Undernutrition clearly remains widespread, even after significant reductions in poverty achieved in recent years. A recent review (Black and others 2008) suggests that maternal and child malnutrition is the underlying cause of 3.5 million deaths annually. Undernutrition accounts for 35 percent of the disease burden in children younger than age 5, and 11 percent of total global disability-adjusted life years (DALYs), a measure that takes into account the impact of both early mortality and disability.

Stunting is a condition that reflects chronic malnutrition as measured by low height for age when compared to international references. South Asia alone accounts for almost half of the world’s population of stunted children under age 5 (73.8 million of the 177.7 million). This region also has 10.3 million of the 19.3 million severely wasted children; that is, those with acute malnutrition. Most worrisome is the fact that Sub-Saharan Africa, which accounts for an additional 56.9 million stunted children, has not seen a decline in these numbers over the last two decades, in contrast to other regions. Malnutrition rates have declined in all regions, but in Africa the decline has not been fast enough to offset the growth in population.

Despite the substantial evidence of economic benefits, investments in nutrition are often deferred. A primary challenge for nutrition policy is to position nutrition as an investment rather than simply as a form of social spending that governments grant poor people to the degree that governments prioritize equity. This policy brief addresses this challenge (see figure 1 below and see figure 2 on page 2).

FIGURE 1. GLOBAL TRENDS IN UNDERWEIGHT CHILDREN, AGES 0-4 YEARS

Realizing the Economic Benefits of Addressing Undernutrition

Addressing undernutrition is likely to yield high economic returns and speed up poverty reduction. In 2004, the Copenhagen Consensus, a panel of economists that included three Nobel Laureates, assessed the expected rate of return of 17 possible development investments. These investments covered a broad range, including nutrition as well as a diverse set of interventions in education, water and sanitation, trade reform, and private-sector deregulation. The assessment involved comparisons that went beyond a simple cost-effectiveness focus: By estimating rates of returns in a common metric, the ranking permitted comparisons across different sectors with different outcomes.

The panel found that, among all these possible undertakings, addressing micronutrient deficiencies had the highest rate of economic return (Behrman and others 2004). The group ranked programs to address child stunting among those with the highest rates of economic returns. In 2008, these findings were updated and 30 possible interventions were ranked by eight leading economists, including five Nobel Laureates. This panel rated four nutrition interventions among the most profitable six interventions (Horton and others 2008).

Examples of the economic benefits recognized by this team of economists are presented in the table. For example, every US$1 of expenditures on vitamin A supplementation is likely to produce US$100 in benefits. To be fair, such estimates are based on a variety of assumptions, such as the value of future benefits compared with current benefits (economists generally view a dollar today as worth more than a dollar some time in the future). However, the comparisons across different interventions used a standard set of such assumptions; moreover, comparisons of benefits and costs were reported for a range of alternative assumptions.

The economic benefits from improved nutrition come, in part, from reduced infant and child mortality and from reduced costs of health care for neonates, infants, and children. However, the economic benefits are dominated by productivity gains from reduced stunting and from increased schooling and cognitive ability attributable to health in early childhood. Undernutrition affects the timing of school entry, the number of years completed, and the learning that takes place per year of school. Years of schooling and actual achievement in school are commonly shown to lead to increased lifetime earnings. Moreover, even controlling for schooling, individuals with higher cognitive abilities are found to earn more (Behrman and others 2004).
The evidence base for such calculations of the impact of nutrition on earnings is substantial and growing. While separating the factors that lead to undernutrition from the constraints of poverty that will limit schooling regardless of nutritional status can be problematic, recent studies confirm that the impact of improved nutrition is distinct from the contribution of poverty reduction. The increased availability of longitudinal data sets that track individuals over decades assists in documenting this link between health and productivity. For example, one recent contribution to this knowledge comes from a randomized trial assessing the earnings of adults up to 42 years of age who received nutritional supplements as children or whose mothers received them during their pregnancy (Hoddinott and others 2008).

Why do economic investments often fail to follow from this and similar evidence? This policy brief argues, first, that governments often believe that they are addressing malnutrition when they accelerate economic growth and food production in their countries. In this belief, they are mistaken. Second, a substantial gap exists between the knowledge the health profession has regarding what programs will achieve an improvement in outcomes and how to scale up such programs. A portion of this gap reflects the need for a better understanding of household behavior and a means of motivating households to utilize health services. Finally, what is known about what works is largely from vertical programs designed to address a specific disease or achieve a specific measurable outcome. With a shift from designing effective programs to improving the capacity of health care systems, a new knowledge gap has developed on how to motivate service providers to achieve results. This gap must be addressed.

### Placing Nutrition Within Economic Growth Strategies

It may be tempting to say that nutrition investments are neglected because finance ministers are simply not listening to health economists or that politicians are too short-sighted to give proper consideration to long-term investments, no matter how profitable. Whatever the merits of such arguments, this perspective is of limited value in placing nutrition into economic development programs.

Faced with competing claims for limited resources, governments need to consider whether, by addressing economic growth, they may be able to achieve improvements in nutrition as a collateral gain, perhaps setting up a positive feedback loop in which improved nutrition leads to faster economic growth; this, in turn, assists in addressing malnutrition. This is especially an issue with the renewed indeed overdue interest in agricultural growth.

### LOOKING BEYOND ECONOMIC GROWTH AS A SOLUTION

One needs to ask: Will robust income growth bring sufficient improvements in nutritional status? Will increasing food production be adequate to address undernutrition?
Unfortunately, the answer to both questions is “no.” Data from household surveys as well as from cross-country comparisons regularly confirm that income growth, even when evenly distributed over a population, has only a modest impact on undernutrition rates (Haddad and others 2003). For example, Alderman (2007) found that income growth will have a positive and statistically significant impact on undernutrition in rural Uganda. However, the same study showed that with a 5 percent rate of per capita income growth substantially larger than the average for the last decade it would take 33 years to reduce current underweight rates by half. If per capita income growth rises to 8 percent—a rate difficult to attain, let alone sustain, the number of years required to halve undernutrition drops to 14.

As a general rule, rates of undernutrition, defined as low weights for age, decline at 50 percent of the rate that gross national product (GNP) per capita increases. Anemia, defined as hemoglobin levels below 10.9 g/dl, declines at roughly 25 percent of the rate of income growth. Looking at this from another perspective, malnutrition rates among the richest 40 percent of the population in a country with high overall rates of malnutrition, such as India or Malawi, are only slightly less than those for the poorest 40 percent.

Still, addressing poverty must be a pillar in a comprehensive strategy to prevent undernutrition. It is clear that adverse income shocks contribute to undernutrition; the misfortune of being born in a year of low rainfall can leave a child stunted for life. For example, during droughts in Zimbabwe in the 1980s, infants younger than 2 years old—the period a child is most vulnerable to undernutrition—had higher undernutrition attributable to the weather shock. A study that followed these children to their young adult years showed that this stunting led to fewer completed years of school, translating into a 14 percent reduction in lifetime earnings (Alderman and others 2006).

The substantial impact of such shocks on nutrition can be reconciled with the moderate expected impact of income growth because shocks can rapidly reverse the income growth achieved over years. For many households, accumulating assets is like a child’s board game, with laborious efforts to increase one’s position set back in one unlucky draw. Since drawing down a household’s assets reduces its ability to earn income in the future, many households respond to an income shock by limiting human capital investments both in health and schooling. Although this may come about through reallocation of a limited cash budget, it may also represent a change in time allocation among care providers within a household.

Thus, protecting poor people from income shocks remains a key instrument in an overall nutrition strategy. However, this is only a holding pattern that keeps a household from falling further into a poverty trap but does not remove the barriers to improved nutrition. Recognizing that income growth policies and child growth polices are distinct is a key step in encouraging the latter. The World Bank, for example, initiated investments in nutrition after Alan Berg (1981) presented scenarios similar to that for Uganda mentioned above.

**STABILIZING RESOURCES AND INCREASING FOOD PRODUCTION**

Rural poor persons remain the majority of those at risk of undernutrition. Protecting their livelihoods is an element of a comprehensive nutrition strategy. However, increases in agricultural productivity work mainly through the income of poor persons rather than through aggregate food availability. This tendency is particularly true in an open economy where such increases in food production at the local level are not expected to affect long-run prices, despite their significant impact on trade balances.

An example of increasing production and limited change in local prices was shown in the rapid phase of agricultural growth in India in the 1960s and 1970s. Despite improved agriculture and reduced imports in these years, increased food production did not translate into increased food consumption or improved nutritional status. Thus, although many components of a pro-poor food policy contribute to improved real welfare of the malnourished, these policies and programs are adjuncts to addressing undernutrition rather than central to the goal.

Nor does food aid play a major role. The recent review of successful nutrition interventions in *The Lancet* (Bhutta and others 2008) specifically mentioned that food aid in nonemergency situations is often counterproductive and not recommended. Conversely, there may be scope for such aid in natural disasters. For example, Yamano and others (2005) show that food aid largely offset the expected increase in undernutrition attributable to harvest failure in Ethiopia. The study, however, also observed that this aid merely held the line; undernutrition rates in Ethiopia remained among the highest in Africa. Moreover, the study
did not address the issue of whether an equal amount of cash assistance would have done as much or more to prevent undernutrition.

UNDERSTANDING THE LIMITATIONS OF SCHOOL MEALS PROGRAMS

Just as governments mistakenly believe that addressing food supply is equivalent to addressing undernutrition, they often consider school feeding as an effective response to undernutrition. In fact, the contribution of school meals programs is primarily in terms of increased school attendance rather than child growth. The impact on attendance is similar to the expected outcome of a conditional cash transfer program; the value of the food partially offsets the cost in fees or the lost labor of the school child and thus increases investments in schooling. Both school meals and take-home rations serve this function. The empirical evidence suggests that such programs have a positive impact on school participation in areas where initial indicators of school participation are low. Both in-school meals programs and take-home rations have been shown to have small impacts on attendance rates for children already enrolled in school (Adelman and others 2008).

Improvements in nutrition in school meals programs, however, are typically small, perhaps because the window of opportunity for child nutrition is between gestation and 24 months of age—long before classroom education begins. Moreover, nutritionists question whether gains in weight relative to height at school age are beneficial; rapid weight gain among stunted children may increase the risk of chronic disease later in life. School meals programs, however, can contribute more to nutrition when meals are fortified with iron. A combination of deworming and iron fortification or supplementation proves particularly effective in improving iron status.

Short-term hunger may affect a child’s attention span. Thus, providing breakfast may contribute to educational outcomes. This impact is expected, however, only when a child would have fasted. If a school meal substitutes for a breakfast that would otherwise be provided, it serves as an income support and incentive for attendance, but is less likely to change cognition. Moreover, while feeding children improved attention in Jamaican classrooms, the impact on learning depended on the classroom organization (Grantham-McGregor and others 1998). Additionally, as the impact of such an intervention is more likely if the snack or meal is early in the day, it may be a logistical challenge to time the meals appropriately.

A final drawback to school feeding as a nutrition intervention is its cost. The costs of successful school feeding programs range between US$18 (for fortified snacks) and US$50 (for meals) per child per year. Thus, a poorly targeted school meals program can cost more than what many countries in Africa budget for all of the other costs of education. School meals programs also cost far more than priority nutrition investments. Typically, community-based nutrition programs aimed at children younger than 24 months cost about US$10 per beneficiary; child health days that provide vitamin A supplementation as well as immunizations and deworming cost only US$3 per child per year.

Meeting the Challenge of Scaling Up Actions

A substantial consensus exists on which interventions work to improve child nutrition (Bhutta and others 2008). Many of these promising interventions lie within the responsibility of the health sector and target mothers and children in the most vulnerable early years of life. Key interventions proven effective in reducing infant mortality, underweight rates, and micronutrient deficiencies include the following:

- Promotion of exclusive breastfeeding;
- Promotion of adequate and timely complementary feeding (at about six months of age);
- Promotion of key hygiene behaviors (for example, handwashing with soap);
- Micronutrient interventions such as vitamin A and iron supplements for pregnant and lactating women and for young children;
- Presumptive treatment for malaria for pregnant women in endemic malarial regions and promotion of long-lasting insecticide-treated bednets; and
- Deworming in endemic parasitic areas and oral rehydration in high-diarrhea regions.

Considerable evidence indicates that a favorable outcome is likely if the intervention is delivered to the target population. Indeed, this is the basis for the benefit:cost ratios already mentioned. Such evidence on what works, however, largely begs the question of how to actually deliver these services at scale.
The distinction between the provision of services and the utilization of such programs provides one rationale for collaboration between economists and health professionals. Economists view individuals as consuming a range of goods and services, including leisure, subject to available resources. Health is one, but only one, of these services. The scarcity of cash and time for households influences health care choices, as does the availability of health providers and of information. The household may see little opportunity to spend more time in preventive health actions; in the absence of credit for the costs of investing in children, they may find few resources for such measures. Making services cheaper and more accessible clearly addresses these obstacles. However, as the demands on a caregiver’s time are many, relying only on curative services and irregular visits to clinics can lead to failed programs.

ENCOURAGING SERVICE UTILIZATION

Community growth promotion—consisting of growth monitoring, exclusive breastfeeding, and educating mothers about complementary feeding and hygiene behaviors—is one widely advocated approach to promoting recommended practices and taking services out of clinics that are often distant as well as understaffed. The value of growth promotion has been endorsed by various fora and confirmed in numerous case studies. Similarly, 63.8 percent of 529 operational and research professionals working in nutrition disagreed with the statement that “growth monitoring and promotion is ineffective” (Berg and others 2008).

In contrast to this supportive view, published reviews of trials have uncovered little evidence of the effectiveness of growth promotion (Bhutta and others 2008). This difference of perspective reflects, in part, that few studies of community growth promotion in peer-reviewed publications use longitudinal analysis of large-scale programs.

More central is the fact that community growth promotion as a platform for service delivery differs from approaches to growth monitoring that only emphasize child weighing. However, such monitoring is actually a limited and relatively ineffective interpretation of growth promotion. Growth promotion can provide an opportunity to impart knowledge on a face-to-face basis—hence the stress on community mobilization in many programs. Many growth promotion programs also facilitate the provision of immunizations, vitamin and mineral supplements, and deworming medicine.

It is noteworthy that a review of what works in nutrition claimed that the evidence on growth monitoring showed little or no effect, “without adequate nutrition counseling and referrals” (Bhutta and others 2008). That review also maintained that common components of community growth promotion such as breastfeeding promotion and vitamin A supplementation had sufficient evidence for advocating implementation in all countries with high undernutrition. Similarly, that review endorsed the use of insecticide-treated nets and deworming programs in specific contexts. Most community growth promotions, such as Senegal’s national program, include measures to deliver these services. However, when viewed as a package of service delivery that includes many measures supported in clinical trials, the favorable view of growth promotion held by a number of practitioners does not challenge the view that growth monitoring alone is ineffective.

Community mobilization is one possible means to provide the interface between health service provision and service utilization. Another means of balancing the demands of child care and earning a livelihood is to link poverty programs with health care. In recent years, some countries have offered income support to poor households in a manner that encourages—or even obligates—participation in public health measures. Such conditional cash transfer programs serve the immediate need of poverty alleviation and also serve as long-term investments in the productivity of the next generation.

IMPROVING MATERNAL NUTRITION

Reducing the incidence of low birth weight (LBW), taken as a proxy for birth outcomes, not only reduces infant mortality but also has multiple benefits over the life cycle. Alderman and Behrman (2006) have calculated, for example, that the economic benefits from reducing the incidence of LBW are fairly substantial; under plausible assumptions these are approximately US$510 per infant moved from the LBW to non-LBW category in a low-income context. The estimated gains are primarily from increases in labor productivity, partially through inducing more education; secondary gains arise from avoiding costs associated with infant mortality and morbidity (see figure 3 on page 7).

The value of the productivity gains come to US$290. An additional benefit of US$77 comes from savings in health care costs for neonates and children. While this study used a very conservative estimate for the value of avoiding early mortality, it also recognizes that there is no
universally accepted procedure to assign a dollar value on a life. However, the large share of total benefits attributable to future productivity and the tangible reductions of health care costs means that any interventions that costs less than US$367 per incident of LBW averted will be profitable in terms of productivity and child health expenditures. Taking the full set of benefits, any intervention less than US$510 has a favorable benefit:cost ratio.

**FIGURE 3. SOURCE OF BENEFITS OF SHIFTING ONE LOW BIRTH WEIGHT INFANT TO NORMAL STATUS**

![Pie chart showing sources of benefits]

Source: Author’s calculations based on Alderman and Behrman 2006.

Moreover, addressing LBW may also reduce subsequent adult chronic diseases. This possibility is supported by recent laboratory as well as experimental evidence, even if the magnitude and policy import remain to be determined. Some continuing differences of perspective exist between those who maintain that the priority for malnutrition should be undernutrition and those who maintain the priority should be obesity. However, if the latter also reflects nutritional deprivation, then addressing obesity and adult chronic diseases shares many of the same priorities as addressing childhood undernutrition.

The estimates on the benefits from improved birth outcomes show that, if LBW is reduced, the investment could be justified purely on the grounds of saving resources or increasing productivity. The estimates do not, however, show how to achieve this reduction. As with other desired nutritional outcomes, candidate programs range from folate and iron fortification of food or supplementation to presumptive treatment of malaria and treatment for sexually transmitted diseases. However, the appropriate systems to deliver such programs and the platforms on which they should be included are not always clear. For example, the age range for interventions is wide, including adolescents and young women prior to conception as well as, in many cultures, women who are neither under direct care—as an infant would be—nor given full responsibility for their own choices. This restriction of choices for women adds to the gaps between the provision and utilization of services.

The challenge of preventing unfavorable birth outcomes is formidable because the offices responsible for reproductive health may differ from those charged with improving the health of young children. Reproductive health services are often heavily involved in preventing HIV/AIDS; indeed these offices are frequently stretched thin. However, few countries prioritize adolescent nutrition. While it may be some time before active information campaigns can reach this demographic group with regularity, food fortification that requires little behavioral change can address micronutrient needs. Iodine programs have one of the highest ratios of benefits to costs in health. Double fortification of salt with iron is likely to fall into the same category; pilot programs to verify this are underway.

To the degree that addressing maternal nutrition goes beyond fortification, it is necessary to overcome cultural constraints and information barriers. The same community services that address children’s needs can be designed to include maternal nutrition. For example, mother and grandmother clubs can reduce friction about childcare practices, including exclusive breastfeeding. In Senegal such clubs have been instrumental in encouraging regular use of iron supplements; the supplementation has been facilitated by close coordination of community workers and health service providers. Where this coordination is not achieved, the provision of supplements may be confined to health centers, requiring not only additional time commitments of women but also separating the provision of supplements from the communication of their benefits and the increase of motivation for their use.
HARMONIZING NUTRITION WITHIN HEALTH SYSTEMS

It is not simply households and communities that need motivation. The members of the nutrition profession regularly debate how to motivate policymakers to adopt nutrition programs and the role of champions to take policies forward. They also debate whether health or agriculture should take the lead or if interministerial agencies need to be set up and housed outside of such ministries. Whatever the answers to such questions, the issue of incentives for results is partially an economic question.

Governments may have an interest in nutrition, yet they may delegate the responsibility. They are often keenly aware that donors are frequently more willing to finance health programs than to pay for many other items in the national budget. However, many donor-financed programs are vertical; as such, they may have a structure distinct from the basic health infrastructure in the country. This problem has been recognized, and efforts are being made to harmonize donor programs and support building up health systems rather than to introduce new piecemeal programs.

To be sure, this is a welcome development. However, it changes the process of how programs can be adapted to local conditions. In the long run, a national nutrition strategy must be wholly integrated and supported by many branches of government. Thailand’s success in the 1980s is an example of what can be achieved when this integration occurs. However, in many cases a project approach—often donor-financed—is needed initially to provide a proof of concept. This situation may present an opportunity to learn how to integrate community services provided by nongovernmental organizations and supported by volunteers into a national health care system.

National publicly provided health care has a mixed track record globally, with problems of underfunding, absenteeism, and a curative rather than preventive focus. Motivating individuals to attend clinics, for example, as conditional cash transfers attempt, may bring results, but only if the quality of services at these clinics is satisfactory. Thus, concurrent with a focus on donor harmonization and direct support to national budgets is an increased focus on results-based financing. In some cases, donor financing offers aid based on the results or measurable performance of a health system rather than on a program structure per se. In other circumstances, such as in Rwanda, results-based programs are agreements between the central and local governments, with health personal benefiting directly from improved performance. This model of buying results rather than inputs has achieved documented favorable results in Rwanda. It remains to be seen how widespread and sustainable this approach can be—and whether it can be designed to meet the gap between small-scale successful projects and national programs.

Summary

Economic growth and child growth respond to different programs and policies. The path from nutrition to economic growth is as strong or stronger than the reverse path. While severe climatic or financial shocks will exacerbate malnutrition, it will take a generation or more for robust and steady economic growth to eliminate substantial pockets of malnutrition. Conversely, improvements in nutrition not only reduce health costs and limit a major factor in infant and child mortality; they also lead to higher lifetime earnings of the survivors.

A number of proven and profitable interventions exist to address malnutrition in the key window of opportunity in utero and in the first two years of life. Some of these provide micronutrient fortification and supplementation. Others use community mobilization as a platform for nutrition education. Scaling up such profitable programs, however, remains a challenge. Setting up sustainable programs requires addressing how donor assistance is made available, as well as how governments establish incentives for public health and community workers to provide services.

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References


