Determinants of Health and Education Outcomes

Background Note for World Development Report 2004:
Making Services Work for Poor People

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**Demand and supply interact to determine health and education outcomes**

Health and education outcomes are determined by more than the availability and quality of health care and schooling. Better nutrition helps children learn. Better refrigeration and transport networks help keep medicines safe. Many factors determine outcomes on both the demand and the supply side, linked at many levels. The demand for health and education is determined by individuals and households weighing the benefits and costs of their choices and the constraints they face. The supply of services that affect health and education outcomes starts with global technological knowledge and goes all the way to whether teachers report for work and communities maintain water pumps (figure 1).

**Figure 1 The determinants of demand and supply operate through many channels**

<table>
<thead>
<tr>
<th>Policies, capacity, technical know-how, politics</th>
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<tbody>
<tr>
<td>Global knowledge</td>
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<td>National macro-, sector-, and microlevel policies</td>
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<tr>
<td>Technical capacity to implement policies</td>
</tr>
<tr>
<td>Governance; politics and patronage; political capacity and incentives to implement policies</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Health, nutrition, water education sectors</th>
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</thead>
<tbody>
<tr>
<td>- Service price, accessibility, and quality</td>
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<tr>
<td>- Financing arrangements</td>
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<th>Related sectors</th>
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<tr>
<td>- Availability, prices, and accessibility of:</td>
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<tr>
<td>- Food, energy, roads, …</td>
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<td>- Infrastructure</td>
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<tr>
<td>- Environment</td>
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<thead>
<tr>
<th>Local context</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Local government and politics</td>
</tr>
<tr>
<td>- Community institutions</td>
</tr>
<tr>
<td>- Cultural norms (including exclusion: gender, ethnic, …)</td>
</tr>
<tr>
<td>- Social capital</td>
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</table>

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<thead>
<tr>
<th>Households and individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviors and actions</td>
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<tr>
<td>Health: preventive care, care seeking for illness, feeding practices, sanitary practices, …</td>
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<td>Education: enrollment and school participation, learning outside of school, …</td>
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<th>Constraints</th>
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<td>- Income</td>
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<tr>
<td>- Wealth</td>
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<td>- Education and knowledge</td>
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<thead>
<tr>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Child mortality</td>
</tr>
<tr>
<td>Child nutrition</td>
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<tr>
<td>School completion / Learning achievement</td>
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**Demand: individuals and households**

Benefits and costs determine how much an individual invests in education or health. What are the benefits? Higher levels of education and health are associated with higher productivity—and higher earnings. Investing in human capital is a way to get those returns. But the returns might differ for different people, such as lower expected earnings for women or for ethnic minorities. In these cases one would expect different levels of investment: different desired levels of schooling, for instance. A crucial element of demand is the degree to which individuals rather
than society reap the rewards. Goods with large positive externalities—in the extreme, public goods—will be demanded at less than the socially optimal level.

What are the costs? There are direct costs: user fees, transport costs, textbook fees, drug costs. Some of these can be borne by families—though not all families. Coping mechanisms for those that cannot are often hard to use. For example, the lack of insurance markets can make it hard to absorb the financial burden of sudden illness. Or the inability to borrow against future earnings can make it hard to get credit for schooling investments.

Indirect costs can also be large. For example, children often contribute to household income by working inside or outside the home (looking after siblings, working on the family farm). The value of this contribution is forgone if they spend substantial time in school.

The total cost of illness includes days of work lost recovering, seeking care, or looking after the ill. Richer families can cope better with these costs, leading to a direct association between income and outcomes. In addition, better health and education are often valued in themselves. As incomes increase families demand more of them, again resulting in an association between income and outcomes.

The production of health and education depends on the knowledge and practices of adults in households. This works through both the demand for human capital and the generation of outcomes. A review of four hygiene interventions in poor countries that targeted hand-washing found 35 percent less diarrhea-related illness among children who received the interventions.\(^1\) And factors in the home complement schooling: books and reading at home contribute to literacy.

Investments in the human capital of children are sensitive to the allocation of power within households: families in which the bargaining power of women is stronger tend to invest more in health and education. A study in Brazil found that demand for calories and protein was up to 10 times more responsive to women’s than men’s income.\(^2\) This result, strongest in societies that proscribe woman’s roles, tends to affect girls more than boys.\(^3\)

More generally, the roles and responsibilities of different household members can affect how investments are made. A woman in Egypt says: “We face a calamity when my husband falls ill. Our life comes to a halt until he recovers.”\(^4\) Her husband’s earnings are crucial for sustaining the family. Since productivity is related to illness, households respond. In Bangladesh a study found that household members who engaged in more strenuous activities received more nutritious food.\(^5\) Daughters’ education might be less valuable to parents if sons look after them in old-age, so parents might be less willing to send girls to school.\(^6\)

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1 Based on interventions in Burma, Bangladesh, India, and Indonesia (Huttley, Morris, and Pisani (1997)).
2 Thomas (1997).
3 See Quisumbing and Mallucio (2000).
5 Pitt, Rosenzweig, and Hassan (1990).
6 Reviews of the theory and empirical issues related to household decision making and demand are in Strauss and Thomas (1995) and Strauss, Mwabu, and Beegle (2000).
**Demand: links between sectors at individual and household levels**

Health and nutritional status directly affects a child’s probability of school enrollment and capacity to learn and succeed in school. Malnutrition among children was associated with significant delays in school enrollment in Ghana.\(^7\) Improving child health and nutrition at the pre-primary level has long-term impacts on development. A study in the Philippines found that a one-standard-deviation increase in early-age child health increased subsequent test scores by about a third of a standard deviation.\(^8\)

Improving the health and nutritional status of students positively affects school enrollment and attendance. A longitudinal study in Pakistan found that a one-third of a standard deviation increase in child height increased school enrollment by 19 percentage points for girls and 4 percentage points for boys.\(^9\) An evaluation of school-based mass treatment for deworming in rural Kenya found that student absenteeism fell by a quarter—but test scores did not appear to be affected.\(^10\)

Improving nutrition is not as simple as supplementary feeding at school: households can reallocate resources with the effect of “sharing” that food. A study in the Philippines found no such “sharing” in general, but for a school snack program there was “sharing” in poorer families.\(^11\)

Parents’ education has intergenerational effects on the health, nutritional status, and schooling of their children. Adult female education is one of the most robust correlates of child mortality in cross-national studies, even controlling for national income. Similarly, mother’s education is a strong determinant of lower mortality at the household level, though the relationship weakens when other household and community socioeconomic characteristics are controlled for.\(^12\) A large part of this effect might not be general education but specific health knowledge, perhaps acquired using literacy and numeracy skills learned in school, as a study in Morocco found.\(^13\)

The effects can also be interspatial: a study in Peru found that the education of a mother’s neighbors significantly increases the nutritional status of her children.\(^14\) Parents’ education is similarly associated with the schooling of their children, though the magnitude of the effect—and the relative roles of mother’s and father’s education—vary substantially across countries.\(^15\)

Access to—and use of—safe water, as well as adequate sanitation, have direct effects on health status. Hand-washing is a powerful health practice, but it requires sufficient quantities of water. An eight-country study found that going from no improved water to “optimal” water was associated with a 6 percentage point reduction in the prevalence of diarrhea in children under three years old (from a base of 25 percent) in households without sanitation. Nutritional status

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\(^7\) Glewwe and Jacoby (1995).
\(^8\) Glewwe and King (2001).
\(^9\) Alderman and others (2001).
\(^11\) Jacoby (2002).
\(^12\) Desai and Alva (1998); Bonilla-Chacin and Hammer (2000).
\(^13\) Glewwe (1999).
\(^15\) For examples in Conakry, Guinea, see Glick and Sahn (2000); in rural China see Brown and Park, forthcoming.; for a multi-country comparison see Filmer (2000).
was likewise associated with access to improved water.\textsuperscript{16} But not all studies find strong associations between water source and better health.\textsuperscript{17}

The water source is only part of the story: in Bangladesh water accessed through tubewells—an “improved” source—is frequently contaminated with arsenic. One study found that arsenic levels higher than the World Health Organization’s maximum acceptable level are associated with twice the level of diarrhea in children under 6. Extremely high levels of arsenic are associated with shorter stature among adolescents.\textsuperscript{18}

The same eight-country study mentioned above found that going to “optimal” sanitation from none was associated with a 10 percentage point drop in recent diarrhea in households with no improved water source.\textsuperscript{19} As in education, there are spillover effects: sanitation practices at the community level impact everyone’s health.\textsuperscript{20} In Peru the sanitation investments of a family’s neighbors were associated with better nutritional status for that household’s children.\textsuperscript{21}

The use of safe energy sources affects both health and education. Indoor air pollution—from using dirty cooking and heating fuels—hurts child health. One review of studies found that the probability of respiratory illness, or even death, was between two and five times higher in houses where exposure to indoor air pollution was high.\textsuperscript{22} A study in Guatemala found birthweights 65 grams lower among newborns of women who used wood as a domestic cooking fuel.\textsuperscript{23} Coping with the cold, in cold climates, affects health and imposes substantial direct and indirect costs on households.\textsuperscript{24} Education is affected as well: schools have to close when there is not enough heat, and it is hard to imagine that working on schoolwork at home is an option when indoor temperatures are below freezing.

\textit{Supply: global developments}

At any given income, health and education outcomes have been improving (figure 2). The difference between 1990 and 2000, continuing a trend that goes back several decades, is interpreted as advances in technologies and leaps in knowledge about health and hygiene.\textsuperscript{25} Predicted levels of child mortality declined more at higher incomes, although some debate this finding.\textsuperscript{26} The changes are large, even among poorer countries. At a national income of $600

\begin{footnotes}
\item[16] The model includes indicators of household assets, number of siblings, characteristics of parents (including education), as well as child age and country dummy variables. The countries are Burundi, Ghana, Guatemala, Morocco, Sri Lanka, Togo, and Uganda (Esrey (1996)).
\item[18] Hallman, background note for the WDR 2004.
\item[19] The model includes indicators of household assets, number of siblings, characteristics of parents (including education), as well as child age and country dummy variables. The countries are Burundi, Ghana, Guatemala, Morocco, Sri Lanka, Togo, and Uganda (Esrey (1996)).
\item[20] Hughes, Lvovsky, and Dunleavy (2000).
\item[22] Bruce, Perez-Padilla, and Albalak (2000); also see discussion in Hughes, Lvovsky, and Dunleavy (2000).
\item[23] After taking into account confounding socio-economic factors – although the authors admit that this is perhaps imperfect (Boy, Bruce, and Delgado (2002)).
\item[25] Preston (1980).
\item[26] Hill and Pebley (1989).
\end{footnotes}
per capita, the predicted child mortality fell from 100 per 1,000 births to 80—a full 20 percent reduction—between 1990 and 2000. If this association were sustained, major headway would be made toward the Millennium Development Goal through these changes alone. Major breakthroughs in immunizations for malaria—or even HIV—could have a huge impact on mortality at any given level of income.

Recent years have seen major developments in global funding for health and education expenditures. Debt relief through the Heavily Indebted Poor Countries initiative is tied to increases in expenditures on these sectors. New assistance, delivered through multisectoral products, such as Poverty Reduction Support Credits, requires explicit strategies for human development investments. Global funds for health and the “Fast-Track Initiative” for education are international pledges to support initiatives in the sectors.27 Easing financial constraints goes hand-in-hand with using resources effectively to support services that work for poor people.

**Figure 2 Mortality at a given level of national income has been declining**

Changes over time in the association between GDP per capita and child mortality

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**Sources:** GDP per capita data from World Development Indicators database. Under-5 Mortality from Unicef (2002).

**Note:** Lines show outcome as predicted by a non-linear function of GDP per capita.

**Supply: national resources**

National income is strongly associated with child mortality and primary school completion. Income and health and education outcomes build off of each other. More income leads to better human development outcomes, and better health and education can lead to increased productivity and better incomes. Studies that have tried to disentangle these relationships typically find income to be a robust and strong determinant of outcomes.

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27 See Chapter 11.
National endowments are also a strong determinant. Geography and climate sometimes make it tougher to overcome health problems. For example, areas conducive to mosquito survival have great difficulty in combating malaria—and widely dispersed populations are difficult to serve through traditional school systems.

The performance of public expenditure in producing outcomes varies substantially across countries. There are large differences in achievements at similar levels of expenditure and similar achievements with very large differences in expenditures—conditional on income. Spending more through the public sector is not always associated with improved outcomes. This is not to say that spending cannot be helpful—but the way resources are used is crucial to their effectiveness.

Supply: political, economic, and policy context

Governance affects the efficiency of expenditures: in corrupt settings money that is ostensibly earmarked for improving human development outcomes is diverted. Staffs ostensibly delivering services do not. But the effects of poor governance can be deeper. Famines are caused as much by human factors as by nature. And the repercussions run across national borders. For example, a drought combined with misguided policies and bad governance in Zimbabwe resulted in a regional food shortage.

Managing public expenditures can be a critical link in ensuring that allocated expenditures get put to uses that improve outcomes. “Cash budgeting” in Zambia led to unpredictable social service spending and deep cuts in spending on rural infrastructure.

Conflict leaves long-lived scars on health and education. Children in wartorn countries are hard to find, hard to get into school, and hard to keep in school. During Sierra Leone’s recent civil war, tens of thousands of children attended primary school but hundreds of thousands did not. Wars, including civil wars, lead to “lost generations” of undernourished and undereducated children. These deficiencies are difficult—if not impossible—to make up for. Out of school for a long time, it is hard to return. And bad health and poor nutrition at an early age affects children throughout their lives.

Periods of national economic and social crisis can result in bad health and education outcomes. This is clear in Russia’s recent history: adult mortality has increased dramatically over the past 10 years. Sustained economic depression can severely compromise children’s health, with cascading effects on subsequent development and learning. The evidence of shorter term economic crises is more mixed. In middle-income environments school enrollments might increase as the opportunity cost of time of young people falls. Even in Indonesia, a relatively poor country, the deep economic and social crisis of the late 1990s had smaller impacts on outcomes than initially feared. This was partly because broad social safety nets were rapidly put in place.

28 For discussions see Sen (1981) and Ravallion (1996).
29 Dinh, Adugna, and Myers (2002).
30 Sommers (2002).
31 Schady (2002).
Supply: the local context of government and communities

Decentralization can be a powerful tool for moving decisionmaking closer to those affected by it. Doing so can strengthen the links and accountability between policymakers and citizens—local governments are potentially more accountable to local demands. It can also strengthen them between policymakers and providers—local governments are potentially more able to monitor providers. But local governments should not be romanticized. Like national governments they are vulnerable to capture—and this might be easier for local elites on a local scale.32

Community-level institutions, shaped by cultural norms and practices, can facilitate or hinder an environment for improving in outcomes. A review of safe-water projects in Central Java, Indonesia, associates success with greater social capital.33 In Rajasthan, India, manifestations of “mutually beneficial collective action” were associated with watershed conservation and development activities more generally.34 A broader review of the literature suggests that participatory approaches to implementing projects are more successful in communities with less economic inequality and less social and ethnic heterogeneity.35

Supply: services and their financing

Services themselves are important. Inaccessible or poor quality services raise the effective price of health care and schooling, which results in higher mortality and lower educational achievement. Bad quality schools deter enrollment and reduce attainment and achievement, especially among children of poor families. Health clinics where the technical skills of staff are so bad as to be dangerous will lead to higher mortality. Lack of water will significantly hurt child health.

Financing arrangements matter. Absorbing the burden of unpredictable large expenditures through health insurance can reduce impoverishment, which in turn will affect outcomes. Financing primary schooling might seem relatively minor: direct costs are typically small. Even so, a lack of access to credit has been found to be associated with lower school enrollment.36 Borrowing to pay the direct costs of primary school is almost unheard of, but there could be second-round effects if the lack of access to credit means that families need children to engage in home production.

Supply: services working together to produce outcomes

Links among services are critical. Vaccines can become less effective, ineffective, or even dangerous if they get too hot, freeze, or are exposed to light. The ability to transport and store vaccines properly thus determines the success of immunization campaigns. In cold climates schools and health facilities often need to close because of the lack of heating, and dependable energy sources can directly affect health and education outcomes. The accessibility of services

32 Bardhan and Mookherjee (2002).
33 Isham and Kahkonen (2002).
34 Krishna and Uphoff (2002).
36 For example see Jacoby (1994) and Rose (2000).
can be a deterrent to their use: roads and adequate transport contribute to the total cost of using a service. Since the expected return to education determines the benefits of schooling, labor markets that are not fundamentally distorted (for example, through discriminatory practices toward marginalized groups) can contribute to higher education achievement.
References

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