MICHAEL P. TODARO
STEPHEN C. SMITH

ECONOMIC DEVELOPMENT

Pearson

THIRTEENTH EDITION

Human Capital: Education and Health in Economic Development

8

8.1 The Central Roles of Education and Health

Education and health are basic *objectives of development;* they are important ends in themselves. Health is central to well-being, and education is essential for a satisfying and rewarding life; both are fundamental to the broader notion of expanded human capabilities that lie at the heart of the meaning of development (see Chapter 1). At the same time, education plays a key role in the ability of a developing country to absorb modern technology and to develop the capacity for self-sustaining growth and development. Moreover, health is a prerequisite for increases in productivity, and successful education relies on adequate health as well. Thus, both health and education can also be seen as vital *components of growth and development*—as inputs to the aggregate production function. Their dual role as both inputs and outputs gives health and education their central importance in economic development.

It is hard to overstate how truly dramatic the improvements in world health and education have been. In 1950, some 280 of every 1,000 children in the developing world as a whole died before their fifth birthday. By 2011, that number had fallen to 69 per 1,000 in low-income countries, 49 per 1,000 in lower-middle-income countries and 14 per 1,000 in upper-middle-income countries (now compared to 5 per 1,000 in high-income countries, and just 3 or less in many European countries).[1] Some important killers have been completely or nearly eradicated. Smallpox used to kill more than 5 million people every year; the virus no longer exists outside a few laboratory samples. Major childhood illnesses such as rubella and polio have been largely controlled through the use of vaccines. In addition, recent decades have witnessed a historically unprecedented extension of **literacy** and other basic education to a majority of people in the developing world. The United Nations reports that although there were still a staggering 750 million or more illiterate people aged 15 or older in the world in 2017, the good news is that 85% of all people are literate today, compared to just 63% as recently as 1970.[2] But almost two-thirds of the world's illiterate people are women.

Literacy The ability to read and write.

Despite such outstanding achievements, developing countries continue to face great challenges as they seek to continue to improve the health and education of their people. The distribution of health and education within countries is as important as income distribution; life expectancy may be quite high for better-off people in developing countries but far lower for the poor. Child mortality rates in developing countries remain more than 10 times higher than

those found in the rich countries. These deaths generally result from conditions that are easily treatable, including millions who continue to die needlessly each year from dehydration caused by diarrhoea. If child death rates in developing countries fell to those prevailing in the developed countries, the lives of nearly 7 million children would be saved each year. Many children who survive nonetheless suffer chronic problems of malnutrition, debilitating parasitic infections, and other recurrent illnesses. Problems caused by lack of key micronutrients such as iodine, as well as protein, affect up to 2 billion people, but children are particularly vulnerable. Whereas citizens in Europe, North America, or Japan have more than 12 years of schooling on average, the average citizen in sub-Saharan Africa and South Asia spends less than six years in school—before taking account of teacher absenteeism and making no adjustment for the lack of schoolbooks and other resources even when a teacher is present. The "voices of the poor" in Box 8.1 convey some of the impact of deprivation in health and education on people's lives.

In this chapter, we examine the roles of education and health in economic development. These two **human capital** issues are treated together because of their close relationship. There are dual impacts of the effects of health spending on the effectiveness of the educational system and vice versa; and when we speak of investing in a person's health and investing in a person's education, we are, after all, talking about the same person. We then consider the relationships between income on the one hand and health and education on the other. Despite their close relationship, you will see that higher household income is no guarantee of improved health and education: human capital must be given

Human capital Productive investments embodied in human persons, including skills, abilities, ideals, health, and locations, often resulting from expenditures on education, on-the-job training programmes, and medical care.

BOX 8.1 Development Policy: Health and Education: Voices of the Poor

If you don't have money today, your disease will take you to your grave.

—An old woman from Ghana

The children keep playing in the sewage.

—Sacadura Cabral, Brazil

In the hospitals, they don't provide good care to the indigenous people like they ought to; because of their illiteracy they treat them badly. . . They give us other medicines that are not for the health problem you have.

—A young man from La Calera, Ecuador

The school was OK, but now it is in shambles; there are no teachers for weeks. . . There is no safety and no hygiene.

—Vila Junqueira, Brazil

If parents do not meet these payments, which are as high as 40 to 50 rupees per month, the teachers were reported to beat the student or submit a failing grade for her/him.

—Pakistan ("Voice of the Poor")

Teachers do not go to school except when it is time to receive salaries.

—Nigeria ("Voice of the Poor")

Before everyone could get health care, but now everyone just prays to God that they don't get sick because everywhere they just ask for money.

—Vares, Bosnia and Herzegovina

direct attention in its own right, even in economies that are growing rapidly. Health and education may be distributed very unequally, just as with income and wealth. But improved health and education help families escape some of the vicious circles of poverty in which they are trapped. Finally, we take a close look at educational and health systems in developing countries, to identify the sources of the severe inequalities and inefficiencies that continue to plague them. The evidence reveals that investments in human capital have to be undertaken with both equity and efficiency for them to have their potential positive effects on incomes.

8.1.1 Education and Health as Joint Investments for Development

Health and education are closely related in economic development.[3] On one hand, greater health capital may improve the return to investments in education, in part because health is an important factor in school attendance and in the formal learning process of a child. A longer life raises the return to investments in education; better health at any point during working life may in effect lower the rate of depreciation of education capital. On the other hand, greater education capital may improve the return to investments in health, because many health programmes rely on basic skills often learned at school, including personal hygiene and sanitation, not to mention basic literacy and numeracy; education is also needed for the formation and training of health personnel. Finally, an improvement in productive efficiency from investments in education raises the return on a lifesaving investment in health. Box 8.2 summarises the linkages between investments in health and education.

BOX 8.2 Development Policy: Linkages Between Investments in Health and Education

- Health and education are investments made in the same individual.
- Greater health capital may raise the return on investment in education for several reasons:
  - Health is an important factor in school attendance.
  - Healthier children are more successful in school and learn more efficiently.
  - Deaths of school-age children also increase the cost of education per worker.
  - Longer life spans raise the return to investments in education.
  - Healthier individuals are more able to productively use education at any point in life.
- Greater education capital may raise the return to investment in health in the following ways:
  - Many health programmes rely on skills learned in school (including literacy and numeracy).
  - Schools teach basic personal hygiene and sanitation.
  - Education is needed for the formation and training of health personnel.
  - Education leads to delayed childbearing, which improves health.
- Improvements in productive efficiency from investment in education raise the return on a lifesaving investment in health.

The past half-century or so has witnessed unprecedented advances in human capital. Health and education levels improved in both developed and developing countries but, by most measures, they have improved more rapidly in developing countries. As a result, there has been some international convergence in these measures. Only in sub-Saharan Africa, where life expectancies fell due to the AIDS crisis, has some doubt been cast on the trend toward catching up in health. As primary enrolments rise in developing countries, education is catching up, though some observers believe that the quality gap may be larger than ever. Even though the health and education gap between developed and developing countries remains large and further improvements may prove difficult, the progress to date has been unmistakable.[4]

8.1.2 Improving Health and Education: Why Increasing Income Is Not Sufficient

Health and education levels are much higher in high-income countries. There are good reasons to believe that the causality runs in both directions: With higher income, people and governments can afford to spend more on education and health, and with greater health and education, higher productivity and incomes are possible. Because of these relationships, development policy needs to focus on income, health, and education simultaneously. This conclusion is parallel to our conclusion in Chapter 5 that we need a multipronged strategy to address the stubborn problems of absolute poverty.

People will spend more on human capital when income is higher. But the evidence shows clearly that even if we were able to raise incomes without a large improvement in health and education, we could not count on that income increase being used to adequately invest in children's education and health. The market will not solve this problem automatically, and in many cases household consumption choices themselves may lead to a surprisingly small link between income and nutrition, especially for children.[5] The income elasticity of the demand for calories (that is, the percentage change in calories consumed for a percentage change in family incomes) among low-income people ranges from near zero to about 0.5, depending on the region and the statistical strategy used by the researchers.[6] This less-than-proportional response is due to two factors: income is spent on other goods besides food, and part of the increased food expenditure is used to increase food variety without necessarily increasing the consumption of calories. If the relationship between income and nutrition is indeed quite low, as some studies suggest, then development policies that emphasise increasing incomes of the poor without attention to the way these additional resources are expended within the family may not lead to improved health, and successful development more generally—at least not very quickly.[7] As discussed further in Chapter 15 and its case study, credit for microenterprises has been one of the most popular poverty alleviation strategies in recent years. In this case, credit may help the poor improve their nutrition, for example, because seasonal price fluctuations are also shown to be an important determinant of calorie consumption along with average income among the very poor, but credit will not be sufficient if nutrition remains inadequate and does not improve automatically with higher income.

Moreover, calories are not the same as nutrition, and the nutrition of earners is not the same as the nutrition of their children. The income elasticity of "convenience" foods is greater than unity.[8] An increase in income frequently allows families in developing countries to switch consumption from nutritious foods such as beans and rice to nonnutritious "empty calories" such as candy and soda, which may be perceived as modern and symbolic of economic success.[9] A major problem is that poor health (e.g., diarrhoeal diseases) can negate the health advantages of better nutrition.[10]

There is considerable evidence that the better the education of the mother, the better the health of her children (see Box 8.3).[11] There are still opportunities for improving health through simple activities in school that have not been utilised.

Health status, once attained, also affects school performance, as has been shown in studies of many developing countries. Better health and nutrition leads to earlier and longer school enrolment, better school attendance, and more effective learning.[12] Thus, to improve enrolments and the effectiveness of schooling, we must improve the health of children in developing countries. Indeed, advances in statistical methods are showing that the links from health to educational attainment in developing countries are stronger than had been believed (see Box 8.4). These effects are large for both boys and often especially for girls.[13]

Finally, there are other important spillover benefits to investment in one's health or education. An educated person provides benefits to people around him or her, such as reading for them or coming up with innovations that benefit the community.[14] As a result, there are significant market failures in education. Moreover, a healthy person is not only less contagious but also can benefit the community in many ways that a sick person cannot. Because of such spillover effects, the market cannot be counted on to deliver the socially efficient levels of health and education. Thus, as the World Health Organization (WHO) concluded, "Ultimate responsibility for the performance of a country's health system

BOX 8.3 Findings: Mothers' Health Knowledge is Crucial for Raising Child Health

Usually, formal education is needed in complementary relationship with ongoing access to current information. Paul Glewwe found in an analysis of data from Morocco that a mother's basic health knowledge had a positive effect on her children's health. Several mechanisms were possible, such as that "formal education directly teaches health knowledge to future mothers; literacy and numeracy skills acquired in school assist future mothers in diagnosing and treating child health problems; and exposure to modern society from formal schooling makes women more receptive to modern medical treatments." But, Glewwe concludes, "Mother's health knowledge alone appears to be the crucial skill for raising child health. In Morocco, such knowledge is primarily obtained outside the classroom, although it is obtained using literacy and numeracy skills learned in school. . . Teaching of health knowledge skills in Moroccan schools could substantially raise child health and nutrition in Morocco."

Source: Based on Glewwe, Paul (1999), 'Why does mother's schooling raise child health in developing countries? Evidence from Morocco,' *Journal of Human Resources*, 34: 124–59.

BOX 8.4 Findings: School Impact of a Low-Cost Health Intervention

A study in the Busia district in Kenya conducted by Edward Miguel of the University of California at Berkeley and Michael Kremer of Harvard University showed that inexpensive "deworming" drugs to eliminate parasitic infections in children are also very cost-effective in increasing school attendance. The order in which schools received the treatments was randomised, enabling identification of the causal effect of treatments by comparing outcomes with the not-yet-treated schools.

Their baseline survey showed 92% of schoolchildren were infected with at least one parasite, and 28% had at least three infections. A moderate to heavy infection was present in 31%. In fact, the prevalence was probably worse because "heavily infected children were more likely to be absent from school on the day of the survey."

As a result of the deworming, absenteeism decreased by about one-quarter (7 percentage points). Younger children typically had suffered more infection, and they now attended 15 more school days per year on average; older children attended about 10 more days. The programme cost per additional year of schooling was about $3.50, much less than the alternative methods used to increase school participation. Treated children also had lower anemia, somewhat reduced reported illness, and better height-for-age scores.

Children can spread parasitic infections across school districts, notably when they swim in the same lake. This explains the study's finding that curing worm infections also led to substantial benefits for neighbouring school districts that had not yet been dewormed—a classic externality. Reduced infection can also benefit adults, who can work more days.

Although academic test scores did not increase significantly, this may have been due to the larger school class size that resulted from greater participation rates, thereby increasing the student-to-teacher ratio. Evaluated over the course of the student's lifetime, the deworming drugs are not only inexpensive but also yield a very high rate of return, with the implied present discounted value of wage gains of more than $30 per treated child. The net benefit of the programme is greater than the cost of hiring additional teachers to keep this ratio from rising—though this does depend on the political will to do so.

Despite its large benefits, families in impoverished Busia are very sensitive to the price of deworming treatments, suggesting that subsidies will be needed for some time. As one might hope from such clear findings, this study has had a substantial impact on health priorities of developing-country governments and international agencies, and deworming programmes are expanding in many countries. This study's clear findings from carefully designed methods provide one of the important impetuses to the recent emphasis on and progress in deworming in schools.

Follow-up research by Sarah Baird, Joan Hamory Hicks, Michael Kremer, and Edward Miguel shows that the long-term effects of deworming are also strikingly large. Ten years after deworming treatment, males had remained longer in primary school, and now work 17% more hours, and are more likely to have a manufacturing job and to spend more time in nonagricultural self-employment. Females were significantly more likely to have attended secondary school—a large enough effect to cut the gender gap by about half; as adults, they shifted time from traditional agriculture to cash crops and to nonagricultural self-employment, in comparison to the control group. The authors calculated that the financial rate of return of the programme is so high that the costs of mass deworming could be less than the future government revenue eventually generated.

Source: Edward Miguel and Michael Kremer, "Worms: Identifying impact on education and health in the presence of treatment externalities," *Econometrica* 72 (2004): 159–217. On deworming activities, see the links at http://www.dewormtheworld.org; and Sarah Baird, Joan Hamory Hicks, Michael Kremer, and Edward Miguel (2016) "Worms at Work: Long Run Impacts of a Child Health Investment," *Quarterly Journal of Economics*, 131, 4, 1637–80.

lies with government."[15] Developing-country officials are drawing lessons from the many studies showing the interrelationships among health, education, and incomes and are devising integrated strategies. The case study of Mexico at the end of this chapter provides an important example.

8.2 Investing in Education and Health: The Human Capital Approach

The analysis of investments in health and education is unified in the human capital approach. *Human capital* is the term economists often use for education, health, and other human capacities that can raise productivity when increased. An analogy is made to conventional investments in physical capital: after an initial investment is made, a stream of higher future income can be generated from both expansion of education and improvements in health. As a result, a rate of return can be deduced and compared with returns to other investments. This is done by estimating the present discounted value of the increased income stream made possible by these investments and then comparing it with their direct and indirect costs. Of course, health and education also contribute directly to well-being. For example, education increases empowerment and autonomy in major matters in life, such as capacity for civic engagement, making decisions concerning one's own health care, and freedom to choose one's own spouse over an arranged marriage.[16] But the basic human capital approach focuses on the indirect ability to increase well-being by increasing incomes. In this section, we will generally illustrate points with educational investments, but the same principles apply to health investments.

The impact of human capital investments in developing countries can be quite substantial. Figure 8.1 shows the age-earnings profiles by levels of education in Venezuela.[17] The chart shows how incomes vary over the life cycle for people with various levels of education. Note that those with higher levels of education start full-time work at a later age, but, as is shown, their incomes quickly outpace those who started working earlier. But such future income gains from education must be compared with the total costs incurred to understand the value of human capital as an investment. Education costs include any direct tuition or other expenditures specifically related to education, such as books and required school uniforms, and indirect costs, primarily income forgone because the student could not work while in school.

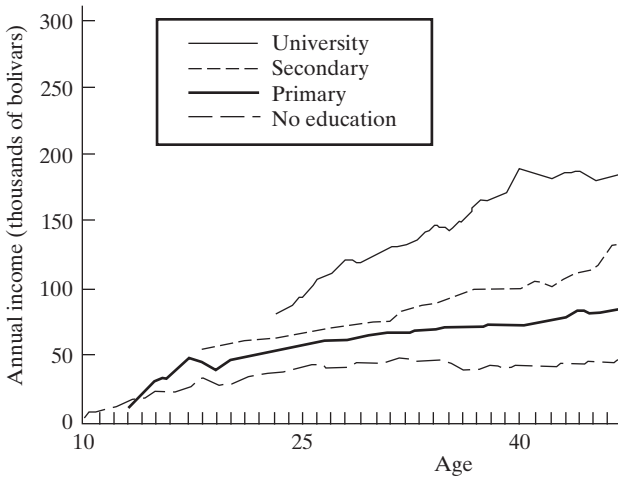
Discount rate In present-value calculations, the annual rate at which future values are decreased to make them comparable to values in the present.

Formally, the income gains can be written as follows, where E is income with extra education, N is income without extra education, t is year, i is the **discount rate**, and the summation is over expected years of working life:

$$\sum \frac{E_t - N_t}{(1 + i)^t} \tag{8.1}$$

An analogous formula applies to health (such as improved nutritional status), with the direct and indirect cost of resources devoted to health compared with the extra income gained in the future as a result of higher health status.

FIGURE 8.1 Age-Earnings Profiles by Level of Education: Venezuela



Source: International Bank for Reconstruction and Development/The World Bank: *The Profitability of Investment in Education: Concepts & Methods* by George Psacharopoulos, 1995. Reprinted with permission.

Figure 8.2 provides a typical schematic representation of the trade-offs involved in the decision to continue in school.[18] It is assumed that the individual works from the time he or she finishes school until he or she is unable to work, retires, or dies. This is taken to be 66 years. Two earnings profiles are presented—for workers with primary school but no secondary education and for those with a full secondary (but no higher) education. Primary graduates are assumed to begin work at age 13, and secondary graduates, at age 17. For an individual in a developing country deciding whether to go on from primary to secondary education, four years of income are forgone. This is the indirect cost, as labelled in the diagram. The child may work part time, a possibility ignored here for simplicity, but if so, only part of the indirect-cost area applies. There is also a direct cost, such as fees, school uniforms, books, and other expenditures that would not have been made if the individual had left school at the end of the primary grades. Over the rest of the person's life, he or she makes more money each year than would have been earned with only a primary education. This differential is labelled "Benefits" in the diagram. Before comparing costs with benefits, note that a dollar today is worth more to an individual than a dollar in the future, so those future income gains must be discounted accordingly, as is done in Equation 8.1. The rate of return will be higher whenever the discount rate is lower, the direct or indirect costs are lower, or the benefits are higher.

This analysis was performed from the individual's point of view in the three right-hand columns of Table 8.1. Notice that in sub-Saharan Africa, the

FIGURE 8.2 Financial Trade-Offs in the Decision to Continue in School

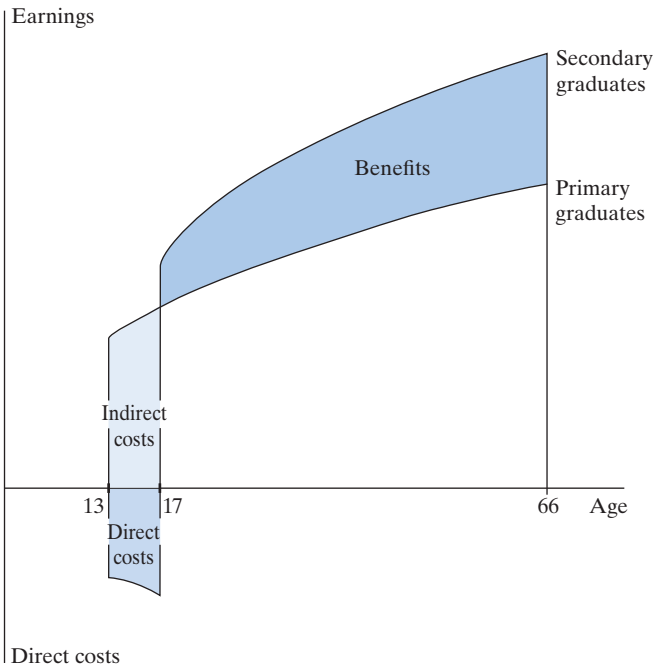


TABLE 8.1 Returns to Investment in Education by Level, Regional Averages (%)

	Social			Private		
Region	Primary	Secondary	Higher	Primary	Secondary	Higher
Asia[a]	16.2	11.1	11.0	20.0	15.8	18.2
MENA[b]	15.6	9.7	9.9	13.8	13.6	18.8
Latin America/Caribbean	17.4	12.9	12.3	26.6	17.0	19.5
OECD	8.5	9.4	8.5	13.4	11.3	11.6
Sub-Saharan Africa	25.4	18.4	11.3	37.6	24.6	27.8
World	18.9	13.1	10.8	26.6	17.0	19.0

[a] Non-OECD.
[b] Europe/Middle East/North Africa, Non-OECD
Source: George G. Psacharopoulos and Harry A. Patrinos, "Returns to investment in education: A further update," *Education Economics* 12, No. 2 (August 2004), tab. 1.
Note: How these rates of return were calculated is explained in detail in note 19 at the end of this chapter.

private rate of return to primary education is over 37%! Despite this extraordinary return, many families do not make this investment because they have no ability to borrow even the meagre amount of money that a working child can bring into the family—the topic of the next section. Note that the higher rates of return for developing countries reflect that the income differential between those with more and less schooling is greater on average than for the developed countries.

The first three columns of Table 8.1 indicate the social rate of return. This is found by including the amount of public subsidy for the individual's education as part of the direct costs, because this is part of the investment from the social point of view (and also by considering pre-tax rather than after-tax incomes). Details of the calculations are presented in note 19.[19] It should be noted that these social returns are probably understated because they do not take into account the externality that educated people confer on others (e.g., being able to read for other family members and coworkers), not to mention other individual and social benefits such as increased autonomy and civic participation, being able to communicate more effectively, making more informed choices, and even being taken more seriously in public discussions, as stressed by Amartya Sen.

Figure 8.2 can also be used to illustrate the benefit–cost trade-off from the public policy point of view by including fiscal costs and social welfare benefits; that is, adding the social costs of education such as subsidies to the direct costs part of the costs area below the x-axis and adding in any net spillover benefits to the benefits area (not shown are such benefits as occur before graduation or after retirement).[20]

8.2.1 Social Versus Private Benefits and Costs

Typically, in developing countries, the **social costs of education** (the opportunity cost to society as a whole resulting from the need to finance costly educational expansion at higher levels when these limited funds might be more productively used in other sectors of the economy) increase rapidly as students climb the educational ladder. The **private costs** of education (those borne by students themselves) increase more slowly or may even decline.

Social costs of education Costs borne by both the individual and society from private education decisions, including government education subsidies.

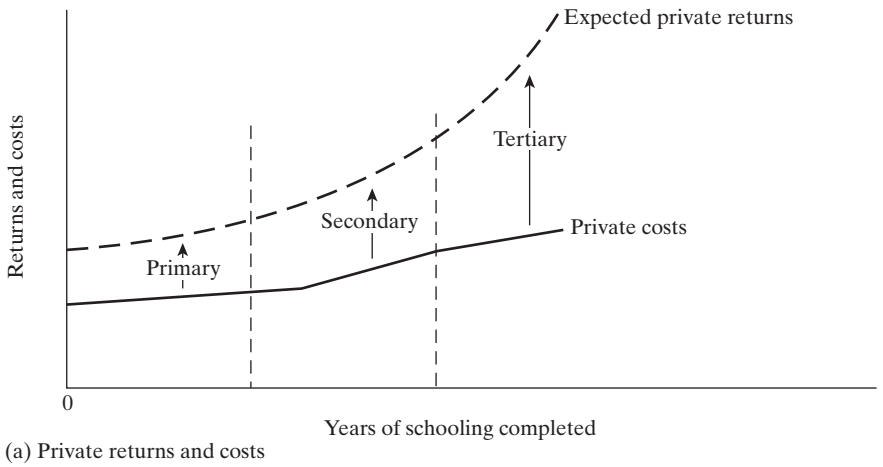
Private costs The costs that accrue to an individual economic unit.

This widening gap between social and private costs provides an even greater stimulus to the demand for higher education than it does for education at lower levels. But educational opportunities can be accommodated to these distorted demands only at full social cost.

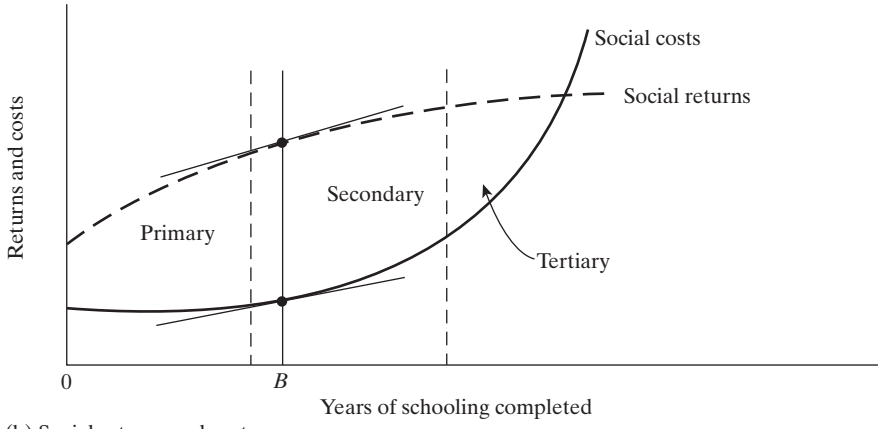
Figure 8.3 provides an illustration of this divergence between private and social benefits and costs. It also demonstrates how this divergence can lead to a misallocation of resources when private interests supersede social investment criteria. In Figure 8.3a, expected private returns and actual private costs are plotted against years of completed schooling. As a student completes more and more years of schooling, expected private returns grow at a much faster rate than private costs, for reasons explained earlier. To maximise the difference between expected benefits and costs (and thereby the private rate of return to investment in education), the optimal strategy for a student would be to secure as much schooling as possible.

Now consider Figure 8.3b, where social returns and social costs are plotted against years of schooling. The social benefits curve rises sharply at first, reflecting the improved levels of productivity of, say, small farmers and the self-employed that result from receipt of a basic education and the attainment of literacy, arithmetic skills, and elementary vocational skills. Thereafter, the marginal social benefit of additional years of schooling rises more slowly, and the social returns curve begins to level off. By contrast, the social cost curve shows

FIGURE 8.3 Private Versus Social Benefits and Costs of Education: An Illustration



(a) Private returns and costs



(b) Social returns and costs

a slow rate of growth for early years of schooling (basic education) and then a much more rapid growth for higher levels of education. This rapid increase in the marginal social costs of postprimary education is the result both of the much more expensive capital and recurrent costs of higher education (buildings and equipment) and the fact that much postprimary education in developing countries is heavily subsidised.[21]

It follows from Figure 8.3b that the optimal strategy from a social viewpoint, the one that maximises the net social rate of return to educational investment, would be one that focuses on providing all students with at least *B* years of schooling. Beyond *B* years, *marginal* social costs exceed *marginal* social benefits, so additional public educational investment in new,

higher-level school places will yield a *negative* net social rate of return. The value of *B*, such as nine years of school, would vary according to economic conditions and would be controversial both because of difficulties in calculating earnings gains and debate over which types of social benefits should be considered.

In summary, social benefits can differ from private benefits, and social costs can differ from private costs. On the one hand, public subsidies for private education make net social benefits of education less than private benefits (generally larger divergence at higher educational levels). On the other hand, educational spillover benefits can augment social returns above private returns, such as in productive activities; or in households when one family member or neighbour who gains (better) literacy can assist others, such as with understanding medicine prescription labels.

8.3 Child Labour

Child labour is a widespread problem in developing countries. When children under the age of 15 work, their labour time disrupts their schooling and, in a majority of cases, prevents them from attending school altogether. Compounding this, the health of child workers is significantly worse, even accounting for their poverty status, than that of children who do not work; physical stunting among child labourers is very common. In addition, many labouring children are subject to especially cruel and exploitative working conditions.

Child labour is defined as "either under the minimum age for work [generally 15] or above that age [through to age 17] and engaged in work that poses a threat to their health, safety, or morals, or are subject to conditions of forced labour." The International Labour Organization (ILO), a UN body that has played a leading role on the child labour issue, reported in its 2017 quadrennial report on child labour that, as of 2015, there were 152 million children classified as "child labourers," 48% of them reportedly just 11 years of age or younger. Of these, 73 million child labourers were found to be doing "hazardous work that directly endangers their health, safety, and moral development."

There has been progress over time, as the number has been falling, if slowly, since the ILO began its quadrennial child labour report series in 2000; in the subsequent 16 years, there was a net reduction of 94 million in children reported to be in child labour. But the ILO found that the rate of progress slowed during the 2012 to 2016 period when there was a one percentage point fall, compared with the 2008 to 2012 period when the decline was three percentage points. Target 8.7 of the SDGs is to end child labour in all its forms by 2025. At the current rate of progress, the world will not come close to meeting this target.

The continent of Africa and the Asia and Pacific region together account for about 90% of child labour, with 72 million and 62 million children, respectively. By sector, 71% work in agriculture, with 12% in industry, and 17% in services.

Working conditions are often horrendous; the ILO reports that some of its surveys show that more than half of child labourers toil for nine or more hours per day. The worst forms of child labour endanger health or well-being, involving hazards, sexual exploitation, trafficking, and debt bondage. In a 2011 publication, the ILO reported that, every year, about 22,000 children die as a result of work-related accidents. Clearly, child labour is not an isolated problem but a widespread one, especially in Africa and South Asia.

In some cases, time at work comes from the child's leisure time rather than school time, as many child labourers do attend school. However, in these cases child labour is still likely to reduce time needed for homework, and to cause the child to be tired while at school, with the result that children will not benefit as much from the schooling they receive, and may be likely to drop out sooner than otherwise. Beyond this, child labour takes away from the regenerative time of play—and indeed from childhood itself.

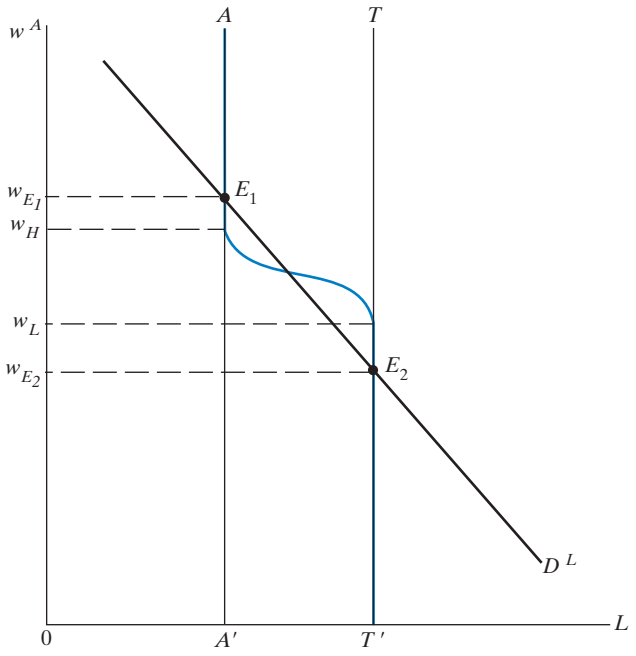
Nevertheless, it is not obvious that an immediate ban on all forms of child labour is always in the best interests of the child. Without work, a child may become severely malnourished; with work, school fees as well as basic nutrition and health care may be available. But there is one set of circumstances under which both the child labourer and the family as a whole may be unambiguously better off with a ban on: multiple equilibria. Kaushik Basu has provided such an analysis, and we shall first consider his simple model, which shows how this problem may arise.[22]

To model child labour, we make two important assumptions. First, a household with a sufficiently high income would not send its children to work. As one might hope, there is strong evidence that this is true, at least most of the time. Second, child and adult labour are substitutes. In fact, children are not as productive as adults, and adults can do any work that children can do. This assertion is not an assumption; it is a finding of many studies of the productivity of child labourers in many countries. It is important to emphasise this, because one rationalisation for child labour often heard is that children have special productive abilities, such as small fingers, that make them important for the production of rugs and other products. However, there is no support for this view. In essentially every task that has been studied, including carpet weaving, adult labourers are significantly more productive. As a result, we can consider the supply of adult and child labour together in an economic analysis of the problem.

The child labour model is graphed in Figure 8.4. On the x-axis, we have the supply of labour in adult equivalents. Because we are interested in understanding the impact of the demand for labour, in a graph it is best to consider homogeneous units of labour. So, if a child labourer is γ times as productive as an adult worker, we consider one child the productive equivalent of γ adult workers. According to our assumptions, $\gamma < 1$. For example, if a child labourer is half as productive as an adult worker, $\gamma = 0.5$.

We start with the assumption that in the region in question, all (unskilled) adults work, regardless of the wage. This gives us a perfectly inelastic, vertical adult labour supply curve, called AA' in the diagram. Highly inelastic supply is a very reasonable assumption among families so poor that their children

FIGURE 8.4 Child Labour as a Bad Equilibrium



Source: From Kaushik Basu, "Child labour: Cause, consequence, and cure, with remarks on international labour standards," *Journal of Economic Literature* 37 (1999): 1101. Reprinted with the permission of the author and the American Economic Association.

must work. While the parents may not have modern-sector jobs, every adult is involved in some type of activity to help the family survive. This adult supply AA' is simply the number of unskilled adults. To understand the total labour supply curve, consider what happens if the wage falls. If the wage falls below w_H, then some families find they are poor enough that they have to send their children to work. At first wages are still high enough so that this affects only a few families and children, reflected in the fact that the S-shaped curve just below w_H is still quite steep. As the wage continues to fall, more families would do the same, and labour supplied expands along the S-shaped curve, which becomes flatter as smaller drops in the wage lead many more families to send their children to work. If a wage of w_L were reached, all of the children would work. At this point, we are on the vertical line labelled TT', which is the aggregate labour supply of all the adults and all the children together. This sum is the number of adults plus the number of children, multiplied by their lower productivity, $\gamma < 1$. (An S shape in the middle portion is likely, but the analysis holds even if this is a straight line.) The resulting supply curve for children and adults together is very different from the standard ones that we usually consider in basic microeconomics, such as the upward-sloping supply curve seen in

Figure 5.13 (in Chapters 5), but it is highly relevant for the developing-country child labour context. To summarise, as long as the wage is above w_H, the supply curve is along AA'; if the wage is below w_L, the supply curve is along TT', and in between, it follows the S-shaped curve between the two vertical lines.

Now consider the labour demand curve, D^L; if demand is inelastic enough to cut the AA' line above w_H and also cut the TT' line below w_L, there will be two stable equilibria, labelled E_1 and E_2, in the diagram.[23] When there are two equilibria, if we start out at the bad equilibrium E_2, an effective ban on child labour will move the region to the good equilibrium E_1. Moreover, once the economy has moved to the new equilibrium, the child labour ban will be self-enforcing, because by assumption, the new wage is high enough for no family to have to send its children to work. If poor families coordinate with each other and refuse to send their children to work, each will be better off; but in general, with a large number of families, they will be unable to achieve this.[24]

In contrast, note that, if the demand curve is sufficiently elastic, there will only be a single equilibrium. With high and elastic demand, the single equilibrium will be at a high wage with no child labour, while with low and elastic demand, there will be a low wage with child labour.

Banning child labour when there is an alternative equilibrium in which all children go to school might seem like an irresistible policy, but note that while all the families of child labourers are better off, employers may now be worse off, because they have to pay a higher wage. Thus, employers may use political pressure to prevent enactment and enforcement of child labour laws. In this sense, child labour, even its worst forms, could actually be Pareto-optimal—a discovery that should remind us that Pareto optimality is sometimes a very weak condition on which to base development policy! In the same sense, many other problems of underdevelopment, including extreme poverty itself, may at times also be Pareto-optimal, in that solving these problems may make the rich worse off.

While these child labour models are probably reasonable depictions of many developing areas, we do not know enough about conditions in unskilled labour markets to say how significant these types of multiple equilibria and severe credit constraints really are as explanations for child labour. Thus, it would be potentially counterproductive, if even enforceable, to seek an immediate ban on all child labour in all parts of the world today. As a result, an intermediate approach is currently dominant in international policy circles.[25]

There are four main approaches to child labour policy current in development policy. The first recognises child labour as an expression of poverty and recommends an emphasis on eliminating poverty rather than directly addressing child labour; this position is generally associated with the World Bank (poverty policy is discussed further in Chapters 5, 9, and 15).

Conditional cash transfer (CCT) programmes Welfare benefits provided conditionally based on family behaviour, such as children's regular school attendance and health clinic visitations.

The second approach emphasises strategies to get more children into school, including expanded school places, such as new village schools, and **conditional cash transfer (CCT)** incentives to induce parents to send their children to school, such as the Progresa/Oportunidades Programme in Mexico, discussed in this chapter's case study, or the experimental Malawi programme discussed in Box 8.5. This strategy has widespread support from

BOX 8.5 Findings: Cash or Condition? Evidence from Malawi

What programmes are effective at addressing the nexus of poverty and unmet health and education needs, especially for girls growing up in extreme poverty? As Sarah Baird, Craig McIntosh, and Berk Ozler note, school enrolment and effective learning, and marriage and fertility outcomes are of "central importance to the long-term prospects of school-age girls" living in poverty. What programmes would be most cost-effective?

Findings from a randomised control trial study of a cash transfer programme targeted at adolescent girls in Malawi offer important insights. Baird, McIntosh, and Ozler compared families who were randomly assigned to one of three groups: no cash transfer, unconditional cash transfers (UCTs), and cash transfers that were made conditional on the girls' continued school attendance (CCTs). Given this structure, the researchers examined education achievements and marriage and childbearing outcomes. They found both transfer programmes led to higher rates of continued enrolment (avoiding dropouts); but CCTs had well over double (about 2.3 times) the impact of UCTs. On the other hand, some earlier studies (primarily in Latin America) had implied little or no effect of UCTs; perhaps the difference reflects conditions prevailing in low-income Africa. The research found that girls in the CCT programme outperformed those in the UCT programme on English reading comprehension (a "modest but significant" difference).

At the same time, the authors found that the CCTs were far more *cost-effective* in raising enrolment and attendance than the UCTs, even taking into account the extra expenses of running the more administratively complex CCT programme. The authors examined different transfers and found that even the smallest amount studied—$4 per month to the parents and $1 per month to the school-age girl—"were sufficient to attain the average schooling impacts observed under the CCT arm."

On the other hand, the UCT programme was found to have a strong impact on "delaying marriage and childbearing—by 44% and 27%, respectively, after 2 years." And while the CCTs worked better at keeping girls in school and learning effectively, they still "had no effect on reducing the likelihood of teenage pregnancies or marriages." The authors found this was "entirely due to the impact of UCTs on these outcomes among girls who dropped out of school" but whose families continued to receive the transfer benefits (because, after all, the transfer is unconditional). The authors concluded that the "offer of a CCT appears to have been ineffective in dissuading those with a high propensity to drop out of school from getting married and starting childbearing, especially among girls sixteen or older." Meanwhile, families living in poverty whose daughters did drop out of school ended up receiving nothing, precluding other poverty-reduction benefits.

These findings reflect the difficulties in identifying a single programme design to effectively achieve poverty reduction, health, education, and social progress goals. As the authors conclude, "This study makes clear that while CCT programmes may be more effective than UCTs in obtaining the desired behaviour change, they can also undermine the social protection dimension of cash transfer programmes."

Source: Based on Sarah Baird, Craig McIntosh, and Berk Ozler, "Cash or condition? Evidence from a cash transfer experiment," *Quarterly Journal of Economics* 126, No. 4 (2011): 1709–1753.

many international agencies and development bodies. It is probably a more effective approach than making basic education compulsory, because without complementary policies, the incentives to send children to work would still remain strong and enforcement is likely to be weak, for the same reasons that regulation of the informal sector has proved almost impossible in many other cases. Compulsory schooling is a good idea, but it is not by itself a sufficient solution to the problem of child labour. Improving the quality of basic schooling and increasing accessibility are also very important; the fraction of national income spent on basic education in a majority of low-income countries remains problematic. As the ILO points out,

> In sub-Saharan Africa, about half of all low-income countries spend less than 4 per-cent of their national income on education. In South Asia, Bangladesh devotes only 2.6 per-cent of its national income to education and Pakistan, 2.7 per-cent. India invests a smaller proportion of GNP (around 3.3 per-cent) than the median for sub-Saharan Africa, even though average incomes are around one third higher. Even more worrying is that the share of national income devoted to education is stagnating or decreasing in key countries, including Bangladesh, India and Pakistan, which account for over 15 million out-of-school children.[26]

The third approach considers child labour inevitable, at least in the short run, and stresses palliative measures such as regulating it to prevent abuse and to provide support services for working children. This approach is most commonly associated with UNICEF, which has prepared a checklist of regulatory and social approaches that could meet the "best interest of the child." The regulations included on UNICEF's checklist include expanding educational opportunities through "time off" for standard or workplace schooling, encouraging stricter law enforcement against illegal child labour trafficking, providing support services for parents and for children working on the streets, and working to develop social norms against the economic exploitation of children.

The fourth approach, most often associated with the ILO, favours banning child labour. If this is not possible, however, and recognising that child labour may not always result from multiple equilibria problems, this approach favors banning child labour *in its most abusive forms.* The latter approach has received much attention in recent years; the ILO's "Worst Forms of Child Labour Convention" was adopted in 1999. The worst forms covered under the convention include "all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labour"; child prostitution and pornography; other illicit activities, such as drug trafficking; and work that "by its nature or the circumstances . . . is likely to harm the health, safety or morals of children." The ILO set a working target to completely eliminate the worst forms of child labour by 2016; significant progress has been made, but as of 2011, the ILO reported that progress was not fast enough to meet this goal.

A 2003 study by the ILO estimated that eliminating child labour and extending quality schooling for all children up to age 14 over a 20-year period would result in the baseline case of $5 trillion of economic gains (in present discounted value), after accounting for opportunity costs. Even when

changing the assumptions of the study to be very conservative about the likely income gains, the result is an enormously productive economic investment with a 44% internal rate of return in the baseline case and 23% in a conservative case.[27]

Finally, many activists in developed countries have proposed the imposition of trade sanctions against countries that permit child labour, or at least banning the goods on which children work. This approach is well intentioned, but if the objective is the welfare of children it needs to be considered carefully, because if children cannot work in the export sector, they will almost certainly be forced to work in the informal sector, where wages and other working conditions are generally worse. Export restrictions may also make it more difficult for poor countries to grow their way out of poverty. Of course, the worst forms of child labour can never be tolerated. It seems clear that if efforts at banning imports from developing countries were channelled instead into working to secure more public and private development assistance for nongovernmental organisations that work with child labourers, much more would be accomplished to help these children.

8.4 The Gender Gap: Discrimination in Education and Health

8.4.1 Education and Gender

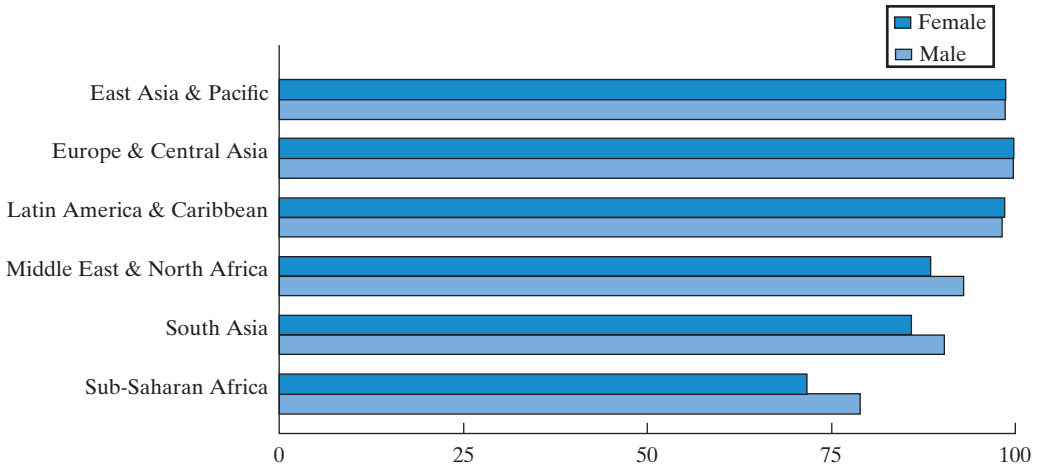
Young females receive less education than young males in most low-income developing countries. Large majorities of illiterate people and those who have been unable to attend school around the developing world are female. The **educational gender gap** is especially great in the least-developed countries in Africa, where female literacy rates can be less than half that of men in countries such as Niger, Mali, Guinea, and Benin. The gap is also relatively large in South Asia. In most low-income countries and many middle-income countries, women make up a minority—sometimes a small minority—of college students. But the long-term trend in higher-income countries for a significantly higher and growing share of female than male enrolment in tertiary (university) education has been extending recently to many upper-middle-income countries in the Middle East, Latin America, and elsewhere.

Educational gender gap Male–female differences in school access and completion.

School completion is also subject to gender inequalities, and the gap is often particularly large in rural areas. For example, in rural Pakistan, 42% of males complete their primary education, while only 17% of females do so. In the cities, the gender gap is smaller though still substantial, as 64% of males complete primary education versus 50% of females in urban areas.[28] Figure 8.5 shows the estimated youth literacy rates in 2016 for males and females by region.

Empirical evidence shows that educational discrimination against women hinders economic development in addition to reinforcing social inequality. Closing the educational gender gap by expanding educational opportunities for

FIGURE 8.5 Youth Literacy Rate, 2016



Source: UNESCO Institute for Statistics

women—a key plank of the Millennium Development Goals—is economically desirable for at least three reasons:[29]

1. The rate of return on women's education is higher than that on men's in most developing countries. [This may partly reflect that, with fewer girls enrolled, the next (marginal) girl to enroll is likely to be more talented on average than the marginal boy.]
2. Increasing women's education not only increases their productivity (and hence also earnings) in the workplace but also results in greater labour force participation, later marriage, lower fertility, and greatly improved child health and nutrition, thus benefiting the next generation as well. The latter is because a mother's education directly increases knowledge that can help child survival, nutrition, education, and indirectly by making possible higher earnings for the family—noting in particular that mothers generally spend a somewhat larger fraction of an additional dollar on their children than do fathers.
3. Because women carry a disproportionate burden of poverty, any significant improvements in their role and status via education can have an important impact on breaking the vicious circles of poverty and inadequate schooling.

8.4.2 Health and Gender

Girls also face discrimination in health care in many developing countries, as discussed in Chapter 6. In South Asia, for example, studies show that families are far more likely to take an ill boy than an ill girl to a health centre. Women

are often denied reproductive rights, whether legally or illegally. Broadly, health spending on men is often substantially higher than that on women. And in many countries, such as Nigeria, health care decisions affecting wives are often made by their husbands.

Female genital mutilation/cutting (FGM/C) is a health and gender tragedy, explained in an influential 2005 UNICEF report, *Changing a Harmful Social Convention: Female Genital Mutilation/Cutting*. FGM/C is most widely practised in sub-Saharan Africa and the Middle East and is believed to have affected about 130 million women. This practice, which is dangerous and a violation of the most basic rights, does not only result from decisions made by men; many mothers who have undergone FGM/C also require their daughters to do so. If most other families practise FGM/C, it becomes difficult for any one family to refuse to take part, to avoid the perceived resulting "dishonour" to the daughter and her family and lost "marriageability." The general problem fits the model of multiple equilibria associated with social norms or conventions, such as foot binding—an interpretation suggested by Gerry Mackie drawing on work of Nobel laureate Thomas Schelling. This general framework was also applied earlier in the text in the analysis of whether women have high or low fertility (using Figure 4.1, applied in a way similar to the discussion in Chapter 6). In an encouraging sign of progress, there are a growing number of experiences of "mass abandonment" of the practice of FGM/C, sometimes started with an organised pledge of families in an intermarrying group that they will no longer follow the practice with their daughters. Thus, such coordination failures can be overcome, often with the facilitation of locally based NGOs and similar organisations.[30]

8.4.3 Consequences of Gender Bias in Health and Education

Studies from around the developing world consistently show that expansion of basic education of girls earns among the very highest rates of return of any investment—much higher, for example, than most public infrastructure projects. One estimate is that the global cost of *failing* to educate girls is about $92 billion a year.[31] This is one reason why discrimination against girls in education is not just inequitable but also very costly from the standpoint of achieving development goals.

Education of girls has also been shown to be one of the most cost-effective means of improving local health standards. Studies by the United Nations, the World Bank, and other agencies have concluded that the social benefits alone of increased education of girls is more than sufficient to cover its costs—even before considering the added earning power this education would bring. However, evidence from Pakistan, Bangladesh, and other countries shows that we cannot assume that education of girls will increase automatically with increases in family income.

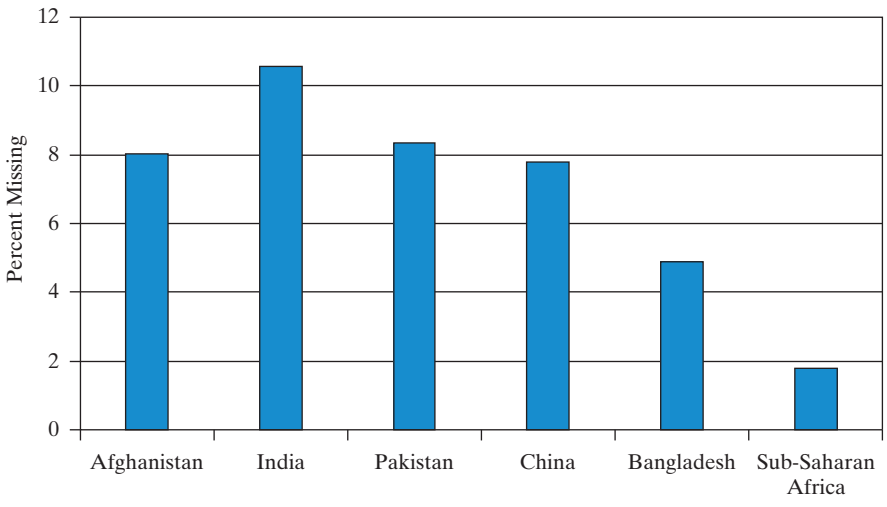
Inferior education and health care access for girls shows the interlinked nature of economic incentives and the cultural setting. In many parts of Asia, a boy provides future economic benefits, such as support of parents in their old age and possible receipt of a dowry upon marriage, and often continues to work on the farm into adulthood. A girl, in contrast, may require a dowry upon marriage, often at a young age, and will then move to the village of her

husband's family, becoming responsible for the welfare of her husband's parents rather than her own. A girl from a poor rural family in South Asia will in many cases perceive no suitable alternatives in life than serving a husband and his family; indeed, a more educated girl may be considered "less marriageable." For the parents, treatment of disease may be expensive and may require several days lost from work to go into town for medical attention. Empirical studies demonstrate what we might guess from these perverse incentives: often more strenuous efforts are made to save the life of a son than a daughter, and girls generally receive less schooling than boys.

The bias toward boys helps explain the "missing women" mystery. In Asia, the United Nations has found that there are far fewer females as a share of the population than would be predicted by demographic norms (see Chapter 6). Estimating from developed-country gender ratios, Nobel laureate Amartya Sen concludes that, worldwide, "many more than" 100 million women are "missing."[32] Evidence shows that these conditions are continuing to worsen in China and India, implying that tens of millions of young males will be unable to marry, increasing the chances of future social instability. As Sen notes, the dearth of women is not just a matter of poverty *per se*, because in Africa, where poverty is most severe, there are actually about 2% more women than men. Although this number is not as high as in western Europe and North America, it is still much higher than in Asia, which has higher income on average. A large part of the explanation is poorer treatment of girls.[33]

Figure 8.6 shows the estimated percentage of females missing in the populations of five Asian countries, along with the overall average for sub-Saharan Africa, using the same base as the highly regarded research of Stephan Klasen and Claudia Wink, calculated from 2017 UN data.[34]

FIGURE 8.6 Estimated Percentage of Women "Missing"



Source: United Nations, Department of Economic and Social Affairs, Population Division (2017)

Greater mothers' education, however, generally improves prospects for both their sons' and daughters' health and education, but apparently even more so for girls.[35]

Taken together, the evidence shows that increases in family income do not automatically result in improved health status or educational attainment. If higher income cannot be expected to necessarily lead to higher health and education, as we will show in subsequent sections, there are no guarantees that higher health or education will lead to higher productivities and incomes. Much depends on the context, on whether gains from income growth and also the benefits of public investments in health and education and other infrastructure are shared equitably.

In the remainder of this chapter, we will examine issues of education and health systems in turn. Even though the two topics will be examined separately, it is important to keep their mutually reinforcing roles in mind.

8.5 Educational Systems and Development

Much of the literature and public discussion about education and economic development in general, and education and employment in particular, revolves around two fundamental economic processes: (1) the interaction between economically motivated demands and politically responsive supplies in determining how many quality school places are provided, who gets access to these places, and what kind of instruction they receive; and (2) the important distinction between social and private benefits and costs of different levels of education, and the implications of these differentials for educational investment strategy.

8.5.1 The Political Economy of Educational Supply and Demand: The Relationship Between Employment Opportunities and Educational Demands

The amount of schooling received by an individual, although affected by many nonmarket factors, can be regarded as largely determined by demand and supply, like any other commodity or service.[36] On the demand side, the two principal influences on the amount of schooling desired are (1) a more educated student's prospects of earning considerably more income through future modern-sector employment (the family's **private benefits** of education), and (2) the educational costs, both direct and indirect, that a student or family must bear. The amount of education demanded is thus in reality a **derived demand** for high-wage employment opportunities in the modern sector. This is because access to such jobs is largely determined by an individual's education.

Private benefits The benefits that accrue directly to an individual economic unit. For example, private benefits of education are those that directly accrue to a student and his or her family.

Derived demand Demand for a good that emerges indirectly from demand for another good.

On the supply side, the quantity of school places at the primary, secondary, and university levels is determined largely by political processes, often unrelated to economic criteria. Given mounting political pressure throughout the developing world for greater numbers of school places at higher levels, we can for convenience assume that the public supply of these places is fixed by the level of government educational expenditures. These are in turn influenced by the level of aggregate private demand for education.

Because the amount of education demanded largely determines the supply (within the limits of government financial feasibility), let us look more closely at the economic (employment-oriented) determinants of this derived demand.

The amount of schooling demanded that is sufficient to qualify an individual for modern-sector jobs appears to be related to or determined by the combined influence of four variables: the wage or income differential, the probability of success in finding modern-sector employment, the direct private costs of education, and the indirect or opportunity costs of education.

For example, suppose that we have a situation in a developing country where the following conditions prevail:

1. The modern–traditional or urban–rural wage gap is of the magnitude of, say, 100% for secondary versus primary school graduates.
2. The rate of increase in modern-sector employment opportunities for primary school dropouts is slower than the rate at which such individuals enter the labour force. The same may be true at the secondary level and even the university level in countries such as India, Mexico, Egypt, Pakistan, Ghana, Nigeria, and Kenya.
3. Employers, facing an excess of applicants, tend to select by level of education. They will choose candidates with secondary rather than primary education even though satisfactory job performance may require no more than a primary education.
4. Governments, supported by the political pressure of the educated, tend to bind the going wage to the level of educational attainment of jobholders rather than to the minimum educational qualification required for the job.
5. School fees decline at the university level, as the state bears a larger proportion of the college student's costs.

Under these conditions, which conform closely to the realities of the employment and education situation in many developing nations, we would expect the quantity of higher education demanded for the formal sector to be substantial. This is because the anticipated private benefits of more schooling would be high compared to the alternative of little schooling, while the direct and indirect private educational costs are relatively low. And the demand spirals upward over time. As job opportunities for the uneducated are limited, individuals must safeguard their position by acquiring increasingly more education.

Social benefits of education
Benefits of the schooling of individuals, including those that accrue to others or even to the entire society, such as the benefits of a more literate workforce and citizenry.

Educational certification
The phenomenon by which particular jobs require specified levels of education.

The upshot is the chronic tendency for some developing nations to expand their higher-level educational facilities at a rate that is extremely difficult to justify either socially or financially in terms of optimal resource allocations. Supply and amount demanded are equated not by a price-adjusting market mechanism but rather institutionally, largely by the state. The **social benefits of education** (the payoff to society as a whole) for all levels of schooling fall short of the private benefits (see Table 8.1).

Governments and formal-sector private employers in many developing countries tend to reinforce this trend by **educational certification**—continuously upgraded formal educational entry requirements for jobs previously filled by

less-educated workers. Excess educational qualification becomes formalised and may resist downward adjustment. Moreover, to the extent that trade unions succeed in binding going wages to the educational attainments of jobholders, the going wage for each job will tend to rise (even though worker productivity in that job does not significantly increase). Existing distortions in wage differentials will be magnified, thus stimulating the amount of education demanded even further. Egypt presents a classic case of this phenomenon with its government-guaranteed and budget-busting employment in the public sector and its massive civil service overstaffing of overcredentialised school graduates.[37]

Note that this political economy process pulls scarce public resources away from the limited and often low-quality **basic education** available for the many and toward more advanced education for the few. This is both inequitable and economically inefficient.

Basic education The attainment of literacy, arithmetic competence, and elementary vocational skills.

8.5.2 Distribution of Education

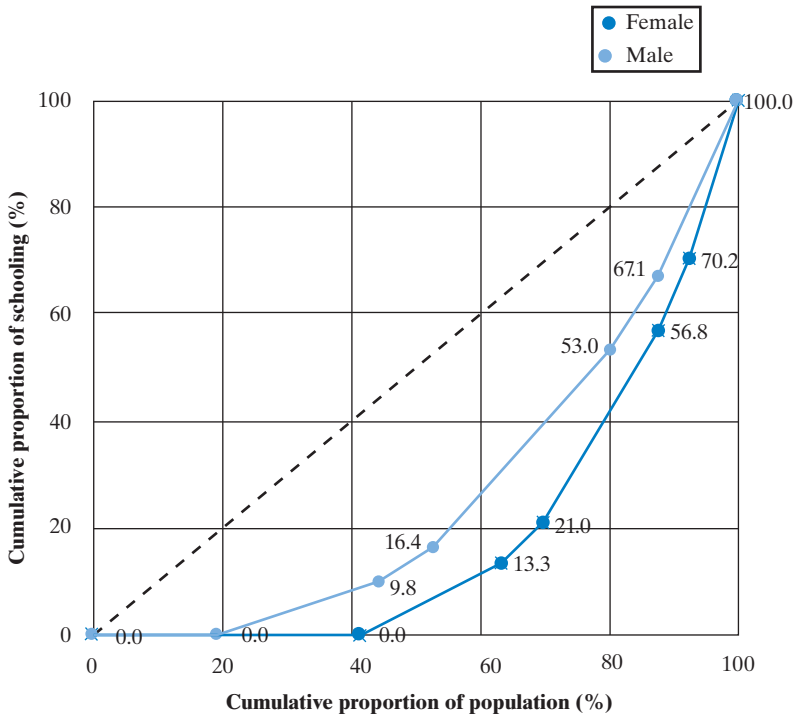
Figure 8.3 also illustrates the inherent conflict between optimal private and social investment strategies—a conflict that will continue to exist as long as private and social valuations of investment in education continue to diverge as students climb the educational ladder, with the highest subsidies at the highest levels of education, commonly availed of by elites. This is one of the reasons why we must also consider the structure and pattern of that economic growth and its distribution implications—who benefits.

The foregoing analysis of forces operating for overeducation in developing countries should not lead us to despair over the possibility of fostering development through greater education. Countries that have developed successfully have generally ensured that educational benefits are more broadly available in the economy—to the poor as well as the rich, in the rural areas as well as the urban. And so we turn to examining the distribution of educational benefits in developing countries.

Just as we can derive Lorenz curves for distribution of income (see Chapter 5), we can also develop Lorenz curves for the distribution of education. Figure 8.7 shows Lorenz curves for education in India for females and males with data from 2006. By analogy with income Lorenz curves, we write the cumulative proportion of the population on the x-axis and the cumulative proportion of years of schooling on the y-axis. Along the 45-degree line of perfect equality, everyone in the economy would have the same number of years of schooling; for example, everyone would have finished a basic eight years of school, but no one would have started secondary education. In a highly unequal economy, many people might have no years of schooling at all, while a few might have received a Ph.D. from foreign universities. The closer the Lorenz curve is to the 45-degree line, the more equal the distribution of education.

One may also derive an education Gini coefficient, again by analogy with the derivation of the Gini coefficient for income inequality examined in Chapter 5; it is given by the area A above the education Lorenz curve, divided by the whole area $A + B$ below the 45-degree line of perfect equality. Educational inequality (in relation to number of years of schooling) tends to fall as average years of education in the population rises. Nonetheless, for a given average years of

FIGURE 8.7 Lorenz Curves for Education in India



Source: https://www.epdc.org/epdc-data-points/epdc-spotlight-india; Data are based on the 2006 DHS India household dataset.

schooling, some countries such as Sri Lanka have achieved relatively equal access to education, and others such as India have had relatively unequal access.[38]

There is also great inequality in school quality. Some secondary school systems, for example, do a much more effective job of teaching than others. Certainly, educational quality is higher in high- than in low-income countries—higher in Europe than in Africa, for example. However, it is also likely that the variability of educational quality is higher in a country such as Mali, where elite schools offer excellent college preparation while many rural public schools may have only one textbook for each five or six students. Although quality differs from school to school in developed countries as well, the differences are not as extreme, on average, as they are in developing countries. The quality of education (the quality of teaching, facilities, and curricula) matters at least as much as its quantity (years of schooling) for differential earnings and productivity.[39] In South Asia, for example, many children complete several years in primary school without ever learning to read. Students from lower-income households are far more likely to find classrooms that lack basic facilities and supplies, and truant teachers.

Inequality in higher education is sometimes revealed in the location of elite universities in one or two cities. For example, China has invested most heavily in its 70 Beijing-based universities, specifically the several that are designated as National Key Universities, including Peking University and Tsinghua University.

These and other elite schools are most accessible to applicants from Beijing; most students attend universities near their home. There is also a significant concentration of university investment in Shanghai, similarly more accessible for local residents. Such concentrations reinforce other existing inequalities, such as in the much higher spending on high-school education in these elite areas.[40]

But much can be done to improve the chances that children living in poverty will at least receive a decent primary education, as the findings reported in Box 8.6 reveal.

Depending on how it is designed and financed, a nation's educational system can either improve or worsen income inequality. As levels of earned income are

BOX 8.6 Findings: Impacts of Tutor and Computer-Assisted Learning Programmes

Pratham is a large India-based nongovernmental organisation (NGO); its name means "primary" or "beginning." Its motto is "To ensure that every child is in school . . . and learning well." This is of critical importance because "a large fraction of Indian children cannot read when they leave school." Randomised evaluations in urban schools found two of Pratham's programmes to be highly cost-effective: tutoring poor children from slums and providing computer learning programmes for children to set their own pace to catch up in maths. Like many areas in India, in Vadodara, where the programme was studied, children are usually on the school's books but often attend sporadically.

Targeted Tutoring

Enrolled children in grades (standards) three and four identified as at risk—lagging behind in first-grade literacy and numeracy—are tutored about two hours a day by young women. These *balsakhis,* meaning "children's friends," have managed to finish secondary school but typically live in the same slums as the children they tutor. *Balsakhis* provide patient attention to children who may find the school environment threatening. The presence of the programme increased average test scores of all children in treatment schools by a substantial amount, normalised to 0.28 standard deviations (SDs) after two years. Children with low starting test grades—usually the ones taking part in the programme—accounted for most of these gains. The cost is only about $5 per child per year. Results suggest that the programme is 12 to 16 times more cost-effective than hiring new teachers. There could be spillover benefits from tutored to untutored children or from the programme's presence, but evidence indicates that most gains were from children who worked with a *balsakhi*. Their scores gained an average of 0.6 SDs in their second year in the programme—more than half the gain from a year of school for a comparison child. *Balsakhi* salaries are the programme's main cost, about 500 to 750 rupees per month, around $14 based on 2010 exchange rates—a good income for them, though far less than regular teachers make. Thus, the programme costs about 107 rupees (about $2.25) per student per year.

Computer-Assisted Learning (CAL)

Pratham set up computers for fourth-grade (standard) children to review maths skills—similar to learning programmes seen in the United States, Canada, and Britain—for randomly selected participants. Maths scores increased by 0.36 SDs the first year and by 0.54 SDs the second year. But some of the gains faded over time. The CAL programme costs approximately 722 rupees (about $16) per student per year, including costs for computers.

Thus, both programmes are relatively inexpensive and work well. But the *balsakhi* programme is five to seven times more cost-effective than the CAL programme (evaluated as costs incurred for

a given gain in test scores). In fact, total benefits may be greater; for example, greater student learning may lead to higher earnings later in life. The *balsakhi* programme has already included tens of thousands of children in India, and the CAL programme should not be hard to replicate. Clearly, such programmes can be expanded to a large scale. But more research is needed on conditions for helping students better retain what they learn.

Source: Based on Abhijit V. Banerjee, Shawn Cole, Esther Duflo, and Leigh Linden, "Remedying education: Evidence from two randomised experiments in India," *Quarterly Journal of Economics* 122 (2007): 1235–1264.

clearly dependent on years of completed schooling, it follows that large income inequalities will be reinforced and income mobility reduced if students from the middle- and upper-income brackets are represented disproportionately in secondary and university enrolments. Despite the recent rapid proliferation of private schools for nonelites in South Asia and other developing regions, their quality is generally not high, and their teacher qualifications are often lower than those in the public schools. In many cases, parents do not appear to be getting what they think they are paying for. The cost of quality education therefore becomes prohibitive to lower-income families, who are often unable to borrow funds to finance their children's middle and secondary school education. Child labour can be understood as a substitute for a loan as a way to bring money to the family now at later cost—a very high cost in the case of child labour. This, in effect, amounts to a system of educational advancement and selection based not on merit but on family wealth. It thus perpetuates concentration of income within certain population groups.[41]

The inegalitarian nature of many developing-country educational systems is compounded even further at the university level, where the government may pay the full cost of tuition and fees and even provide university students with income grants in the form of stipends. Because most university students already come from the upper-income brackets (and were so selected at the secondary level), highly subsidised university education using public funds often amounts to a transfer payment from the poor to the wealthy in the name of "free" higher education![42]

8.6 Health Measurement and Disease Burden

World Health Organization (WHO) The key UN agency concerned with global health matters.

The **World Health Organization (WHO)**, the key UN agency concerned with global health matters, defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease and infirmity."[43] This approach may put us on a better conceptual foundation but does not in itself provide a better measure.

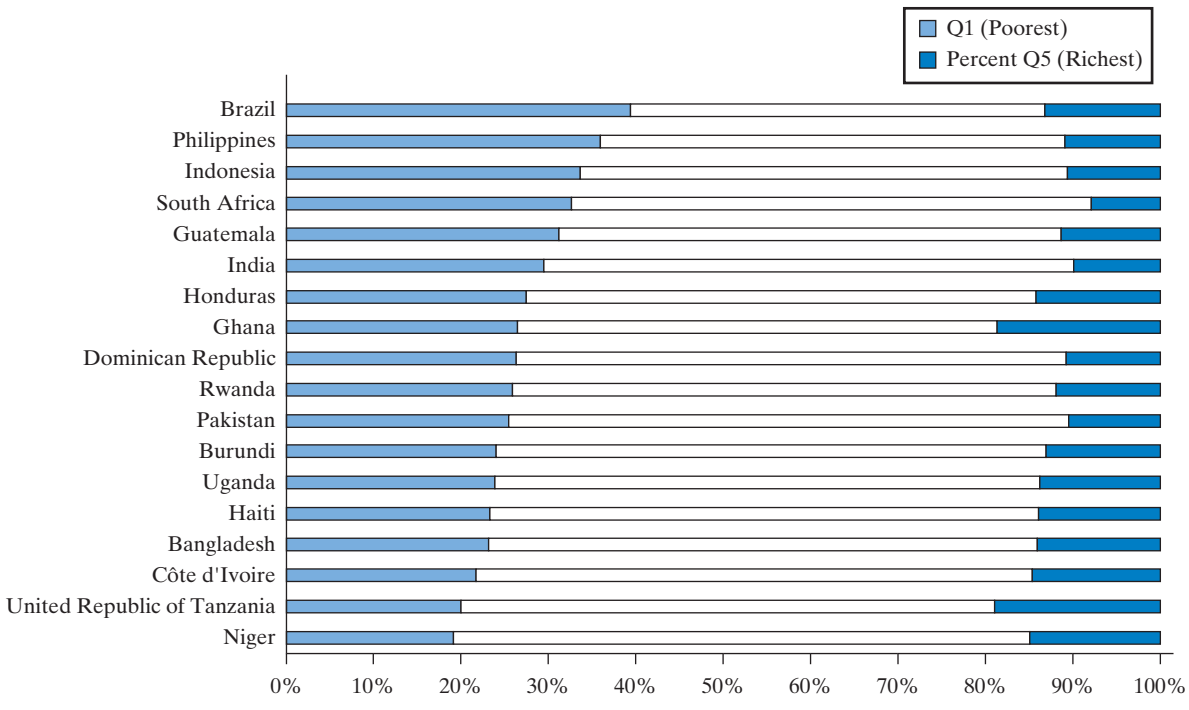
Disability-Adjusted Life Years (DALYs) The DALY is an alternative measure of health promoted by the WHO to help quantify the burden of disease from morbidity as well as from mortality. One DALY can be thought of as one lost year of "healthy" life. In streamlined form, DALYs for a disease or health condition are calculated as the sum of the years of life lost (YLL) due to premature mortality in the population; and the years lost due to disability (YLD) for people living with the health condition or its consequences. That is, DALY = YLL + YLD. In turn, the YLL corresponds to number of deaths multiplied by standard life expectancy from the age at which death occurs; the basic formula for a given cause, age

and sex is: YLL = M*L, where: N = number of deaths, and L = standard life expectancy at age of death in years. In the basic formula, YLD = P*DW, where P = number of prevalent cases, and DW = disability weight. The sum of these DALYs across the population, or the burden of disease, represents a measure of the gap between current health status and an ideal health situation—one in which the entire population lives to a full potential lifespan while remaining free of disease and disability. In practice, DALY calculations often use social value weights for diseases and injuries, specifically disability weights, age weights, and time discounting. Some alternative measures attempt to go further to estimate a quality-adjusted life year (QALY), to account for the quality of life as well as disability duration.[44]

There are doubts about the quality of data used in these measures, especially for some of the poorest countries, and the use of DALYs to compare health across countries is controversial. Premature deaths represented about two-thirds of lost DALYs, and disabilities accounted for the remaining third.[45] Progress has continued to be made in most but not all of these disease categories.

However, average health levels can mask great inequality. For example, in some countries, minorities and indigenous populations can have life expectancies that are a decade or more shorter than the dominant groups, and their infant mortality rates can be more than triple the national average.[46] Thus, as is the case with income and education, the distribution of health among the population, not just averages, is what matters. As one might expect, the poor are significantly less healthy than the more affluent. Figure 8.8 shows that the children of the poor

FIGURE 8.8 Children's Likelihood to Die in Selected Countries



Source: World Health Organization

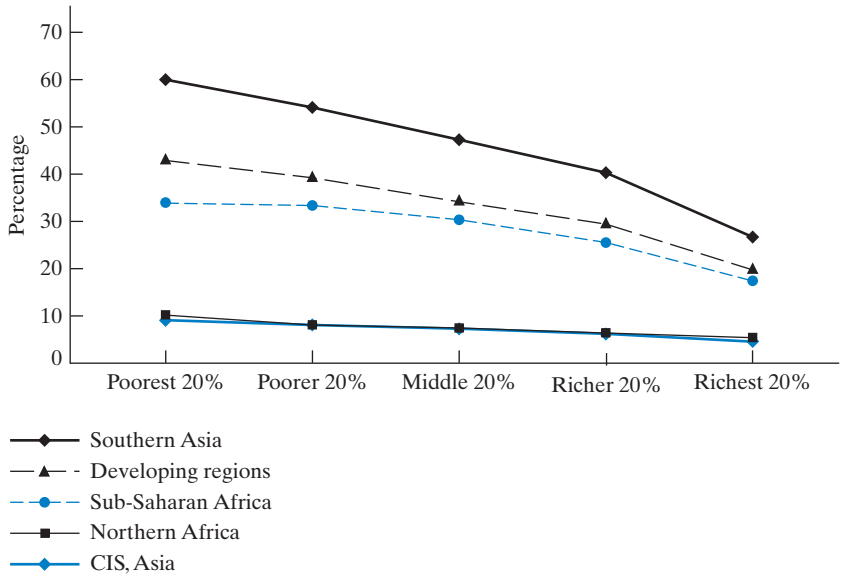
are far more likely to die than those of the rich. Figure 8.9 points to an important culprit. The proportion of children under the age of 5 who are underweight is far higher for poorer quintiles than for richer quintiles, particularly in South Asia and sub-Saharan Africa. Health inequality is a consistent pattern, whatever the measure of health outcomes used.

Health inputs are also very unequal, even when they are provided by public authorities rather than procured privately. Higher-quality medical facilities are concentrated in urban and richer areas, where the more affluent have the political clout to secure them. Even when public clinics are available in poor rural areas, they are typically underequipped and understaffed. Just as teacher truancy is a problem in schools, absenteeism of medical personnel can be pervasive. A World Bank study found that absentee rates among health care workers in primary health facilities on which the poorer population depends was 43% in India in 14 states studied, 42% in Indonesia, 35% in Bangladesh, 35% in Uganda, 26% in Peru, and 19% in Papua New Guinea.[47]

Developing countries face a far more crippling disease burden than developed countries, especially regarding infectious diseases. AIDS, malaria, and parasites are three major problems that we consider in this section. These and other health challenges faced by developing countries are surveyed in Box 8.7.

Some diseases are especially deadly when combined with other diseases. Malnutrition is a form of disease, and its presence is a major factor in children both contracting disease and dying of it. While the death certificate may

FIGURE 8.9 Proportion of Children Under Five Who Are Underweight, by Household Wealth, Around 2008



Source: From *Millennium Development Goals Report, 2010,* p. 14. Reprinted with permission from the United Nations.

BOX 8.7 Development Policy: Health Challenges Faced by Developing Countries

- *Absolute poverty.* Poverty plays such a central role in most health problems faced by developing countries that it has its own designation in the International Classification of Diseases: code Z59.5—extreme poverty.
- *Malnutrition.* Many deaths attributed to a particular cause of disease—particularly among children—have as their root cause malnutrition, which can weaken the immune system. About 800 million people suffer undernourishment, and up to 2 billion suffer one or more micronutrient deficiencies.
- *AIDS.* Now the leading cause of death of working-age adults in the developing world, if unchecked it may condemn many countries in sub-Saharan Africa, the hardest-hit region, to continued grinding poverty.
- *Malaria.* Once in retreat, its most deadly strain is now making a big comeback, particularly in Africa; it still kills well over 1 million people each year, 70% of them children under 5.
- *Tuberculosis.* TB currently claims about 2 million lives each year. One-third of the world's population is infected with the TB bacillus, and each year about 8 million new cases result from this "reservoir of infection." New multi-drug-resistant strains of TB, difficult and expensive to treat, are spreading in "TB hot zones" in the developing world.
- *Acute lower respiratory infections.* Lung infections, primarily pneumonia—generally preventable and curable—cause about 20% of all deaths in children under the age of 5.
- *Hepatitis B.* Hepatitis B may now kill as many as 1 million people each year.
- *Ascariasis. Ascaris* roundworm parasites affect some 10% of the population of the developing world, possibly as many as 1.2 billion people. The parasites most commonly infect children aged 3 to 8 years when they put their hands to their mouths after playing in contaminated soil or eat uncooked food grown in contaminated soil or irrigated with unsanitary water. The worst infections cause about 60,000 deaths per year, the overwhelming majority of whom are children.
- *Cholera.* Once largely in retreat, cholera has been on the upsurge in recent years in many countries in Africa, Asia, and Latin America. Untreated, dehydration from severe diarrhoea causes death.
- *Dengue.* Dengue and dengue haemorrhagic fever are spreading rapidly, with millions of cases reported each year and thousands of deaths; about a half-million cases require hospital treatment.
- *Leprosy (Hansen disease).* There are still about 400,000 new cases of leprosy each year. About 2 million people are disabled by leprosy, including those who have been cured but crippled prior to treatment, in India and many other developing countries.
- *Dracunculiasis (guinea worm disease).* This debilitating nematode infestation afflicts the poorest of the poor, who lack access to even minimally safe water.
- *Chagas disease.* This parasitic infection attacks an estimated 17 million people in Latin America, causing about 45,000 deaths annually.
- *Leishmaniasis.* This group of parasitic diseases infects about 12 million people. Visceral leishmaniasis, also known as *kala-azar*, is the most severe form. Fatal in 90% of untreated cases, it causes tens of thousands of deaths each year.
- *Lymphatic filariasis (elephantiasis).* This disfiguring parasitic disease still affects around 100 million people in the developing world, leaving 40 million of them seriously incapacitated and disfigured.
- *Other parasites.* Many other parasites are active, including *Trichuris* and hookworm, each of which affects about 600 million people.

- *Other diarrhoeal diseases.* Whether caused by infectious agents listed in this box or other bacterial, viral, or parasitic organisms, diarrhoea is often spread by contaminated water; untreated, it can lead to extreme dehydration, the proximate cause of death of close to 2 million people each year.

Source: World Health Organization

cite dehydration from diarrhoea or a specific infectious disease, in many cases death would not have occurred without the contributing factor of malnutrition.

The United Nations World Food Programme estimated in 2019 that 821 million people were suffering from hunger. This was 216 million fewer people than at the beginning of the 1990s, a decline of over one-fifth, despite the nearly 2 billion increase in world population during the intervening period. However, the existence of hunger on this scale represents a global public health emergency, one that can be addressed with better policies and assistance.

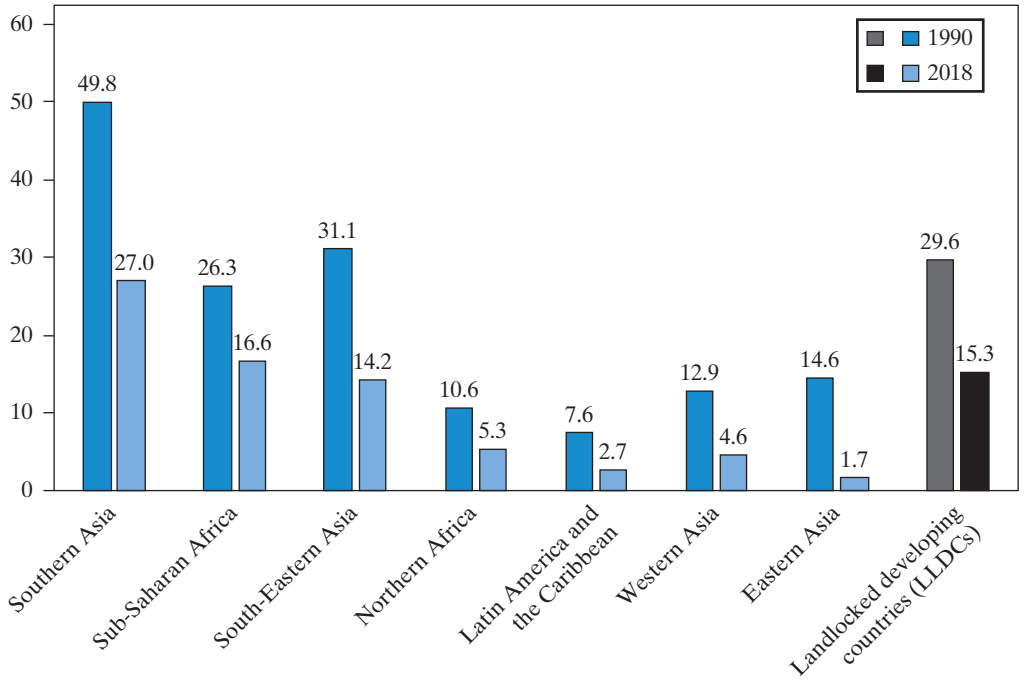
The International Food Policy Research Institute (IFPRI) reported that, globally, in 2018, over 150 million children were stunted (of low height for their age); and over 50 million children were wasted (of low weight for their height). Malnutrition among children is particularly consequential, as the effects can lead to lifelong physical and mental impairments. Consistent with progress in reducing other forms of poverty, since 1990 child hunger has been declining in all regions, albeit more slowly than widely considered possible. One indicator is the decline in the proportion of children under five years of age who are underweight, as shown in Figure 8.10. In South Asia, the decline in wasting has been especially rapid since about 2010. The rate of child stunting has similarly improved.

But hard-won gains can be reversed. In 2018, IFPRI reported that approximately 124 million people were suffering from acute hunger, a dramatic 55% increase from the 80 million reported in 2016. IFPRI found that, over time, the rates of improvement are not nearly fast enough to achieve the SDG of ending hunger by 2030. The 2019 UNICEF State Of The World's Children report found that globally, at least half of all children under 5 suffers from "hidden hunger due to deficiencies in vitamins and other essential nutrients," and that "in 2018, almost 200 million children under 5 suffered from stunting or wasting."[48]

The interaction between malaria and acute respiratory infections or anaemia is also deadly. Another important lethal interaction is between AIDS and tuberculosis. Failure to control either of the diseases makes each more likely to be fatal. Moreover, the spread of HIV has been demonstrated to be significantly promoted by the presence of other sexually transmitted diseases, whose sores facilitate viral invasion.

To address problems of acute respiratory infections, diarrhoea, measles, malaria, and malnutrition, the WHO, in cooperation with other major international agencies and national health authorities, has been implementing its Integrated Management of Childhood Illness (IMCI) programme, aimed at improving the training and performance of national health organisations and personnel in disease prevention and the treatment of sick children. The programme emphasises education on practices such as breast-feeding and use of oral rehydration therapy.

FIGURE 8.10 Proportion of Children Under Five Who are Underweight, 1990 and 2018



Source: World Health Organization, 2018

Poor sanitation is one of the root causes of the burden of disease. Research by the WHO and UNICEF found that, as of 2015, more than three in five people globally used sanitation facilities (if any) that were not safely managed and that contribute to the spread of disease.[49]

8.6.1 HIV/AIDS

The AIDS epidemic has been threatening to halt or even reverse years of hard-won human and economic development progress in numerous countries. The WHO reported in 2018 that since the AIDS epidemic began, close to 70 million people have been infected with the HIV virus; and about half of them—about 37 million people—have already died of AIDS. Sub-Saharan Africa remains the most severely affected, with nearly 1 in every 20 adults (4.9%) living with HIV and accounting for 69% of the people living with HIV worldwide.

There has been great progress in the global fight against HIV/AIDS. The UNAIDS interagency programme estimates that, from the beginning of the epidemic through to 2017, between 60 to 100 million people have become infected with HIV, of whom 25 to 50 million have died from AIDS-related illnesses. In 2017, an estimated 37 million people were living with HIV. Of these, about 21 million were accessing antiretroviral therapy (ART), an increase from 8 million in 2010. About 80% of pregnant HIV-positive women had access to ART medicines to prevent its transmission. By 2017, total AIDS-related deaths had fallen

by more than half since the annual peak was reached in 2004, and new HIV infections fell by 47% from its 1996 peak year.

More than half of HIV-positive people live in sub-Saharan Africa, particularly eastern and southern Africa, together accounting for 45% of HIV infections and 53% of people living with HIV globally. But the reduction of both deaths and new infections is also the largest in the SSA region—the result of impressive success in addressing the disease. Until recently, the HIV/AIDS epidemic threatened to undercut development hopes in SSA; and while the crisis is far from over, concerted national and international focus and resources have helped avert a greater disaster.

This is an impressive global health achievement, but enormous challenges remain. As UNAIDS recently put it, "gains are real but still fragile." Though usually thought of as an issue of health care systems and delivery, AIDS is equally an issue of economic development. **Acquired immunodeficiency syndrome (AIDS)** is the final and fatal stage of infection with the **human immunodeficiency virus (HIV)**. In the developing countries as a whole, AIDS is transmitted primarily through heterosexual intercourse; contact with infected blood and drug needles, both by drug abusers and in hospitals; and perinatal transmission (from mother to fetus). In low-income countries, without proper treatment, average survival once AIDS symptoms appear has been under one year. There has been progress in making expensive antiretroviral medication available to low- and lower-middle-income countries at much reduced prices (or even free of charge); at the end of 2011, for the first time, a majority of HIV-positive people eligible for antiretroviral therapy treatment in low- and middle-income countries actually were receiving it—8 million people in all, up dramatically in recent years. Unfortunately, these lifesaving drugs are still not available to millions infected in Africa and South Asia. Treatments have often otherwise been limited to aspirin, antibiotics for infections, and cortisone for skin rashes.

Acquired immunodeficiency syndrome (AIDS) Viral disease transmitted predominantly through sexual contact.

Human immunodeficiency virus (HIV) The virus that causes the acquired immunodeficiency syndrome (AIDS).

Initially, AIDS was widely perceived as a disease of developed countries, primarily affecting men who have sex with men. But, in fact, more than 95% of all HIV cases and AIDS deaths occur in the developing world. Throughout the region of sub-Saharan Africa, AIDS is now the leading cause of death of adults in the economically active years. Although infectious childhood diseases still kill far more people in developing countries, AIDS strikes those who have successfully run this gauntlet of child killers. Their societies depend on the energies and skills of precisely the part of the population most afflicted.

Emily Oster presents evidence that the high incidence of HIV in Africa may result from higher rates of HIV viral transmission, which is facilitated by higher rates of other untreated sexually transmitted diseases. This provides another example of potential synergies among health problems, to be taken into account in the design of successful programmes.

According to the *UNAIDS Report on the Global AIDS Epidemic, 2010*, there were about 15 million AIDS orphans in sub-Saharan Africa as of 2009 (who had lost at least one parent to AIDS). Providing basic needs for these orphans, ensuring that they are not discriminated against because of irrational fears, and seeing that they are able to obtain the few years of schooling that will help rescue them from absolute poverty will be a major development challenge. It is not a challenge that Africa, with all its problems, is accustomed to. Extended family networks have provided privately for children who have lost their parents. In

some parts of East Africa, this traditional family adaptation to death appears threatened due to the scope of the AIDS crisis. Political analysts claim that conditions are ripe not only for child abuse and exploitation but also for recruiting of children for guerrilla armies led by unscrupulous aspiring dictators or mercenary groups. The resulting destabilisation and diversion of resources can have a devastating impact on social and economic development. An excellent strategy developed by church groups in Zimbabwe is to have volunteers visit and provide basic care for these orphans in the homes where they live, which can be homes of child-headed households, foster parents, grandparents, or other relatives. These visits provide a much-needed combination of emotional and material support for these orphans.

The case of the AIDS crisis in Uganda and the response of government and civil society is presented in Box 8.8.

BOX 8.8 Development Policy: AIDS: Crisis and Response in Uganda

The AIDS pandemic in Uganda was the first to reach a large scale and then the first to register a significant decline in prevalence; as a result, the Ugandan experience has been widely studied. Although the picture is not completely clear, some important lessons have emerged. HIV was probably spreading in the late 1970s, and the first AIDS cases were diagnosed in the early 1980s. It was several years before a national response emerged, criticised as slow at the time but rapid in comparison with many other countries. A 1988 national survey of the epidemic found an HIV prevalence of 9%, unprecedented at that time. UNAIDS estimated that national prevalence peaked at 15% in 1991. But the national and international response also accelerated.

The Ugandan government introduced one of the most active and comprehensive AIDS prevention programmes in Africa. Programmes were coordinated by the Ugandan AIDS Commission Secretariat. Funding was provided by UNICEF, the WHO, USAID, the World Bank, and the UNDP. Donor countries, including the United States, were probably more active on AIDS in Uganda than other countries as a result of the extensive attention to the early epidemic there. The AIDS Support Organization (TASO), a Ugandan NGO, has played a crucial role in innovation and scaled-up service delivery in treatment, family assistance, and counselling, as well as education and awareness, since its founding in 1987. Civil society, including churches, played a major role in mobilising a community response.

Mass media were employed in Uganda's HIV awareness efforts. The main slogan, "Zero Grazing," was a locally sophisticated way of saying "stay with one partner." At first, many people did not understand it, but once they did, its simple message—at a time when many knew infected Ugandans—was thought to have had some impact. The AIDS film, *It's Not Easy*, was viewed by some 90% of Uganda's formal-sector workforce. T-shirts with mottos such as "Love Carefully" became popular. Abstinence was promoted but is estimated to have had a more limited effect. After overcoming religious opposition, condom use was heavily promoted—a major factor in reduced transmission of HIV in Uganda. The spread of HIV has also been demonstrated to be significantly promoted by the presence of other sexually transmitted diseases, which could also be reduced by condom use. In Uganda, the commercial sex industry in towns known to be highly infected dropped dramatically. Several studies showed that the rate of AIDS

infection among teenagers in Uganda dropped steeply from 1990 to 1995, most likely due in part to the adoption of at least comparatively safer sex practices. However, some of this decrease might have been due to a decline in trade in this period. And the rate fell further when many of those previously infected began to die in larger numbers.

During the early spread of HIV, commercial controls were a factor leading to an active smuggling industry. Some highly paid truck smugglers, often stranded for days in towns along smuggling routes, made frequent visits to sex workers, encouraging the rapid spread of the disease. The decrease in economic activity in the 1990s may be a complementary explanation for the reduced HIV infection rates, along with behaviour change.

The HIV prevalence rate appears to have risen somewhat since 2000. UNAIDS has estimated that 6.9% to 7.7% of Ugandan adults were infected in 2011. About 1.4 million people are HIV-positive in the country, with 62,000 deaths in 2011 alone. There are over 1 million AIDS orphans in the country. This has generated great concern. The apparent uptick may be partly due to complacency in sexual behaviour after rates fell and antiretrovirals became more available. It may also not be a coincidence that economic activity has also picked up in Uganda in recent years. There is concern that previous estimates may have been somewhat low. Many Ugandans and aid officials are worried about the trend and are working to reverse it with renewed emphasis on the media and community mobilisation strategies that are widely understood to have helped in the past.

Sources: Martha Ainsworth and Mead Over, "AIDS and African development," *World Bank Research Observer* 9 (1994): 203–240; Jill Armstrong, "Socioeconomic implications of AIDS in developing countries," *Finance and Development,* 28, No. 4 (1991): 14–17; Tony Barnett and Piers Blaikie, *AIDS in Africa: Its Present and Future Impact.* New York: Guilford Press, 1992; Gerard Kambou, Shanta Devarajan, and Mead Over, "The economic impact of AIDS in an African country: Simulations with a CGE model of Cameroon," *Journal of African Economies* 1 (1993): 109–130; Jean-Louis Lamboray and A. Edward Elmendorf, "Combating AIDS and other sexually transmitted diseases in Africa." World Bank Africa Technical Division Paper No. 181. Washington, D.C.: World Bank, 1994; Maureen A. Lewis et al., *AIDS in Developing Countries: Cost Issues and Policy Tradeoffs.* Washington, D.C.: Urban Institute, 1989; Mead Over, *The Macroeconomic Impact of AIDS in Sub-Saharan Africa.* Washington, D.C.: World Bank Africa Technical Division, 1993; *Population and Development,* special issue, "A Cultural Perspective on HIV Transmission," January 1993; Uganda AIDS Commission, http://www.aidsuganda.org; UNAIDS; http://www.unaids.org/en/HIV_data/epi2006/default.asp; United Nations Development Programme, *Human Development Report, 2001.* New York: Oxford University Press, 2001; World Bank, *Report on a Workshop on the Economic Impact of Fatal Adult Illness in Sub-Saharan Africa.* Washington, D.C.: World Bank, July 1993; Emily Oster, "Routes of infection: Exports and HIV incidence in sub-Saharan Africa." NBER Working Paper No. 13610, January 16, 2009, forthcoming in the *Journal of the European Economic Association*; Emily Oster, "Sexually transmitted infections, sexual behavior, and the HIV/AIDS epidemic," *Quarterly Journal of Economics* 120 (2005): 467–515; Note that an AIDS orphan is defined by UNAIDS as a child who has lost at least one parent to AIDS.

8.6.2 Malaria

Malaria directly causes over 1 million deaths each year, most of them among impoverished African children. Pregnant women are also at high risk. Severe cases of malaria leave about 15% of the children who survive the disease with substantial neurological problems and learning disabilities. A child dies from malaria every 30 seconds. Over 500 million people become severely ill with malaria each year. There is evidence that malaria can lower productivity and possibly even reduce growth rates.[50]

The WHO's Roll Back Malaria Partnership seeks to eradicate this disease at its source. Eradication has been most successful where campaigns have combined better-targeted DDT spraying and draining swamps where malarial mosquitoes are breeding with using mosquito bed nets, improving nutrition to build resistance, and sealing houses against mosquito entry.[51]

In addition, major efforts are under way to increase international funding for a war on malaria, emphasising the development of a malaria vaccine. With proper funding, specialists believe that an effective vaccine might be just a few years away, but because victims of malaria tend to come from low-income countries and cannot afford expensive drugs, there has been little incentive for pharmaceutical companies to emphasise research in this field. However, citizen and government pressure in developed countries and a desire to score public relations points, among other factors, have increasingly led drug companies to begin to offer drugs at lower costs in low-income countries, and this may expand to a more balanced portfolio of research.

Vaccines for other diseases have saved many children's lives in developing countries. For example, the WHO and UNICEF, in their 2005 report, *Global Immunization Vision and Strategy,* estimated that immunisation of children carried out in 2003 alone saved 2 million lives (plus hundreds of thousands of additional lives saved in adulthood from complications of hepatitis B). Most vaccines (against diphtheria, tetanus, pertussis/whooping cough, polio, hepatitis B, and measles, for example) were first developed for use in high-income countries. There are other diseases—concentrated in the developing world rather than in both developing and developed countries—that could be controlled with vaccines that pose technical problems no more difficult than vaccines for other diseases previously developed. So why aren't there more vaccines for diseases of the developing world?

If the science is not necessarily the constraint, one reason is that the people who would most benefit are poor and therefore less able to pay. Governments and international assistance could help with subsidies. But, as pointed out by Michael Kremer, two market failures are also at work. First, there is an incentive for governments to wait for other countries to spend the resources on vaccine R&D, after which the benefits will largely spill over as an externality to citizens in one's own country. Even if cooperation could be agreed, there still would be an incentive for participating governments to "defect" and not pay their share. And second, whatever is claimed by aid agencies and governments in advance, companies developing vaccines fear that once they have succeeded, they will be pushed to lower their prices close to production costs, thereby making recouping their original R&D costs unlikely. This is a "time inconsistency problem."[52]

If such problems could be overcome, a potential vaccine would be one of the best solutions for malaria and many other tropical diseases. An idea that has received much attention to address market failure problems is guaranteed vaccine purchases, studied by the Advance Market Commitment Working Group led by Ruth Levine, Michael Kremer, and Alice Albright. In their report, *Making Markets for Vaccines: Ideas to Action,* the group proposed that international sponsors make a legally binding commitment to pay for 200 million malaria vaccine treatments at a guaranteed real price of $15 each, of which $14 would be paid by the sponsors and $1 by the recipient countries. The agreement would set up an independent adjudication committee (IAC) to determine that the required technical specifications for the vaccine had been met. If the IAC found that a later-developed product was superior, it too would be eligible for the price guarantee within the 200 million doses, according to the underlying demand. Firms would have to agree to offer further treatments after the 200 million had been subsidised at a price reflecting production costs, estimated at about $1 per

treatment. The group estimated the market under these parameters at about $3 billion, which it found was approximately average revenue for new drugs developed for rich countries. This project has since been introduced. Funding for malaria vaccines is now substantially improving. A similar structure should work for vaccines for other diseases.[53]

8.6.3 Parasitic Worms and Other "Neglected Tropical Diseases"

Many health challenges of developing countries have received high-profile attention in recent years, epitomised by the relatively well-funded and central role of the Global Fund to Fight AIDS, Tuberculosis, and Malaria.[54] Recall from Chapter 1 that the sixth Millennium Development Goal is to combat "HIV-AIDS, malaria, and other diseases." Indeed, these "other" developing-country health problems, including several types of parasitic worms, have also had devastating impacts on the developing world but have long been comparatively neglected.

The incidence of debilitating parasitic worms has been vast, with some 2 billion people affected—300 million severely. Among the many parasitic diseases plaguing people in the developing world, schistosomiasis (also called *bilharziasis*, or *snail fever*) is one of the worst in terms of its human and development impact (following malaria, which is also classified as a parasitic disease). Schistosomiasis in humans is caused by waterborne flatworms (also known as blood flukes) called *schistosomes*. According to WHO estimates, the disease infects about 200 million people in 74 developing countries, of whom about 120 million are symptomatic and some 20 million suffer severe consequences, including about 200,000 deaths each year. Half of those severely affected are school-age children. The disease retards their growth and harms their school performance if they are in school. The WHO reports that the stunting effects of schistosomiasis are 90% reversible with effective treatment, which is still all too often entirely lacking. Effects on adults can also be serious. According to the WHO, the work capacity of rural labourers in Egypt, Sudan, and northeastern Brazil, for example, is severely reduced due to weakness and lethargy caused by the disease. Liver and kidney damage can result. If this were not enough, the WHO's International Agency for Research on Cancer has determined that urinary schistosomiasis causes bladder cancer; in some areas of sub-Saharan Africa, the incidence of schistosomiasis-linked bladder cancer is about 32 times higher than the incidence of bladder cancer in the United States.

Another long-standing scourge, African trypanosomiasis, or sleeping sickness, still affects several hundred thousand people in sub-Saharan Africa, mostly in remote areas. Tragically, because the disease is endemic where health systems are weakest, most people who contract sleeping sickness die before they are even diagnosed. The WHO estimated that sleeping sickness kills some 55,000 people a year. The impact of trypanosomiasis on economic development can be severe: in addition to the loss of human life and vitality, the disease kills cattle and leads to the abandonment of fertile but infected land. In this case, the parasites (*Trypanosoma*) are protozoa transmitted to humans by tsetse flies. The disease is being attacked with drugs donated to international organisations from a pharmaceutical company. In recent years, public pressure and attention have played an important role in getting drug companies to be more active and constructive in developing countries and in making donations to key agencies such as the WHO. The sleeping sickness initiative is a good example, with Aventis Pharma

providing three key drugs—pentamidine, melarsoprol, and eflornithine—that are each essential for treating sleeping sickness.

Table 8.2 shows the 13 major **neglected tropical diseases**, ranked by their global prevalence (number infected). Taken together, these diseases cause an estimated 534,000 deaths each year. But most of these diseases are curable, can be prevented with environmental improvements at their source, and can ultimately be inoculated against with vaccines. The cost of combating these diseases is relatively low in most cases, and the tragedy is that despite this, they have received relatively little attention. Yet research demonstrates that deworming of

Neglected tropical diseases Thirteen treatable diseases, most of them parasitic, that are prevalent in developing countries but receive much less attention than tuberculosis, malaria, and AIDS.

TABLE 8.2 Some Major Neglected Tropical Diseases

Neglected Disease	Symptoms and Effects	Global prevalance (millions)*	Regions with highest Prevalance/Risk
Roundworm (Ascariasis)	Malnutrition and intestinal obstruction in young children; child stunting; impaired cognition	820	East Asia and Pacific Islands, sub-Saharan Africa, India, South Asia, China, Latin America and Caribbean
Whipworm (Trichuriasis)	Colitis and inflammatory bowel disease; child stunting and impaired cognition	465	Sub-Saharan Africa, East Asia and Pacific Islands, Latin America and Caribbean, India, South Asia
Hookworm infection	Severe iron deficiency anaemia and protein malnutrition; anaemia; child stunting and impaired intellectual and cognitive development; maternal morbidity and mortality in pregnancy	439	Sub-Saharan Africa, East Asia and Pacific Islands, India, South Asia, Latin America and Caribbean
Schistosomiasis	Bladder damage, intestine or liver inflammation; chronic pain, anaemia, malnutrition and stunting; liver and intestinal fibrosis, kidney disease, female genital schistosomiasis	200+	Sub-Saharan Africa, Latin America and Caribbean
Lymphatic filariasis (elephantiasis)	Leg swelling, disfigurement, extreme pain	120	India, South Asia, East Asia and Pacific Islands, sub-Saharan Africa
Trachoma	Blindness	60–80	Sub-Saharan Africa, Middle East and North Africa
Onchocerciasis	Larvae in skin and eyes; onchocerca skin disease; blindness	30–40	Sub-Saharan Africa, Latin America and Caribbean
Leishmaniasis	Fever, weight loss, enlargement of the spleen and liver, and anaemia	12	India, South Asia, sub-Saharan Africa, Latin America and Caribbean
Chagas' disease	Heart and digestive problems	8+	Latin America and Caribbean
Trypanosomiasis (Human African)	Sleepiness, swollen lymph nodes, weakness, psychiatric disorders, seizures	0.3	Sub-Saharan Africa

**Note:* Population considered at risk generally much higher than current prevalence; estimated DALYs are far higher than death rates

Source: World Health Organization Website, Neglected Tropical Diseases website accessed Feb. 15, 2014: http://www.who.int/neglected_diseases/en/; infections in 2010 Rachel L Pullan, Jennifer L Smith, Rashmi Jasrasaria, and Simon J Brooke, "Global numbers of infection and disease burden of soil transmitted helminth infections in 2010," Parasites and Vectors, 2014; Peter Hotez, "A Plan to Defeat Neglected Tropical Diseases," Scientific American, Jan. 10, 2010, p90-96; Peter J Hotez, Alan Fenwick, Lorenzo Savioli, and David H Molyneux, "Rescuing the bottom billion through control of neglected tropical diseases, May 2, 2009 Lancet #379, p1570-75 ; Peter Hotez, "NTDs V.2.0: "Blue Marble Health"—Neglected Tropical Disease Control and Elimination in a Shifting Health Policy Landscape Blue Marble Health 2013 PLOS Neglected Tropical Diseases, www.plosntds.org, 1 November 2013, Vol. 7, No. 11 ,e2570; Peter Hotez et al., "Control of neglected tropical diseases," New England Journal of Medicine, 357: 1018–1027 (2007)

children can improve both their health and their school attendance—at very low cost (again, see the findings in Box 8.4).

But these "neglected" tropical diseases are finally starting to get the focus they deserve. The Global Network for Neglected Tropical Diseases is coordinating a campaign to fight these scourges.

The net benefits of expanded support for other health programmes in addition to HIV/AIDS, including child nutrition and the neglected tropical diseases, are very high and often show strong synergies. The moral and economic case for a much-enhanced international response is clear.

8.7 Behavioural Economics Insights for Designing Health Policies and Programmes

There is increasing work applying behavioural economics methods (introduced in Chapter 5) to facilitate building human capital in physical and mental health as well as in education. Recent research from this relatively new field has demonstrated how the design of programme structures, outreach, and follow up can benefit from taking into account the approach of behavioural economics. Some of the findings, including two that are relevant to addressing HIV/AIDS, are reviewed in Box 8.9.

BOX 8.9 Findings: Applying Behavioural Economics to Improve Physical and Mental Health

Recent research has examined what policies and programmes can help people become more successful at building their human capital utilising behavioural economics and psychology research methods.

Combining financial with psycho-social support

Several RCT studies have demonstrated that reductions in poverty resulting from cash transfers lead, in turn, to reduced stress and depression, and improved psychological well-being, in countries including Mexico, Malawi, and Kenya. There is also a growing "cash plus" literature showing that family cash transfer programmes, coupled with complementary family services including psycho-social support home visits, can have wider beneficial effects on children and youth. Among poor South African households receiving cash transfers, adolescents who also received household visits by a home-based counsellor reported fewer HIV risk-taking behaviours than those in cash-only households.[a]

[a]Lia C.H. Fernald, and Megan R. Gunnar (2009) "Poverty-Alleviation Programme Participation and Salivary Cortisol in Very Low-Income Children," *Social Science & Medicine* 68 (12): 2180–9; Ozer, et al. (2011) "Does Alleviating Poverty Affect Mothers' Depressive Symptoms? A Quasi-Experimental Investigation of Mexico's Oportunidades Programme," *International Journal of Epidemiology*, 40 (6): 1565–76; Sarah Baird, Jacobus de Hoop, and Berk Özler (2013) "Income Shocks and Adolescent Mental Health," *Journal of Human Resources* 48 (2): 370–403; Johannes Haushofer , and Jeremy Shapiro (2016) "The Short-Term Impact of Unconditional Cash Transfers to the Poor: Experimental Evidence from Kenya," *Quarterly Journal of Economics* 131 (4): 1973–2042; Keetie Roelen, et al. (2017) "How to Make 'Cash Plus' Work: Linking Cash Transfers to Services and Sectors," Innocenti Working Paper WP-2017-10, UNICEF Office of Research, UNICEF, Florence, Italy; Lucie D. Cluver, et al. (2014) "Cash Plus Care: Social Protection Cumulatively Mitigates HIV-Risk Behavior among Adolescents in South Africa," AIDS 28 (Suppl 3): S389–S397.

Deterring Violence and Criminality with Psycho-Social Interventions

The importance of combining financial and psychological support is also demonstrated in a Liberia study that examined the impact of cash and therapy on violence and other criminal activities. The research found that transferring a small amount of funds had a short-run positive effect in deterring violence and other criminal activities, and switching to noncriminal activities. Cognitive behavioural therapy also had a positive but time-limited effect, and a combination of the two interventions had a longer-lasting effect. (A caveat is that participants were not studied beyond the one-year mark; so we don't know if some study participants returned to criminality after that point.)[b]

The Importance of Being Reminded

As introduced in Chapter 5, plans and goals often go unattended; but recent developing-country evidence has demonstrated that people can benefit from receiving reminders to take timely actions on health and education matters that they already understand are important and desirable. For example, adherence to medicine regimens is lower for the poor than for the non-poor in every country; this has been attributed to the cognitive burden of living in poverty. A case in point is the lower adherence to following daily HIV/AIDS drug regimens. In Kenya, patients were randomly selected to receive either daily or weekly phone-call reminders to take their HIV medications. Patients who received *weekly* text (SMS) reminders, had a 13% increase in their adherence rates, defined as taking their medicines 90% of days—although, curiously, daily reminders produced no significant effect. Effective reminders can be implicit rather than verbal, as illustrated by a successful programme that provided chlorine at the places where people collect water in Kenya.[c]

Providing self-commitment opportunities

Substance abuse, including alcoholism, is a serious mental health disorder with negative consequences for capabilities. Chapter 5 introduced the approach of offering people "self-commitment devices" to reach financial goals. This approach has also been applied to offer opportunities to help people improve their health behaviour. For example, nearly half of low-income workers in a study in India were willing to pay for a product providing incentives to remain sober; about a third of participants were willing to give up 10% or more of daily income to make a sobriety commitment. Again, this constitutes evidence that cognitive limitations are quite real, and also provides a hint at how they can be managed.[d]

[b]Christopher Blattman, Julian C. Jamison and Margaret Sheridan (2017) "Reducing Crime and Violence: Experimental Evidence from Cognitive Behavioral Therapy in Liberia," *American Economic Review*, 107, no. 4, April 2017, 1165-1206.

[c]Richard Thaler and Cass Sunstein (2008) *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New Haven, CT: Yale University Press.Pop-Eleches, et al. (2011) "Mobile Phone Technologies Improve Adherence to Antiretroviral Treatment in Resource-Limited Settings: A Randomized Controlled Trial of Text Message Reminders," AIDS 25 (6): 825–342011); Michael Kremer, Edward Miguel, Sendhil Mullainathan, Clair Null, and Alix P. Zwane (2009) "How to get safe water: Price, Persuasion, Peers, Promoters, or Product?" *American Journal of Tropical Medicine and Hygiene*, 2009, 81 (5), 305–6.

[d]Emma Boswell Dean, Frank Schilbach, and Heather Schofield (2018) "Poverty and Cognitive Function," *The Economics of Asset Accumulation and Poverty Traps*, edited by Barrett, et al., NBER 2018.

8.8 Health, Productivity, and Policy

8.8.1 Productivity

The devastating effects of poor health on child mortality are clear enough. But do poor health conditions in developing countries also harm the productivity of adults? The answer appears to be yes. Studies show that healthier people earn higher wages. For example, daily wage rates in Côte d'Ivoire have been estimated

to be about 19% lower among men whose health status makes them likely to lose a day of work per month because of illness than daily wage rates of healthier men. Careful statistical methods have shown that a large part of the effect of health on raising earnings is due to productivity differences: it is not just the reverse causality that higher wages are used in part to purchase better health. A study in Bangladesh found that the higher productivity of healthier workers allows them to get better-paying jobs. In another study, the elimination of deformity from leprosy was estimated to more than triple earnings of workers in India.[55]

The Nobel laureate Robert Fogel has found that citizens of developed countries are substantially taller today than they were two centuries ago and has argued that stature is a useful index of the health and general well-being of a population. Increases in height have also been found in developing countries in recent decades as health conditions have improved. In most cases, rapid increases in average height earlier in the twentieth century gave way to smaller increases by midcentury.

If height is an indicator of general health status, to the extent that increases in health lead to higher productivity, taller people should earn more (unless height also proxies other productivity characteristics). John Strauss and Duncan Thomas found that taller men earn more money in Brazil, even after controlling for other important determinants of income such as education and experience (see Figure 8.11, panels A1 and A2). A 1% increase in height is associated with a 7% increase in wages in that middle-income country. In the United States, there is also an association, but a much smaller one, with a 1% increase in height associated with a 1% increase in wages. Moreover, shorter individuals are more likely to be unemployed altogether. Height reflects various benefits achieved early in life; thus one is not seeing just the impact of current income on current height. In particular, taller people receive significantly more education than shorter people (see Figure 8.11, panels B1 and B2). Note also that these relationships carry over to alternative health measures such as the body mass index, which reflects short-term as well as long-term health and nutrition. Strauss and Thomas draw on these results and a survey of the literature to conclude that health and nutrition do increase productivity, with the greatest improvements occurring for those who are initially least educated and poorest.[56]

Thus, the preponderance of the evidence is that health and nutrition do affect employment, productivity, and wages, and very substantially so among the poorest of the poor. This finding magnifies the policy priority of health in development; not only is health a major goal in itself, but also it has a significant impact on income levels. After their exhaustive review of the literature and its complex statistical and data problems, Strauss and Thomas conclude that "the balance of evidence points to a positive effect of elevated nutrient intakes on wages, at least among those who are malnourished."[57]

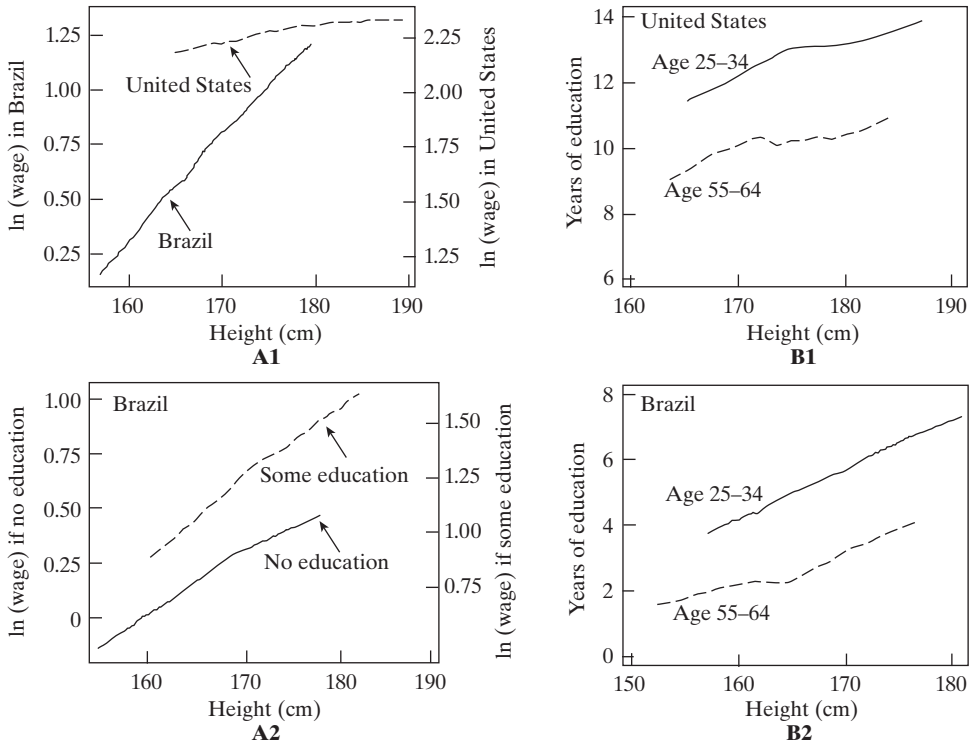
A healthy population is a prerequisite for successful development.

8.8.2 Health Systems Policy

Health system All the activities whose primary purpose is to promote, restore, or maintain health.

In the WHO's definition, a **health system** is "all the activities whose primary purpose is to promote, restore, or maintain health." Health systems include the components of public health departments, hospitals and clinics, and offices of doctors and paramedics. Outside this formal system is an informal network

FIGURE 8.11 Wages, Education, and Height of Males in Brazil and the United States



Source: "Health, nutrition, and economic development," by John Strauss and Duncan Thomas, *Journal of Economic Literature* 36 (1998): 766–817. Reprinted with permission.
Note: ln (wage) stands for natural log of wage.

used by many poorer citizens, which includes traditional healers, who may use somewhat effective herbal remedies or other methods that provide some medical benefits, such as acupuncture, but who also may employ techniques for which there is no evidence of effectiveness beyond the placebo effect (and in some cases could cause harm).

It has long been understood that some developing countries' health systems are far more effective than others in achieving health goals. Some countries, such as China and Sri Lanka, and some regions, such as Kerala in India, have achieved life expectancies of more than 70 years while still in low-income status. At the same time, some middle-income countries, such as South Africa and Gabon, have only been able to achieve significantly lower life expectancies despite their much greater resources. The latter countries all have far more inequitable access to health care than China, Sri Lanka, and Kerala.

The WHO compared health systems around the world, revealing great variability in the performance of health systems at each income level. For example, Singapore was ranked 6th, Morocco 29th, Colombia 22nd, Chile 33rd, and Costa Rica 36th—all of these developing countries ranked higher than the United States. Clearly, much can be done with relatively modest incomes.[58]

The study used five performance indicators to measure health systems in the 191 WHO member states: (1) the overall level of health of the population; (2) health inequalities within the population; (3) health system responsiveness (a combination of patient satisfaction and system performance); (4) the distribution of responsiveness within the population (how well people of varying economic status find that they are served by the health system); and (5) the distribution, or fairness, of the health system's financial burden within the population.

The WHO concluded that "dollar for dollar spent on health, many countries are falling short of their performance potential. The result is a large number of preventable deaths and lives stunted by disability. The impact of this failure is born disproportionately by the poor." At any given income level, there was wide variation in country performance, showing that a low-income country can achieve fairness in allocating the resources that it has. In fact, in equity of financial contribution, Colombia was the top-rated country overall. But several developing countries were judged to have the least-fair financing of health systems, including Sierra Leone, Myanmar, Brazil, China, Vietnam, Nepal, the Russian Federation, Peru, and Cambodia. In Brazil and Peru, people make high out-of-pocket payments for health care, so poor households spend a large portion of their income on health.

Formal public health measures have played a very important role in developing countries. Ministries of health, sometimes complemented by the services of nongovernmental organisations, have played vital roles in extending vaccines to remote rural areas, greatly reducing once-lethal diseases such as smallpox. But, as with educational systems, public health operations have often favoured the wealthy and well connected. Partly as a result, health systems often use public funds inefficiently. In effect, subsidies turn out to be focused on expensive curative measures for older (and generally richer) patients, such as those with heart disease or cancer, who are influential enough to get into the right hospitals. Too-often ignored, or at best underfunded, are cost-effective preventive health campaigns and basic medical care for those not currently attended to by any health professionals. Doctors trained with public subsidies often choose to practise a speciality in affluent areas of the cities or emigrate to developed countries. And, as the World Bank concluded, "In some countries a single teaching hospital can absorb 20% or more of the budget of the ministry of health, even though almost all cost-effective interventions are best delivered at lower-level facilities."[59]

In addition to its direct positive effect on national health standards, basic health is also an effective means to achieve goals of poverty reduction. Although both parents may be employed or self-employed long hours, if parents are too weak, unhealthy, and unskilled to be productive enough to support their family, the children have to work. But if the children work, they cannot get the education they need, so when they grow up, they will have to send their own children to work. Thus, the bad equilibrium of child labour examined earlier in the chapter may extend across generations, as a family is effectively locked into a vicious circle of poverty. Calculations of benefits of health investments need to keep these long-term spillovers in mind.

An effective government role in health systems is crucial for at least four important reasons. First, health is central to poverty alleviation, because people are often uninformed about health—a situation compounded by poverty.

Second, households spend too little on health because they may neglect externalities (such as, literally, contagion problems). Third, the market would invest too little in health infrastructure and research and development and technology transfer to developing countries due to market failures. Fourth, public health programmes in developing countries have many proven successes. Government has different roles in different countries, but as the WHO concluded, "The careful and responsible management of the well-being of the population—stewardship—is the very essence of good government. . . . The health of people is always a national priority: government responsibility for it is continuous and permanent."[60]

Broad Findings We conclude that health and education play pivotal roles in economic development, both as inputs into production enabling higher incomes, and outputs directly affecting human well-being. Many health and education problems plague developing countries, ranging from child labour to heavy disease burdens. Education and health will not always automatically improve with higher incomes. And market failures mean that too few investments in education and health will be made from the social point of view. Moreover, the wrong kinds of government policies have sometimes led to distortions in the educational system that have reinforced inequality; and inequities in health systems are common. Thus, government plays an essential role in health and education, and in most developing countries considerable improvements in policy are needed.

Case Study 8

Pathways Out of Poverty: Progresa/Oportunidades in Mexico

The Mexican Programme on Education, Health, and Nutrition is widely known by its Spanish acronym, Progresa, though renamed the Oportunidades Human Development Programme by a subsequent administration, and more recently further rebranded as Prospera. Progresa/Oportunidades combats child labour, poor education, and poor health by ensuring that parents can feed their children, take them to health clinics, and keep them in school, while providing financial incentives to do so.

Progresa/Oportunidades builds on the growing understanding that health, nutrition, and education are complements in the struggle to end poverty. The programme features the promotion of an integrated package to promote the education, health, and nutritional status of poor families. It provides cash transfers to poor families, family clinic visits, in-kind nutritional supplements, and other health benefits for pregnant and lactating women and their children under the age of 5. Some of these benefits are provided conditionally on children's regular school and health clinic attendance, and so programmes of this kind are commonly called conditional cash transfer (CCT) programmes.

In effect, low-income parents are paid to send their children to school and clinics, and this is one of the recent tactics most widely believed by the donor and development community to be effective in sustainably reducing poverty. The benefits compensate parents for lost income or the lost value of work at home or in workplaces in the form of child labour. Such payments work to increase school enrolments, attendance, progress through grades, other schooling outcomes, and nutrition and health.

Before the programme, Mexico operated a maze of inefficiently run food subsidy programmes managed by as many as 10 different ministries. These programmes were very blunt instruments against poverty and often failed to reach the very poor. For example, the better-off urban poor benefited far more than the hard-to-reach but worse-off rural poor. There was no mechanism to ensure that food subsidies benefited vulnerable children in poor households. Nor was there any clear exit strategy for sustainably helping poor families stay out of poverty. Malnutrition remained common in poor rural (especially indigenous) families, and educational achievements and health gains failed to reach the poor in the way they had benefited the better-off in Mexico. For economic reasons, many poor children had to work rather than go to school. But poor health and education as a child are major determinants of lifelong poverty.

One solution has turned out to be Progresa/Oportunidades, an innovative developing-country-designed integrated poverty programme. Its major architect was Santiago Levy, a development economist who led the design and implementation of the programme in the 1990s while serving as deputy minister of finance. Levy describes the programme and its development, implementation, and evaluation in his excellent 2006 book, *Progress Against Poverty*.

From its inception in rural areas in August 1997, the Progresa programme had grown to benefit some 5.8 million rural and urban households by 2012 (Government of Mexico website data).

It has been estimated that more than 21 million people benefit—approximately one-fifth of the Mexican population—in over 75,000 localities. In 2002, the programme distributed 857 million doses of nutritional supplements and covered 2.4 million medical checkups. Over 4.5 million "scholarships" were

provided to schoolchildren. By the end of 2005, the programme had covered 5 million families, which encompassed almost one-quarter of the country's population and most people living in extreme poverty.

Progresa/Oportunidades affects child nutrition through four programme components, called *pathways:* cash transfers, which may be used in part for improved nutrition; nutritional supplements given to all participating children under the age of 2, pregnant and breastfeeding mothers, and children between the ages of 2 and 5 who show signs of malnutrition; growth monitoring, which provides feedback to parents; and other preventive measures, including required participation in regular meetings where vital information about hygiene and nutrition is taught.

Participating families receive school programme payments every other month. In addition, families receive grants for school supplies and food subsidies, on the proviso that they get regular public health care for the children, including medical checkups and immunisations. Payments are generally provided through the mother, because evidence shows that mothers use more of their available funds in support of their children's well-being than do fathers. The payments are supplied via a bank card, directly from the federal government and not through intermediaries, reducing chances of corruption, and mothers are taught how and where to cash in their payments.

Programme payments are conditional on children in grades three through to nine attending school regularly. In developing countries such as Mexico, children are often enrolled in school but do not attend for long. The payments increase as the child increases in grade level. This gives an incentive to keep children in school longer and helps the children continue into higher grades. Initially, parents of a third grader receive a little over $10 per month; parents of girls in ninth grade get over $35 per month. This is close to two-thirds of the income the children would have received as labourers. The overall result is to break the trade-off that parents faced between higher consumption for the family today and the higher future consumption possible when the child completed school. Families of girls also receive slightly higher payments than boys, partly because girls are more likely to drop out, while the social benefits of keeping girls in school are well known from development economics research to be very high. Provided that the school and health checkup conditions are met, the families, not the government, decide how to best spend these extra resources. Levy estimates that the average family participating in the programme receives about $35 per month in combined cash and in-kind transfers, which is about 25% of average poor rural family income without the programme.

The programme is also more effective than standard alternatives. For example, evidence shows that Progresa/Oportunidades has a larger impact on enrolment and performance per dollar spent than building new schools.

The budget for the much-expanded Progresa/Oportunidades Programme in 2005 was still some $2.8 billion—fairly modest, even in Mexico's economy. This represented less than 0.4% of gross national income. Only Mexico's pension (social security) system is a larger social programme. Progresa/Oportunidades is also organisationally efficient, with operating expenses of only about 6% of total outlays. This it owes in part to the direct provision of cash grants via bank cards to the beneficiaries, bypassing the sometimes ineffective and potentially corrupt administrative bureaucracy. Fully 82% goes to the direct cash transfers, and the remaining 12% goes to nutritional supplements and other in-kind transfers. Some additional costs for provision of health care and schooling are borne by the Mexican health and education ministries.

However, Progresa/Oportunidades is lauded not so much for its modest cost as for the fact that it works. It has been subject to one of the most rigorous randomised trials of any public poverty programme in the world. The Washington-based International Food Policy Research Institute (IFPRI), with many affiliated researchers, has intensively studied the programme, using a variety of methods. The most convincing evidence comes from the way the programme was initially rolled out. Only some communities were to take part in the programme at first, before it reached full scale, and the order in which initially targeted communities were included was randomised. Data were collected from both initially included and excluded families so that the impact of the programme could be studied independently of the many possible confounding factors that could otherwise distort the results of an

evaluation. Participants in these rigorous studies have included some of the world's leading development microeconomists.

Evaluations of Progresa/Oportunidades indicate that its integrated approach has been highly successful, with large improvements in the well-being of participants. Malnutrition has measurably declined; family use of health care, including prenatal care, has increased, and child health indicators have improved; school attendance is up significantly, and the dropout rate has declined substantially, especially in the so-called transition grades six to nine, when children either get launched toward high school or drop out. In general terms, the research showed that Progresa/Oportunidades increased by some 20% the number of children who stay in school rather than drop out just before high school. Child labour decreased by about 15%. At first, there were some concerns that adults might work less when receiving the transfers, but the evidence is that no work reduction has occurred. Several of the most statistically reliable studies and their research methods and findings are reviewed in Emmanuel Skoufias's 2005 IFPRI report, *PROGRESA and Its Impacts on the Welfare of Rural Households in Mexico.* Other key research reports are listed among the sources at the end of this case study.

The lessons of Progresa/Oportunidades are spreading throughout Latin America, and some of its features are also found in the Bolsa Familia programme in Brazil, Familias por la Inclusión Social in Argentina, Chile Solidario, Familias en Acción in Colombia, Superemonos in Costa Rica, Bono de Desarrollo Humano in Ecuador, Programa de Asignación Familiar in Honduras, Programa de Avance Mediante la Salud y la Educación in Nicaragua, Red de Oportunidades in Panama, and Proyecto 300 in Uruguay. By 2019, Progresa had been replicated in whole or in part in over 30 countries.

Although the cost of a CCT programme such as Progresa/Oportunidades may be manageable in middle- to upper-middle-income countries, in low-income countries, outside financial assistance is needed, both for the payments themselves and to increase the number (and quality) of clinics and schools to be availed of in the programme. Poverty reduction still requires complementary improvements, such as better roads to poor areas, public health investments, market access, electricity, and local empowerment. The will to replace poorly performing but politically expedient programmes with more effective ones is necessary. Administrative infrastructure may be a major challenge, and disbursing funds to beneficiaries electronically can prove problematic. But CCT pilot or larger-scale programmes have been launched in recent years in several African countries, including Nigeria, Malawi, and Mali. Critics, many outside Mexico, have expressed concerns that CCT programmes may not reach the poorest who may have the hardest time meeting the conditions; that schools and clinics may be far away for isolated poor families; that families who do not speak the mainstream language may find it very difficult to participate; that if parents do not meet conditions for payments—and also lose some of the previous programmes from which they had benefited—some families could be made worse off; and that relative differences among ultrapoor and poor—between those who can and cannot participate—may also widen. Clearly, CCT programmes focusing on improving health, nutrition, and education need to be part of a broader strategy to be fully effective.

In conclusion, CCT programmes focusing on improving health, nutrition, and education are a key component of a successful policy to end poverty—although in most cases they will need to be part of a broader strategy to be fully effective. In Mexico, as in other countries, the broader package includes development of infrastructure so the poor can get their products to market and get access to safe water and electricity. It also includes integrated rural development programmes of the type outlined in Chapter 9, along with provision of credit and some temporary employment programmes. But by building the human capital of the poor, the programme provides the essential foundation for the poor to increase their capabilities and take advantage of opportunities as the economy grows. It thereby also enhances the prospects for Mexico's own growth and development.

In summary, the Progresa/Oportunidades Programme is a model of success in many ways. The rigorous programme evaluations show that it has a substantial effect on human welfare. It was designed and implemented in the developing world with close

attention given to local circumstances while making constructive use of what has been learned in development economics. It placed the crucial complementarities between education, health, and nutrition at the centre of the programme's design while paying close attention to the need for appropriate incentives for beneficiaries. Finally, its method of cash transfer and the move away from cumbersome and nontransparent in-kind transfer programmes placed constraints on possible bureaucratic inefficiency as well as official corruption. Progresa/Oportunidades thus offers a model for providing health and educational progress for poor families and opportunities for their permanent escape from poverty.

Indeed, similar programmes have been introduced throughout the world with mostly favourable results; and cash transfer programmes are now well-established as a way to help people living in poverty, vulnerable to poverty, and otherwise lagging behind in social progress. As we have seen, placing conditions on family assistance has the benefit of providing good incentives; however, it also has the potential for excluding some people whom most would consider deserving. Partly as a result, targeted unconditional cash transfers in combination with social services are becoming an increasingly popular alternative or supplementary approach. ■

Sources

Baird, Sarah, Craig McIntosh, and Özler Ozler. "Cash or condition? Evidence from a cash transfer experiment" (2011) *The Quarterly Journal of Economics*, Vol. 126 (4), 1709–53.

Bando, Rosangela, Luis F. Lopez-Calva, and Harry Anthony Patrinos. "Child labour, school attendance, and indigenous households: Evidence from Mexico." World Bank Policy Research Working Paper No. 3487. Washington, D.C.: 2005.

Behrman, Jere R., and John Hoddinott. "Programme evaluation with unobserved heterogeneity and selective implementation: The Mexican PROGRESA impact on child nutrition." *Oxford Bulletin of Economics and Statistics* 67 (2005): 547–569.

Behrman, J.R., Parker, S.W., and Todd, P.E. (2009) "Schooling impacts of conditional cash transfers on young children: Evidence from Mexico," *Economic development and cultural change*, 57(3), 439–77.

Behrman, J.R., Parker, S.W., and Todd, P.E. (2011) "Do conditional cash transfers for schooling generate lasting benefits? A five-year followup of PROGRESA/Oportunidades," *Journal of Human Resources*, 46(1), 93–122.

Behrman, Jere R., Piyali Sengupta, and Petra Todd. "Progressing through PROGRESA: An impact assessment of a school subsidy experiment in rural Mexico." *Economic Development and Cultural Change* 54 (2005): 237–275.

Buddelmeyer, Hielke, and Emmanuel Skoufias. "An evaluation of the performance of regression discontinuity design on PROGRESA." World Bank Policy Research Working Paper No. 3386. Washington, D.C.: , 2004.

Cardenas-Rodriguez, Oscar J. "Do indigenous peoples benefit from poverty programmes? Evidence from Mexico's 2000 census." *Estudios Economicos* 19 (2004): 125–135.

Coady, David P., and Susan W. Parker. "Cost-effectiveness analysis of demand- and supply-side education interventions: The case of PROGRESA in Mexico." *Review of Development Economics* 8 (2004): 440–451.

Davis, Benjamin, Sudhanshu Handa, and Humberto Soto. "Households, poverty and policy in times of crisis: Mexico, 1992–1996." *CEPAL Review* 82 (2004): 191–212.

Fernald, Lia C.H., Paul J. Gertler, and Lynnette M. Neufeld (2008) "Role of Cash in Conditional Cash Transfer Programmes for Child Health, Growth, and Development: An Analysis of Mexico's Oportunidades," *The Lancet* 371 (9615): pp.828–37.

Government of Mexico, Prospera website, available at: https://www.gob.mx/prospera (Note: former Oportunidades website transfers here.)

Hoddinott, John, and Emmanuel Skoufias. "The impact of PROGRESA on food consumption." *Economic Development and Cultural Change* 53 (2004): 37–61.

Levy, Santiago. *Progress against Poverty: Sustaining Mexico's Progresa-Oportunidades Program*. Washington, D.C.: Brookings Institution Press, 2006, available at: http://www.brookings.edu/global/progress/pap_total.pdf.

Parker, Susan W., and Graciela M. Teruel. "Randomization and social programme evaluation: The case of Progresa." *Annals of the American Academy of Political and Social Science* 599 (2005): 199–219.

Schultz, T. Paul. "School subsidies for the poor: Evaluating the Mexican Progresa poverty programme." *Journal of Development Economics* 74 (2004): 199–250.

Secretaría de Desarrollo Social (SEDESOL). "Programa de Educación, Salud y Alimentación (PROGRESA)," 2001.

Skoufias, Emmanuel. *PROGRESA and Its Impacts on the Welfare of Rural Households in Mexico*. Research Report No. 139. Washington, D.C.: International Food Policy Research Institute, 2005, http://www.ifpri.org/pubs/abstract/abstr139.htm.

Skoufias, Emmanuel, Benjamin Davis, and Sergio de la Vega. "Targeting the poor in Mexico: An evaluation of the selection of households into PROGRESA." *World Development* 29 (2001): 1769–1784.

Skoufias, Emmanuel, and Bonnie McClafferty. "Is PROGRESA working? Summary of the results of an evaluation by IFPRI," 2000, http://www.ifpri.org/themes/progresa/synthesis.htm.

Skoufias, Emmanuel, and Susan W. Parker, with comments by Jere R. Behrman and Carola Pessino. "Conditional cash transfers and their impact on child work and schooling: Evidence from the PROGRESA programme in Mexico." *Economia* 2 (2001): 45–96.

Smith, Stephen C. *Ending Global Poverty: A Guide to What Works*. New York: Palgrave Macmillan, 2005.

Stecklov, Guy, Paul Winters, Marco Stampini, and Benjamin Davis. "Do conditional cash transfers influence migration? A study using experimental data from the Mexican PROGRESA programme." *Demography* 42 (2005): 769–790.

Todd, Petra, and Kenneth Wolpin. "Using a social experiment to validate a dynamic behavioral model of child schooling and fertility: Assessing the impact of a school subsidy programme in Mexico." Penn Institute for Economic Research Working Paper, Department of Economics, University of Pennsylvania, 2002.

Concepts for Review

Acquired immunodeficiency syndrome (AIDS)
Basic education
Conditional cash transfer (CCT) programmes
Derived demand
Discount rate
Educational certification
Educational gender gap
Health system
Human capital
Human immunodeficiency virus (HIV)
Literacy
Neglected tropical diseases
Private benefits
Private costs
Social benefits of education
Social costs of education
World Health Organization (WHO)

Questions for Discussion

1. What reasons would you give for the rather sizeable school dropout rates in developing countries? What might be done to lower these rates?
2. What are the differences between formal and nonformal education? Give some examples of each.

3. It is often asserted that educational systems in developing countries, especially in rural areas, are unsuited to the real social and economic needs of development. Do you agree or disagree with this statement? Explain your reasoning.
4. How would you explain the fact that relative costs of and returns to higher education are so much higher in developing than in developed countries?
5. What is the supposed rationale for subsidising higher education in many developing countries? Do you think that it is a legitimate rationale from an economic viewpoint? Explain your answer.
6. Early-childhood environmental factors are said to be important determinants of school performance. What are some of these factors, how important do you think they are, and what might be done to ensure that these factors are not negative?
7. What do we mean by the *economics of education?* To what extent do you think educational planning and policy decisions ought to be guided by economic considerations? Explain, giving hypothetical or actual examples.
8. What is meant by the statement, "The demand for education is a 'derived demand' for high-paying modern-sector job opportunities"?
9. What are the links among educational systems, labour markets, and employment determination in many developing countries? Describe the process of educational job displacement.
10. Distinguish carefully between private and social benefits and costs of education. What economic factors give rise to the wide divergence between private and social benefit-to-cost valuations in most developing countries? Should governments attempt through their educational and economic policies to narrow the gap between private and social valuations? Explain.
11. Describe and comment on each of the following education development relationships:
    a. Education and economic growth: does education promote growth? How?
    b. Education, inequality, and poverty: do educational systems typical of most developing countries tend to reduce, exacerbate, or have no effect on inequality and poverty? Explain with specific reference to a country with which you are familiar, or investigate.
    c. Education and migration: does education stimulate rural–urban migration? Why?
    d. Education and fertility: does the education of women tend to reduce their fertility? Why?
    e. Education and rural development: do most formal educational systems in developing countries contribute substantially to the promotion of rural development? Explain.
12. Governments can influence the character, quality, and content of their educational systems by manipulating important economic and noneconomic factors or variables both outside of and within educational systems. What are some of these external and internal factors, and how can government policies make education more relevant to the real meaning of development?
13. What explains the large gains in health and education in recent decades?
14. Why are health and education so closely linked in the development challenge?
15. What are the most pressing health and education challenges today? What makes them so difficult to solve?
16. What makes for (a) a good and fair health system and (b) a good and fair education system?
17. What are the consequences of gender bias in health and education? Can a large gap between male and female literacy affect development? Why?
18. What is the human capital approach to health and education? What do you think are its most important strengths and weaknesses?
19. What are the strategies being discussed to address the problem of child labour? What are the strengths and weaknesses of these approaches?
20. What are the relationships between health and education on the one hand, and productivity and incomes on the other?

21. What can governments do to make health systems more equitable?
22. Here are some questions to review for the Progresa/Oportunidades Programme, examined in the end-of-chapter case study:
    a. What is the Progresa/Oportunidades Programme, and what does it try to accomplish?
    b. How does it try to do so—what are the key programme features and innovations?
    c. Why make transfers conditional? What are the possible benefits as well as drawbacks?
    d. Specifically, how does Progresa work to improve nutrition (with its "four pathways")?
    e. Specifically, how does Progresa work to improve education?
    f. What were the features of the original evaluation?

Notes

1. United Nations Development Programme, *Human Development Report, 2004* (New York: Oxford University Press, 2004), p. 171; World Bank, *World Development Indicators, 2017* (Washington, D.C.: World Bank, 2017). Note that the developing-country child mortality statistics in some cases actually *understate* progress, because some formerly middle-income countries have become high-income countries in recent years.
2. The 2017 data are drawn from the UNESCO webpage at https://en.unesco.org/. See also UNESCO, *EFA Global Monitoring Report, 2007,* Statistical Annex, tab. 2, http://unesdoc.unesco.org/images/0014/001477/147794E.pdf.
3. Mushkin, S. (1962), 'Health as an investment,' *Journal of Political Economy*, 70: 129–157.
4. See Randa Sab and Stephen C. Smith, "Human capital convergence: International evidence," http://www.imf.org/external/pubs/ft/wp/2001/wp0132.pdf. The paper presents evidence that the relative improvement in health and education in the developing world is pronounced enough to conclude that slow but steady convergence is taking place across countries. See also Randa Sab and Stephen C. Smith, "Human capital convergence: A joint estimation approach," *IMF Staff Papers* 49 (2002): 200–211, https://www.imf.org/external/pubs/ft/staffp/2002/02/pdf/sab.pdf, and Robert J. Barro and Jong-Wha Lee, "International comparisons of educational attainment," *Journal of Monetary Economics* 32 (1993): 363–394.
5. This discussion draws on Stephen C. Smith, "Microcredit and health programmes: To integrate or not to integrate?" in *Microenterprise Development for Better Health Outcomes,* eds. Rosalia Rodriguez-Garcia, James A. Macinko, and William F. Waters (Westport, Conn.: Greenwood Press, 2001), pp. 41–50.
6. See Howarth E. Bouis and Lawrence J. Haddad, "Are estimates of calorie-income elasticities too high? A recalibration of the plausible range," *Journal of Development Economics* 39 (1992): 333–364; Jere Behrman and Anil Deolalikar, "Will developing country nutrition improve with income? A case study for rural South India," *Journal of Political Economy* 95 (1987): 108–138; and Shankar Subramanian and Angus Deaton, "The demand for food and calories," *Journal of Political Economy* 104 (1996): 133–162.
7. For a review of some of this literature, see Tonia Marek, *Ending Malnutrition: Why Increasing Income Is Not Enough* (Washington, D.C.: World Bank, 1992).
8. See Maurice Schiff and Alberto Valdes, "Nutrition: Alternative definitions and policy implications," *Economic Development and Cultural Change* 38 (1990): 281–292; and Marek, *Ending Malnutrition*.

9. Howarth Bouis found that intake of vitamins A and C was not positively associated with income in the Philippines and argued that consumer education was important. Moreover, morbidity (incidence of sickness) did not necessarily decrease significantly with income in that country. See Bouis, H.E. (1991), *The Determinants of Household-Level Demand for Micronutrients: An Analysis for Philippine Farm Households*, Washington D.C.: International Food Policy Research Institute.
10. A study of the Gambia found that diarrhoea is associated with reduced nutritional status even after calorie intake is controlled for; see Joachim von Braum, Detlev Peutz, and Patrick Webb, *Irrigation Technology and Commercialization of Rice in the Gambia: Effects on Income and Nutrition* (Washington, D.C.: International Food Policy Research Institute, 1989).
11. See Paul Glewwe, "Why does mother's schooling raise child health in developing countries? Evidence from Morocco," *Journal of Human Resources* 34 (1999): 124–159; and Ravi Kanbur and Lyn Squire, "The evolution of thinking about poverty," in *Frontiers of Development Economics: The Future in Perspective*, eds. Gerald M. Meier and Joseph E. Stiglitz (New York: Oxford University Press, 2001).
12. For example, it was found that the probability of attending school among nutritionally stunted children in Nepal was far lower than for nonstunted students; children with low height for their age, an indicator of undernutrition, were found to lag in school grade attainment in many parts of the world, including rural China and Thailand; and undernourished children were found to lag 20% in test score gains in northeast Brazil. See World Bank, *World Development Report, 1993* (New York: Oxford University Press, 1993), p. 18–19.
13. In addition to Box 8.4, see Ernesto Pollitt, *Malnutrition and Infection in the Classroom* (Paris: UNESCO, 1990); Harold Alderman, Jere Behrman, Victor Lavy, and Rekha Menon, "Child health and school enrolment: A longitudinal analysis," *Journal of Human Resources* 36 (2001): 185–201; Jere Behrman, "The impact of health and nutrition on education," *World Bank Researcher* 11 (1996): 23–37; and Paul Glewwe and Hanan G. Jacoby, "An economic analysis of delayed primary school enrolment in a low-income country: The role of early childhood nutrition," *Review of Economics and Statistics* 77 (1995): 156–169.
14. See Kaushik Basu and James Foster, "On measuring literacy," *Economic Journal* 108 (1998): 1733–1749.
15. World Health Organization, *World Health Report, 2000* (Geneva: World Health Organization, 2000), p. 4.
16. The concept of human capital goes back at least as far as Adam Smith, who wrote that, "The acquisition of . . . talents during . . . education, study or apprenticeship, costs a real expense, which capital in person. Those talents [form] part of his fortune likewise that of society," Adam Smith, *The Wealth of Nations* (1776) Penguin Classics, 1978 edition, p. 377. Amartya Sen, *Development as Freedom* (New York: Knopf, 1999), p. 294; M. Shahe Emran, Fenohasina Maret, and Stephen C. Smith, "Education and freedom of choice: Evidence from arranged marriages in Vietnam," forthcoming 2014 in the *Journal of Development Studies* [online version at: http://www.tandfonline.com/doi/abs/10.1080/00220388.2013.841884#.UrN2m2RDtWJ].
17. For an example, see Harry A. Patrinos and S. Metzger, "Returns to education in Mexico: An update," World Bank, World Bank/Universidad de las Americas, Mexico, 2004; and Dominic J. Brewer and Patrick J. McEwan, eds., *Economics of Education* (San Diego, Calif.: Elsevier, 2010).
18. The human capital analysis was introduced by Jacob Mincer, "Investment in human capital and personal income distribution," *Journal of Political Economy* 66 (1958): 281–302. Graphs similar to Figure 8.2 are also widely used in the labour economics literature. See, for example, Ronald Ehrenberg and Robert Smith, *Modern Labour Economics*, 2nd ed. (Glenview, Ill: Scott Foresman, 1985), fig. 9.1, p. 256; or Daniel Hamermesh and Albert Rees, *The Economics of Work and Play*, 4th ed. (New York: HarperCollins, 1988), fig. 3.3, p. 70.

19. See George Psacharopoulos, "Returns to education: An updated international comparison," *Comparative Education* 17 (1981): 321–341, and "Returns to investment in education: A global update," *World Development* 22 (1994): 1325–1343; Christopher Colclough, "The impact of primary schooling on economic development: A review of the evidence," *World Development* 10 (1982): 167–185; and Rati Ram, "Level of development and rates of return to schooling: Some estimates from multicountry data," *Economic Development and Cultural Change* 44 (1996): 839–857. As Psacharopoulos explains in "Education as investment," *Finance and Development* (1982): 40 (reprinted with permission from International Monetary Fund), "Estimates of the private rate of return to a given level of education are calculated by comparing the discounted benefits over the lifetime of an educational investment 'project' to the costs of such a project. Thus, for a calculation of the private rate of return to four years of university education, benefits are estimated by taking the difference between existing statistics on the mean post-tax earnings of university graduates by age and those of a sample group of secondary school graduates. The earnings of the latter also represent the opportunity costs of staying in school. Direct costs are obtained from statistics on a student's out-of-pocket expenditures that are strictly due to the costs of college attendance. Given these data, the rate of return to investment in a college degree compared with a secondary school qualification is the rate of interest that reduces to zero the net present value of the discounted difference between the costs and benefits. A simple equation for the private rate of return is

$$\text{Private rate of return} = \frac{\begin{pmatrix}\text{Mean annual post-tax}\\ \text{earnings of university}\\ \text{graduates}\end{pmatrix} - \begin{pmatrix}\text{Mean annual post-tax}\\ \text{earnings of secondary}\\ \text{school graduates}\end{pmatrix}}{\begin{pmatrix}\text{Four}\\ \text{years}\\ \text{of study}\end{pmatrix} \times \begin{pmatrix}\text{Mean annual post-tax}\\ \text{earnings of secondary}\\ \text{school graduates}\end{pmatrix} + \begin{pmatrix}\text{Mean annual}\\ \text{private direct}\\ \text{cost of study}\end{pmatrix}}$$

A social rate of return to college education could be calculated in the same way, although earnings should be pre-tax (as taxes are a transfer from the point of view of society at large), and the direct cost should include the full amount of resources committed per student for higher education, rather than the usually smaller part of expenditures borne by the student.

20. See Amartya Sen, op. cit. (note 16), Basu and Foster, op. cit. (note 14), and Ehrenberg and Smith, op. cit. (note 18).]
21. For evidence of this, see Emmanuel Jimenez, "The public subsidization of education and health in developing countries: A review of equity and efficiency," *World Bank Research Observer* 1 (1986): 123.
22. For further details on the model and an excellent survey, see Kaushik Basu, "Child labour: Cause, consequence, and cure, with remarks on international labour standards," *Journal of Economic Literature* 37 (1999): 1083–1120.
23. Notice that the demand curve also cuts the labour supply curve a third time, through the S-shaped part of the supply curve, but this is an unstable equilibrium; see Chapter 4 for a discussion of unstable equilibria. Note also that it is not necessary for this part of the curve to be S-shaped for the result to occur. To see this, consider that, instead, the supply curve from the point at which AA' and W_H intersect to the point at which TT' and W_L intersect is just a straight line: there are still two stable equilibria and one unstable equilibrium. Either way, this middle part of the curve slopes downward, characteristic of a "backward-bending supply curve" in labour economics, in which families use some of their extra earnings potential when wages are higher to "consume" more leisure, which in this case represents nonwork by the children.

24. Another influential theoretical model was provided by Jean-Marie Baland and James Robinson, who point out that with highly imperfect capital markets such as those faced by many impoverished rural families, child labour is one of the few ways families have to borrow from the future. The result is that child labour, which reduces future earning opportunities because the working child receives less schooling, may exist only because of market failures. The authors formally derive conditions under which a ban on child labour may be Pareto-improving in general equilibrium. See Jean-Marie Baland and James A. Robinson, "Is child labour inefficient?" *Journal of Political Economy* 108 (2000): 663–679.
25. The following discussion draws on information obtained from the ILO, UNICEF, and the World Bank.
26. ILO, 2010 report, p. 50; data from UNICEF, *The State of the World's Children, 2008: Child Survival* (New York, United Nations, 2007), p. 140.
27. International Programme on the Elimination of Child Labour, *Investing in Every Child. An Economic Study of the Costs and Benefits of Eliminating Child Labour* (Geneva: International Labour Organization, 2003).
28. United Nations Development Programme, *Human Development Report, 2005* (New York: Oxford University Press, 2005), p. 60.
29. Wadi D. Haddad et al., *Education and Development: Evidence for New Priorities* (Washington, D.C.: World Bank, 1990), pp. 12–15. The Millennium Development Goals are described in Chapter 1.
30. See UNICEF Innocenti Centre, *Changing a Harmful Social Convention: Female Genital Mutilation/Cutting*, (New York: United Nations, 2005) and subsequent working papers; Gerry Mackie, "Female genital cutting: The beginning of the end," in *Female Circumcision: Multidisciplinary Perspectives*, eds. Bettina Shell-Duncan and Ylva Hernlund (Boulder, Colo.: Reinner, 2000), pp. 245–282; and Gerry Mackie, "Ending footbinding and infibulation: A convention account," *American Sociological Review* 61, no. 6(1996): 999–1017. In applying Figure 4.1, the x-axis can be interpreted as the fraction of families who practise FGM/C, and the y-axis the chance that an individual family will respond by adopting the practice. The complementarity (upward-sloping reaction function) gives rise to possible multiple equilibria.
31. Plan International, *Paying the Price: The Economic Cost of Failing to Educate Girls* (Woking, England: Plan International, 2008). Although human capital investment rate of return estimates are often fraught with errors and problems of interpretation, results such as those on the benefits of educating girls, when consistent across time and space and methods of evaluation, offer useful guidance for policy. See, for example, George Psacharopoulos, "Education and development: A review," *World Bank Research Observer* 3 (January 1988): 99–116. As Psacharopoulos notes, potential benefits of education for development are broad ranging. Basic education, which has been steadily approaching the target of universal primary school enrolment, has made great contributions to development, broadly conceived. Moreover, despite the substantial distortions just reviewed, it seems clear that the expansion of educational opportunities has contributed to aggregate economic growth by: (1) creating a more productive labour force and endowing it with increased knowledge and skills; (2) providing widespread employment and income-earning opportunities for teachers, school and construction workers, textbook and paper printers, school uniform manufacturers, and related workers; (3) creating a class of educated leaders to fill vacancies left by departing expatriates or otherwise vacant or prospective positions in governmental services, public corporations, private domestic and foreign businesses, and professions; and (4) providing the kind of training and education that would promote literacy and basic skills while encouraging "modern" attitudes on the part of diverse segments of the population. Even if alternative investments in the economy could have generated greater growth, this would not detract from the important contributions, noneconomic as well as economic, that education can make and has made to promoting aggregate economic growth.
32. Amartya Sen, "Missing women," *British Medical Journal* 304 (1992): 587–588. See also Sen's *Development as Freedom*, p. 104.
33. Yuyu Chen, Hongbin Li, and Lingsheng Meng, "Prenatal sex selection and missing girls in China:

Evidence from the diffusion of diagnostic ultrasound," Working Paper, Tsinghua University, May 2010. See also the Chinese Academy of Science book on gender imbalance reported in BBC News, "China faces growing gender imbalance," January 11, 2010, http://news.bbc.co.uk/2/hi/asia-pacific/8451289.stm. On the social instability and security implications of the 12% to 15% of the adult male population in China and India projected by 2020 to find itself unable to marry, see Valerie M. Hudson and Andrea M. den Boer, *Bare Branches: The Security Implications of Asia's Surplus Male Population* (Cambridge, Mass.: MIT Press, 2004.) Alternate estimates for most countries are available in the *CIA World Factbook* at https://www.cia.gov/library/publications/the-world-factbook/.

34. The calculations conservatively use the same baseline rate of 97.7% as used in the seminal article by Amartya Sen. The numbers differ with the baseline selected, but the general conclusion holds. For more on the Africa debate, see Stephan Klasen, "Nutrition, health, and mortality in sub-Saharan Africa: Is there a gender bias?" and "Rejoinder," *Journal of Development Studies* 32 (1996): 913–933, 944–948; and Peter Svedberg, "Gender biases in sub-Saharan Africa: Reply and further evidence," *Journal of Development Studies* 32 (1996): 934–943.

35. Studies show that mothers' education plays a decisive role in raising nutritional levels in rural areas. The level of child stunting, a valid indicator of child undernutrition, is much lower with higher education attainment of the mother at every income level. Harold Alderman and Marito Garcia report that the incidence of child stunting would be reduced by a quarter of current levels (from 63.6% to 47.1% in their sample in Pakistan) if women were to obtain a primary-level education. They note that this is almost 10 times the projected impact of a 10% increase in per capita income. Coupled with the result that in many countries, mothers' education tends to make a disproportionately larger health difference for daughters than for sons, as Duncan Thomas has reported, we can expect major benefits for girls. See Harold Alderman and Marito Garcia, *Food Security and Health Security: Explaining the Levels of Nutrition in Pakistan* (Washington, D.C.: World Bank, 1992); Duncan Thomas, *Gender Differences in Household Resource Allocations* (Washington, D.C.: World Bank, 1991).

36. Much of the material in this section is drawn from Michael P. Todaro and Edgar O. Edwards, "Educational demand and supply in the context of growing unemployment in less developed countries," *World Development* 1 (1973): 107–117.

37. See, for example, Ragui Assaad, "The effects of public sector hiring and compensation policies on the Egyptian labour market," *World Bank Economic Review* 11 (1997): 85–118.

38. See World Bank, *The Quality of Growth* (New York: Oxford University Press, 2000), pp. 56–66, and Vinod Thomas, Yan Wang, and Xibo Fan, *Measuring Education Inequality: Gini Coefficients of Education* (Washington, D.C.: World Bank Institute, 2000). See also "The Education Lorenz Curve: Exploring Education and Social Mobility in a Lorenz Curve Framework" (2014).

39. Jere Behrman and Nancy Birdsall, "The quality of schooling: Quantity alone is misleading," *American Economic Review* 73 (1983): 928–946. See also Eric A. Hanushek, "Interpreting recent research on schooling in developing countries," *World Bank Research Observer* 10 (1995): 227–246, and Paul Glewwe, "The relevance of standard estimates of rates of return to schooling for educational policy," *Journal of Development Economics* 51 (1996): 267–290.

40. See Hongbin Li, "Human Capital and China's Future Growth," 2017, paper presented at George Washington University. Available at: https://cpb-us-e1.wpmucdn.com/blogs.gwu.edu/dist/5/1304/files/2018/04/HongbinLiPPT-vui6pr.pdf.

41. Another explanation is that where perfect capital markets exist, all individuals can borrow for their education in anticipation of high future earnings. But in developing countries with imperfect capital markets, limited information about individual abilities, and poor loan enforcement, it is extremely difficult for the poor to borrow to finance their education. This is not, however, a problem for the rich, who can rely on their own resources to invest in education. So the system of inequality has a built-in tendency to reproduce itself with each generation.

42. For some evidence of the regressive nature of educational subsidies in Latin America, see Jean-Pierre Jallade, *Public Expenditures on Education and Income*

Distribution in Colombia (Baltimore: Johns Hopkins University Press, 1974), and *Basic Education and Income Inequality in Brazil: The Long-Term View* (Washington, D.C.: World Bank, 1977).

43. World Health Organization, "Frequently asked questions," http://www.who.int/suggestions/faq/en.
44. DALYs are used in *Global Burden of Disease* studies. We would like to thank Zoë McLaren for helpful discussions on this topic.
45. For details on the global burden of disease, see: https://www.thelancet.com/gbd. World Bank, *World Development Report, 1993* (New York: Oxford University Press, 1993).
46. The same types of measures used for studying the distribution of income (reviewed in Chapter 5) could also be used to examine the distribution of health; see, for example, R. Andrew Allison and James Foster, *Measuring Health Inequality Using Qualitative Data* (Cambridge, Mass.: Harvard Centre for Population and Development Studies, 1999).
47. World Bank, *World Development Indicators, 2007* (Washington, D.C.: World Bank, 2007), fig. 2n.
48. For methods and updates on the annual global hunger index, see: https://www.globalhungerindex.org. Using a DALY measure, a World Bank study calculated that about one-quarter of the global burden of disease was represented by diarrhoea, childhood diseases including measles, respiratory infections, parasitic worm infections, and malaria—all major health problems in developing countries. Data from *World Development Indicators, 2010* (Washington, D.C.: World Bank, 2010), and http://stats.uis.unesco.org/unesco. See International Food Policy Research Institute, "2013 Global Hunger Index," http://www.ifpri.org/ghi/2013, accessed 15 Feb. 2014. See UNICEF, The State Of The World's Children 2019. Children, food and nutrition: Growing well in a changing world, New York: UNICEF.
49. Source: Atlas of Sustainable Development Goals 2018, drawing on WHO/UNICEF JMP for Water Supply, Sanitation and Hygiene, https://washdata.org; and World Bank WDI data: SH.STA.SMSS.ZS; SH.STA.BASS.ZS.
50. See, for example, Jeffrey D. Sachs, "Institutions don't rule: Direct effects of geography on per capita income," NBER Working Paper No. 9490, 2003; and John L. Gallup and Jeffrey D. Sachs, "The economic burden of malaria: Cause, consequence and correlation: Assessing the relationship between malaria and poverty," Commission on Macroeconomics and Health, World Health Organization, 2001; Gallup and Sachs, "The economic burden of malaria," *American Journal of Tropical Medicine and Hygiene* 64(2001): 85–96; and, Matthew A. Cole and Eric Neumayer, "The impact of poor health on total factor productivity," *Journal of Development Studies* 42 (2006): 918–938, and references therein.
51. For informative field reports, see the *Financial Times*, 2012.
52. Michael Kremer, "Creating markets for new vaccines: Part I: Rationale," in *Innovation Policy and the Economy,* vol. 1, eds. Adam B. Jaffe, Josh Lerner, and Scott Stern (Cambridge, Mass: MIT Press, 2001).
53. Note that even the $1 share could be supported internationally. A treatment might be administered in three doses (at $5 each, say) for a malaria vaccine. See Centre for Global Development, Advance Market Commitment Working Group (Ruth Levine, Michael Kremer, and Alice Albright, co-chairs), *Making Markets for Vaccines: Ideas to Action* (Washington, D.C.: Centre for Global Development, 2005). The underlying concepts are examined in Rachel Glennerster and Michael Kremer, "A World Bank vaccine commitment," Brookings Policy Brief No. 57, May 2000, and in Kremer, "Creating markets for new vaccines." A short overview is found in Rachel Glennerster, Michael Kremer, and Heidi Williams, "Creating markets for vaccines," *Innovations* (Winter 2006): 67–79.
54. The fund's website is http://www.theglobalfund.org.
55. World Bank, *World Development Report, 1993*; T. Paul Schultz and Aysit Tansel, "Wage and labour supply effects of illness in Côte d'Ivoire and Ghana: Instrumental variable estimates for days disabled," *Journal of Development Economics* 53 (1997): 251–286; Emmanuel Max and Donald S. Shepard, "Productivity loss to deformity from leprosy in India," *International Journal of Leprosy* 57 (1989): 476–482.
56. John Strauss and Duncan Thomas, "Health, nutrition, and economic development," *Journal*

of Economic Literature 36 (1998): 766–817; see also Strauss and Thomas, "Health wages: Evidence on men and women in urban Brazil," *Journal of Econometrics* 77 (1997): 159–185. Note, however, that height could be independently associated with physical strength (e.g., through muscle length), which would tend to overstate the effect of health *per se*.

57. Strauss and Thomas, "Health, nutrition, and economic development," p. 806. Note that some statements to the contrary were found in earlier literature reviews, but those reports fail to take into account more recent rigorous studies that do a better job of accounting for the joint determination of health and income.

58. World Health Organization, *World Health Report, 2000* (Geneva: World Health Organization, 2000), http://www.who.int/whr/2000/en/index.htm. The study ranked France in first place and found that the "US health system spends a higher portion of its gross domestic product than any other country but ranks 37 out of 191 countries according to its performance."

59. World Bank, *World Development Report, 1993*, p. viii.

60. World Health Organization, *World Health Report, 2000*. For a review of public health successes in developing countries, see Ruth Levine and Molly Kinder, *Millions Saved: Proven Successes in Public Health* (Washington, D.C.: Centre for Global Development, 2004).