadrupling of expenditures on public health, from $5 billion at present to $20 billion a year, and an increase from about $20 billion to $40 billion in spending on essential clinical services. In the poorest countries governments typically spend about $6 per person for health and total health expenditures are about $14 per person. There, paying for an essential package will require a combination of increased expenditures by governments, donor agencies, and patients and some reorientation of current public spending for health. In middle-income countries, where public spending for health averages $62 per person, the $22 cost of the package is financially feasible if the political commitment exists for shifting existing resources away from discretionary services with lower cost-effectiveness toward public health programs and essential clinical care. These major changes cannot be made overnight, but it is important to start and complete them as swiftly as possible, before interest groups and bureaucratic inertia undermine reform.

A critical question in designing an essential clinical package is the extent of government financing. Should governments pay for everyone, or only for the poor? The main problem with universal government financing is that it subsidizes the wealthy, who could afford to pay for their own services, and thus leaves fewer government resources for the poor. A policy requiring those who can pay all or part of their own costs to do so may make sense on equity grounds, but it also has disadvantages. Often, the administrative costs of targeting are high, and exclusion of wealthy and middle-income groups can lead to erosion of political support for the essential package and to decreased funding and lower quality of care. Furthermore, problems of cost escalation and access to insurance on the part of high-risk groups can complicate private finance. For these reasons, in most member countries of the Organization for Economic Cooperation and Development (OECD), governments finance (or mandate the financing of) comprehensively defined essential packages for virtually all their citizens.

In low-income countries, where current public spending for health is less than the cost of an essential package, some degree of targeting is inevitable. If the wealthy are already opting out of government-financed services because of the higher quality and convenience of privately financed services, targeting is fairly easy. Community-financing schemes, whereby patients at local health centers and pharmacies pay modest fees, are another option that can help both to improve the quality of care and, when fees are retained and managed locally, to sustain services. A large number of countries in Africa have had some early success with community financing as part of the Bamako Initiative led by UNICEF and WHO. Nonetheless, experience to date suggests that introduction of user fees at levels that do not discourage the poor is likely to be more useful for improving technical efficiency (for example, by facilitating drug supply) than for raising substantial revenues on a nationwide basis.

Reforming health systems: promoting diversity and competition

Ensuring basic public health services and essential clinical care while the rest of the health system becomes self-financed will require substantial health system reforms and reallocations of public spending. Only by reducing or eliminating spending on discretionary clinical services can governments concentrate on ensuring cost-effective clinical care for the poor. One way to do so is by charging fees to affluent patients who use government hospitals and services. In Chile, Kenya, Lesotho, and other countries governments are increasing user fees for the wealthy and for those covered by insurance and are strengthening the legal and administrative systems for billing patients and collecting revenues.

Promoting self-financed insurance, thus eliminating large and inequitable subsidies to the more affluent groups who are covered by insurance,
would also help to free government funds for public health programs and essential clinical care. Subsidies in the form of tax relief for contributions to private insurance are equal to nearly a fifth of total government spending for health in South Africa. In Latin America subsidies to the social insurance systems are widespread and include tax relief, direct transfers to cover the operating deficits of social security health funds, and matching government funds for employee payroll contributions. Where these subsidies benefit only the better-off in society, they need to be scaled back.

Reforms entail shifting new government spending for health away from specialized personnel, equipment, and facilities at the apex of health systems and "down the pyramid" toward the broad base of widely accessible care in community facilities and health centers. Very few cost-effective interventions depend on sophisticated hospitals and specialized physicians—all the services contained in the minimum essential clinical package proposed in this Report can be provided by health centers and district hospitals. Yet specialized facilities everywhere absorb a large amount of public resources, a problem that has frequently been exacerbated by donor investments in tertiary care facilities. In the 1980s Papua New Guinea, to correct overconcentration of resources on higher-level facilities, limited public spending on hospitals to 40 percent of the recurrent budget of the Ministry of Health—well below the level in most developing countries.

Governments need to use more effective policies for financing training (including use of national service mechanisms) to help meet the need for primary care providers, particularly nurses and midwives, and for public health, health policy, and management personnel. At the same time, governments should limit or eliminate subsidies for specialist training. Increased government support for health information systems and operations research would help to guide public policies for health. Estimates of the national burden of disease along the lines of the global burden of disease methodology used in this Report, and local information on the cost-effectiveness of different interventions, would enable governments to establish health priorities.

In every developing country decisive steps are needed to correct the pervasive inefficiency of clinical health programs and facilities and especially of government services. Clinics and outreach programs operate poorly because of shortages of drugs, transport, and maintenance. Hospitals keep patients longer than necessary and are poorly organized and managed. Countries pay too much for drugs of low efficacy, and drugs and supplies are stolen or go to waste in government warehouses and hospitals.

In the short term, reforms in pharmaceutical usage offer the greatest gains in efficiency. Governments that have introduced competition in the procurement of drugs have typically achieved savings of 40 to 60 percent. Governments can also develop national essential drug lists, consisting of a limited number of inexpensive drugs that address the important health problems of the population. Many countries have such lists, but not all use them to guide the selection and procurement of drugs for the public sector. New treatment protocols and alternative uses of facilities can also raise efficiency. Outpatient surgery can replace some procedures customarily performed on an inpatient basis, at considerable savings.

In the long run, decentralization can help to increase efficiency when there is adequate capacity and accountability at lower levels of the national health system. Some countries, such as Botswana and Ghana, have delegated a wide range of management responsibilities to regional and district-level offices of the ministry of health; others, including Chile and Poland, have devolved authority and resources to local government agencies. Their experience provides evidence that success is possible—but also that hasty and unplanned decentralization, sometimes purely in response to political pressures, can create new problems.

Greater reliance on the private sector to deliver clinical services, both those that are included by a country in its essential package and those that are discretionary, can help raise efficiency. The private sector already serves a large and diverse clientele in developing countries and often delivers services of higher quality without the long lines and inadequate supplies frequently found in government facilities. In many countries private doctors and pharmacies face unnecessary legal and administrative barriers, and these need to be removed. But the tendency for profit-making providers to overprescribe drugs, procedures, and diagnostics needs to be countered; encouraging the for-profit sector to move away from fee-for-service to prepaid coverage (through, for example, encouraging health maintenance organizations) is one feasible approach.

Governments could also subsidize private health care providers who deliver essential clinical
services to the poor. This is already beginning to happen and needs to go further. In many African countries, including Malawi, Uganda, and Zambia, governments subsidize the operating expenditures of church hospitals and clinics in rural areas and the training of their health personnel. In Bangladesh, Kenya, Thailand, and other countries, governments, with assistance from donors, are supporting the work of traditional birth attendants in safe pregnancy and delivery care and of traditional healers in controlling infectious diseases such as malaria, diarrhea, and AIDS.

Regulation is an essential element of government efforts to encourage private health care suppliers. In most countries, governments have an important role to play in ensuring the quality of private sector health care—through accreditation of hospitals and laboratories, licensing of medical schools and physicians, regulation of drugs, and reviews of medical practices. Some countries in which the government’s ability to regulate is particularly weak could explore self-regulation for health care providers, while building up government capacity. In Brazil experiments with self-regulation for local hospital associations and medical ethics boards are now under way.

Government regulation of insurance is equally important. In some countries part of the population is denied insurance because of selection bias under private voluntary insurance. In the United States millions of people with high health risks—and thus high need for health insurance—are unable to obtain affordable coverage. Some types of insurance schemes also seem to contribute to pushing up health care costs; this is particularly true of third-party systems and of systems that reimburse hospitals and physicians item by item for any and all services performed. In both the Republic of Korea, which relies on universal social insurance, and the United States, which uses mostly private insurance, health care already absorbs an unusually high share of GNP—and costs are still rising. During the 1980s, for example, health expenditures in Korea increased from 3.7 to almost 7 percent of GNP, in large part because of expansion of third-party insurance coverage combined with fee-for-service provider compensation.

To eliminate selection bias and expand insurance coverage, governments can require insurers to pool risks across large numbers of people. To control costs, governments have a number of options for limiting payments to health providers. One approach is to encourage prepayment of a fixed amount for each person, as is now done in private health maintenance organizations and in the British National Health Service. Another is for insurers jointly to negotiate uniform fees with doctors and hospitals, as is done in Japan’s social insurance system and Zimbabwe’s private medical aid insurance system; or insurers themselves can set fixed payments for specified medical diagnoses, as in Brazil. Yet a third approach, which has been tested on a limited scale in the United States, is “managed competition.” This scheme pursues the three objectives of cost-effective health spending, universal insurance coverage, and cost containment simultaneously through tightly regulated competition among companies that provide a specified package of health care for a fixed annual fee. Each of these approaches has proved workable, but each also has its limits and disadvantages. There are no simple answers for health policymakers.

An agenda for action

Adoption of the main policy recommendations of this Report by developing country governments would enormously improve the health status of their people, especially poor households, and would also help to control health care spending (Table 3). Millions of lives and billions of dollars could be saved. Implementation of the public health and essential clinical care packages, pursuit of economic growth strategies that reduce poverty, and increased investment in schooling for girls would have the largest payoffs in averting deaths and reducing disability. Scaling back public spending for tertiary care facilities, specialist training, and clinical care with lower cost-effectiveness would help to increase the effectiveness of health spending. So would encouragement of competition in delivery of health services and regulation of insurance and of provider payment systems.

These recommendations will facilitate progress toward the goal contained in the declaration from the historic 1978 Alma-Ata conference: “The attainment of all peoples of the world by the year 2000 of a level of health that will permit them to lead a socially and economically productive life.” Continued momentum toward this goal was provided by the 1990 World Summit for Children. Almost 150 countries have now signed commitments to specific goals for their countries to improve the health of children and women (Box 2). These goals include reduction of child mortality rates by one-third (or to 70 per 1,000 births, whichever would be less) over the course of the decade of the 1990s,
Table 3 Contribution of policy change to objectives for the health sector

<table>
<thead>
<tr>
<th>Government objectives and policies</th>
<th>Contribution to goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foster an enabling environment for households to improve health</strong></td>
<td></td>
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<tr>
<td>Pursue economic growth policies that benefit the poor</td>
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</tr>
<tr>
<td>Expand investment in education, particularly for females</td>
<td></td>
</tr>
<tr>
<td>Promote the rights and status of women through political and economic empowerment and legal protection against abuse</td>
<td></td>
</tr>
<tr>
<td><strong>Improve government investments in health</strong></td>
<td></td>
</tr>
<tr>
<td>Reduce government expenditures for tertiary care facilities, specialist training, and discretionary services</td>
<td></td>
</tr>
<tr>
<td>Finance and ensure delivery of a public health package, including AIDS prevention</td>
<td></td>
</tr>
<tr>
<td>Finance and ensure delivery of essential clinical services, at least to the poor</td>
<td></td>
</tr>
<tr>
<td>Improve the management of public health services</td>
<td></td>
</tr>
<tr>
<td><strong>Facilitate involvement by the private sector</strong></td>
<td></td>
</tr>
<tr>
<td>Encourage private finance and provision of insurance (with incentives to contain costs) for all discretionary clinical services</td>
<td></td>
</tr>
<tr>
<td>Encourage private sector delivery of clinical services (including those that are publicly financed)</td>
<td></td>
</tr>
<tr>
<td>Provide information on performance and cost</td>
<td></td>
</tr>
</tbody>
</table>

[Very favorable] [Favorable] [Somewhat favorable] [No impact expected]

Reduction of maternal mortality rates by half, eradication of polio, and major reductions in morbidity and mortality from several other diseases. Commitments to specific improvements in education, nutrition, water supply, and sanitation were also made. These commitments underscore the political potential of action agendas for improving health.

The relevance of the main recommendations of this Report varies from one setting to another. In low-income countries renewed emphasis on basic schooling for girls, strengthening of public health programs, and support for expanded public financing of essential clinical services should be at the top of the policy agenda. In most middle-income countries these policies are still germane, but reducing public subsidies for insurance and discretionary care would also yield large benefits and should therefore be a key element of policy change. In the formerly socialist economies there are two particularly crucial policy areas—improving the management of government health services and developing sustainable health-financing systems that maintain universal coverage while encouraging competition among cost-conscious suppliers.
Box 2 The World Summit for Children

The declaration and plan of action adopted at the World Summit for Children, held in New York in 1990, incorporate a politically salient agenda for health. The summit focused, in particular, on the needs of children and women but was set in the broader context of human and community goals. The seventy-one heads of state who attended and the seventy-seven more who subsequently signed the declaration committed their countries to developing national programs of action (NPAs) for achieving these goals. To date, about eighty-five countries have drawn up NPAs, and another sixty are in the process of preparing them.

NPAs typically cover, among other concerns, primary health care, family planning, safe water, environmental sanitation, nutrition, and basic education. Because of their concentration on the welfare of children, NPAs are able to transcend political differences. They offer a means of mobilizing the whole of civil society—neighborhood and civic associations, religious groups and professional bodies, businesses, voluntary agencies, organized labor, and universities—in the cause of investment for health.

NPAs are being integrated into national development planning. They set forth measurable, attainable goals—to be met by 2000 or earlier—that are adapted to the realities of the country. By quantifying the resources required to achieve these goals, NPAs help to identify the changes that are needed in national budgets and external aid if priorities for human development are to be met. The health goals of the summit’s plan of action include:

- The eradication of polio by 2000
- The elimination of neonatal tetanus by 1995
- A 90 percent reduction in measles cases and a 95 percent reduction in measles deaths
- Achievement (by 2000) and maintenance of at least 90 percent immunization coverage of one-year-old children, as well as universal tetanus immunization for women of childbearing age
- A halving of child deaths caused by diarrhea and a one-quarter reduction in the incidence of diarrheal disease
- A reduction by one-third in child deaths caused by acute respiratory infections
- Virtual elimination of vitamin A deficiency and iodine deficiency disorders
- A reduction in the incidence of low birth weight (2.5 kilograms or less) to no more than 10 percent
- A one-third reduction from 1990 levels in iron deficiency anemia among women
- Access for all women to prenatal care, trained attendants during childbirth, and referral for high-risk pregnancies and obstetric emergencies.

The agenda for action of the children’s health summit is broadly consistent with the messages of this Report.

At first glance, it might appear that adoption of this Report’s major recommendations will be easy. To reach most people living in the developing world with the minimum package of cost-effective public health and essential clinical services, about half of current government expenditures on other, more discretionary care would have to be redirected. But in reality, change will be difficult, since an array of interest groups may stand to lose—from suppliers of medical services to rich beneficiaries of public subsidies to protected drug companies. Many of the changes will take years to implement because they mean a major redirection of public resources and require the development of new institutional capabilities.

A number of developing countries have already shown in recent years that broad reforms in the health sector are possible when there is sufficient political will and when changes to the health system are designed and implemented by capable planners and managers. Zimbabwe has imposed a decade-long moratorium on new investments in central hospitals and has concentrated on improving health centers and other district-level infrastructure. Tunisia has converted eleven large government hospitals to semiautonomous institutions with strong incentives for improved performance. During the 1980s Chile delegated responsibility for its entire primary clinical care system to local governments and fostered more public and private competition in health service delivery and in insurance. Costa Rica and Korea achieved universal health coverage through social insurance.

The international community can do more to support health policy reforms. In 1990 donors disbursed about $4.8 billion of assistance for health, or about 2.5 percent of all health spending in developing countries. The share of total development aid for health declined slightly in the 1980s, from 7 to 6 percent, despite widespread calls for increased investment in human resource development, including health. As an immediate first step, donors need to restore this share to its former level. A more substantial increase can be easily
justified, given the importance of health in reducing poverty and the large gap between current and needed spending for public health programs and minimum clinical services. An additional $2 billion a year from donors would meet about one-quarter of the costs of stabilizing the AIDS epidemic ($500 million) and one-sixth of the extra resources needed to provide the public health and clinical care package for low-income countries ($1.5 billion of the $10 billion required).

Increased external assistance for health research that focuses on the major health problems of developing countries—such as the search for new antimalarial drugs and new or improved vaccines—could have a very high payoff and would build on the comparative advantage of donor countries in conducting scientific research. That most health research benefits many countries further justifies donor support, particularly through such effective internationally collaborative mechanisms as the Special Programme for Research and Training in Tropical Diseases.

Donors and developing country governments can also do much to improve the effectiveness of aid for health. This is especially important in low-income Africa, where aid already accounts for an average 20 percent of health spending—and for over half in Burundi, Chad, Guinea-Bissau, Mozambique, and Tanzania. Even in other developing regions, where aid amounts to 2 percent or less of health expenditures, better targeting and management of this assistance can catalyze policy change.

Redirecting donor money from hospitals and specialist training to public health programs and essential clinical care—especially for tuberculosis control, the EPI Plus program, AIDS prevention, and reduction of tobacco consumption—would be a significant contribution to policy reform. So would support for capacity-building. Countries that are willing to undertake major changes in health policy should be strong candidates for increased aid, including donor financing of recurrent costs. An increasing number of donors, among them the World Bank, are now supporting this kind of broad sectoral reform. Stronger donor coordination, especially at the level of individual developing country clients, would improve the positive impact of aid on health, as shown by the experience of Bangladesh, Senegal, and Zimbabwe.

The benefits to the developing world from adopting sound policies for health are enormous. There is great potential for change during the closing years of this decade as more countries encourage broad political participation and public accountability, as levels of education and knowledge improve, and as understanding of human biology, public health, and health care systems increases. If the right policy choices are made, the payoff will be high. The momentum of past reductions in the burden of infectious disease in developing countries can be maintained and accelerated. The AIDS epidemic can be slowed or reversed. The emerging problems of noncommunicable disease in aging populations can be managed without rapid increases in health expenditures. In the end, this will translate into longer, healthier, and more productive lives for people around the world, especially the more than 1 billion now living in poverty.
Health in developing countries: successes and challenges

On October 22, 1977, Ali Maow Maalin, a twenty-three-year-old cook living in the town of Merca, Somalia, developed a fever and rash that was subsequently diagnosed as smallpox. Vaccination teams immediately descended on Merca and within three weeks had vaccinated more than 50,000 people. They also began an intensive search for other cases in Merca and along the road and footpaths leading to it. By December 29 the World Health Organization (WHO) had removed Merca from its list of potential outbreaks of smallpox and had initiated a two-year surveillance for the disease throughout the Horn of Africa. It turned out, however, that Mr. Maalin had experienced the world’s last case of smallpox. He survived, and WHO’s twelve-year-long Intensified Smallpox Eradication Programme was brought to a triumphant end.

In 1967, the year when the program began, somewhere between 1.5 million and 2 million people died from smallpox. Perhaps half a million more were blinded, and more than 10 million were seriously and permanently disfigured. In the early 1950s the toll from smallpox had been three or four times greater. Then more and more countries undertook vaccination programs, and by the time the global program began, the disease had been virtually eradicated in 125 countries. Even so, the cost of smallpox vaccination, quarantine programs, and treatment totaled more than $300 million in 1968 alone. The eradication program, by contrast, cost $300 million over the whole of its twelve-year life and has therefore saved hundreds of millions of dollars a year in direct, measurable costs, as well as unquantifiable amounts of human suffering.

Few investments of any kind generate human and financial benefits on that scale. Yet in many ways the Intensified Smallpox Eradication Programme exemplifies the potential of today’s medicine. Around the world, the past half century has seen startling improvements in health. Progress in drugs, vaccines, epidemiological knowledge, and organizational experience continually expands the range of options for tomorrow. Tools and methods for combating and eliminating much of the remaining burden of disease are now affordable, even by the poorest countries. Good policy, however, is essential for achieving good health. Some countries have made full use of the potential of medicine; others have barely tapped it, despite heavy spending. This Report draws from this varied experience lessons that will assist policymakers in realizing the enormous potential returns from their countries’ investments in health.

Why health matters

Good health, as people know from their own experience, is a crucial part of well-being, but spending on health can also be justified on purely economic grounds. Improved health contributes to economic growth in four ways: it reduces production losses caused by worker illness; it permits the use of natural resources that had been totally or nearly inaccessible because of disease; it increases the enrollment of children in school and makes them better able to learn; and it frees for alternative uses resources that would otherwise have to be spent on treating illness. The economic gains are relatively greater for poor people, who are typ-
ically most handicapped by ill health and who stand to gain the most from the development of underutilized natural resources.

**Gains in worker productivity**

The most obvious sources of gain are fewer work days lost to illness, increased productivity, greater opportunities to obtain better-paying jobs, and longer working lives. To take a classic example, leprosy is a disease that affects people in the prime of life, with peak incidence rates among young adults. As many as 30 percent of those affected may be seriously deformed, and their working lives will be shortened as well. A study of lepers in urban Tamil Nadu, India, estimates that the elimination of deformity would more than triple the expected annual earnings of those with jobs. The prevention of deformity in all of India's 645,000 lepers would have added an estimated $130 million to the country's 1985 GNP. This amount is the equivalent of almost 10 percent of all the official development assistance received by India in 1985. Yet leprosy accounted for only a small proportion of the country's disease burden, less than 1 percent in 1990.

Healthier workers earn more because (as research in Bangladesh has demonstrated) they are more productive and can get better-paying jobs. In Côte d'Ivoire daily wage rates are estimated to be 19 percent lower, on average, among men who are likely to lose a day of work per month because of illness than among healthier men.

When illness strikes, an individual's lost output and earnings often go undetected in economic statistics because they are borne by the household. In many developing countries unemployment (or disability) insurance is rare, and healthier members of the household work harder or longer to make up for the loss in income. In a sample of 250 Sudanese households, each of which lost, on average, forty working hours per year because of malaria alone, this extra work made up for 68 percent of the lost agricultural labor. Similar findings have come from research in Paraguay and Colombia.

In the long run, the benefits of improved health are also likely to influence the way work is organized and carried out. With a healthy work force, employers can reduce the costs of building slack into their production schedules, invest more in staff training, and exploit the benefits of specialization. Similar gains are likely among farmers, who often hedge against sickness by being risk-averse; they forgo higher output in return for less variability in their income. In Paraguay, for example, farmers in malarious areas choose to grow crops that are of lower value but that can be worked outside the malaria season.

**Improved utilization of natural resources**

Some health investments raise the productivity of land. In Sri Lanka the near-eradication of malaria during 1947-77 is estimated to have raised national income by 9 percent in 1977. The cumulative cost was $52 million, compared with a cumulative gain in national income over the thirty-one years of $7.6 billion, implying a spectacular benefit-cost ratio of more than 140. Areas previously blighted by mosquitoes became attractive for settlement; migrants moved in, and output increased. In Uganda massive migration to fertile but underexploited land followed the partial control of river blindness (onchocerciasis) in the 1950s. The Onchocerciasis Control Programme, conducted in eleven countries of the Sahel, is a more recent example of the same benefits (see Box 1.1).

**Benefits in the next generation through education**

There is no question that schooling pays off in higher incomes. Four years of primary education boosts farmers' annual productivity by 9 percent on average, and workers who do better at school earn more. Studies in Ghana, Kenya, Pakistan, and Tanzania indicate that workers who scored 10 percent above the sample mean on various cognitive tests have a wage advantage ranging from 13 to 22 percent; in Nepal farmers with better mathematical skills are more likely to adopt profitable new crops.

Poor health and nutrition reduce the gains of schooling in three areas: enrollment, ability to learn, and participation by girls. Children who enjoy better health and nutrition during early childhood are more ready for school and more likely to enroll. A study in Nepal has found that the probability of attending school is only 5 percent for nutritionally stunted children, compared with 27 percent for those at the norm.

Health and nutrition problems affect a child's ability to learn. Nutritional deficiencies in early childhood can lead to lasting problems: iron deficiency anemia reduces cognitive function, iodine deficiency causes irreversible mental retardation, and vitamin A deficiency is the primary cause of blindness among children. Older children are subject to other kinds of disease. In a recent study in
Box 1.1 Controlling river blindness

Onchocerciasis, or river blindness as it is more commonly known, is caused by a parasitic worm which produces millions of larvae that move through the body, causing intense itching, debilitation, and eventually blindness. The disease is spread by a small, fiercely biting blackfly that transmits the larvae from infected to uninfected people.

The goals of the Onchocerciasis Control Programme (OCP), set up in 1974 and covering eleven Sahelian countries, are to control the blackfly by destroying its larvae with insecticides sprayed from the air. The environmental impact of the insecticides is continuously monitored by an independent ecological committee, in cooperation with the national governments. The committee has full authority to screen insecticides and to approve or reject their use. The program has also collaborated with the pharmaceutical industry to develop for human use a drug, ivermectin, that safely and effectively kills the larvae in the body. Ivermectin, however, has little impact on the adult worm and so must be supplemented with vector control by aerial spraying. The producer of ivermectin, Merck & Co., has committed itself to provide the drug free of charge as long as it is needed to combat river blindness.

The OCP’s four sponsoring agencies—the Food and Agriculture Organization, the United Nations Development Programme (UNDP), the World Bank, and WHO—through a steering committee chaired by the World Bank, make broad policy decisions and oversee operations. WHO has executive responsibility through a team of entomologists, epidemiologists, field staff, and pilots; 97 percent of the staff are nationals of the participating countries. The World Bank organizes the finances and manages them through a trust fund. It also supports socioeconomic development in the areas affected by the disease.

The program is widely regarded as a great success. It protects from river blindness about 30 million people, including more than 9 million children born since the OCP began, at an annual cost of less than $1 per person. More than 1.5 million people who were once seriously infected have completely recovered. It is estimated that the program will have prevented at least 500,000 cases of blindness by the time it is wound up around the end of the century. And it is already freeing approximately 25 million hectares of previously blighted land for resettlement and cultivation, boosting agricultural production.

The estimated cost of the OCP during the whole of its existence, from 1974 to 2000, is about $570 million. Its estimated internal rate of return is in the range of 16 to 28 percent (depending on the pace at which the newly available land is settled, the incremental output added by the new land, the income level of the OCP area, and the productivity growth rate that is projected). These estimated benefits do not include the program’s favorable effects on income distribution; its main beneficiaries are subsistence farmers whose incomes are well below average.

Jamaica children with moderate whipworm infection scored 15 percent lower before treatment than uninfected children in the same school. When retested after treatment, those same children did almost as well as the uninfected children.

In a sample of children in a poverty-stricken area of northeast Brazil, inadequately nourished children lagged 20 percent behind the average gain in achievement score over a two-year period. The same study also shows the harm done by a simple and easily remedied handicap: children with bad eyesight lagged 27 percent behind the average gain over the two years. Both groups had below-average promotion rates and above-average dropout rates. In China a child at the twentieth percentile in height-for-age (a sign of poor health) averages about one-third of a year behind the grade normally reached by children of that age. In Thailand children whose height-for-age is 10 percent below average are 14 percent lower in grade attainment.

Girls are particularly liable to suffer from iodine or iron deficiency—reasons why fewer of them complete primary school. Other health-related reasons include dropping out as a result of pregnancy and parental concern about sexual violence. In societies where girls’ education is given lower priority than boys’, girls miss school because they have to stay home to look after sick relatives.

Reduced costs of medical care

Spending that reduces the incidence of disease can produce big savings in treatment costs. For some diseases the expenditure pays for itself even when all the indirect benefits—such as higher labor productivity and reduced pain and suffering—are ignored. Polio is one example. Calculations for the Americas made prior to the eradication of polio in the region showed that investing $220 million over fifteen years to eliminate the disease would prevent 220,000 cases and save between $320 million
Box 1.2  The economic impact of AIDS

The AIDS epidemic, through its effects on savings and productivity, poses a threat to economic growth in many countries that are already in distress. World Bank simulations indicate a slowing of growth of income per capita by an average 0.6 percentage point a year in the ten worst-affected countries in Sub-Saharan Africa. In Tanzania, where income per capita has already fallen 0.2 percent a year in recent years, the estimated slowdown ranges between 0.1 and 0.8 percentage point, depending on the assumptions used. In Malawi, which has had a recent growth rate of 0.9 percent a year, the simulated reduction ranges from 0.3 to 0.5 percentage point. These calculations include the effect of the epidemic on population growth, which will slow slightly in severely affected countries.

The heavy macroeconomic impact of AIDS comes partly from the high costs of treatment, which divert resources from productive investments. Tanzanian clinicians estimate that, on average, an HIV-infected adult suffers 17 episodes of HIV-related illnesses prior to death and a child suffers 6.5 episodes. Depending on how much medical care a patient receives, the typical developing country the total cost per adult death ranges from 8 to 400 percent of annual income per capita; the average is about 150 percent of annual income per capita.

That AIDS kills so many skilled adults adds to its economic impact. At a large hospital in Kinshasa, for example, more than 1 percent per year of the health personnel, including highly trained staff, become infected (through sexual rather than occupational contact). Among the (largely male) employees at a Kinshasa textile mill, managers had a higher infection rate than foremen, who in turn had a higher rate than workers. The cost of replacing skilled workers will be substantial. A study of Thailand estimates that through 2000 the cost of replacing long-haul truckers lost to AIDS will be $8 million, and another study, of Tanzania, projects the cost of replacing teachers at $40 million through 2010.

The death of an adult can tip vulnerable households into poverty. Even in Tanzania, where the government pays a large share of health costs, a World Bank study shows that affected rural households in 1991 spent $60—roughly the equivalent of annual rural income per capita—on treatment and funerals. The study also showed that the effects of losing an adult persist into the next generation as children are withdrawn from school to help at home. School attendance of young people ages 15–20 is reduced by half if the household has lost an adult female member in the previous year.

and $1.3 billion (depending on the number of people treated) in annual treatment costs. The program’s net return, after discounting at even as much as 12 percent a year, was calculated to be between $18 million and $480 million.

AIDS is another example. Although it remains much less common in the developing world than diseases such as malaria, its economic impact per case is greater for two reasons: it mainly affects adults in their most productive years, and the infections resulting from it lead to heavy demand for expensive health care (Box 1.2). For example, because individuals with AIDS are typically more prone to pneumonia, diarrhea, and tuberculosis, the cost of medical care is high even though there is no effective treatment as yet for the disease itself. Research in nine developing and seven high-income countries suggests that preventing a case of AIDS saves, on average, about twice GNP per capita in discounted lifetime costs of medical care; in some urban areas the saving may be as much as five times GNP per capita. Calculations for India show that, given prevailing transmission patterns, each currently HIV-positive person infects one previously uninfected person every four years. At this rate, there will be six HIV-positive persons in 2000 for every one today. If the transmission rate could be slowed to one every five years, that number could be reduced to only four infected persons in 2000 for every one today. The corresponding reduction in medical costs, after discounting at 3 percent a year, amounts to $750 by 2000 for each currently HIV-positive person in India, for a total saving of $750 million. Similar calculations for Thailand suggest savings of $1,250 per currently HIV-positive person, for a potential total of $560 million.

Health investments and poverty

The goal of reducing poverty provides a different but equally powerful case for health investments. The adverse effects of ill health are greatest for poor people, mainly because they are ill more often, but partly because their income depends exclusively on physical labor and they have no savings to cushion the blow. They may therefore find it impossible to recover from an illness with their human and financial capital intact.
The health consequences of poverty are severe: the poor die younger and suffer more from disability. In Porto Alegre, Brazil, adult mortality rates in poor areas in the late 1980s were 75 percent higher than in rich areas, and in São Paulo rates were two to three times higher for nonprofessionals than for professionals. In the late 1970s among Kenyan families in which the mother had no schooling, the probability of dying by age 2 averaged 184 per 1,000 in regions where half of the families lived below the poverty line but 100 per 1,000 in regions where only one-fifth of the families lived in poverty. The poor are exposed to greater risks from unhealthy and dangerous conditions, both at home and at work. Malaria and the legacy of past illness mean that they are more likely to fall ill and slower to recover, especially as they have little access to health care.

When a family's breadwinner becomes ill, other members of the household may at first cope by working harder themselves and by reducing consumption, perhaps even of food. Both adjustments can harm the health of the whole family. If free health care is not available, the costs of treatment may drive a household deeper into debt. Although ill health is only one of many factors that can cause financial distress, its potential for disaster means that it should be explicitly recognized in formulating policies. Investments to reduce health risks among the poor and provision of insurance against catastrophic health care costs are important elements in a strategy for reducing poverty.

Spending on health is a productive investment: it can raise incomes, particularly among the poor, and it reduces the toll of human suffering from ill health. Good health, however, is a fundamental goal of development as well as a means of accelerating it. Targeting health as part of development efforts is an effective way to improve welfare in low-income countries. Evidence gathered over the past thirty years indicates that in health, unlike income, the gap between poor and rich countries has been narrowing.

**Putting the effects together**

The detrimental effects of poor health on individuals and households and on the use of resources suggest that better health should lead to better economic performance at the national level. A number of analyses have found a positive relationship between growth of income per capita and the initial national educational stock. A similar analysis carried out for this Report examines the relation of growth in income per capita between 1960 and 1990 in about seventy countries to the initial level of national income, the initial educational level, and an indicator of initial health status (the child mortality rate, used in this Report to mean the risk of dying by age 5 per 1,000 live births). The health status indicator is found to be a highly significant predictor of economic performance. For the average country in the sample, the annual growth rate of income per capita is 1.40 percent and the child mortality rate is 116 per 1,000. An otherwise average country with a child mortality rate of 106 would have a growth rate of income per capita of 1.55 percent, whereas one with a child mortality rate of 126 would have a growth rate of 1.26 percent.

Not surprisingly, the health status variable is strongly correlated with educational stock, but the significant association between income growth and health remains strong and of similar magnitude across time periods and for a range of model formulations. Although it is possible that unobserved factors such as government capacity to implement effective policies could explain the apparent association, the data do suggest that better health means more rapid growth.

**The record of success**

Mortality started to decline in Europe, North America, and Australasia about two centuries ago, but slowly at first. A century ago life expectancy in the United States, then the world's richest country, was only forty-nine years, and child mortality was about 180 per 1,000. The rate of improvement accelerated in the first half of this century; by 1950 life expectancy in the United States had increased to sixty-six years, and child mortality had fallen to 34 per 1,000. Progress was also being made in developing countries: in Chile, for example, life expectancy increased from thirty-seven years in 1930 to forty-nine in 1950, and child mortality fell from 350 to 209 per 1,000.

**Mortality transitions since 1950**

Health conditions around the world have improved more in the past forty years than in all previous human history. Life expectancy at birth in developing countries increased from forty to sixty-three years, and child mortality fell from 280 to 106 per 1,000. In a high-income country life expectancy is more than seventy-five years; in a low-mortality developing country it is seventy years or
Child mortality has fallen sharply in the past thirty years, with particularly rapid declines in parts of Asia and Latin America.

Figure 1.1 Child mortality by country, 1960 and 1990

Under-five mortality rate
- 175 or more
- 125 - 174
- 75 - 124
- 50 - 74
- 25 - 49
- Less than 25

Source: Appendix A.
more; and in Sub-Saharan Africa, the region where least progress has been made, it is about fifty years.

Much of what is known about the decline in mortality in the developing world since 1950 is limited to the mortality of children and has come from a series of standardized, internationally funded demographic surveys. Enormous reductions in child mortality occurred almost everywhere around the world between 1960 and 1990 (Figure 1.1). For example, child mortality in Chile dropped from 155 to 20 per 1,000, in Tunisia from 245 to 45, and in Sri Lanka from 140 to 22.

The statistics for adult mortality in the developing world are much less satisfactory than those for child mortality. Approximate estimates for all developing countries suggest that the adult mortality rate (defined as the probability of dying between ages 15 and 60 per 1,000 persons reaching age 15) fell from about 450 in 1950 to about 230 in 1990. In Chile, a country with excellent statistics, the rate dropped from 466 in 1930 to 152 in 1990.

The decline in mortality has accelerated over the past thirty years. In the 1960s child mortality fell by approximately 2 percent a year in about seventy developing countries for which estimates are available. The annual decline increased to more than 3 percent in the 1970s and to more than 5 percent in the 1980s. This result could be skewed by changes in the mix of countries with reliable data; there were, however, twenty-one countries with a continuous series of acceptable estimates of child mortality from the early 1960s to the late 1980s, and for this group as a whole the fall in child mortality averaged 3 percent a year in the 1960s but 6 percent a year in the 1980s. In seventeen of the twenty-one the pace of decline increased over the period.

**Regional patterns**

The extent of success has varied significantly between regions. Between 1950 and 1990 all eight demographic regions used for this Report enjoyed increases in life expectancy at birth, but China and the Middle Eastern crescent did particularly well (see Figure 1.2). Sub-Saharan Africa showed the slowest improvement, with life expectancy increasing only from thirty-nine to fifty-two years—although even this compares well with European experience in the nineteenth century. (It took England and Wales more than half a century to raise life expectancy by a similar amount.) The formerly socialist economies of Europe showed a rapid improvement in the 1950s and 1960s, but the rise was much slower in the 1970s and 1980s.

*Life expectancy has increased substantially everywhere over the past forty years.*

**Figure 1.2 Trends in life expectancy by demographic region, 1950–90**

<table>
<thead>
<tr>
<th>Life expectancy at birth (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-------</td>
</tr>
<tr>
<td>80</td>
</tr>
</tbody>
</table>

---

- Sub-Saharan Africa
- India
- China
- Other Asia and islands
- Latin America and the Caribbean
- Middle Eastern crescent
- Formerly socialist economies of Europe
- Established market economies

*Source: Appendix A.*

There are strong parallels between the pattern of mortality decline in the high-income countries and the accelerated progress of developing countries over the past forty years. In both groups the control of communicable diseases, particularly those of childhood, accounts for most of the gains. (The term “communicable diseases,” in the analyses for this Report, includes deaths from maternal and perinatal causes.) Progress against noncommunicable diseases—primarily those of the circulatory and respiratory systems, which principally affect adults—has been much slower. In both Chile (from 1930 to 1987) and England and Wales (over the longer period 1891 to 1990) mortality from communicable disease fell to less than 5 percent of its initial level, whereas mortality from noncommuni-
Mortality from communicable diseases has fallen much faster than that from noncommunicable diseases or injuries.

Figure 1.3 Age-standardized female death rates in Chile and in England and Wales, selected years

<table>
<thead>
<tr>
<th>Earlier period</th>
<th>Later period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td></td>
</tr>
<tr>
<td>Communicable diseases</td>
<td></td>
</tr>
<tr>
<td>Noncommunicable diseases</td>
<td></td>
</tr>
<tr>
<td>Injuries</td>
<td></td>
</tr>
<tr>
<td>England and Wales</td>
<td></td>
</tr>
<tr>
<td>Communicable diseases</td>
<td></td>
</tr>
<tr>
<td>Noncommunicable diseases</td>
<td></td>
</tr>
<tr>
<td>Injuries</td>
<td></td>
</tr>
</tbody>
</table>

a. For Chile, 1930; for England and Wales, 1891.
b. For Chile, 1987; for England and Wales, 1990.
c. Includes maternal and neonatal mortality.
d. For earlier period, includes "other and unknown" category.


Similar patterns in Chile and in England and Wales show how mortality rates have declined much more sharply for the young than for the old.

Figure 1.4 Change in female age-specific mortality rates in Chile and in England and Wales, selected years

<table>
<thead>
<tr>
<th>Ratio of mortality rates at two time periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>0.8</td>
</tr>
<tr>
<td>0.6</td>
</tr>
<tr>
<td>0.4</td>
</tr>
<tr>
<td>0.2</td>
</tr>
</tbody>
</table>


Adults. In Chile, for example, mortality risks up to age 30 fell by more than 90 percent between 1930 and 1990; the decline was at least 60 percent at ages 30-70, but above age 70 the gains were much smaller (Figure 1.4). The age pattern of mortality decline in Chile over sixty years is strikingly similar to the pattern in England and Wales during the ninety years from 1891 to 1981.

The only exception to this broad similarity between industrial and developing countries has been in the formerly socialist economies. In these countries child mortality has continued to decline, as has the mortality of women, albeit more slowly. The mortality of adult men, on the other hand, has stopped declining in the past two decades and has actually started to increase. This excess male mor-
tality is largely the result of extremely high death rates from cardiovascular disease, associated with heavy smoking and drinking.

Measuring the burden of disease

The health improvements of the past few decades have done much to enhance human welfare, both directly and indirectly. But much more remains to be done. Communicable (and largely preventable) diseases are still common. Health systems also have to cope with the aging of populations, which leads to an increased burden of the more expensive noncommunicable diseases. New illnesses, such as AIDS, have emerged. One simple statistic gives a sense of the remaining burden of disease: about 12.4 million children under age 5 died in 1990 in the developing world. Had those children faced the mortality risks of children in the established market economies, the number of deaths would have been cut by more than 90 percent, to 1.1 million.

Any discussion of health policy must start with a sense of the scale of health problems. These problems are often assessed in terms of mortality, but that indicator fails to account for the losses that occur this side of death because of handicap, pain, or other disability. A background study for this Report, undertaken jointly with the World Health Organization, measures the global burden of disease (GBD) by combining (a) losses from premature death, which is defined as the difference between actual age at death and life expectancy at that age in a low-mortality population, and (b) loss of healthy life resulting from disability. The GBD is measured in units of disability-adjusted life years (DALYs). Worldwide, 1.36 billion DALYs were lost in 1990, the equivalent of 42 million deaths of newborn children or of 80 million deaths at age 50. Premature deaths were responsible for 66 percent of all DALYs lost and disabilities for 34 percent. In the developing world 67 percent of all DALY loss was a result of premature death; in the established market economies and the formerly socialist economies of Europe the figure was only 55 percent. Table 1.1 shows the GBD broken down by sex, category of disease, and type of loss (premature death or disability). The three categories of disease used are the group of communicable diseases, noncommunicable diseases, and injuries.

The derivation and interpretation of the GBD are explained in Box 1.3. The results of research on the GBD challenge the belief that the war against infectious and parasitic diseases has been won. Diarrhea, childhood diseases such as measles, respiratory infections, worm infections, and malaria account for one-quarter of the GBD. The burden of these largely preventable or inexpensively curable diseases of children is far larger in Sub-Saharan Africa (43 percent of all DALYs lost) than anywhere else, although it is still substantial in India (28 percent), Other Asia and islands (29 percent), and the Middle Eastern crescent (29 percent). For adults too, communicable diseases are far from trivial: sexually transmitted diseases (STDs) and tuberculosis together contribute 7 percent of the GBD.

Even as broad a measure as the GBD does not capture all the consequences of disease or injury. It excludes the social costs of disfigurement, such as that arising from river blindness or leprosy, and of dysfunction—for example, marital breakups resulting from obstetric fistula (permanent damage to the reproductive tract incurred during delivery). And some health-related factors are likely to be underreported. A clear example is violence against women, much of which goes undetected—but not unsuffered.

Comparisons of absolute numbers of DALYs lost may be misleading because the sizes and age structures of the populations at risk are not the same. The effects of population size can be allowed for by expressing the 1990 burden per 1,000 population. Figure 1.5 shows the resulting rates by sex and regional group. This index is 259 for the world as a whole, but it varies widely among regions. Sub-Saharan Africa loses 574 DALYs for every 1,000 population, more than twice the global average. India, the Middle Eastern crescent, and Other Asia and islands all have values between 250 and 350. For China, the formerly socialist economies of Europe, and Latin America and the Caribbean, the figures are between 150 and 250. The burden per
Box 1.3 Measuring the burden of disease

Most assessments of the relative importance of different diseases are based on how many deaths they cause. This convention has certain merits: death is an unambiguous event, and the statistical systems of many countries routinely produce the data required. There are, however, many diseases or conditions that are not fatal but that are responsible for great loss of healthy life: examples are chronic depression and paralysis caused by polio. These conditions are common, can last a long time, and frequently lead to significant demands on health systems.

To quantify the full loss of healthy life, the World Bank and the World Health Organization undertook a joint exercise for this Report. Diseases were classified into 109 categories on the basis of the International Classification of Diseases (ninth revision). These categories cover all possible causes of death and about 95 percent of the possible causes of disability. Using the recorded cause of death where available, and expert judgment when records were not available, the study assigned all deaths in 1990 to these categories by age, sex, and demographic region. For each death, the number of years of life lost was defined as the difference between the actual age at death and the expectation of life at that age in a low-mortality population. For disability, the incidence of cases by age, sex, and demographic region was estimated on the basis of community surveys or, failing that, expert opinion; the number of years of healthy life lost was then obtained by multiplying the expected duration of the condition (to remission or to death) by a severity weight that measured the severity of the disability in comparison with loss of life. Diseases were grouped into six classes of severity of disability; for example, class 2, which includes most cases of leprosy and half the cases of pelvic inflammatory disease, was given a severity weight of 0.22, and class 4, which includes 30 percent of cases of dementia and 50 percent of those of blindness, was assigned a severity weight of 0.6. The death and disability losses were then combined, and allowance was made for a discount rate of 3 percent (so that future years of healthy life were valued at progressively lower levels) and for age weights (so that years of life lost at different ages were given different relative values). The value for each year of life lost, shown in the left-hand panel of Box figure 1.3, rises steeply from zero at birth to a peak at age 25 and then declines gradually with increasing age. These age weights reflect a consensus judgment, but other patterns could be used—for example, uniform age weights, with each year of life having the same value, which would increase the relative importance of childhood diseases.

The combination of discounting and age weights produces the pattern of DALYs (disability-adjusted life years) lost by a death at each age. As the right-hand panel of Box figure 1.3 shows, the death of a newborn

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Box figure 1.3 Age patterns of age weights and DALY losses

![Graphs showing value of a year of life and DALYs lost by death at a given year for females](source: World Bank data.)
# Box table 1.3 Distribution of DALY loss by cause and demographic region, 1990

(percentage)

<table>
<thead>
<tr>
<th>Cause</th>
<th>World</th>
<th>Sub-Saharan Africa</th>
<th>India</th>
<th>Other Asia and islands</th>
<th>Latin America and the Caribbean</th>
<th>Middle Eastern crescent</th>
<th>Formerly socialist economies of Europe</th>
<th>Established market economies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (millions)</td>
<td>5,267</td>
<td>510</td>
<td>850</td>
<td>1,134</td>
<td>683</td>
<td>444</td>
<td>503</td>
<td>346</td>
</tr>
<tr>
<td>Communicable diseases</td>
<td>45.8</td>
<td>71.3</td>
<td>50.5</td>
<td>25.3</td>
<td>48.5</td>
<td>42.2</td>
<td>51.0</td>
<td>8.6</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>3.4</td>
<td>4.7</td>
<td>3.7</td>
<td>2.9</td>
<td>5.1</td>
<td>2.5</td>
<td>2.8</td>
<td>0.6</td>
</tr>
<tr>
<td>STDs and HIV</td>
<td>3.8</td>
<td>8.8</td>
<td>2.7</td>
<td>1.7</td>
<td>1.5</td>
<td>6.6</td>
<td>0.7</td>
<td>1.2</td>
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<td>Diarrhea</td>
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<td>10.4</td>
<td>9.6</td>
<td>2.1</td>
<td>8.3</td>
<td>5.7</td>
<td>10.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Vaccine-preventable childhood infections</td>
<td>5.0</td>
<td>9.6</td>
<td>6.7</td>
<td>0.9</td>
<td>4.5</td>
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<td>10.8</td>
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<td>*</td>
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<td>0.4</td>
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<td>Worm infections</td>
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<td>1.8</td>
<td>0.9</td>
<td>3.4</td>
<td>3.4</td>
<td>2.5</td>
<td>0.4</td>
<td>*</td>
</tr>
<tr>
<td>Respiratory infections</td>
<td>9.0</td>
<td>10.8</td>
<td>10.9</td>
<td>6.4</td>
<td>11.1</td>
<td>6.2</td>
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<td>Maternal causes</td>
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<td>2.7</td>
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<td>2.5</td>
<td>1.7</td>
<td>2.9</td>
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<tr>
<td>Perinatal causes</td>
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<td>7.1</td>
<td>9.1</td>
<td>5.2</td>
<td>7.4</td>
<td>9.1</td>
<td>10.9</td>
<td>2.4</td>
</tr>
<tr>
<td>Other</td>
<td>3.5</td>
<td>4.6</td>
<td>4.0</td>
<td>1.4</td>
<td>3.3</td>
<td>5.8</td>
<td>4.9</td>
<td>0.6</td>
</tr>
<tr>
<td>Noncommunicable diseases</td>
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<td>19.4</td>
<td>40.4</td>
<td>58.0</td>
<td>40.1</td>
<td>42.8</td>
<td>36.0</td>
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<td>4.4</td>
<td>5.2</td>
<td>3.4</td>
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<td>Nutritional deficiencies</td>
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<td>4.6</td>
<td>4.6</td>
<td>3.7</td>
<td>1.4</td>
</tr>
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<td>Neuropsychiatric disease</td>
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<td>3.3</td>
<td>6.1</td>
<td>8.0</td>
<td>7.0</td>
<td>8.0</td>
<td>5.6</td>
<td>11.1</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>3.2</td>
<td>1.5</td>
<td>2.1</td>
<td>6.3</td>
<td>2.1</td>
<td>2.6</td>
<td>2.4</td>
<td>8.9</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>3.1</td>
<td>0.4</td>
<td>2.8</td>
<td>2.1</td>
<td>3.5</td>
<td>2.7</td>
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<td>Pulmonary obstruction</td>
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<td>0.6</td>
<td>5.5</td>
<td>0.5</td>
<td>0.7</td>
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<tr>
<td>Other</td>
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<td>18.5</td>
<td>23.6</td>
<td>17.9</td>
<td>19.1</td>
<td>18.7</td>
<td>23.4</td>
</tr>
<tr>
<td>Injuries</td>
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<td>9.3</td>
<td>9.1</td>
<td>16.7</td>
<td>11.3</td>
<td>15.0</td>
<td>13.0</td>
<td>16.6</td>
</tr>
<tr>
<td>Motor vehicle</td>
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<td>1.3</td>
<td>1.1</td>
<td>2.3</td>
<td>2.3</td>
<td>3.5</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Intentional</td>
<td>3.7</td>
<td>4.2</td>
<td>1.2</td>
<td>5.1</td>
<td>3.2</td>
<td>4.3</td>
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<td>8.1</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Millions of DALYs</td>
<td>1,362</td>
<td>293</td>
<td>292</td>
<td>201</td>
<td>177</td>
<td>103</td>
<td>144</td>
<td>58</td>
</tr>
<tr>
<td>Equivalent infant deaths</td>
<td>42.0</td>
<td>9.0</td>
<td>9.0</td>
<td>6.2</td>
<td>5.5</td>
<td>3.2</td>
<td>4.4</td>
<td>1.8</td>
</tr>
<tr>
<td>(millions)</td>
<td>259</td>
<td>575</td>
<td>344</td>
<td>178</td>
<td>260</td>
<td>233</td>
<td>286</td>
<td>168</td>
</tr>
</tbody>
</table>

*Less than 0.05 percent.

Note: DALY, disability-adjusted life year; STD, sexually transmitted disease; HIV, human immunodeficiency virus.

Source: World Bank data.

A baby girl represents a loss of 32.5 DALYs; a female death at age 30 means the loss of 29 DALYs; and a female death at age 60 represents 12 lost DALYs. (Values are slightly lower for males.) The sum across all ages, conditions, and regions is referred to as the global burden of disease (GBD). More details on the GBD are presented in Appendix B.

The global burden measures the present value of the future stream of disability-free life lost as a result of death, disease, or injury in 1990. It is thus based on events that occurred in 1990 but includes the loss of disability-free life in future years. This Report expresses the burden in three distinct ways: as the number of DALYs, as a percentage of some larger aggregate (such as the percentage of total loss attributable to a specific disease), and in relation to population size in 1990. This last measure calls for careful interpretation because all future loss is expressed in relation to the current population, and the measure can easily exceed one year per person. A baby who died in 1990 contributed about thirty-two years (the discounted value of about eighty years of expected life) to the burden but counted as one in the population. To take an extreme case, if the entire population of the world were to be killed in one year, the burden per 1,000 population in that year would exceed 20,000 DALYs. There is therefore no absolute scale with which the GBD per 1,000 population can be compared; the only comparisons that make sense are those between categories—of regions, risk factors, disease groups, or sex. Box table 1.3 shows the GBD by cause and demographic region.

The approach used to compute the GBD can also be used to track improvements in a nation’s health over time by following changes in the national burden of disease. Preliminary plans for initial national assessments have been developed for Costa Rica, South Africa, and Andhra Pradesh State in India.
1,000 population for the established market economies is easily the lowest, at 117. It turns out that these broad rankings are not significantly affected by differences in age distributions between regions.

Females have about a 10 percent lower disease burden per 1,000 population than males for the world as a whole. They lose fewer DALYs from premature mortality, but their DALY loss from disability is about the same as for males. Within the disability category, however, the female disease burden from the group of communicable causes is considerably higher than that for males, partly because of a substantial toll from maternal causes but also because of the much greater female burden associated with STDs. Effective interventions exist for much of this excess female burden. For all causes together, the female advantage ranges from more than 30 percent in the formerly socialist economies, where adult mortality is much higher for men than for women, to negative in India, where females suffer a disadvantage of 8 percent. Both India and China show a female disadvantage in disease burden per 1,000 population, and, not coincidentally, both countries also have large numbers of “missing” (and presumed dead) women in relation to the expected population balance between the sexes. In China illegal female infanticide (and, in the recent past, illegal sex-selective abortion) is thought to be the main reason.

### Table 1.2 Burden of five major diseases by age of incidence and sex, 1990
(millions of DALYs)

<table>
<thead>
<tr>
<th>Disease and sex</th>
<th>Age (years)</th>
<th>0-4</th>
<th>5-14</th>
<th>15-44</th>
<th>45-59</th>
<th>60+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>Male</td>
<td>42.1</td>
<td>4.6</td>
<td>2.8</td>
<td>0.4</td>
<td>0.2</td>
<td>50.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>40.7</td>
<td>4.8</td>
<td>2.8</td>
<td>0.4</td>
<td>0.3</td>
<td>48.9</td>
</tr>
<tr>
<td>Warm infection</td>
<td>Male</td>
<td>0.2</td>
<td>10.6</td>
<td>1.6</td>
<td>0.5</td>
<td>0.1</td>
<td>13.1</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.1</td>
<td>9.2</td>
<td>0.9</td>
<td>0.5</td>
<td>0.1</td>
<td>10.9</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>Male</td>
<td>1.2</td>
<td>3.1</td>
<td>13.4</td>
<td>6.2</td>
<td>2.6</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>1.3</td>
<td>3.8</td>
<td>10.9</td>
<td>2.8</td>
<td>1.2</td>
<td>20.0</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>Male</td>
<td>0.1</td>
<td>0.1</td>
<td>3.6</td>
<td>8.1</td>
<td>13.1</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>1.2</td>
<td>3.2</td>
<td>13.0</td>
<td>17.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Less than 0.05 million.

*Note: DALY, disability-adjusted life year.*
Source: World Bank data.
The figures on disease burden by age (Table 1.2) suggest how health officials should target their programs. More than 80 percent of the DALY loss from diarrhea is a result of infections in children under age 5. Worm infections are concentrated among children ages 5–14. More than half the burden of tuberculosis is borne by the 15–44 age group. More than 60 percent of the burden of ischemic heart disease falls on the population over age 60.

The higher the disease burden, the higher the proportion attributable to the communicable group of causes (Figure 1.6). Sub-Saharan Africa has the highest disease burden per 1,000 population, and 71 percent of this is from the communicable disease group, whereas in Latin America (a medium-burden region) the figure is 42 percent and in the established market economies it is only 10 percent. Noncommunicable diseases show the opposite pattern, accounting for 19 percent of the total burden in Sub-Saharan Africa, 43 percent in Latin America, and 78 percent in the established market economies. Despite these marked differences in relative burden, however, the absolute rates of loss for both groups are highest in Sub-Saharan Africa and lowest in the established market economies. The pattern is plain: as health improves, the burden from all types of disease declines, but the distribution of the burden shifts dramatically from a preponderance of communicable disease to a preponderance of noncommunicable disease.

Despite the sharp improvements in health around the world, the GBD calculations show that a large burden of premature mortality and disability still remains, particularly in the world’s poorer regions. There are inexpensive and effective ways to eliminate the share caused by communicable diseases (other than maternal and perinatal conditions), which is roughly 35 percent of the world burden and more than 60 percent in Sub-Saharan Africa. The remaining 65 percent of the world burden is less responsive to such measures, and reducing it will require changes in the behavior and life-styles of adults.

**Challenges for the future**

New health challenges will emerge over the next few decades. Some are certain: these involve the significant increase in noncommunicable diseases arising from the continuing demographic transition. Others are less certain: the spread of HIV and the increase in AIDS deaths; the increasing number of drug-resistant disease strains; and the continued use of health-damaging substances such as tobacco. Although nobody can forecast the impact of these challenges with any precision, reasonable projections are possible. For example, outside the established market economies the number of deaths attributable to smoking is expected to increase from 1.7 million in 1990 (40 percent of which were in the formerly socialist economies of Europe) to more than 3 million by 2005 and to about 4.5 million by 2015. Other challenges are potentially important but not forecastable: possible ex-
Worldwide, fertility and mortality declines go hand in hand.

Figure 1.7 Trends in life expectancy and fertility in Sub-Saharan Africa and Latin America and the Caribbean, 1960–2020

<table>
<thead>
<tr>
<th>Life expectancy at birth (years)</th>
<th>Total fertility rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>70</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Appendix A and World Bank data.

Box 1.4 The demographic and epidemiological transitions

Changes in the pattern of disease proceed in two steps. The first is the demographic transition, when mortality from infectious disease declines and, partly as a result, fertility decreases as well. The second, a consequence of declining fertility and differential rates of decline among causes of death, is the epidemiological transition. The population grows older, and noninfectious diseases become the main causes of ill health. Health patterns in the developing world over the next three decades will be profoundly influenced by both these transitions.

It is commonly assumed that when a country is going through its demographic transition, the changes in its health indicators are primarily a function of declines in mortality. In fact, both the age structure and the cause-of-death structure are strongly influenced by the rapid decline in fertility. When fertility is high, the age structure of a population is heavily skewed toward the young, irrespective of the level of mortality. Because birth rates remain high and larger numbers of women enter the reproductive ages every year, the base of the population is continually expanding. When birth rates start to fall rapidly, the absolute number of babies born each year may remain unaltered or even decline. As Box figure 1.4 shows, the shape of the age structure of the population then begins to be transformed from a broad-based triangle into a rectangle, or even into a pear shape with a more pronounced narrowing of the base.

and low fertility is essentially complete in the high-income countries and has almost been completed in China and Latin America. Even in Sub-Saharan Africa fertility seems to be starting to decline.

The systematic relationship between gains in life expectancy and reductions in fertility is expected to continue into the next century. Figure 1.7 shows this relationship for two developing regions at different stages of the transition, Latin America and Sub-Saharan Africa. The projected changes for Sub-Saharan Africa are substantial, but they are similar in magnitude to those that have already occurred in Latin America. In much of the developing world the decline in death rates has preceded the decline in birth rates by two decades or more, resulting in temporarily high rates of population growth of 3 or even, occasionally, 4 percent a year. (By contrast, in the established market economies and the formerly socialist economies of Europe birth and death rates declined more or less
Box figure 1.4 Evolving patterns of age distribution and mortality in England and Wales and in Latin America and the Caribbean

England and Wales, 1891

Latin America and the Caribbean, 1955

England and Wales, 1966

Latin America and the Caribbean, 2030

Percentage of total population
Percentage of total deaths

Median age at death

a. Projected.
b. The age below which half of all deaths in a year occur.

in tandem beginning in the late nineteenth century, and population growth rates rarely exceeded 2 percent a year.)

These demographic changes are having, and will continue to have, dramatic effects on age distributions in developing countries. As fertility declines, age structures in these countries are evolving toward the existing patterns in the established market economies and the formerly socialist economies (see Box 1.4). The proportion of the population age 65 and over is expected to increase from 4 percent in 1990 to 9 percent by 2030 (in absolute numbers, from 184 million to 678 million). As a result, the burden from noncommunicable diseases will increase sharply, both absolutely and proportionately. At the same time, the challenge of communicable diseases of the young will persist. Despite declines in fertility, the number of births each year in developing countries will rise somewhat, from 127 million in 1990 to 145 million in 2020, before decreasing to 142 million in 2030. The number of children under age 5 will increase more rapidly, from 552 million in 1990 to 682 million in 2030. These changes, which took a century to complete in today's high-income countries, are occurring within fifty years or less in parts of the developing world.

In judging the importance of the health problems of the young in comparison with those of the elderly, one useful guide is the median age at death. For all six regions of the developing world, the median was below 20 in 1950, indicating the dominance of the health problems of children. By 1990 the median had risen close to age 60 in China and in Latin America but was scarcely above 5 in Sub-Saharan Africa and was still below 25 in the Middle Eastern crescent (see Figure 1.8). By 2030, assuming that current trends continue, the median age at death will have risen above 60 in all regions except Sub-Saharan Africa, where it will still be close to 40.

The message from these population projections is that health services must plan for a modest increase in child-related demands over the next forty years. At the same time, the numbers of the elderly, with very different health needs, will be rising sharply. The pace of demographic change has been, and is expected to continue to be, faster in the developing world than it was in the high-income countries, and the problems of adaptation are therefore greater. Because treatments for noncommunicable diseases are often expensive, there is a danger that these diseases will absorb resources needed to combat communicable diseases (which will still be widespread). This kind of dilemma has already been noted in World Bank studies in Brazil and China.

**HIV and AIDS**

More than 80 percent of the estimated 8.8 million people infected with HIV in 1990 lived in developing countries. There the disease is primarily one of heterosexual adults, with substantial perinatal infection of young children. Of the eight demographic regions used in this Report, only the formerly socialist economies, the Middle Eastern crescent, and China have little recorded spread of...
Table 1.3 Evolution of the HIV-AIDS epidemic

<table>
<thead>
<tr>
<th>Region</th>
<th>HIV incidence (millions)</th>
<th>HIV prevalence (millions)</th>
<th>AIDS-related deaths (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographically developing groupb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>1.6</td>
<td>2.5</td>
<td>7.4</td>
</tr>
<tr>
<td>Asia*c</td>
<td>1.1</td>
<td>1.0</td>
<td>5.8</td>
</tr>
<tr>
<td>EME and FSE*d</td>
<td>0.3</td>
<td>1.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>1.7</td>
<td>2.5</td>
<td>8.8</td>
</tr>
</tbody>
</table>

** Less than 0.05 million.

Note: Incidence refers to new infections in a given year; prevalence refers to the total number of persons infected.

a. Conservative estimates.
b. The countries of the demographic regions Sub-Saharan Africa, India, China, Other Asia and islands, Latin America and the Caribbean, and Middle Eastern crescent.
c. India, China, and the demographic region Other Asia and islands.
d. EME, established market economies; FSE, formerly socialist economies of Europe.

Source: World Health Organization data.

the virus. Spread of the virus may be about to occur even in these three regions. It takes six to ten years, on average, for an HIV-infected adult to develop AIDS. Thus, regardless of future changes in transmission of the virus, there will certainly be an increasing number of AIDS cases over the next few years.

It is difficult to predict the future course of the epidemic because so little is known about the dynamics of HIV transmission. WHO has projected that in 2000, 2.5 million people will be newly infected with HIV, HIV prevalence will have reached 26 million, and AIDS deaths will total 1.8 million (see Table 1.3). These estimates are conservative, since they assume that the rate of new infections in Africa will slow somewhat and that new transmission will be concentrated in India and in the Other Asia and islands region. If no effective interventions to slow transmission are introduced, the total number of deaths may be twice as large, in which case AIDS would be responsible for 8 percent of the global burden of disease by 2000 instead of the 3.5 percent implied by the estimates in Table 1.3. If, however, sexual behavior changes dramatically over the next decade, even the conservative projections given here may prove too pessimistic. Relatively modest reductions in numbers of casual sexual partners, or in the prevalence of STDs—or, alternatively, substantial increases in condom use—could reduce transmission significantly. Early (and still tentative) findings from Thailand are encouraging; perhaps behavior really will change.

Opinions differ concerning the effects of AIDS on population growth. The variables needed to model the epidemic—including baseline rates of infections, behavioral risk factors, efficacy of transmission, incubation periods, survival times, and the role of such factors as STDs—are not well quantified, and accurate projections are therefore impossible. In the African communities that are most severely affected, early assessments predicted absolute declines in population. Later views suggest that population growth will continue, albeit at a reduced rate. Trial projections for Sub-Saharan Africa, based on a high assumption of HIV prevalence of 60 million infections worldwide in 2000, suggest a reduction in life expectancy by 2010 of about six years, in comparison with a low-HIV model, and a 25 percent increase in adult mortality. The effect on population growth would still be modest: a reduction of about 0.25 percentage point a year, to an annual rate of 2.7 rather than 2.95 percent in 2005-10. In areas such as Thailand where fertility and mortality rates are much lower than in Sub-Saharan Africa, AIDS may well contribute to actual population declines over a period of thirty years or more.

Drug-resistant diseases

Microbes evolve as a result of natural mutation, which throws up new threats, and of drug therapy-induced selection, which fosters drug resistance. Two major new threats have arisen in this century: the influenza virus responsible for the 1918–19 worldwide epidemic, and HIV.

The evolution of drug resistance, partly driven by incomplete or inadequate treatment, is more gradual and less dramatic but no less serious. The everyday bacteria responsible for pneumonias and diarrheas have become resistant to the older antibiotics and will gradually do the same with the newer antibiotics developed over the past few decades.
Life expectancy is related to income, but the relationship has shifted upward during the twentieth century.

Figure 1.9 Life expectancy and income per capita for selected countries and periods

Life expectancy (years)

<table>
<thead>
<tr>
<th>Year</th>
<th>Income per capita (1991 international dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>About 1900</td>
</tr>
<tr>
<td>1990</td>
<td>1900</td>
</tr>
</tbody>
</table>

Note: International dollars are derived from national currencies not by use of exchange rates but by assessment of purchasing power. The effect is to raise the relative incomes of poorer countries, often substantially. For illustrative country comparisons and a more detailed explanation, see Table 30 in the World Development Indicators.
Source: Preston, Keyfitz, and Schoen 1972; World Bank data.

Tuberculosis resistant to the standard mix of antibiotics is becoming more common in the industrial world, and it kills many of those who contract it. Chloroquine-resistant malaria has now spread to practically all endemic areas, and although new drug therapies are available, widespread resistance even to several of these is being reported. Malaria has thus reemerged as a significant health risk in urban areas that had been free of it for several decades. Resurgence of the disease has been abetted by the reduced effectiveness of vector control, which is partly attributable to the increasing resistance of mosquitoes to standard insecticides. Resistant strains of many STDs are also emerging. In the developing world the diseases for which drug resistance is already a major issue (respiratory infections, tuberculosis, STDs, and malaria) accounted for almost one-fifth of the GBD in 1990.

This steady evolution of drug-resistant microbes poses challenges for research and for health care. Better understanding of infectious agents is needed as a basis for the development of new therapies. Health providers must consider the effects of drug use on the evolution of resistant microbial strains. Basic scientific advances can contribute to tracking resistance, as recently shown by developments in identifying drug-resistant strains of tuberculosis. There is little reason to hope for permanent success in humanity’s struggle against infection; investments in scientific research and vigilance on the part of public health authorities will remain indispensable.

These problems arising from microbial evolution are most severe in Sub-Saharan Africa. If efforts to control the spread of HIV fail, by 2000 an additional 1 million people in the region will be dying from AIDS each year. Most of them will be young adults who would otherwise have gone on to live healthy lives. If malaria develops resistance to all available drugs, the number of people it kills every year could increase sharply, from the expected 1.5 million deaths in 2000 to 2.3 million. Sub-Saharan Africa might also suffer from a tuberculosis epidemic, driven partly by drug resistance and partly by the spread of the disease by people with HIV. Extrapolation of current trends indicates an annual total of 8.5 million premature deaths in Sub-Saharan Africa by the end of the century. But it is all too easy to project a figure as high as 11.5 million, accompanied by a sharp reduction in life expectancy.

Lessons from the past: explaining declines in mortality

Three factors have been important in the dramatic and unprecedented mortality declines of the past hundred years and in the still more dramatic declines in developing countries since World War II. These factors are income growth, improvements in medical technology, and public health programs combined with the spread of knowledge about health.

Income growth

Increased income allows people, particularly the poor, to buy more food, better housing, and more
health care. Throughout the twentieth century life expectancy has been strongly associated at the national level with income per capita, as seen in Figure 1.9. Life expectancy rises rapidly with income at low levels of income, particularly when income per capita is less than $3,000 (1991 purchasing power dollars). The figure shows, however, that the relationship has shifted upward over each thirty-year period, so that more health is realized for a given income. For example, in 1900 life expectancy in the United States was about forty-nine years and income per capita in 1991 dollars was about $4,800. In 1990 that income per capita would be associated with a life expectancy of about seventy-one years. This upward shift shows that health depends on more than income alone.

**Improvements in medical technology**

Before the 1930s medical technology had little to offer humanity, with the exception of smallpox inoculation, the use of which was widespread in Europe from the late eighteenth century onward, and diphtheria antitoxin, discovered in 1894. Starting in the 1930s, with the introduction of antibacterial drugs and new vaccines, a wide range of effective interventions has become available to counter most communicable diseases.

The effect of these technological improvements on health has depended on other factors, such as income gains for the poor, increased schooling, and public policies that affect health systems. As a result, outcomes have varied widely by country, even within the same region. For example, in the early 1980s child mortality was three times higher in Mali than in Botswana, six times higher in Bolivia than in Chile, and five times higher in Bangladesh than in Sri Lanka. Between the early 1960s and the early 1980s child mortality fell 20 percent in Bangladesh but 65 percent in Sri Lanka, 10 percent in Uganda but 50 percent in Kenya, and 10 percent in Haiti but nearly 80 percent in Costa Rica. Some countries have clearly made better use of the available technology than others.

**Public health and the spread of knowledge**

The introduction of public health measures—particularly clean water, sanitation, and food regulation—certainly contributed to the decline in child mortality in the late nineteenth century and to the accelerated decline in the early twentieth century. The geographic distribution of mortality declines suggests, however, that until people began to understand the sources of poor health, such public health measures were responsible for only a small part of the progress made. In the late nineteenth century Robert Koch showed that the bacterium *M. tuberculosis* causes tuberculosis, and people began to understand about germs. They took simple precautions—preparing food and disposing of waste hygienically, eliminating flies, and quarantining sick family members—that had far-reaching benefits. Recent research has shown that child mortality differed little by education or even by income in the United States in the last decade of the nineteenth century but that differences widened sharply as child mortality fell in the early twentieth century. The implication is that affluence and education made little difference until scientific knowledge showed households how to reduce the dangers to their health. Since better-educated individuals acquire and use new information more quickly, this emphasis on knowledge helps to explain the large differences in child mortality by mother’s education observed in developing countries today.

**The potential for effective action**

The recent declines in mortality in the developing world have been sharper than the earlier declines in the high-income countries and more influenced by technical advances. To take one example, Sri Lanka achieved a remarkable decrease in mortality after World War II; the crude death rate fell from 21.5 per 1,000 in 1945 to 12.4 in 1950. Some 23 percent of that drop has been attributed to the malaria eradication program, which mainly involved spraying of insecticide from the air. The same approach also did much to control yellow fever, onchocerciasis, and many other diseases. Widespread use of newly available antibiotics against conditions such as yaws in Africa helped to reduce STDs and (probably) acute respiratory infections. Improvements in water and sanitation curbed the spread of disease, particularly in towns and cities. Whereas at the beginning of this century child mortality rates in today’s high-income countries were much higher in urban than in rural areas, the opposite has been true of the developing world since 1950.

Vaccination, too, has produced dramatic results, including the eradication of smallpox and the elimination of paralytic polio in the Western Hemisphere. About 80 percent of the world’s children are now vaccinated against the main infectious diseases of childhood, thanks largely to the Expanded Programme on Immunization (EPI) sponsored by WHO and UNICEF. It is estimated that the EPI
prevented the deaths of 2.6 million children in 1990 alone. Substantial benefits have also come from simple curative measures such as oral rehydration to avert death from diarrhea and a short course of drugs for curing tuberculosis. But there is much more still to be done: in 1990 childhood deaths from diarrhea and immunizable diseases alone accounted for 12 percent of the GBD.

The march of science has increased both the range of inexpensive clinical treatments and practices and the potential performance of health systems. It is now possible to treat at low cost tuberculosis, STDs, many respiratory infections, and risky deliveries, which together accounted for more than 20 percent of the GBD in 1990. Epidemiological advances are giving governments and households warning of the enormous health toll from smoking. But if the full benefits of scientific advances are to be realized, parallel developments are needed to empower households so that they can put the advances into practice. The key developments are schooling, particularly of girls; income growth, particularly of the poor; and a flexible, responsive health system able to provide the necessary preventive and curative care. The policies needed to achieve these developments are the subject of the remainder of this Report.
Households and health

What people do with their lives and those of their children affects their health far more than anything that governments do. But what they can do is determined, to a great extent, by their income and knowledge—factors that are not completely within their control. In every society, moreover, the capabilities, income, and status of women exert a powerful influence on health. Because of these interrelations, government actions, through their effects on the conditions facing households and individuals, can be important to people’s health. Especially in the poorest countries, policies that accelerate income growth and reduce poverty make it possible for people to afford better diets, healthier living conditions, and better health care. Policies to expand educational opportunities, particularly for girls, help households achieve healthier lives by increasing their access to information

Economic growth and investments in human resources interact to improve well-being.

Figure 2.1 Mutually reinforcing cycles: reduction of poverty and development of human resources

<table>
<thead>
<tr>
<th>Economic growth policies that benefit the poor</th>
<th>Poverty reduction</th>
<th>Human resource development</th>
<th>Investment in schooling and health</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Health improvements</td>
<td>Expansion of schooling opportunities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Empowerment of women</td>
<td></td>
</tr>
</tbody>
</table>

Health improvements

Empowerment of women

Expansion of schooling opportunities
prevented the deaths of 2.6 million children in 1990 alone. Substantial benefits have also come from simple curative measures such as oral rehydration to avert death from diarrhea and a short course of drugs for curing tuberculosis. But there is much more still to be done: in 1990 childhood deaths from diarrhea and immunizable diseases alone accounted for 12 percent of the GBD.

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and their ability to make good use of it. The same goes for policies that work to ensure effective and accessible health services for all. When all these policies are combined, they create a virtuous cycle in which reduction of poverty and improvements in health reinforce each other (Figure 2.1).

**Box 2.1 Progress in child health in four countries**

In the 1960s a child born in the developing world had a 77 percent chance of surviving the first five years of life. About thirty years later, the chances of survival have improved to 89 percent. How much did income growth and expansion of schooling contribute to this gain? What was the role of other factors, such as progress in science and medicine? Some answers to these questions emerge from data on child survival from seventy-five industrial and developing countries for the period between 1960 and 1987 (see note to Appendix table A.3). This box reviews the results for four countries with different income levels—Costa Rica, Côte d’Ivoire, Egypt, and Japan (see Box table 2.1 and Box figure 2.1).

In all four countries, part of the gain in child health depends on the initial levels in 1960 of schooling in the population and of income per capita. Because schooling and income per capita produce health benefits that often persist through time, health in a population may be improved simply by maintaining initial levels of schooling and income. In Costa Rica, where in 1960 income per capita was relatively high and schooling was already widespread, initial conditions accounted for 58 percent of the gain in child health between 1960 and 1987. In Côte d’Ivoire and Egypt, where the levels of schooling and income per capita were modest in 1960, initial conditions contributed only about one-fifth to one-quarter of the gains. In Japan, too, these initial conditions contributed a fifth of the gains in child health, but this is not surprising in a country where a baby’s chance of survival was already very good in 1960.

In reality, of course, income and schooling have improved in all these countries, and these improvements contributed to further gains in child survival. In Côte d’Ivoire educational improvements did the most for child health, accounting for 66 percent of the gains between 1960 and 1980. For Egypt, by contrast, the figure was only 21 percent. A comparison between Côte d’Ivoire and Egypt is illuminating. The probability of surviving the first five years of life started at similar levels in both countries and improved at comparable rates. In both, too, the responsiveness of child survival to income per capita and to the schooling of adults was comparable. In Côte d’Ivoire, however, adult schooling started from much lower levels than in Egypt but increased five times faster. Income per capita in Côte d’Ivoire was nearly twice Egypt’s in 1960 but then grew only 60 percent as fast. Thus, improvements in schooling were most significant in Côte d’Ivoire, whereas in Egypt growth in income per capita accounted for fully half of the gain in child health.

Costa Rica and Japan followed the same pattern as Egypt: growth of income per capita contributed substantially more to child health gains than did educational improvements. Technical progress (estimated using the passage of time as a proxy), however, was important in Japan, whereas in Costa Rica and Egypt it mattered less than improvements in education. Except in Japan, where people were already quite well educated in 1960, the analysis probably underestimated the contribution of schooling because it dealt with the schooling of all adults rather than of women alone. Child health is particularly affected by maternal education, and the number of years of schooling received by younger women is likely to have risen much faster between 1960 and 1987 than was the case for the adult population as a whole.

**Box table 2.1 Child health, income per capita, and schooling in Costa Rica, Côte d’Ivoire, Egypt, and Japan, 1960–87**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Costa Rica</th>
<th>Côte d’Ivoire</th>
<th>Egypt</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child survival&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.89</td>
<td>0.72</td>
<td>0.74</td>
<td>0.96</td>
</tr>
<tr>
<td>Income per capita (1987 international dollars)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2,160</td>
<td>1,021</td>
<td>557</td>
<td>2,701</td>
</tr>
<tr>
<td>Average schooling of adults (years)</td>
<td>4.0</td>
<td>0.2</td>
<td>3.0</td>
<td>10.7</td>
</tr>
<tr>
<td>Average annual percentage change, 1960–87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child survival&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Income per capita</td>
<td>2.3</td>
<td>3.2</td>
<td>5.2</td>
<td>5.3</td>
</tr>
<tr>
<td>Schooling of adult population</td>
<td>2.0</td>
<td>11.8</td>
<td>2.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Elasticity of child survival with respect to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income per capita&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>Schooling of adult population&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<sup>a</sup> Data refer to 1960–80.

<sup>b</sup> Child survival refers to the probability of surviving from birth through age 5.

<sup>c</sup> Income is adjusted for differences in purchasing power parity.

<sup>d</sup> Elasticities denote the percentage change in the probability of surviving from birth through age 5 corresponding to a 1 percent change in the indicated variable.

Source: Lau and others, background paper.
and its ability to acquire and apply new scientific knowledge depends on the level of schooling in the population.

The influence of income on health

The higher a country’s average income per capita, the more likely its people are to live long and healthy lives. Of course, this effect tapers off as income rises: a doubling of income per capita (adjusted for purchasing power parity) from, say, $1,000 in 1990 corresponds to a gain of eleven years in life expectancy, whereas a doubling from

Box figure 2.1 Gains in child health, 1960–87, and share contributed by various factors

Note: The area of the circle is proportional to the absolute increase, over the period 1960–87, in the probability of surviving to age 5. For Côte d’Ivoire changes for the period are extrapolated from the observed change during 1960–80. Source: Lau and others, background paper.
Within the same city, health status is worse in poorer areas.

Figure 2.2 Child mortality in rich and poor neighborhoods in selected metropolitan areas, late 1980s

- Poor neighborhoods
- Rich neighborhoods

Percentage deviation from national mean

- Cairo, Egypt
- Colombo, Sri Lanka
- Lima, Peru

Note: Child mortality indexes for each neighborhood are calculated by dividing the observed number of deaths among children of women in the sampled households of a neighborhood by the expected number (given the distribution of women by the length of time they have been bearing children and the national average child mortality levels at each duration of childbearing). Percentage deviations from the national average are obtained by subtracting 1 from a neighborhood's index and multiplying the result by 100. Neighborhoods in each city were ranked according to the proportion of houses with concrete floors. Poor neighborhoods were the lowest 25 percent in this ranking; rich neighborhoods were the top 25 percent.

Source: Calculated from data from national Demographic and Health Surveys.

$4,000 is matched by a gain of only four years (see Figure 1.9 in Chapter 1). Income growth has more impact in poor populations because additional resources buy basic necessities, particularly food and shelter, that yield especially large health benefits.

Because poverty has a powerful influence on health, it is not just income per capita that is relevant; the distribution of income and the number of people in poverty matter as well. In industrial countries life expectancy depends much more on income distribution than on income per capita, and it has been rising faster in countries with improving income distribution. Japan and the United Kingdom had similar income distributions and life expectancies in 1970, but they have diverged since then. Japan now has the highest life expectancy in the world and a highly egalitarian income distribution. In the United Kingdom, where income disparity has widened since the mid-1980s, life expectancy is now more than three years shorter than in Japan.

In developing countries the number of people in poverty is an especially important reason for differences in health. One study looked at twenty-two developing countries with comparable data on poverty (defined as the share of the population consuming less than $1 a day at 1985 purchasing power parity prices) and found that variation in the prevalence of poverty and in per capita public spending on health is important in explaining cross-country variation in life expectancy. Differences in income per capita became unimportant once those two factors were taken into account. This does not mean that income growth is irrelevant to increased life expectancy; rather, its main effect lies in how much it reduces poverty and supports public health services. In the twenty-two countries, roughly one-third of the effect of economic growth on life expectancy came through poverty reduction and the remaining two-thirds through increased public spending on health. In Sri Lanka an increase in per capita public spending on health was twenty-two times more effective in reducing infant mortality than was the same increase in average income.

Within countries, too, health correlates strongly with poverty. In India, Indonesia, and Kenya child mortality is higher in states or provinces with larger proportions of poor people. Within cities, there are large differences in child survival between rich and poor neighborhoods (Figure 2.2). And children in poor families are less healthy. In Madurai, the second largest city in India's Tamil Nadu State, children ages 2-9 in the poorest households were more than twice as likely to suffer from serious physical or mental disabilities as children from slightly better-off families.

Poor people are vulnerable to disease not only because of poor living conditions but often also for work-related reasons. In Adana, Turkey, the risk of malaria is significantly greater among migrant workers than for the local population; the average
number of anopheline mosquito bites per person was five times greater in the tents of these workers than in the houses of village residents. In Sri Lanka one of the commonest causes of pesticide poisoning is leaky knapsack sprayers; surveys show that although farmers are aware of the risks involved, they continue to use broken equipment because they cannot afford to replace or repair it.

The distribution of income within households also affects health. Increasing women’s access to income can be especially beneficial for the health of children. In Brazil income in the hands of the mother has a bigger effect on family health than income controlled by the father. In Jamaica households headed by women eat more nutritious food than those headed by men; they also spend more of their income on child-centered goods and significantly less on alcohol. In Côte d’Ivoire a doubling of household income under women’s control reduces the share of alcohol in the family budget by 26 percent and the share of cigarettes by 14 percent. In Guatemala it takes fifteen times more spending to achieve a given improvement in child nutrition when income is earned by the father than when it is earned by the mother. Although a working mother may breastfeed less and have less time for child care—both of which could be detrimental to her children’s health—evidence from numerous developing countries suggests that this harm can be offset by the health benefits that her earnings bring.

Because fewer people live in poverty as average incomes rise, there is generally a strong link between incomes and health status. Across countries, more than 75 percent of the difference in health is associated with income differences. Indeed, this relation is not merely associative but causal and structural: income growth leads directly to better health. In a sample of fifty-eight developing countries, a 10 percent increase in income per capita, all else being equal, reduced infant and child mortality rates by between 2.0 and 3.5 percent and increased life expectancy by a month. This estimate reflects the total impact of income on health; it includes effects working directly through income (such as food consumption), as well as indirectly through factors that are themselves mainly determined by income (access to safe water and sanitation, availability of physicians, and so on). Studies based on individual households corroborate the cross-country results. A 10 percent advantage in income reduces infant mortality by between 1 and 2 percent in Nigeria, Sri Lanka, Thailand, and several Latin American countries and by as much as 4 to 8 percent in Côte d’Ivoire and Ghana.

These findings highlight the costs to health of slow economic growth. Child health has been improving everywhere, but gains are much less rapid in countries with slow income growth (Figure 2.3). During the 1980s the economic performance of developing countries was mixed, with income per capita constant or falling, and in some countries the incidence of poverty rose (Table 2.1). Had economic growth been as fast in the 1980s as in the period between 1960 and 1980, in 1990 alone an estimated 350,000 infant deaths, or 6 percent of total infant deaths, would have been averted in developing countries (excluding India and China). In Africa and Latin America, where average growth was 2.5 percentage points slower during the 1980s, the saving in babies’ lives in 1990 would
Table 2.1 Poverty and growth of income per capita by developing region, 1985 and 1990, and long- and medium-term trends

<table>
<thead>
<tr>
<th>Region</th>
<th>Head-count index of povertya</th>
<th>Annual percentage change in income per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>All developing countries</td>
<td>30.5</td>
<td>29.7</td>
</tr>
<tr>
<td>Sub-Saharan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>47.6</td>
<td>47.8</td>
</tr>
<tr>
<td>East Asia</td>
<td>13.2</td>
<td>11.3</td>
</tr>
<tr>
<td>South Asia</td>
<td>51.8</td>
<td>49.0</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>7.1</td>
<td>7.1</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>30.6</td>
<td>33.1</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>22.4</td>
<td>25.2</td>
</tr>
</tbody>
</table>

Note: Regional data on annual change in income per capita refer to unweighted country averages. The regions used in this table are as defined in the World Development Indicators, except for Eastern Europe, which includes Albania, Bulgaria, Hungary, Poland, Romania, the former Czechoslovakia, and the former Socialist Federal Republic of Yugoslavia. Disaggregated data for the last two are not yet available.

Source: For poverty index, World Bank 1993c; for change in income per capita, World Bank data.

have been as much as 7 and 12 percent, respectively. Latin America’s recession in 1983 is estimated to have caused 12,000 additional deaths of babies, or 2 percent of all infant deaths in that year. And because slow economic growth hampers poverty reduction and constrains spending on health, schooling, and other services, it is highly likely that the health of the poor suffered disproportionately in the 1980s.

The influence of schooling on health

Households with more education enjoy better health, both for adults and for children. This result is strikingly consistent in a great number of studies, despite differences in research methods, time periods, and population samples.

MATERNAL SCHOOLING AND CHILD HEALTH. In most households women have the main responsibility for a broad range of activities that affect health. They manage household chores, keep the house clean, process foods and prepare meals, feed and care for young children, and look after the sick. Women’s own health and their efficiency in using available resources have an important bearing on the health of others in the family, particularly children. A study of children under 10 in Bangladesh, for example, found that over a period of two years following the death of a mother, mortality rates, in comparison with those of children with living mothers, were twice as high for boys and three times as high for girls.

Education greatly strengthens women’s ability to perform their vital role in creating healthy households. It increases their ability to benefit from health information and to make good use of health services; it increases their access to income and enables them to live healthier lives. It is not surprising, therefore, that a child’s health is affected much more by the mother’s schooling than by the father’s schooling. Data for thirteen African countries between 1975 and 1985 show that a 10 percent increase in female literacy rates reduced child mortality by 10 percent, whereas changes in male literacy had little influence. Demographic and Health Surveys in twenty-five developing countries show that, all else being equal, even one to three years of maternal schooling reduces child mortality by about 15 percent, whereas a similar level of paternal schooling achieves a 6 percent reduction. The effects increase when mothers have had more education; in Peru, for example, seven or more years of maternal schooling reduces the mortality risks nearly 75 percent, or about 28 percent more than the reduction for the same level of paternal schooling (Figure 2.4). Countries that in 1965 had achieved near-universal enrollment for boys but much less for girls had about twice the infant mortality in 1985 of countries with a smaller boy-girl gap.

The advantages that a mother’s schooling confers on her children’s health are felt even before birth. In developing countries better-educated women marry and start their families later, diminishing the risk to child health associated with early pregnancies. Educated women also tend to make greater use of prenatal care and delivery assistance. In a study in Lima that controlled for service availability and socioeconomic status, 82 percent of women with six or more years of education sought prenatal care, compared with only 62 percent for women with no education.

Following birth, the children of educated mothers continue to enjoy other health-enhancing advantages: better domestic hygiene, which reduces the risk of infection; better food and more immunization, both of which reduce susceptibility to infection; and wiser use of medical services. A study of women in Bangladesh documented how educated women kept their homes and children tidier and cleaner than uneducated women and
expressed a preference for water from tanks or tubewells at home rather than from canals or rivers. In Brazil, India, and Nigeria better-educated households are willing to pay 6 to 50 percent more than other households for improved water supplies.

Educated mothers are also better at getting information on health and acting on it. In Brazil the child health benefits of a father’s education work mostly through his income, whereas almost all the effect of maternal education comes from learning about health through newspapers, television, and radio. In Thailand mothers with primary education were 30 percent more likely than mothers with no education to treat childhood diarrhea with oral rehydration therapy or a homemade solution of salt and sugar; this figure rose to 90 percent for mothers with secondary or higher education. Similar results have been reported in countries as diverse as Burundi, Colombia, Ghana, Morocco, and Nigeria. And well-educated mothers often manage to reduce the damage that poverty does to health. Among poor rural households in Côte d’Ivoire, for example, 24 percent of the children of mothers with no education were stunted, compared with only 11 percent of children of mothers with some elementary schooling. Educated women are an important part of the reason for the impressive health achievements of China, Costa Rica, India’s Kerala State, and Sri Lanka, despite relatively low incomes.

Schooling and adult health. Personal habits and life-style choices affect adult health enormously. Because educated people tend to make choices that are better for their health, there is often a strong relation between schooling and health. A study of U.S. life expectancy at age 25 found that between the highest and the lowest levels of education, the difference was about six years for white men and about five years for white women. These differences—which may partly reflect differences in income associated with education—have persisted since the 1960s. The same pattern occurs in developing countries. Surveys in Côte d’Ivoire, Ghana, Pakistan,
Schooling reduces the risk of adult ill health.

Figure 2.5 Schooling and risk factors for adult health in Porto Alegre, Brazil, 1987

Prevalence of risk (percent)

<table>
<thead>
<tr>
<th>Health Factor</th>
<th>No schooling</th>
<th>Postsecondary schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of exercise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Achutti and others 1988.

and Peru show that respondents whose parents were educated were more likely to have living parents than those with uneducated parents. In Peru 72 percent of the educated fathers of respondents ages 25–29 were still alive at the time of the survey, compared with only 55 percent of the uneducated fathers. In Jamaica education had a bigger influence on adult health than did income, particularly before age 50. Death rates for specific diseases also show educational differentials. In Russia death from coronary heart disease was two to three times more common for the poorly educated than for those with higher education. In Brazil those who were illiterate or who had only primary schooling were about five times more likely to have high blood pressure than those with postsecondary schooling. The first group was also substantially more inclined to obesity, alcohol and tobacco consumption, and lack of exercise (Figure 2.5).

The advantages of education continue to show up when new types of health risk appear. For example, when the AIDS epidemic began, infection was initially concentrated among well-educated elites, but these same groups were the first to change their life-styles as information became available about the disease and its prevention. In Brazil between 1982 and 1985, 79 percent of those infected had completed postsecondary education; by the late 1980s this group’s share of cases had fallen to 33 percent. Even more striking is the way that well-educated people have changed their behavior on smoking. In the United Kingdom the proportion of smokers among adults declined between 1958 and 1975 by 50 percent among the most educated but hardly changed among the least educated. In the United States between 1974 and 1987 the smoking habit declined nine times faster in the highest education group than in the lowest. The corresponding difference was twofold in Canada and threefold in Norway.

Policies to strengthen household capacity

Because people’s ability to improve their own health depends so much on income and education, the policy conclusions are clear: governments should work to boost economic growth, reduce poverty, expand schooling (particularly for girls), and help strengthen women’s ability to care for their families. This section deals with each of these points in turn.

Promoting growth and reducing poverty

During the 1980s the pattern of economic growth in developing countries was very uneven. Income per capita grew at more than 6 percent a year in East Asia but remained constant or fell in many other countries. The disappointing record reflected the impact of adverse external shocks as well as poor domestic policies. Nonetheless, some economies grew rapidly despite the external shocks, showing that a great deal can be done by developing countries themselves.

Because it is difficult to reduce poverty without economic growth, establishing sound economic policies for growth is one of the most valuable things a government can do. Development strategies also need to emphasize broadly based growth to give the poor better income-earning opportunities and better access to a range of social services. To protect the most vulnerable members of society, it is appropriate for governments to make transfers and other special arrangements.
POLICY REFORM AND ADJUSTMENT LENDING. As a consequence of the economic crisis of the early 1980s, many developing countries changed their economic policies. They adopted macroeconomic reforms intended to achieve price stability and sustainable internal and external monetary balance and made microeconomic and institutional reforms to promote the efficient use of resources and faster economic growth. These changes typically involved cuts in public spending, the opening of the economy to competition, liberalization of prices, measures to improve the efficiency of public expenditure, and the development of a sound financial system and other institutions needed in a well-functioning market economy.

To support these reforms, the World Bank and the International Monetary Fund have extended adjustment lending. The purpose of this lending is to cushion an economy during the transitional phase to its new growth path. Adjustment lending is therefore essentially an investment in a more productive future. It has been central to the reforms in Latin America and Sub-Saharan Africa and important in other regions as well. Its role will continue in the 1990s; it is already a major channel of assistance for the formerly socialist economies; it is being used for the first time in India; and it has both old and new clients in other parts of the world.

 Nonetheless, adjustment lending remains controversial. Does it really raise long-term growth? Do the poor suffer as a consequence of such adjustment policies as cuts in public spending and liberalization of food and other prices? How is health affected? The answers to these questions are complicated because adjustment lending is neither necessary nor sufficient for policy reform. Some of the most dramatic “adjustment” reforms took place without adjustment lending (as in Chile and Viet Nam), and some countries that received adjustment loans did little or nothing to pursue reforms (for example, Tanzania and Zambia). In addition, because a country’s economic performance is affected by many factors, it is hard to isolate the part played by adjustment lending.

Despite these difficulties, World Bank studies on the impact of adjustment lending are revealing. The research looked at countries in the “intensive adjustment lending” group (which includes countries that received at least two structural adjustment loans or three sectoral adjustment loans by 1990, with the first loan started by mid-1986) and found that in general they did achieve faster growth than in other countries. All else being equal, middle-income countries in the “intensive” group boosted their growth rates during 1986-90 by an estimated average of about 4 percentage points a year over what would probably otherwise have occurred. The low-income countries, especially in Sub-Saharan Africa, did less well; for them, the benefit was 2 percentage points.

Since health is helped by economic recovery and faster long-term growth, adjustment lending, by facilitating economic progress, benefits health in the long run. When a government has to adjust—in response to economic shocks or to rectify mistaken past policies—the whole society, poor and nonpoor, may suffer short-run reductions in employment and wages. But the resulting fall in income is caused not so much by policies associated with adjustment lending as by the necessity for the country to curb its consumption; without adjustment loans, even greater decreases in consumption would probably have been necessary. Nonetheless, adjustment lending can take five or more years to bear fruit, and the transition can be painful because incomes may fall in the short run. Evidence from Sub-Saharan Africa and Latin America suggests that economic downturns are associated with less favorable child mortality outcomes than would be predicted from long-term trends. In countries where child mortality rates are declining over time, for example, adjustment lending would be associated, in the short run, with a slower rate of decline. To minimize such adverse effects, some countries have begun to use resources, including adjustment loans, to support nutrition programs for vulnerable children, as well as basic health and other social services targeted to the poor.

ADJUSTMENT LENDING AND PUBLIC EXPENDITURE ON HEALTH. Because cuts in government spending are usually central to an adjustment program, health spending is likely to be reduced. In many countries early cuts were indiscriminate and failed to preserve those elements of the health system with the strongest long-term benefits for health. Drugs were often cut more heavily than personnel because it is difficult to lay off public employees. Côte d’Ivoire’s experience illustrates the mistakes that occurred in some early programs of economic adjustment. With real income per capita falling 19 percent between 1980 and 1984, the government cut public spending, among other measures. Health expenditure dropped in real terms by 12 percent between 1981 and 1984. But personnel costs were not cut; instead public expenditures on medicines and materials absorbed the reduction,
shrinking in real terms by more than one-third during the first half of the 1980s. In rural clinics, already precarious supplies of basic consumables became even scarcer.

The implications for child health looked grim. Cross-sectional data show that the nutritional status of Ivorian children is strongly related to the availability of drugs in the community. All else being the same, the difference in height-for-age (a measure of long-run nutritional status) of children in communities lacking basic medicines and those in well-supplied communities was equivalent to more than one-third of the difference between the average child in Côte d’Ivoire and in the United States. The health of children from poor families suffers even more when drugs are unavailable. Since 1990 the government has begun putting more resources into nonwage health inputs: their share of the health budget rose from 20 percent in 1991 to 24 percent in 1993. Health services, particularly in rural areas, have been improving as a result.

Various studies have assessed the effect of adjustment programs on public spending on health. Most have found that central government expenditure on health in countries with adjustment lending programs did not suffer more than elsewhere; this result, however, is not definitive because state and local governments are often responsible for a substantial share of public spending on health. More comprehensive data available for twenty countries during 1980–90 show that in both countries with and without adjustment loans, public spending on health as a percentage of total country income declined in the early 1980s in relation to the average for the decade. In 1985–90, however, health spending recovered much faster in countries with adjustment programs. Similarly, per capita public spending on health also recovered faster in such countries (Fig-
Unfortunately, the data are not good enough to allow any judgment on whether adjustment programs directly helped to ensure that public spending on health was efficient. (And, as this Report will show, not all health spending deserves to be protected; some of it is inefficient and regressive.)

**Expanding and improving schooling**

In general, developing countries have made much progress in expanding schooling since the 1960s, but the trends conceal some shortcomings. In the poorest countries, especially in Africa, many children never go to school at all. In Mali, for example, fully 77 percent of all school-age children never go to school—a figure that has remained largely unchanged since 1980. Of those who do go to school, many often enroll late—thus missing the benefits of early learning opportunities—and leave before they complete even the first few years of basic education. Fewer than 60 percent of first-graders in the lowest-income countries and about 70 percent of those in the lower-middle-income countries reach the last year of primary school.

Enrollments are particularly low in isolated rural areas, for lower socioeconomic groups, and for girls. In developing countries as a group, about 10 percent of boys ages 6–11 do not enroll; for girls in the same age group the figure is 40 percent. Especially in poor countries, the gaps can be substantial, as Figure 2.7 illustrates for India. But Sri Lanka’s experience shows that this gender gap is not an inevitable consequence of poverty.

Leaving aside the gaps in enrollment, education in many countries is inadequate. Even children who complete primary school fail to acquire basic literacy and numeracy skills and scientific understanding. These weaknesses in the education system reduce the potential impact of schooling on

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**Figure 2.7 Enrollment ratios in India, by grade, about 1980**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note: The enrollment ratio is the share of children in the age group corresponding to a given grade who are enrolled in that grade.*

*Source: Tan and Mingat 1992.*
Box 2.2 Teaching schoolchildren about health: radio instruction in Bolivia

Many personal habits and life-style choices that have important consequences for health are formed early in life. Health education in schools can help young people make informed choices and so reinforce the effect of schooling on health.

Bolivia has had success with health education through radio lessons. Radio instruction was first introduced in 1987 for teaching mathematics and proved to be both inexpensive (with costs per pupil averaging less than $1 a year) and effective. In 1989 the health and education ministries began to try out the use of radio for teaching disease prevention to schoolchildren, starting with a module on diarrhea prevention and oral rehydration. Children ages 8-13 were targeted because they often take care of younger siblings and perform household chores involving food preparation and sanitation. They thus have a strong influence on their own health and that of younger siblings. The radio health program emphasizes actions that a child can do for himself or herself or can do for or teach to a younger sibling. It rests on the belief that children who learn basic health concepts and practices at a young age are more likely to maintain them as parents.

It is still too early to assess the long-term health impact of teaching health lessons through radio. Nonetheless, pupils already show significant gains in several areas, including ability to recognize symptoms of dehydration and knowledge of the proper mixture and application of homemade oral rehydration solution. There is also evidence of increased hand-washing, and more households are using simple water filters.

The radio program is now being expanded. In 1993 more than 1,000 third- and fourth-grade classrooms will receive broadcasts of a new curriculum that includes lessons on cholera, personal and dental hygiene, acute respiratory infections, immunizations, infectious diseases, and accident prevention. Nutrition, environmental health, and self-esteem are to be added in 1994. In response to parents’ requests, a complementary community-based radio program is also being developed and tested.

health. More important, they also reduce parents’ willingness to enroll their children, thus perpetuating a vicious cycle of poor schooling and poor health. In India, for example, more than 40 percent of parents in a nationwide survey cited either “not interested in education/further study” or “failure” as the main reason for not sending their children to school.

Much more needs to be done to extend education in developing countries. Government support for schooling at the lower levels and for girls is especially justified: the benefits for society are large, and poor families in low-income countries typically undervalue the benefits of sending children to school or are unaware of them. In addition, for such families the opportunity costs of sending children to school are often high. A policy priority is to ensure that every child receives a minimum quantity of schooling—say, 5,000 hours, or roughly six full years of schooling. This would be consistent with the aims of the 1990 World Conference on Education for All, sponsored by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), UNICEF, the UNDP, and the World Bank. Most pupils in developing countries currently receive much less than 5,000 hours of schooling in the primary grades (because of pupil and teacher absences caused by sickness, among other factors). In India no more than a third of girls reach this level, and in China and Latin America only 60 percent do. Achieving 5,000 hours of schooling for all children will thus require significant and sustained policy effort in large parts of the world. To reinforce the effects of school expansion on health, it may be useful to include health topics in school curricula (see Box 2.2).

Incomplete enrollments reflect the combined influence of weak demand for education (which is partly caused by low achievement) and inadequate schooling opportunities. To overcome these obstacles requires a combination of policies. Governments can do more to ensure that lower levels of schooling receive priority in the allocation of public spending. In some countries, current levels of resources for primary schooling are insufficient to support even minimal conditions for instruction. In India public spending per primary pupil in relation to income per capita averages only one-third that in Korea, basically because much more of India’s public expenditure on education goes to higher education. In Burkina Faso, Mali, Mauritania, and Niger one-quarter of the education budget is for higher education, and between 60 and 80 percent of that quarter is devoted to scholarships and other forms of student aid. This, it can be argued, is inefficient, and it is also extremely regressive because most of the benefits of higher ed-
ucation are captured privately in the form of increased earnings and because students tend to come from higher-income families.

On its own, spending more resources for primary schools is not enough. Whatever is spent must also be used efficiently.

Although the health and nutrition of school-age children are not normally thought of as education issues, in fact they do affect a child’s school attendance and performance. Allocating resources to address health problems in this population can often be an efficient way to improve schooling. (Specific interventions are discussed in Chapter 4.) Teachers and pedagogical materials are the main school inputs at lower levels of schooling (with teacher salaries absorbing the bulk of spending). Efficient use of these inputs is thus crucial, particularly in countries where rapid population growth threatens to reverse progress in expanding enrollments. In Mauritania, for example, if spending per pupil and the share of primary schooling in total government expenditure remain constant, the enrollment ratio in primary schools is projected to drop from 51 percent in 1988 to 45 percent by 2000. To forestall such regress, maximizing the learning gain per unit cost and making the correct tradeoffs between unit costs and coverage are of particular importance. A recent World Bank-sponsored review found expenditures on nonsalary inputs such as textbooks and interactive radio instruction to be most cost-effective in improving learning outcomes.

In some circumstances it may also be right to spend more to lower the barriers to schooling for girls and other disadvantaged groups. This can be done in many ways: through scholarships (used in Bangladesh to encourage girls to go to secondary school); by offering free textbooks or fee-exemptions; or by siting schools close to pupils’ homes so that parents are less worried about their daughters’ safety. In Pakistan, for example, girls are as likely to enroll as boys when there is a school in the village but are 10 percent less likely to do so when the school is nearby but not in the village. In several African countries distance education—whereby radio and correspondence materials replace classroom teachers as the principal medium of instruction—has sometimes helped to overcome the physical barriers to schooling for girls.

Empowering women

In addition to education, other policies can enhance women’s capacity to improve their health and that of their families. Removing discrimination—in the labor market, in access to credit, in property law, and so on—can boost women’s earnings and financial security, which (as an earlier section has shown) can promote family health. And women need to be healthy themselves to fulfill their roles as mothers and household managers. They have specific health needs, including protection against violence. More than one-third of the global burden of disease for women ages 15–44, and over one-fifth of that for women ages 45–59, is caused by conditions that afflict women exclusively (maternal mortality and morbidity and cervical cancer) or predominantly (anemia, sexually transmitted diseases, osteoarthritis, and breast cancer). Most of these problems can be addressed cost-effectively, but health services in many developing countries have typically focused narrowly on women as mothers.

What is lacking is a strategy for engaging women in health care from adolescence onward. Often this failing occurs because health services are insensitive to the cultural needs of women: in many Middle Eastern countries, for example, most physicians are men, but there is a strong belief that women should not be seen after puberty by men who are not part of their family. Inconvenience is another deterrent; in many countries individual health services (for example, prenatal care and immunizations) are offered on different days, meaning that women have to return repeatedly with their children. The solution is often as feasible as it is clear: to provide child health services, prenatal care, treatment of sexually transmitted diseases, and family planning services jointly at convenient times. The Bangladesh Women’s Health Coalition and the Chilean Institute of Reproductive Medicine, for example, offer integrated family planning services at the same time as child health services, and Thailand is experimenting with mobile health clinics to reach women in their homes.

The design of health services must also be sensitive to the stigmas surrounding certain diseases, especially any that are sexually transmitted or physically disfiguring. Women are more likely to seek treatment for sexually transmitted diseases if health centers offer multiple services, with privacy in consultations, so that it is not obvious why a person is visiting the center. Diseases that damage the skin (such as leprosy, onchocerciasis, and leishmaniasis) have severe psychological implications for girls and women, reduce their marriage prospects, and may lead to marital separation. In Colombia and India women tend to seek treatment
Box 2.3  Violence against women as a health issue

Data from many industrial and developing countries reveal that anywhere between one-fifth and more than half of women surveyed say they have been beaten by their partners. Often, this abuse is systematic and devastating. In Papua New Guinea, for example, 18 percent of all urban wives surveyed had sought hospital treatment for injuries inflicted by their husbands. In the United States domestic violence is the leading cause of injury among women of reproductive age; between 22 and 35 percent of women who visit emergency rooms are there for that reason.

Research has shown that battered women run twice the risk of miscarriage and four times the risk of having a baby that is below average weight. In some places violence also accounts for a sizable portion of maternal deaths. In Matlab Thana, Bangladesh, for example, intentional injury during pregnancy—motivated by dowry disputes or shame over a rape or a pregnancy outside wedlock—caused 6 percent of all maternal deaths between 1976 and 1986. Research from the United States indicates that battered women are four to five times as likely to require psychiatric treatment as nonbattered women and are five times as likely to attempt suicide. They are also more prone to alcohol abuse, drug dependence, chronic pain, and depression.

Rape and sexual abuse also damage women’s health and are widespread in all regions, classes, and cultures. In Seoul 17 percent of women report being victims of attempted or actual rape. In one study of U.S. women a history of rape or assault was a stronger predictor of how many times women sought medical help and of the severity of their health problems than was a woman’s age or unhealthy habits (such as smoking). In addition to physical injury and emotional trauma, rape victims run the risk of becoming pregnant or contracting sexually transmitted diseases, including AIDS. A rape crisis center in Bangkok reports that 10 percent of its clients contract STDs as a result of rape and 15 to 18 percent become pregnant, a figure consistent with data from Korea and Mexico. In countries where abortion is restricted or illegal, rape victims often resort to unsafe abortions, greatly increasing the danger of infertility or even death.

Another form of violence against women and girls is female genital mutilation, popularly known as female circumcision. An estimated 85 million to 114 million women in the world today have experienced genital mutilation. The practice is reported in twenty-six African countries, among minorities in India, Malaysia, and Yemen, and among some immigrant populations in Western countries. If current trends continue, more than 2 million girls will be at risk of genital mutilation every year.

Clitoridectomies account for 80 to 85 percent of cases worldwide. Infibulation, which involves removal of more tissue, is more common in eastern Africa. These initiation rituals pose a health risk to girls and women and are a threat to their psychological, sexual, and reproductive well-being. The consequences of both procedures can include hemorrhage, tetanus, infection, urine retention, and shock. Infibulation carries the added risk of long-term complications because of the repeated cutting and stitching at marriage and with each childbirth, and it can limit a woman’s choice of contraceptive method.

for leprosy later than men do, when patches have already reached the face and hands; they are reluctant to ask for help when the first patches appear, on the buttocks. Again, sensitivity is needed to encourage women to come forward.

The same is true of another category of danger to women’s health: domestic violence and rape. Violence against women is widespread in all countries in which it has been studied (see Box 2.3). Although this has only recently been viewed as a public health issue, it is a significant cause of female morbidity and mortality, leading to psychological trauma and depression, injuries, sexually transmitted diseases, suicide, and murder. Rape and domestic violence cause a substantial and roughly comparable level of disease burden per capita to women in developing and industrial countries. These problems account for about 5 percent of the total disease burden among women ages 15–44 in developing countries, where the burden from maternal and communicable causes still overwhelms that from other conditions. In industrial countries, where the total disease burden is much smaller, this share rises to 19 percent. By damaging a woman’s physical, mental and emotional capacity to care for her family, domestic violence and rape also hurt the health of other family members, particularly young children.

This is an issue with complex economic, cultural, and legal roots, and it is therefore not easily dealt with by public policies. Prevention will require a coordinated response on many fronts. In the short to medium term, the right measures include training health workers to recognize abuse, expanding treatment and counseling services, and enacting and enforcing laws against battering and
rape. In the long term, much depends on changing cultural beliefs and attitudes toward violence against women. In Africa women’s groups have worked to break the practice of female circumcision, partly by informing people of its severe consequences for health. In the United States the American Medical Association launched a major campaign in 1991 to educate the public and physicians about family violence. Research shows that even health professionals often fail to identify cases of battering. Recently, the U.S. Joint Commission on Hospital Accreditation issued new standards requiring all hospitals to develop protocols and train their staffs to respond to different forms of abuse. In Colombia the Ministry of Health has begun to document the scale of the problem in its most recent Demographic and Health Survey. These efforts come on the heels of almost two decades of organizing efforts by women around the world; in Latin America alone there are now nearly 400 separate organizations working to reduce violence against women.

What can be done?

Around the world, much has already been done to enable people to live longer, healthier lives. The achievements of the past point to the requirements of the future—above all, to economic growth and the expansion of schooling and health services. According to World Bank projections, income per capita in Sub-Saharan African countries will grow by only 0.8 percent a year over the next ten years. Even this modest increase will bring about a decline in the infant mortality rate of between 2 and 4 percent. In South Asia, where faster growth—3.3 percent a year—is projected, infant mortality declines of 15 percent can be expected.

These benefits can be powerfully reinforced by better education and health services. In Africa increasing female literacy rates by 10 percent is likely to lower the infant mortality rate by an estimated 10 percent. In India and Kenya two maternal deaths and about forty-five infant deaths would be averted for every 1,000 girls provided with one extra year of primary schooling. Even in poor countries governments can enhance people’s ability to improve their own health by expanding schooling opportunities for all children—with special efforts to encourage parents to enroll their daughters—and by widening access to health services, particularly for women and children. Such investments pay off in better health and provide a foundation for future economic growth.