CHAPTER 3

Health, Education, Poverty, and the Economy

Learning Objectives

By the end of this chapter the reader will be able to:

- Describe the links between health and education
- Discuss the connections between health, productivity, and earnings
- Describe key relationships between health, the costs of illness, and the impact of health expenditure on poverty
- Discuss some connections between health and equity
- Describe some relationships between expenditure on health and health outcomes
- Differentiate between public and private expenditures on health
- Understand the use of cost-effectiveness analysis as one tool for making investment choices in health
- Discuss the two-way relationship between health and development

VIGNETTES

Savitha lived in a poor village in north India. When she first became sick, she visited an unlicensed "doctor." She did not recover and then went to a practitioner of Indian Systems of Medicine. After another two weeks of illness, she went to the outpatient clinic of the main hospital. By the time Savitha had begun to recover, she had spent $20 equivalent on health services and on the transport to get to them. She had also missed two weeks of work, during which she lost another $20 of income. The total cost of this illness was about 10 percent of Savitha's annual earnings.

Mohammed was in first grade in a small town in northern Nigeria. Mohammed's family was poor. Mohammed was very small for his age, was very thin, and got sick more often than most children. Because of his poor health, Mohammed was unable to attend school regularly and was forced to quit school after only one year. Unfortunately, he could not read or write, had little knowledge of how to work with figures, and was most likely destined for a life of limited job prospects at very low pay.

Birte was born in Denmark to a middle class family. She was exclusively breastfed until she was six months old, when appropriate complementary foods were introduced. Her family took her regularly for "well baby" check-ups and she received all of her scheduled childhood immunizations. Her hearing and her eyesight were checked before she enrolled in school. Birte attended school regularly, she was attentive in class, and she performed well there. She was able to complete high school and medical school and today is a physician.

ABC company was looking for investments in forest products and examined in detail the possibility of investing in Africa. After carefully considering the potential costs and returns to such an investment, the company decided, however, not to invest in Africa but to invest instead in Asia. In the end, the company believed that they were unlikely to make an acceptable profit on any business in Africa because so many of their workers would be infected with HIV and malaria.

INTRODUCTION

Health and economic matters are intimately linked in a number of ways. First, health is an important contributor to people's ability to be productive and to accumulate the knowledge and skills they need to be productive, known as "human capital." Second, health status is also a major determinant of one's enrollment in and success in school,

which itself is an important contributor to future earnings. Third, the costs of health care are also extremely important to individuals, especially to poor people, because large out of pocket expenditures can have a major impact on their financial status and can push them into poverty. Fourth, the costs of health care are also very important to countries, because health is a major item of national expenditure in all countries. Finally, the approach that different countries take to the financing and carrying out of health services raises important issues of equity.[1]

The objective of this chapter is to help you gain an introductory understanding of the two-way relationship between health and development. The chapter examines the connection between health and education. It then reviews the link between health and poverty and health and equity. Lastly, the chapter explores the link between health and income at the level of individuals and the connections between health and development more broadly. As it reviews these themes, the chapter will introduce you to some of the basic concepts of both global health and of health economics.

Health and Education

Essentially, there are three ways that health and education are connected. First, there are intergenerational links; the health and education of parents affects the health and education of their children. Second, malnutrition and disease affect the cognitive development and school performance of children. Lastly, education contributes to the prevention of illness.

The AIDS epidemic worldwide shows how the poor health of one generation can affect the schooling prospects and future earnings of the next generation. When mothers die of HIV, for example, children are more likely to be poorly fed, malnourished, and in ill health. As a result, they are also more likely to attend school less frequently and to perform poorly in school when they are there. During the period that a mother is sick with AIDS, it is also likely that one or more of her children will stay out of school to attend to the mother's health and the chores that the mother is no longer able to do.

Malnutrition or illness can limit schooling and school performance in a number of ways. First, families sometimes delay the enrollment of a sick or malnourished child in school. In addition, malnutrition and illness can also reduce attendance at school and, thereby, reduce an individual's performance in school. Malnutrition and illness can also decrease mental ability. All of these factors ultimately constrain what children will learn in school, decrease the number of years of schooling they complete, and, thereby, reduce future earnings.

However, there is also a powerful connection between health and education in the other direction—the impact of education on health. We already know that education and knowledge of appropriate health behaviors are important determinants of health and, indeed, that the education of a child's mother is an important predictor of the health of a child. Studies like one done in Guatemala have consistently shown, in fact, that the higher the level of education of a mother, the more likely she is to immunize her child, as noted in Figure 3-1.[2]

Another study done in the Philippines illustrated how better educated mothers are able to keep their children healthy, even in locations without a safe water supply.[3] In a study of a large number of developing countries, it was shown that every 10 percent increase in the level of education of mothers led to a reduction in the infant mortality rate by 4.1 deaths for every 1,000 live births.[3] In addition, there is evidence from many countries that education affects the extent to which people make use of health services and better education discourages people from engaging in unhealthy behaviors. This will be referred to in a number of places in this book.

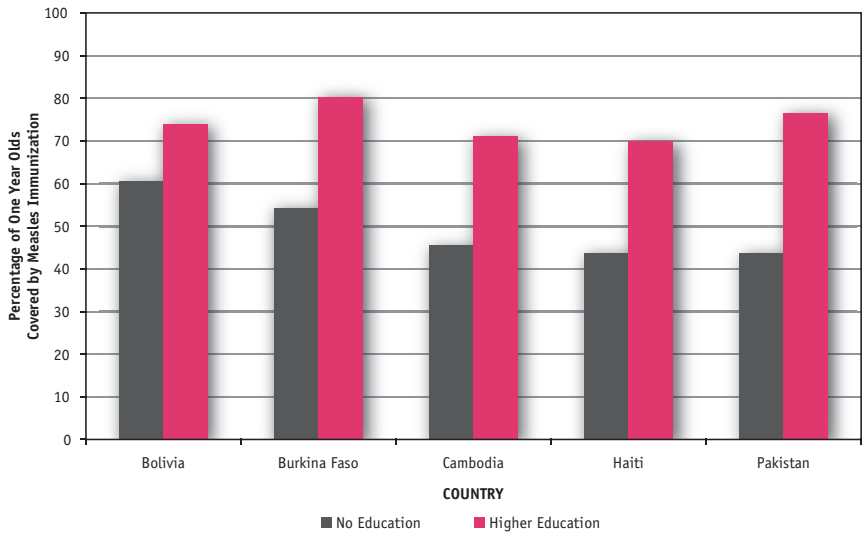
HEALTH, PRODUCTIVITY, AND EARNINGS

Health has an important impact on labor productivity and earnings, separate from its link with education. First, good health increases longevity and the longer that one lives, the longer one can earn and the higher one's lifetime earnings. Second, a number of studies have shown that healthy workers are more productive than unhealthy workers. Among the most cited of such studies was one done on men who tapped rubber trees in Indonesia, many of whom were anemic due to hookworm infection. When the workers were treated for their infections, they became less anemic and their productivity increased by about 20 percent.[4] Third, many people when ill cannot go to work, and when they are absent from work, they often do not earn.

Health, the Costs of Illness, and Poverty

The costs of illness to individuals and their families can be high, can force them to lose or dispose of assets, and can cause them to fall into poverty. When people become ill in poor countries, as noted in the vignette about Savitha at the start of this chapter, they usually do seek health care and they often seek care of different types. They frequently have to pay for treatment and for drugs, the costs of which can be a very substantial share of their income. In addition, illness often leads to a decline in earnings, because people miss work. There are also other indirect costs that people bear when

FIGURE 3-1 Percentage of One Year Old Children Receiving Measles Immunization, by Mothers with No Education and Mothers with Higher Education, for Selected Countries



Data from WHO Statistical Information System (WHOSIS). Available at: http://www3.who.int/whosis/core/core_select_process.cfm. Accessed July 10, 2006.

they are ill, such as the costs of transportation to and from a health service provider.

Beyond the costs of either a short-term or a chronic illness, we must also remember the cost to individuals of living with the disability that comes from different health conditions. Measles or meningitis, for example, could lead to severe disability. Polio can lead to paralysis, and leprosy can lead to deformity. A number of mental health conditions are associated with long-term disability, as discussed further in chapter 12. There is an increasing number of people with diabetes in rich and poor countries alike, and diabetes is often associated with a variety of disabilities. Long lasting disabilities generally require considerable expenditure on health services. They usually also lead to a significant decline in the earnings of the disabled person, compared to what they could earn if they were not disabled.

The costs of illness can be devastating for poor families. A study done in Bangladesh, for example, showed that a Bangladeshi lost the equivalent of four months of income from getting TB.[5] Surveys done in India showed that hospitalization was a major contributor to people and families falling into poverty. Of the patients who were hospitalized at some time during a one-year period that was surveyed, almost 25 percent of the people hospitalized were pushed below the official Indian poverty line because of the costs of their hospitalization, related expenditures, and lost wages. Moreover, more than 40 percent of those hospitalized borrowed money or sold assets to pay for their health care.[6]

Indeed, in a study of the poor that was carried out as a background to the preparation of the 2000 World Development Report of the World Bank, the poor consistently noted the importance to them of maintaining good health. In addition, that report noted that ill health is an important contributor to poverty and to the economic vulnerability that also is at the foundation of poverty problems.[7] Indeed, we know that a certain segment of the population in many countries that do not have adequate health insurance are at risk that catastrophic costs of health care will drive them to poverty or bankruptcy. In Chapter 5, you will read about how different health systems try to protect the poor from the costs of health care.

HEALTH AND EQUITY

There are a number of equity issues that arise when considering global health matters, especially when examining the health, social, and economic status of poor people, disadvantaged ethnic groups, and women. The most important of these are access to health services, the manner in which

health systems are responsive to the needs of people, and the extent to which the financing of health systems is fair, when taking the income of the health system users into account.[8]

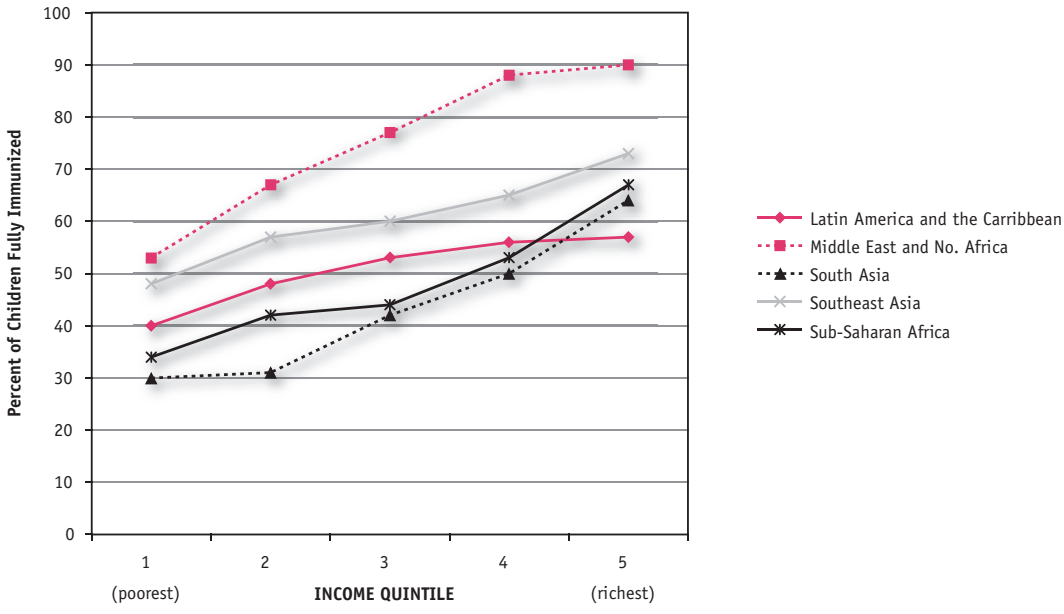
One important theme that runs throughout this book is the fact that poor people, disadvantaged groups such as poor ethnic minorities, people who dwell in distant locations from health services, and women often have less access to health services than do better off groups. Sometimes, especially for the poor and for minority groups, this reflects the fact that there are fewer health services available in the areas in which they live because those places may be distant from larger towns and cities. We would expect, for example, in most countries, that rural areas will have fewer health services than urban ones. If we look at the Andean region, for example, we will see that indigenous groups often live in highland areas that are relatively lacking in health services compared to more urban areas. The same would be true in the mountainous areas of Asia, such as in Nepal, in which the western part of the country has an extraordinarily limited supply of health services and people may have to walk for days to access health services.

A related issue, however, is that the poor, women, and other groups that lack social and political power or "voice" generally seek and are accorded less access to health services than those who are better off, more powerful politically, and have more voice in the allocation of resources.[7] Figure 3-2, for example, shows the coverage of basic childhood immunization, by income group, in a set of selected countries.

As you can clearly see, the higher the income of the child's family, the greater is the likelihood that the child will be immunized. This pattern will be common in almost all low- and middle-income countries.

All better off countries, except the United States, have some type of mandatory and universal health insurance system that is meant to ensure that access to health services is not dependent on income. Many middle-income countries also have such insurance systems. However, most low-income countries do not have formalized health insurance systems, outside of the free or low cost provision of some health services by the public sector or nongovernmental sectors. Thus, many low income countries fail to protect their poor from potentially catastrophic health costs that higher income individuals could afford. In addition, the

FIGURE 3-2 Immunization Coverage Rates by Income Quintile, for Selected Countries, by Region, 2000



Data from Davidson R. Gwatkin and Garima Devashwar-Bahl. Immunization Coverage Inequalities: An overview of Socio-Economic and Gender Differentials in Developing Countries. Washington, DC: The World Bank: September 2001.

relative cost of those health services is much greater for the poor than for better off people, which also raises important equity issues.

Another set of important equity concerns that is related to the financing of health deals with the question of the extent to which different income groups benefit from public subsidies for health services. This can be a complicated issue to assess.[6] Nonetheless, it is clear that there are many countries in which public subsidies for health are disproportionately received by better off people, as shown in Figure 3-3, for India.

It is easy to imagine, for example, a country, in which poor people use basic health services that are financed by the public sector which are relatively inexpensive, while better off people in the urban areas disproportionately use publicly supported hospital services that are relatively expensive. Under these circumstances, better off people, who will have higher rates of chronic disease, will get most of the expensive surgeries, those surgeries will cost hundreds of times what basic health care costs, and the country would be providing a disproportionate share of public subsidies to the better off, rather than to the poor. There is no justification on clinical, economic, or equity grounds for this being the case.

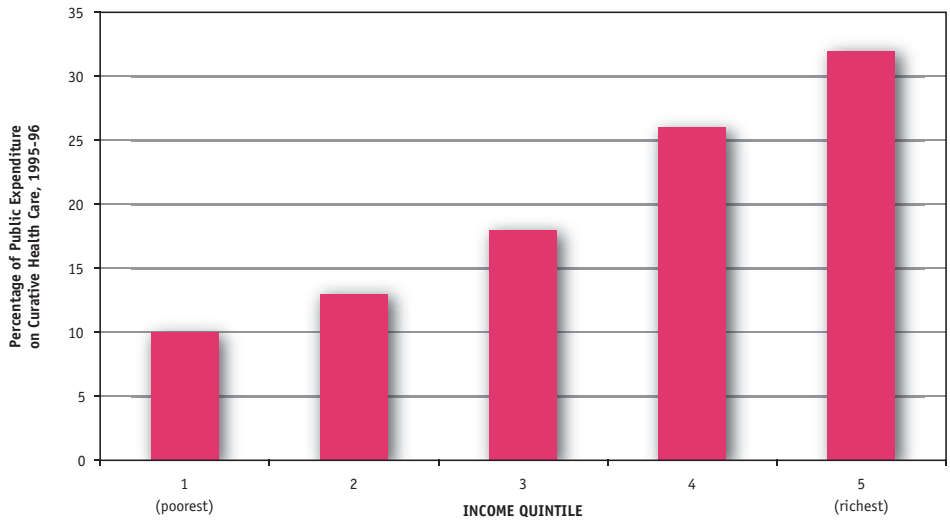
HEALTH EXPENDITURE AND HEALTH OUTCOMES

One of the reasons why health is so important to countries is that they spend a lot of money on it. In addition, as noted earlier, they are also trying, in principle, to get the most for the money they spend, consistent with national values. Figure 3-4 shows the relationship between gross domestic product (GDP) per capita and health expenditure as a share of GDP.

The main themes that emerge from this figure are clear:

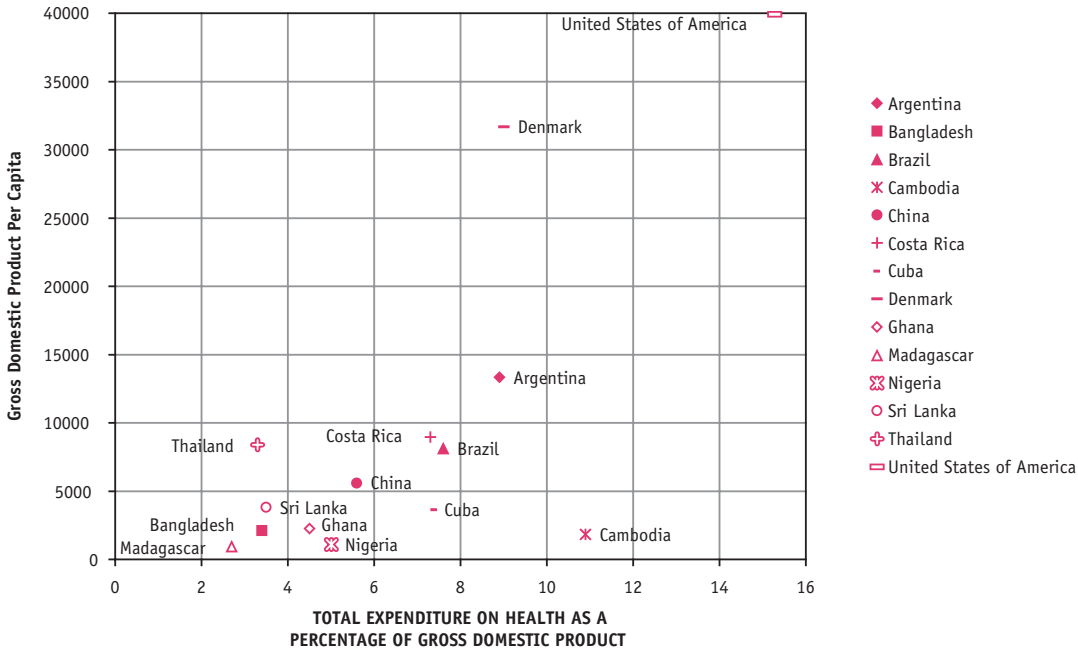
- There is an almost linear relationship between the level of income of a country and the share of public expenditure that a country spends on health. The higher a country's income per person, the more money it is likely to spend per person on health.
- Most high-income countries cluster around an expenditure of 9 to 12 percent of their national income on health.
- Most countries that are low-income cluster around an expenditure of 3 to 6 percent of their national income on health. This can be seen in the figure in Bangladesh, Ghana, and Nigeria.
- Despite the clustering, there are countries that are outliers and that sit significantly away from the normal relationship between income per capita and

FIGURE 3-3 Percentage Distribution of Public Expenditure on Curative Health Care, India, by Income Quintile



Modified from Peters DH, Preker AS, Yazbek AS, et al. Better Health Systems for India's Poor. Washington, DC: World Bank; 2002:4.

FIGURE 3-4 National Income and Health Expenditure, Selected Countries, 2003/2004



Data from World Health Organization. Core Health Indicators, 2006. Available at: http://www3.who.int/whosis/core/core_select_process.cfm. Accessed July 8, 2006.

percentage of national income spent on health. The United States spends more than any other country on health as a share of GDP. Cambodia and Cuba spend relatively more than one would expect for countries with their income.

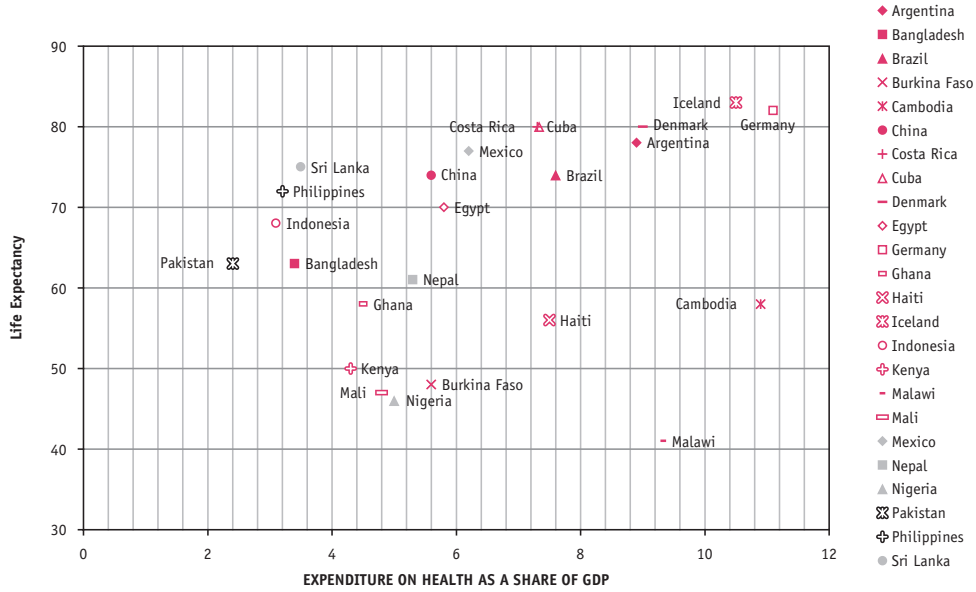
- Having seen what countries spend on health, it is now important to ask what they get in return for that expenditure. Do countries that spend higher shares of their national income on health have better health outcomes? Figure 3-5 plots health expenditure as a share of GDP against life expectancy for selected countries.

We can see from this figure that:

- Many low-income countries spend a relatively low share of their GDP on health and also have low life expectancy. This is seen in Ghana, Kenya, and Mali.
- Most high-income countries spend a relatively high share of their GDP on health and have high life expectancy. This can be seen from Germany and Iceland.
- Some low-income countries spend relatively little on health but still have relatively higher life expectancy than many countries that spend a lower share of GDP on health. This can be seen in Cuba, Costa Rica, China, Sri Lanka, and Thailand.
- Some high-income countries spend relatively high shares of GDP on health but still have lower life expectancy than countries that spend a lower share of GDP on health than they do. This is best shown by the United States, which is an outlier on this figure as well as on the figure that portrays public expenditure on health as a share of GDP.

Why is it that some countries are outliers when considering their health outcomes related to health expenditure? First, we know that health status depends on a number of genetic, social, and economic factors and those factors vary across countries. Second, however, health outcomes depend not only on how much expenditure countries make per capita on health, but they also depend on the particular investments they make with that money. In colloquial terms we could

FIGURE 3-5 Expenditure on Health as a Share of GDP, Compared to Life Expectancy, Selected Countries, 2003/2004



Data from World Health Organization. Core Health Indicators, 2006. Available at: http://www3.who.int/whosis/core/core_select_process.cfm. Accessed July 18, 2006.

say, "It is not just how much money per capita they spend on health, but it is also how they spend it that is important." This theme will be explored throughout this book.

PUBLIC AND PRIVATE EXPENDITURE ON HEALTH

Another important concept is the distinction between public and private expenditures on health. Public expenditure refers to expenditure by the any level of government or of a government agency. Expenditure by a city government, a state government, or a national government would be public expenditure. Expenditure on health by government agencies such as a social security system, as in many countries in Latin America, the national insurance agency, as in most countries in Western Europe, or of a specialized agency, such as a National Commission on HIV/AIDS, would also be considered public expenditure.

Private expenditure is that expenditure that comes from sources other than governments. One such source is the money that individuals spend on health. When this money is not covered or reimbursed by an insurance program, it is also called out of pocket expenditures on health. Other sources of private expenditure on health include expenditure by non-governmental organizations, such as by the Bangladesh Rural Advancement Committee or the Self Employed Women's Association in India. In addition, private expenditure on health includes expenditure by the private for-profit sector. Private sector firms, for example, might contribute to the cost of health insurance or health services for their employees. They might also make contributions to the health work of other organizations.

There is some debate about what are legitimate focuses of public expenditure on health.[9] However, there is widespread agreement that public expenditure on health is warranted when the investment benefits society as a whole, such as an immunization program, when health investments promote equity, and when such expenditure provides financial protection to the poor from expenditures on health that they cannot afford.[9]

THE COST EFFECTIVENESS OF HEALTH INTERVENTIONS

Most governments have a limited amount of money for health, and that money is rarely enough to finance all of the health interventions that a country would like to carry out. Thus, governments have to decide what share of their total budget will go to health and how much of the health budget

will be allocated to different health interventions. All governments have to set priorities for expenditure on health, just as they have to set priorities for expenditure in other sectors.

One important tool for setting priorities for public expenditure on health is cost-effectiveness analysis. This is a method for comparing the cost of an investment with the amount of health that can be purchased with that investment. The cost of the investment can be thought of as the price of the investment. The amount of health that can be purchased could be measured in life years saved or DALYs. The cost-effectiveness of an investment in health will depend, among other things, on the incidence and prevalence of the health condition being considered, the cost of the intervention, the extent to which it can reduce morbidity, mortality, and disability, and how effectively it can be implemented.

One important example of the use of cost-effectiveness analysis is to set priorities among different ways of achieving the same health goal. Important studies were conducted, for example, on the cost-effectiveness of alternative approaches to treating tuberculosis. These studies examined the cost-effectiveness of six months of treatment with direct supervision of people taking their medicines, compared to treatment that was not supervised. The supervised method led to a higher rate than the unsupervised approach of people taking all of their medicine and being cured. As a result, it proved to be more cost-effective than the traditional approach that had been used. Based on these studies, the World Health Organization recommended the supervised approach to therapy, which continues to be the global standard of TB treatment.[10]

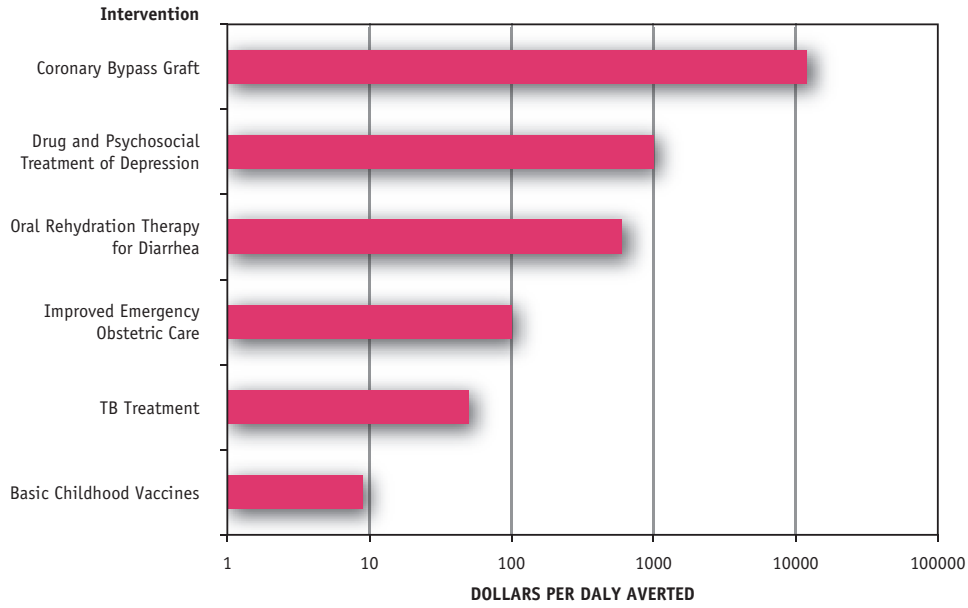
It is easy to imagine how important this type of cost-effectiveness analysis can be when considering different ways of delivering the same health services. In fact, there are many important issues in delivering health services in low-income countries in which such questions remain critical. In Haiti, for example, there is a program operated by Partners in Health. Those operating the program had to assess whether or not the services would be delivered as effectively by volunteer workers as they would be by workers who were paid a small amount for their efforts. Although it cost more to deliver the program when the workers were paid, the outcomes were superior to those when the workers were not paid, and Partners in Health has continued to use the approach of paid workers.[11] Another issue of great importance today is the extent to which antiretroviral drugs for HIV can be delivered effectively by nurses and community health workers, instead of physicians, because physicians are in such short supply in many countries that have high rates or prevalence of HIV. This question is one of many concerning the delivery of services for HIV that is in need of careful cost-effectiveness analysis.

The second manner in which cost-effectiveness analysis is used is to compare the costs and the gains of different health interventions so that investment choices can be made among them. For every $100, for example, that a government has to spend on health, what allocation of government expenditure on health will buy the most DALYs averted? What is the cost per disability adjusted life year saved from different interventions? In a relatively poor country, with a high burden of infectious diseases, such as TB and malaria, is it more cost-effective to invest in infectious disease control or in coronary bypass surgery? In a richer country, will it be cost-effective to invest in vaccination against TB?

Even if we examine the first question above in a somewhat exaggerated and simplistic manner, it will still help us to understand some of the value of cost-effectiveness analysis. Let us say, for example, that the cost of coronary bypass surgery in a low-income country is about $5,000. Let us also say that the costs of such surgery are covered completely by the public sector. This surgery would benefit one individual, who will live an additional 20 years in perfectly good health because of the surgery. In the same country, we can assume an entire course of treatment for TB costs about $50. In addition, we can assume that people who get TB will all be 40 years of age and that they will live an additional 20 years in perfectly good health if they are treated for TB. What this means, in principle, is that if these were the only choices for the investment of $5,000 in health that a country faced and that if this were the only type of analysis that would be done to assess investment choices, then the choice would be between saving one life or saving 100 lives. In addition, the choices would be between saving 20 additional years of healthy life of the coronary bypass patient or 2,000 additional healthy years of life of the TB patient. Table 3-6 illustrates the cost-effectiveness of a selected number of health interventions.

One can see in the figure that the cost of avoiding ill health caused by TB, malaria, and hookworms, for example, is low, while the cost of saving a life through cancer treatment is high. It is very cost-effective to get people to use seat belts in cars, but much less cost-effective to save the lives of people after they have had car accidents. As discussed further in chapter 8, it is cost-effective to enhance the nutritional and health status of young children through supplementation with Vitamin A. However, it is much less cost-effective in health centers and hospitals to deal with the additional morbidity and mortality that occur from measles and pneumonia for children who are deficient in Vitamin A.[12]

FIGURE 3-6 Cost per DALY Averted in US$ for Selected Health Interventions in South Asia



Data from Laxminarayan R, Chow J, Shahid-Salles SA. Intervention Cost Effectiveness: Overview of Main Messages. In: Jamison DT, Breman JG, Measham AR, et al., eds. *Disease Control Priorities in Developing Countries.* Washington, DC: Oxford University Press and the World Bank; 2006:51.

It is important to note that cost-effectiveness analysis is rarely the sole means for determining choices among investments and generally should not be used in that way.[13] However, it is one valuable tool in making such choices. It will always be important, however, to consider such analyses in light of a number of other factors, including:

- Equity considerations
- The burden of disease
- The extent to which the investment serves society as a whole
- The extent to which the investment produces benefits that are additional to its usual ones
- The impact of the intervention on the provision of insurance

In addition, those who set priorities for health investments will also have to take account of:

- The capacity to deliver the proposed services
- The links between the proposed services and other important services
- The ability to change budget priorities in favor of the proposed investment
- Any transitional costs associated with making the proposed changes in priorities

In this book, most of the assessments of cost-effectiveness will relate to DALYs averted. This is because examining the cost of life years saved from death would fail to capture the morbidity and disability that are also important aims of health interventions. In addition, it is important to note that there is no unique cut-off, below which interventions are "cost-effective" and above which they are not. Rather, it is preferable to group the cost-effectiveness of different interventions into ranges and to use cost-effectiveness analysis to explore the relative extent to which various interventions will lead to DALYs averted. In other words, it is not so important to think of TB control as cost-effective, *per se,* as it is to understand that in a county with a high prevalence of TB, control of TB using directly observed therapy will be one of the most cost-effective investments in health that can be made.[14]

HEALTH AND DEVELOPMENT

An important question at the core of thinking about global health concerns the links between health and development,

at the individual, community, and society levels. Does individual health produce more individual wealth and higher levels of economic development at the community and societal levels? Or, are the effects in the opposite direction: does more economic development at the level of society produce better health for individuals, communities, and societies? What we find when we examine these questions is that the effects of health and development go in both directions.

There is no question that good health promotes economic development at the level of societies. First, we know that when countries have to spend money to address health problems, they cannot use that money for other purposes. Countries that have to spend substantial resources treating malaria, for example, have less money to spend not only on other areas of health, but also on schools, roads, and other investments outside of the health sector that could spur economic growth.

In addition, investment in economic activities, by local and foreign investors, is an essential ingredient to the economic growth prospects of low-income countries. Yet, as seen in one of the vignettes that opened this chapter, countries that have high burdens of communicable diseases do not appear to be good investment choices. In fact, in a study of the impact of malaria on economic development that is frequently cited, it was found that "a high prevalence of malaria is associated with a reduction of economic growth of 1 percent per year or more."[15]

There is also growing evidence of the importance of health to economic development from a number of other studies done by economists. Some have shown that higher life expectancy at birth is associated with faster economic growth rates. These studies suggest that a country with a life expectancy at birth of 77 years would be expected to grow economically 1.6 percent faster each year than a country with a life expectancy at birth of 49 years.[16] Another study showed that poor health was an important contributor to the slow pace of economic growth in Africa, compared to other countries with better health.[17] Another series of studies showed that improvements in nutritional status and related health status improvements were very important historically in boosting labor productivity and spurring economic growth in the United Kingdom and Europe.[12, 18-20]

It is also true that higher levels of economic development do promote better health at the level of both individuals and of society. In fact, studies that have been done on the impact of income on the health of different societies suggest that higher income is associated with better health and longer life expectancy.[21] However, more recent analyses of this question suggest that while income growth is associated with better health indicators for a country, the effect of income alone on health indicators is less than previously thought. Rather, these analyses suggest that a considerable share of the improvements in health indicators stem from technical progress such as the development of new vaccines or new drugs, or simple life saving approaches such as the use of oral rehydration for young children with diarrhea, rather than stemming from income growth.[22]

In this light, we should ask: is income growth necessary or sufficient for enhancing health status at the individual, community, or societal levels? Over the long run, increases in income will improve health. However, they will not improve it fast enough in most settings to achieve the health status objectives that many countries have set for themselves or that are necessary to achieve the MDGs in the time that has been set for them. What low- and middle-income countries must do, therefore, is adopt public policy choices that will allow them to speed the achievement of their health aims, even in the face of constrained income, as Kerala did. As indicated earlier, and as will be repeated throughout the book, this is the approach that has been taken by the small number of countries that have been particularly successful in meeting their health aims.

THE COPENHAGEN CONSENSUS

The importance of good health to economic development *has* increasingly been recognized. A panel of economic experts was convened in 2004 to try to identify the most cost-effective investments that would advance global welfare. Their work was referred to as "The Copenhagen Consensus," and Table 3-1 below indicates the rank order of the investments that they considered. Of the four investments that were ranked as "very good," three were investments in health: treatment for HIV/AIDS, micronutrient supplementation, and control of malaria. Five investments were ranked as "good," and the first among them was to combat malnutrition by developing new agriculture technologies. Four investments were ranked "fair." The second and third of these were addressing malnutrition through improving infant and child nutrition and reducing the prevalence of low birth weight. The fourth was the scaling up of basic health services. The economists who forged the Copenhagen Consensus were clearly convinced of the important link of health to development, the relatively inexpensive ways of addressing a number of key health concerns, and the high returns that would come from doing so.[23]

CASE STUDY

Having read about the high returns to some investments in health and the need to prioritize investments in health, it will

TABLE 3-1 The Copenhagen Consensus 2004

Very good projects	Fair projects
1. **Diseases:** Control of HIV/AIDS	10. **Migration:** Lowering barriers to migration for skilled workers
2. **Malnutrition:** Providing micronutrients	11. **Malnutrition:** Improving infant and child nutrition
3. **Subsidies and Trade Barriers:** Trade liberalization	12. **Malnutrition:** Reducing the prevalence of low birth-weight
4. **Diseases:** Control of Malaria	13. **Diseases:** Scaled-up basic health services
Good projects	**Bad projects**
5. **Malnutrition:** Development of new agricultural technologies	14. **Migration:** Guest-worker programs for the unskilled
6. **Water and Sanitation:** Small-scale water technology for livelihoods	15. **Climate:** Optimal carbon tax
7. **Water and Sanitation:** Community-managed water supply and sanitation	16. **Climate** The Kyoto Protocol
8. **Water and Sanitation:** Research on water productivity in food production	17. **Climate:** Value-at-risk carbon tax
9. **Governance and Corruption:** Lowering the cost of starting a new business	

Source: Copenhagen Consensus 2004 http://www.copenhagenconsensus.com/default.aspx?ID=158, Accessed on July 8, 2006

be valuable to end this chapter with a case study of another public health success story. This one concerns guinea worm.

The Challenge of Guinea Worm in Asia and Sub-Saharan Africa

Background

Dracunculiasis, or Guinea worm disease, is an ancient scourge that once afflicted much of the world. Today, it is truly a disease of the poor, persisting in many of the world's most remote and disadvantaged regions with limited access to potable water, despite being one of the most preventable parasitic diseases. In the 1980s, an estimated 3.5 million people in 20 countries in Africa and Asia were infected with Guinea worm disease, and an estimated 120 million were at risk of becoming infected.[24]

The disease is contracted by drinking stagnant water from a well or pond that is contaminated with tiny fleas that carry guinea worm larvae. Once inside the human, the larvae can grow up to three feet long. After a year, the grown female worm rises to the skin in search of a water source to release her larvae. A painful blister forms, usually in the person's lower limbs. To ease the burning pain, infected individuals frequently submerge the blister in water, causing the blister's rupture and the release of more larvae into the water. This contaminated water, when it is drunk, perpetuates the cycle of reinfection. Worms, usually as wide as a match, can take up to 12 weeks to emerge from the blister. They are coaxed out by being slowly wound around a stick a few centimeters each day. Debilitating pain from this process can linger for as long as 18 months.

Although rarely fatal, the disease takes a heavy toll by causing low productivity that makes it both a symptom and perpetrator of poverty—in Mali, it is called the "disease of the empty granary." Because water in contaminated ponds is widely consumed during peak periods of cyclical harvesting and planting, an entire community can be left debilitated and unable to work during the busiest agricultural seasons. The economic damage is severe: annual economic loss in three rice-growing states in Nigeria was calculated at $20 million.[25] While the disease afflicts all age groups, it particularly harms children.[25] School absenteeism rises when infected children are unable to walk to school and when children forego school to take on the agricultural and household work of sick adults.

The likelihood of a child in Sudan being malnourished is more than three times higher when the adults in the child's home are infected with the disease.

The Intervention

In 1980, when The US Centers for Disease Control and Prevention (CDC) first proposed an eradication campaign, the three interventions that would be required to address the disease effectively did not seem feasible: construction of expensive water sources; controlling the vector that spread the disease through the use of larvicides in water sources; and health education campaigns promoting the filtration of water with a cloth filter, self-reporting of infestations, and avoidance of recontamination of public water sources. The absence of a vaccine or cure made success seem even more improbable.

The International Drinking Water Supply and Sanitation Decade was launched the following year, however, and CDC's Dr. Donald Henderson seized the opportunity to include the eradication of Guinea worm disease as a subgoal of the Water Decade program. Nonetheless, progress against Guinea worm disease work remained slow until 1986, when three key events occurred: WHO declared eradication of Guinea worm disease a goal, public health ministers from 14 African nations met to affirm their commitment to the eradication effort, and US President Jimmy Carter became a powerful advocate, personally persuading many leaders to launch national eradication efforts. He also recruited the help in the eradication program of two former popular heads of state of Mali and Nigeria, General Touré and General Gowon, respectively, thereby consolidating political commitment in Africa.

Meanwhile, technical and financial resources of the donor community were marshaled, and by 1995, eradication programs had been established in 20 countries. Water sources were provided, mainly through the construction of wells; in southeast Nigeria alone, village volunteers hand-dug more than 400 wells.[26] Larvicide was added to water sources to kill the fleas. People were taught to filter drinking water using a simple cloth filter. However, these filters were found to clog up and were used as decoration items instead.[25] A newly developed nylon cloth was then donated by the Carter Center, Precision Fabrics, and DuPont. Public education campaigns, including intensive efforts during so-called worm weeks, encouraged people to use the nylon filters, avoid recontaminating ponds, and report infestations.[27] Most of the eradication staff were volunteers trained by the ministries of health, but they pioneered a monthly reporting system for tracking and monitoring that is now hailed as a model for disease surveillance.[28]

The Impact

The campaign led to a 99 percent drop in Guinea worm disease prevalence. In 2005, fewer than 11,000 cases were reported, compared with an estimated 3.5 million infected people in 1986. By 1988, the campaign had already prevented between 9 million and 13 million cases of Guinea worm disease.[29] The Asian countries that were targeted, India, Pakistan, and Yemen, are now free of the disease. Most remaining cases are in Sudan where civil conflict impeded progress against the disease over many years.

Costs and Benefits

The total cost of the program between 1986 and 1998 was $87.5 million, with an estimated cost per case averted of $5 to $8.[29] The World Bank determined that the campaign has been highly cost-effective and cost-beneficial. In addition, the program had a very high economic rate of return, even when basing the calculation of economic benefits only on increases in agricultural productivity that accrued from people having avoided the disease.[29]

Lessons Learned

Success of the program has been attributed to three factors. The first is the exemplary coordination between major partners and donors. The second is the power of data, gathered through the monthly reporting system, to monitor national programs and to help keep countries focused and motivated on the program goals. The third is the high-level advocacy and political leadership from current and former heads of state, especially President Jimmy Carter and General Gowon, who visited and revisited villages in Nigeria to check on progress. The program drew on a truly global partnership between CDC, UNICEF, WHO, the Carter Center, governments, NGOs, the private sector, and volunteers that was able to motivate changes in individual and community behaviors and successfully control a disease.

MAIN MESSAGES

The aim of this chapter was to introduce you to some of the basic concepts of economics as they relate to the global health arena. One important message of the chapter is that education and health are closely linked. Good health encourages the enrollment of students in school at the appropriate age, enhanced student attendance at school, better cognitive performance of students, and more completed years of schooling. Education and knowledge are consistently correlated with people's engagement in more appropriate health behaviors and living healthier lives than those with less schooling. In addition, education promotes

greater opportunities for income earning, which itself is an important determinant of health.

We also learned that health is strongly associated with productivity and earnings. Healthier people can work harder, work more hours, and work over a longer lifetime than can those who are less healthy. Related to this in many ways, we also saw that health has an important relationship with poverty. If people work fewer hours because of ill health, then there is a risk that their income status will decline, perhaps below the poverty line. In addition, there is evidence from many countries that the direct and indirect costs to people of getting health services can itself push people into poverty.

Health is an important subject for all countries for many reasons, among the most important of which is the amount of money they spend on health. High-income countries spend more money on health than do low-income countries. However, health outcomes depend not just on how much money is spent, but also on how the money is used. One way that countries set priorities for health expenditure is by using cost-effectiveness analysis, a tool that is used in the health sector to compare how much health one can buy for a given level of expenditure. All countries, of course, face the question of how they can maximize the health of their population for the minimum cost.

There are also many strong relationships between the health of a population and the economic development of the society in which they live. Better health does promote wealth in a variety of ways, including enhancing labor productivity, reducing the amount countries have to spend on health, and enabling a more attractive investment climate. In addition, the negative impact of some diseases on economic development, such as TB, HIV, and malaria can be very significant. Economic development does improve health; however, many gains in health stem from technological progress, such as on vaccines, and low-income countries in particular have to develop approaches to improving health that will promote better population health faster than economic development alone will do.

Study Questions

1. How does poor health status impact a person's income?
2. What is the relationship between health and the productivity of individuals?
3. Why might the health of some culture groups be different from the health of others?
4. What is the relationship between a country's expenditure on health as a share of national income and its health status?
5. In your country, is expenditure on health from the public sector, private sector, or both?
6. In using cost-effectiveness analysis, why should you also take into account issues such as equity?
7. How could you ensure that public subsidies on health care appropriately benefit the poor?
8. Does "health make wealth," or does "wealth make health?"
9. Why would Guinea worm disease have remained so prevalent for so long?
10. What impact would the health status of a country have on the likelihood that people will invest in economic activity in that country?

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[i] This section is based on the report of the Copenhagen Consensus: http://www.copenhagenconsensus.com/Default.aspx?ID=675, accessed May 29, 2006.