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Education and Public Health: Mutual Challenges Worldwide

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## Guest Editor's Overview

### Education and Public Health: Mutual Challenges Worldwide

DAVID E. BLOOM

Although the importance of education and health for human development has been extensively studied and discussed, recent advances linking these topics suggest novel ways to enhance development policy. As the impressive performance of East Asian tigers seems to show, strong education and health systems are vital ingredients for economic growth and prosperity. The Millennium Development Goals, adopted by member states of the United Nations in September 2000, are evidence of an international consensus regarding human capital development: five of the eight goals relate to education or health.

Development is a complex process involving multiple interactions between different components. In addition to health and education, the most important drivers of development include governance and other political factors, geography and climate, cultural and historical legacies, economic orientation, and the actions of other countries and international organizations. The interactions of these factors carry important implications for our understanding of the development process as well as for policy. It is now clear that increased access to education, while of great importance, is by itself no magic bullet. Its positive effects on development may be limited by the availability of jobs that require high-level skills, which enable people to use education to their economic advantage and increase their motivation to learn. The separate impacts of education and health on development have been widely acknowledged, but less attention has been paid to the connections between the two.<sup>1</sup>

This special issue of *Comparative Education Review* attends to the synergies between health and education. In this introduction to the volume, I briefly

I thank Eric Bettinger, Indu Bhushan, Helen Curry, Om Lala, Ruth Levine, Sangeetha Madhavan, Martin Malin, Andrew Mason, Larry Rosenberg, Jaypee Sevilla, and Mark Weston for their assistance and comments on this overview. In addition, I wish to recognize the essential roles of David Post and Simona Popa in bringing this issue to fruition.

<sup>1</sup> One of the more useful and extensive studies to date is United Nations, *World Population Monitoring 2003: Population, Education and Development* (New York: United Nations, 2005). This work reviews some relevant studies and provides data on education, health, and development. The report asserts that education has been found to be closely associated with better overall health and that this association is supported consistently, using a range of indicators. In general, the report considers education to be a lever for improving health, although the exact relationships that underlie this connection are acknowledged to be unclear. For children's health, the education of their mothers is particularly important.

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outline some of the central issues in the field. The first part of this introduction discusses why interactions between health and education are important. The second part describes how the links might work, looking at conceptual channels between them. Part three reviews the existing literature to establish whether there is empirical evidence for these channels. The fourth part discusses the articles of this issue.

### **Why Do Interactions Matter?**

Better education and better health are important goals in themselves. Each can improve individuals' quality of life and their impact on those around them. There is an extensive literature on the importance of education and health as both indicators and instruments of human development.

#### *Education*

Education is recognized as a basic human right. Pursuing its improvement puts governments on the path to improve the welfare of their people. As an instrument of development, education is important for the enhancement and creation of work skills and broader life skills such as confidence and sociability. These skills in individuals promote economic growth on a societal level via increased productivity and, potentially, better governance. When communities come together around schools, education can also enhance social capital, notwithstanding the fact that, conversely, by making people more mobile, education can weaken family and geographical ties.

Educational indicators are of various types, and those that are monitored relate primarily to inputs—that is, investments in education in terms of resources and time. UNESCO, for example, collects data on enrollment numbers and rates, repetition rates, and pupil/teacher ratios, among other inputs.<sup>2</sup> On outputs—the direct results of the education process—UNESCO measures literacy rates and education stocks. The Organization for Economic Cooperation and Development and the International Association for the Evaluation of Educational Achievement collect other output data on average years of schooling and test scores in mathematics, science, and reading.

#### *Health*

The World Health Organization defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”<sup>3</sup> Good health not only promotes human development but also allows people to attend work regularly, to be productive at work, and to work

<sup>2</sup> David E. Bloom, “Measuring Progress: Facts and Data on Universal Basic and Secondary Education” (occasional paper, American Academy of Arts and Sciences, Cambridge, MA, 2005).

<sup>3</sup> Preamble to the constitution of the World Health Organization, as adopted by the International Health Conference, New York, June 19–22, 1946; signed on July 22, 1946, by the representatives of 61 states (Official Records of the World Health Organization, no. 2, 100) and entered into force on April 7, 1948.

for more years. Healthy individuals also protect the health of those around them because they cannot spread infection, and they have the physical and mental strength to look after others. Health indicators produced by the World Health Organization and other UN bodies include infant and child mortality rates, life expectancy, morbidity data, burden of disease, and disability-adjusted life years. Improvements in these measures reflect improvements in quality of life, and robust health can often serve as a platform for progress in other areas, given a suitable policy environment. However, some countries and regions, such as Cuba and the Indian state of Kerala, have succeeded in boosting public health but, for a variety of reasons, have not seen corresponding improvements in income.

Good health can alter the population growth rate in ways that promote development. Health improvements have the greatest effect on the most vulnerable, children in particular. Advances in medicine and nutrition mean children are more likely to survive into adulthood. Parents therefore need fewer children to attain their ideal family size, and high fertility, still prevalent in the developing world, tends to decline.

Reduced fertility means parents can concentrate investments of time and money on a few children rather than spreading them across many, thus enhancing their children's prospects to lead healthier and better-educated lives. Reduced infant and child mortality lessens emotional stress on families, potentially increasing family cohesion, and gives parents more time to devote to productive activities rather than caring for sick infants. Lower fertility also improves mothers' health. Early and frequent childbirth, particularly in developing countries where health systems are weak and often unsafe, poses serious health risks. Maternal mortality is a major problem in the developing world; in some parts of Africa, 2 percent of live births result in the mother's death.<sup>4</sup>

Fertility declines also change population structure, with positive effects on development. In the time lag between increased child survival and parents' subsequent decision to have smaller families, a boom generation of children is created, which is larger than both the preceding and succeeding generations. As this generation reaches working age, given economic policies that encourage job creation, it can provide a strong boost to an economy. This "demographic dividend" accounted for as much as one-third of East Asia's "economic miracle" and has also had strong effects in Ireland.<sup>5</sup>

<sup>4</sup> United Nations Statistics Division Millennium Indicators Database, [http://millenniumindicators.un.org/unsd/mi/mi\\_goals.asp](http://millenniumindicators.un.org/unsd/mi/mi_goals.asp).

<sup>5</sup> David E. Bloom, David Canning, and Jaypee Sevilla, *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change* (Santa Monica, CA: Rand, 2002); David E. Bloom and David Canning, "Contraception and the Celtic Tiger," *Economic and Social Review* 34 (Winter 2003): 229-47.

*Health and Education*

The effects of health and education on development, then, are well established. But if there are synergies between health and education, we may be underestimating their combined impacts. Understanding these links is important for social policy as well as academic knowledge.

It is apparent that many factors determine overall development progress. Policy perspectives such as the Washington Consensus, which focused on opening economies to trade and foreign investment while maintaining fiscal discipline, are now thought by many economists to have identified development policies that are weaker than their proponents originally claimed. The examples of Cuba and Kerala, meanwhile, show that heavy investment in human capital development does not necessarily spark robust growth and development, although it does promote the alleviation of poverty.

The recent success stories of East and Southeast Asia and Ireland suggest that successful development requires a combination of factors. Among them are investments in health and education, a careful openness to trade and foreign investment, effective governance, labor policies that promote productive employment, good macroeconomic management, and some protection against the effects of environmental shocks. The interactions between these and other factors have the potential to set off virtuous development spirals (and to halt vicious spirals).<sup>6</sup> Determining the ways in which health and education interact is essential for understanding how other drivers of development affect one another.

This knowledge can also translate into better policy. Most governments treat health and education separately, via separate ministries for health and education. Collaboration between these ministries is often patchy, with spending decisions on education rarely taking account of impacts on health, and vice versa.

In all settings, but particularly in developing countries, where funds are especially scarce, maximizing the return on investments is critical. An intervention that improves health will have some impact on human development, but one that improves health and education simultaneously—even if these are somewhat rare—may be a more effective use of resources. In contexts where trade-offs are inevitable, the knowledge that an intervention in one area is likely to spark improvement in other areas could have a major influence on policy.

Failing to capitalize on these opportunities is wasteful. It may also be damaging. Policy interventions intended to spur development are unlikely to succeed unless they adequately address the range of factors that can impede a country's progress. Funds invested in teacher training, for example, may be squandered if teachers receive no advice or assistance with HIV prevention.

<sup>6</sup> Manuel R. Agosin, David E. Bloom, Georges Chapelier, and Jagdish Saigal, eds., *Solving the Riddle of Globalization and Development* (London: Routledge, 2006), forthcoming.

The education workforce in parts of sub-Saharan Africa has been decimated by AIDS, triggering a vicious spiral whereby poor health among teachers hinders the education of children. This leaves children, through their lack of knowledge, more vulnerable to HIV infection themselves.

Figure 1 suggests that health and education are linked. The figure plots infant mortality rate against adult literacy rate for all countries for which data are available and shows the resulting linear regression lines for both 1970 and 2000. Countries with low infant mortality tend to have high literacy levels. Both health status and educational indicators have improved somewhat since 1970, but the relationship between them has remained relatively stable (and this is true for indicators beyond those shown here). As we discuss in more detail below, we cannot infer causality from these data: education could affect health, or vice versa, or both could be affected by other factors.

Investigating causality is key to unlocking the potential of the health-education links hinted at in figure 1. Examination (via case studies) of the countries that do not conform to the general trend may also be instructive. The Maldives, for example, had a high literacy rate (88 percent) but also a high infant mortality rate (157 per 1,000 live births) in 1970. By 2000, the country's infant mortality rate had improved greatly (to 59 per 1,000). Did education have a delayed effect on health, or was it, in 1970, not of the right type or quality to have an effect on health knowledge or behaviors? Alternatively, did noneducational factors, such as a lack of access to technology or medicine, hinder health improvement? In either case, assessing why health

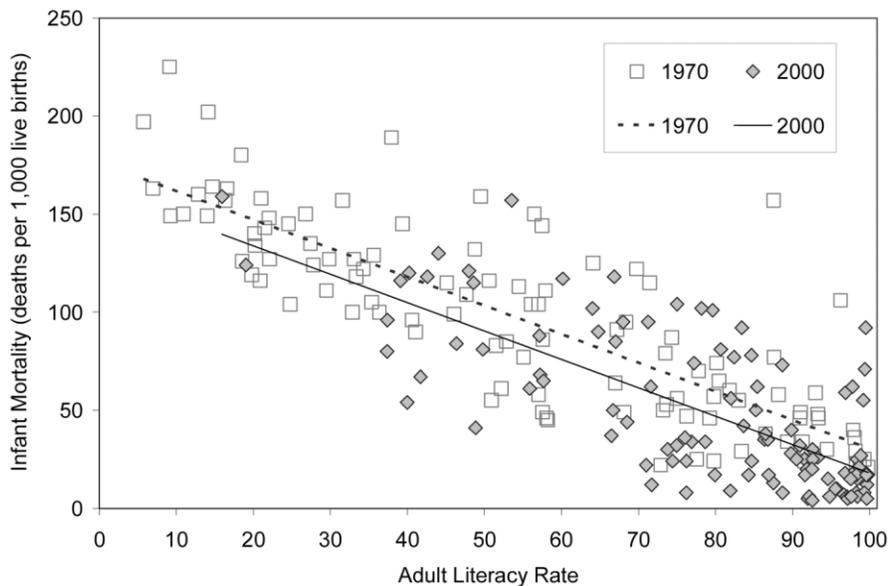


FIG. 1.—Infant mortality and adult literacy, 1970 and 2000. Source: Data from World Bank, *World Development Indicators 2004* (Washington, DC: World Bank, 2004).

lagged education and how the Maldives made such huge strides in cutting infant mortality can provide lessons for policy makers facing similar challenges.

The synergies between health and education offer some promise for development policy. How these might work is the subject of the next section of this article, and evidence of their operating as conceived is the focus of the section following.

#### **Conceptual Channels—How Education and Health Could Be Linked**

Intuitively there are reasons to expect that health and education improvements work in tandem. In this section we look first at the possible channels from health to better or more education and then at the links in the reverse direction.

The theoretical channels from improved health to better education vary in nature over the course of an individual's life. Having good health as an infant enhances cognitive development, so healthy children derive greater benefit from schooling. When children reach school age, good health means they can attend school more frequently and pay better attention in class. Good attendance, enabled by good health, is also more likely to lead to higher attainment through secondary and postsecondary education. The health of other family members affects educational enrollment. Healthy siblings and parents alleviate the pressure on older children to assume caretaker roles at home. Healthy adults, in addition to having accrued benefits from a sound education during childhood, have more free time. This allows workers to be more productive and increases the mental agility needed for lifelong learning.

Good health also makes it more likely that children will receive a good education. Healthy parents are likely to be economically better off and thus can afford education (or better education). Maternal health in particular, because it is closely connected with child health, is linked to educational outcomes. Parents of healthy children, moreover, receive a greater return on the investment in their children's education than do parents of sick children, who may not survive to adulthood.<sup>7</sup> The same is true for governments considering investments in schools. Health improvements thus make it more likely that children will attend school for long periods and that the schools they attend will have the resources to teach them well. Even more to the point, in countries with relatively healthy populations, government investment in education will yield a higher return in economic growth and other social benefits.

Just as good health can strengthen education, bad health can weaken it.

<sup>7</sup> This argument, of course, is based on the idea that parents will act in their children's long-term interests. This assumption, generally reasonable, underlies much thinking about development. However, there is a possibility for this assumption to be off the mark in some cases, since parents' interests are not identical to those of their children, and they may choose, or be forced, to make decisions based on their own shorter-term interests, which could diminish the effect of good health on education.

At a national level, major health shocks divert public funds from schooling. They also damage the human capital needed to run education systems and teach in schools, as in the case of HIV/AIDS in southern Africa. Health shocks also divert assets from education at the family level. Sick parents cannot work to raise the funds for their children's schooling, and they may require children to withdraw from school in order to look after them. Sick children need medicine and care, both of which stretch a family's time and financial resources.

There are numerous conceptual links from education to improved health. Direct effects occur if schools provide health services such as vaccines or treatment for illness, or if they supply nutritious meals that students would not receive at home. In addition, it is widely known that education, particularly of girls, reduces fertility rates. Of particular importance is maternal education: educated mothers are more likely than others to have the knowledge and, perhaps because of that, the determination to seek health care for their children.<sup>8</sup> Direct effects can also be negative—attending school may expose individuals to more illness than if they stayed at home. However, if these short-term sicknesses are overcome, children can build up immunity against diseases that may be dangerous, or at least time-consuming, if caught in adulthood.

Educated individuals have readier access to health information than those without education. Many schools provide lessons on hygiene, nutrition, and sex education, for example, and encourage health-seeking behaviors such as washing hands before meals. Families, of course, also provide much of this information to children. It is still unclear whether health is most improved by health-specific education or general education. Nonetheless, the skills gained through schooling can help children absorb health information and adopt health-seeking behavior. Good education nurtures inquisitiveness and teaches the links between cause and effect, as is evident from the impact of maternal education on child health.<sup>9</sup> Educated children may have a more concrete understanding of how various behaviors affect health outcomes. A better understanding of symptoms could also make interactions with physicians more effective.

We know there are also many indirect channels from education to better health through education's effect on incomes. Educated children ultimately tend to earn higher incomes in adulthood and, therefore, have the money and time to visit medical practitioners. Children in school and their parents have more to lose financially in taking health risks (such as smoking, having

<sup>8</sup> A useful review of the evidence about maternal education and child health is Robert A. LeVine, "Women's Schooling, Patterns of Fertility, and Child Survival," *Educational Researcher* 16 (December 1987): 21–22. A more recent study, focusing on a particular country, is Daniel Buor, "Mothers' Education and Childhood Mortality in Ghana," *Health Policy* 64 (June 2003): 297–309.

<sup>9</sup> J. C. Caldwell, "Education as a Factor in Mortality Decline: An Examination of Nigerian Data," *Population Studies* 33, no. 3 (1979): 395–414.

unprotected sex, making poor dietary choices, and failing to exercise) than those who are unenrolled. This may spur their health-seeking behavior.

In adulthood, higher incomes allow people to eat better food (although in some cases wealth can also lead to their eating too much food), live in more secure dwellings, protect themselves against environmental shocks, and purchase better health care. The educated may, as a consequence, be more resilient to health setbacks and better able to respond to them.

Another effect of higher income is on mental health. People with higher incomes have more effective support networks than the poor, and they are less likely to feel (and to be) socially excluded. Wealth gives one greater control of circumstances than poverty, and stress levels are therefore likely to be lower. The combination of social exclusion and stress could make the less educated more vulnerable to mental illness and its physical effects. That said, we must also recognize the stress levels in Scandinavia and Japan, which purportedly lead to high suicide rates.

Through its positive effects on wage rates, education can make a major contribution to fertility decline. Higher wages increase the opportunity cost for women of bringing up children, and in most countries increased wages have been associated with falls in fertility. As discussed above, having fewer children allows investments to be concentrated in smaller families, which makes it more likely that children will be healthy than if investments are spread thinly.

Finally, it is important to note that government policy and actions influence the potential interactions between education and health. If large numbers of people are unemployed, then increasing education levels will not raise incomes. In this circumstance, the income channel by which education can improve health cannot operate. And with that channel to health improvement blocked, there is no consequent health improvement to feed back to better or more education.

### **The Evidence**

#### *The Big Questions*

Despite a growing body of academic work on the links between health and education, many key questions about their interaction remain unanswered. A search of Rockefeller University library's Evidence-Based Medicine database uncovers over 1,000 items discussing both health and education. Few of these studies, however, are based on randomized trials, and many overlook the effect of external variables on education and health improvements. While associations are often found between advances in health and education, causality is more often implied than proved, with ad hoc studies prevailing over more robust longitudinal data and data from randomized control trials.

To deepen academic understanding of the links and to strengthen policy

decisions, a core set of questions remains to be addressed. Regarding channels leading from health to education, we might first ask, “Whose health, if anyone’s, is important to a child’s educational outcomes?” To answer this question, we must consider the important role of maternal physical and mental health before, during, and after pregnancy. The nutritional status and overall health of a young child may also, quite plausibly, affect his/her ability to learn. The health of teachers, too, may be relevant to children’s educational outcomes.

We also need to investigate what types of health interventions improve schooling outcomes. Such interventions include dietary improvements (school lunches and micronutrient and vitamin supplements), immunization programs, and school-based clinics. They also include public health information campaigns, which can target children or any of their family members.

Regarding channels from education to health, we need to ask, “Whose education benefits whose health?” In particular, we need to better understand what role, if any, mothers’ education plays in maternal, infant, and child health. Do educated children bring health benefits to uneducated parents or siblings? Other questions come to mind, regarding the possibly differing effects of education on male health and female health, along with impacts that may vary by country or region (which would affect whether policy lessons are transferable from one location to another).

Are some health problems—say, infectious diseases or mental health issues—more responsive to education than others? It is plausible that attending school promotes health-seeking behaviors such as exercise, good hygiene, avoidance of alcohol and smoking, and delaying sexual initiation/pregnancy, but we do not know enough about these interactions. For example, some have suggested that education is like a “social vaccine” for HIV/AIDS prevention.<sup>10</sup> To what extent is this true, and do particular levels of education have different effects? And, of course, in the opposite direction, we want to know whether in some circumstances education might pose a threat to health, in terms of exposure to disease.

Finally, we need to understand how different types of education counter risks and maximize health benefits. For example, primary schooling may be key for some prevention efforts, but not others. Health education per se has been the subject of numerous studies, but more could be done to understand the means and extent of any impact.

#### *The Evidence—Research Methods*

Empirical research on the links between health and education can take various forms, including randomized studies, retrospective studies, ethnographic work, and case studies that explore particular connections that seem

<sup>10</sup> “Ministries of education increasingly recognise that education is an effective ‘social vaccine’ against HIV/AIDS, but that the impact of the epidemic is compromising their ability to deliver this vaccine”; Donald Bundy of the World Bank, quoted at [http://siteresources.worldbank.org/CSO/Resources/Learning\\_to\\_Survive\\_by\\_Oxfam.pdf](http://siteresources.worldbank.org/CSO/Resources/Learning_to_Survive_by_Oxfam.pdf).

to be apparent. Relatively few studies on the links between health and education have employed randomized designs.<sup>11</sup> But randomized designs are often the most compelling way of establishing causal connections.<sup>12</sup> Evaluating the value of health and education interventions requires evidence of causality. Studies that look at retrospective data, as valuable (and often necessary) as they are, do not necessarily compare groups that are statistically similar in all characteristics except for the single difference of interest. The validity of the results may, for example, be colored by unexamined differences, making inferences of causality unreliable.<sup>13</sup> A finding that children who attend school are healthier than those who do not may reflect the inability of unhealthy children to attend school, or it may be influenced in a variety of ways by factors such as family income, parental health knowledge, or diet, rather than school attendance itself. Although multivariate analysis can, in principle, eliminate the confounding effects of these factors, it may be difficult to be confident of the impact of schooling unless these factors are reasonably spread across treatment and control groups.

Consider two further points about research methods. First, the relationship between health and education can be investigated using either microdata, such as those emerging from surveys or randomized trials, or macrodata, such as those supplied by the World Bank's *World Development Indicators*. Homing in on the same question via these two very different methods may yield either confirmation of one set of hypotheses or still more unclear results. To the best of our knowledge, this type of comparison has not been carried out very often, if at all. This type of research may be a fruitful direction for researchers. Second, qualitative research methods provide another fruitful approach to learning about the interaction between health and education. Even randomized studies may be unable to explain why people act as they do. Therefore, focus groups, case studies, and ethnographic techniques are required to generate useful hypotheses about the dynamics of a situation. Because these hypotheses can sometimes be tested using quantitative research methods, qualitative designs are often very complementary to quantitative ones.

Below, I briefly summarize a selection of studies covering channels from

<sup>11</sup> Eric P. Bettinger, "Random Experiments in Education: Surveying the Evidence" (occasional paper, American Academy of Arts and Sciences, Cambridge, MA, 2005).

<sup>12</sup> However, such trials can be quite costly to conduct, and they sometimes raise difficult ethical issues. Denying a control group of children access to schooling is not politically or morally feasible. Similarly, offering an intervention to only one group of students or one set of schools, when that intervention seems likely to be beneficial, is also very problematic. This ethical problem is mitigated, however, by the consideration that if no students receive the intervention, none of them will be better off, nor will anyone learn whether the intervention is definitely effective or cost-effective. Obviously, such trials must therefore be carefully designed and reviewed before they are initiated.

<sup>13</sup> Michael Kremer, "The Role of Randomized Evaluations in Making Progress towards Universal Basic and Secondary Education" (occasional paper, American Academy of Arts and Sciences, Cambridge, MA, 2005); Robert Moffitt, "Remarks on the Analysis of Causal Relationships in Population Research," *Demography* 42 (1): 91–108.

health to education, as well as the reverse. Although this summary is far from an exhaustive review of the literature, several of the studies described lend weight to the idea that education and health have mutually reinforcing interactions.

*The Evidence—Health to Education*

The most persuasive evidence that good health leads to good education comes from a handful of randomized studies.<sup>14</sup> These studies examine the effects on school children (absenteeism, test scores) of deworming programs, iron supplementation, and the provision of school meals in an array of developing countries. Some (but not all) of them detect a positive effect of such programs on education-related indicators; in other cases, only a few of the tested indicators appear to be affected by health interventions. In some instances they highlight challenges to reaching accurate conclusions that arise even in randomized trials.<sup>15</sup>

Some nonrandomized studies also point to clear impacts of health and nutrition on education. HIV/AIDS, of course, via its impact on families and teachers, has greatly stressed students and education systems as a whole.<sup>16</sup> In sum, although there is evidence that health affects education, the overall picture is still not entirely clear. Many questions remain unanswered, and many health interventions that may affect education have not been tested in randomized trials. Clearly there is a need for more research before health interventions can be most effectively incorporated into policy.

*The Evidence—Education to Health*

Testing educational interventions to improve the health of children is possible using randomized trials, but most work to determine the effect of

<sup>14</sup> Edward Miguel and Michael Kremer, "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities," *Econometrica* 72, no. 1 (2004): 159–217; G. J. Bobonis, E. Miguel, and C. P. Sharma, "Iron Deficiency Anemia and School Participation," Poverty Action Lab Paper no. 7 (Poverty Action Lab, Massachusetts Institute of Technology, Cambridge, MA, 2004); C. Nokes, S. M. Grantham-McGregor, A. W. Sawyer, E. S. Cooper, B. A. Robinson, and D. A. P. Bundy, "Moderate to Heavy Infections of *Trichuris trichiura* Affect Cognitive Function in Jamaican School Children," *Parasitology* 104 (June 1992): 539–47; Christel Vermeersch and Michael Kremer, "School Meals, Educational Achievement, and School Competition: Evidence from a Randomized Evaluation," World Bank Policy Research Working Paper no. 3523 (World Bank, Washington, DC, November 2004), <http://ssrn.com/abstract=667881>; Rumona Dickson, Shally Awasthi, Paula Williamson, Colin Demellweek, and Paul Garner, "Effects of Treatment for Intestinal Helminth Infection on Growth and Cognitive Performance in Children: Systematic Review of Randomised Trials," *BMJ* 320 (June 24, 2000): 1697–1701.

<sup>15</sup> For example, Bobonis et al., in "Iron Deficiency Anemia and School Participation," found that delivering iron supplementation and deworming drugs to children attending preschool reduced absenteeism by one-fifth in the first 5 months of the program. However, these authors also found that they could not maintain randomized groups for comparison when they extended the study over a further year, as parents who were aware of the program directed their children into treatment schools.

<sup>16</sup> Harold Alderman, Jere Behrman, Victor Lavy, and Rekha Menon, "Child Nutrition, Child Health, and School Enrollment: A Longitudinal Analysis," World Bank Policy Research Working Paper no. 1700 (World Bank, Washington, DC, 1997); A. Haworth, K. Kalumba, P. Kwapa, E. Van Praag, and C. Hamavhwa, "The Impact of HIV/AIDS in Zambia: General Socioeconomic Impact" (paper presented to the Seventh International Conference on AIDS, Florence, 1991); UNICEF, *The Progress of Nations Report 2000* (Geneva: UNICEF, 2000).

education on health has been carried out using other research methods. A large set of studies has assessed various factors (parental education, an individual's years of schooling, extending schooling to more children) in an attempt to determine whether and how education improves health (as measured by lowered blood pressure, fewer functional impairments, increased height, improved health-seeking behavior, lower infant mortality, lower fertility rates, higher birth weights, and fewer premature births).<sup>17</sup> Most of these studies show links that are plausibly causal. One such study, involving a natural experiment based on differences in compulsory education laws, concludes with confidence that education reduces adult mortality and that this effect is larger than previously thought.<sup>18</sup> However, some studies suggest the links from education to health are either negligible or negative.<sup>19</sup>

Although few of the above studies provide decisive evidence of causality, they do identify the possible impacts of education on health, and these are consistent with the intuitive reasons for their occurrence, as discussed above in the second part of this overview. Uncertainties abound, however. Mothers' education appears to be particularly strongly associated with better health outcomes for their children, but clarifying the effect of a child's schooling on his or her own health has proved more difficult. The different effects of health education as compared to general education are unclear, and knowl-

<sup>17</sup> M. C. Berger and J. P. Leigh, "Schooling, Self-Selection, and Health," *Journal of Human Resources* 24, no. 3 (1989): 433–55; Duncan Thomas, "Like Father, Like Son; Like Mother, Like Daughter: Parental Resources and Child Height," *Journal of Human Resources* 29 (Autumn 1994): 950–88; Donald S. Kenkel, "Health Behavior, Health Knowledge, and Schooling," *Journal of Political Economy* 99 (April 1991): 287–305; Robert A. LeVine, "Women's Schooling, Patterns of Fertility, and Child Survival," *Educational Researcher* 16, no. 9 (1987): 21–27; C. Lloyd, C. E. Kaufman, and P. Hewett, "The Spread of Primary Schooling in Sub-Saharan Africa: Implications for Fertility Change," *Population and Development Review* 26, no. 3 (2000): 483–515; S. J. Adams, "Educational Attainment and Health: Evidence from a Sample of Older Adults," *Education Economics* 10, no. 1 (2002): 97–109; Janet Currie and Enrico Moretti, "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings and Longitudinal Data," *Quarterly Journal of Economics* 118, no. 4 (November 2003): 1495–1532; Shari S. Bassuk, Lisa F. Berkman, and Benjamin C. Amick III, "Socioeconomic Status and Mortality among the Elderly: Findings from Four U.S. Communities," *American Journal of Epidemiology* 155, no. 6 (2002): 520–33; Paul Glewwe, "How Does Schooling of Mothers Improve Child Health? Evidence from Morocco," Living Standards Measurement Study Working Paper no. 128 (World Bank, Washington, DC, 1997); R. M. Nayga Jr., "Effect of Schooling on Obesity: Is Health Knowledge a Moderating Factor?" *Education Economics* 9 (August 2001): 129–37; Joint United Nations Programme on HIV/AIDS (UNAIDS), "Impact of HIV and Sexual Health Education on the Sexual Behaviour of Young People: A Review Update," report (UNAIDS, Geneva, 1998).

<sup>18</sup> Adriana Lleras-Muney, "The Relationship between Education and Adult Mortality in the United States," *Review of Economic Studies* 72, no. 1 (2005): 189–221.

<sup>19</sup> Phillip Farrell and Victor R. Fuchs, "Schooling and Health: The Cigarette Connection," *Journal of Health Economics* 1 (December 1982): 217–30; N. M. Beasley, A. Hall, A. M. Tomkins, C. Donnelly, P. Ntumbwa, J. Kivuga, C. M. Kihamia, W. Lorri, and D. A. Bundy, "The Health of Enrolled and Non-enrolled Children of School Age in Tanga, Tanzania," *Acta Tropica* 76 (2000): 223–29; James R. Hargreaves and Judith R. Glynn, "Educational Attainment and HIV Infection in Developing Countries: A Systematic Review," *Tropical Medicine and International Health* 7, no. 6 (2002): 489–98; K. Fylkesnes, R. M. Musonda, K. Kasumba, Z. Ndhlovu, F. Mluanda, L. Kaetano, C. C. Chipaila, "The HIV Epidemic in Zambia: Socio-Demographic Prevalence Patterns and Indications of Trends among Childbearing Women," *AIDS* 11, no. 3 (1997): 339–45; J. Vandemoortele and E. Delamonica, "The 'Education Vaccine' against HIV/AIDS," *Current Issues in Comparative Education* 3, no. 1 (2000), <http://www.tc.columbia.edu/cice/articles/jved131.htm>.

edge of the type of health education required is weaker still. Differences in the specific impact of primary, secondary, and tertiary schooling have yet to be determined. There is also considerable uncertainty about the effects of education on male health versus female health. Nevertheless, with the balance of studies suggesting there are links from education to better health, establishing how these links work is critical for designing policies to take advantage of them.

Finally, we note that the effects of education on health could vary from one context to another and over time. For example, in a country that trades extensively with a large neighbor, the effect of education on health might be different than in a country whose economy is more isolated. In the absence of the push and pull—the dangers and opportunities—that come from proximity to a behemoth, an isolated country may have fewer development options, so the need for education to facilitate health improvements may be stronger. Similarly, the effects of education on health can vary over time. In Africa, individuals with more education were at first more likely to become infected with HIV. As awareness of how HIV spreads increased among the educated, infection became more likely among the uneducated population.

### The Special Issue

The articles in this special issue present new evidence on the links between education and health, along with a case study of the distributional effects of public subsidies for health and education.<sup>20</sup> They are valuable contributions to the topic at hand and offer a glimpse of the much broader research that remains to be done. In “Childbearing and Schooling: New Evidence from South Africa,” Sangeetha Madhavan and Kevin J. A. Thomas investigate one particular pathway by which health can affect education. On its face, childbearing would seem to be an impediment to a girl’s completion of her education, and most data indeed support this supposition. This link, from childbearing to the end of formal education, clearly abets the continuation of poverty. However, the analysis by Madhavan and Thomas suggests that certain household-level attributes might enable young mothers to complete their education. Therefore, the authors call for increased focus on multifaceted programs that support young mothers and encourage them to finish school. This is a case in which a health event (having a child) is not deter-

<sup>20</sup> I wish to offer a warm thank-you to the many reviewers of the papers submitted for this special issue. Their forthrightness and perspicacity were invaluable. These reviewers are Alaka Basu, Srilatha Batliwala, Michael Bennish, Stefano Bertozzi, Indu Bhushan, Melissa Binder, Donald Bundy, David Canning, Richard Cash, John Casterline, Mukesh Chawla, Julie DaVanzo, Parfait Eloundou-Enyegue, David Evans, Tim Evans, Arline Geronimus, Suzanne Grant-Lewis, Michel Guillot, Emily Hannum, Allan Hill, Shireen Jejeebhoy, Emmanuel Jimenez, Sanders Korenman, Ruth Levine, Yuanli Liu, Cynthia Lloyd, Nora Lustig, Colin Maclay, Sangeetha Madhavan, Andrew Mason, Narciso Matos, Thomas Merrick, Marc Mitchell, Juan Moreno, A. K. Nandakumar, Suet-ling Pong, Jaime Saavedra, Janet Schofield, Jaypee Sevilla, Bonnie Shepard, Daniel Tarantola, Kate Taylor, Alexandria Valerio, Speciosa Wandira, Mary Waters, Abdo Yazbeck, Stephen Younger, and Winnie Yip.

minative of the final educational outcome. Intervention—along with a family's values and motivation—can make a difference.

Jean-François Kobiané, Anne-Emmanuèle Calvès, and Richard Marcoux, in "Parental Death and Children's Schooling in Burkina Faso," take up a similar question to that posed by Madhavan and Thomas: How do major life events affect a child's education? By studying the educational participation of orphans, the authors investigate the effect of adult deaths on the education of young children—a particularly salient issue in the face of the HIV/AIDS crisis in Africa. Orphans are indeed less likely to enter school than their nonorphan peers, and this effect is more pronounced in rural areas, among the poor, and for girls. While these results are not surprising, they do highlight an issue that may be amenable to policy intervention, particularly with respect to the education of orphaned girls.

Other authors in this issue investigate the possible effect of education on health. Pat Pridmore and Chris Yates argue that confronting the HIV/AIDS crisis requires that governments embrace open learning systems and new, more flexible means of educating youth. The educational strategies used to date, they suggest, will not carry the day and reverse the spread of the disease, particularly in high-prevalence countries. In "Combating AIDS in South Africa and Mozambique: The Role of Open, Distance, and Flexible Learning (ODFL)," Pridmore and Yates speak of the need to involve young people in getting communities to confront AIDS successfully. Since the articles reviewed in this introduction show that there is some doubt about the efficacy of education initiatives in promoting health, this article provides a welcome suggestion: that a different type of education may be more effective.

Meredith L. Rowe and her coauthors address the question of education's effect on health by focusing on a specific and critical issue, in "How Does Schooling Influence Maternal Health Practices? Evidence from Nepal." As in some other relatively isolated countries, the dissemination of information about health practices that can improve the life chances of children is hampered in Nepal by illiteracy, by within-country geographical barriers, and by long-standing child raising practices that may fit well with day-to-day family needs but that do not benefit from knowledge gained in other parts of the world. Rowe et al. show that the health-related knowledge and practices of mothers is affected not only by their schooling but by subsequent use of their literacy skills (which the authors measure carefully) and also by their exposure to media. Education may be an essential element in spreading knowledge that is beneficial to health, but subsequent public health campaigns can productively build on that education.

In "Mother's Education, Learning-by-Doing, and Child Health Care in Rural India," Sang-Hyop Lee and Andrew Mason examine one specific route by which education might improve health care. Specifically, they seek to determine whether mothers who use prenatal care benefit from that expe-

rience, as shown by the subsequent likelihood of their immunizing their children. Such learning appears in their work to be important in influencing later health-seeking practices only for educated mothers. This is a notable conclusion, since it would not be unreasonable to guess that a mother's lack of education may impede her ability to learn from her prenatal (or other medical) experience. In any case, a health system clearly faces challenges in bringing effective health care to uneducated women.

Finally, in "Policy Implications of the Distribution of Public Subsidies on Health and Education: The Case of Karnataka, India," Ajay Mahal looks at an overarching issue relevant to both health and education. Government support for health and education would appear to be a crucial element in ensuring that the poor have a chance to lead productive lives. Without such support, typically in the form of subsidies, countries would seem likely to diverge ever faster into divided societies. Yet Mahal finds that a disproportionate share of such subsidies has benefited the well-off, with relatively little helping women, people in rural areas, or others with already low levels of education and health. This article serves as a cautionary tale in the context of examining the interactions between health and education. Effective and positive links likely exist, as do possibilities for policies that take advantage of them, but the context in which policies are implemented matters enormously.

Although the evidence base is far from complete, it appears that the interactions between education and health can promote virtuous development spirals. Good health boosts school attendance and improves learning. Good education, particularly of mothers, boosts child health, and the effects can last into adulthood.

Many key questions remain unanswered, however, and policy makers have only slim evidence on which to formulate plans. More research is needed. Randomized studies should be an important focus of our efforts, but different research designs have different strengths and weaknesses. Retrospective quantitative studies can draw on large amounts of data and benefit from experiences in an extremely wide array of situations. Qualitative studies can both provide seminal insights and lead to critical, testable hypotheses. Effective policy requires a strong evidence base, and a robust mix of studies has the potential to push our understanding forward faster than any one research strategy.