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# INVESTING IN EARLY CHILDHOOD NUTRITION

Marie Ruel and John Hoddinott

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It has long been known that good nutrition is essential to children's physical and cognitive development, but recent evidence sheds new light on the optimal timing of interventions to improve child nutrition and the long-term effects of such interventions. Recent studies have shown that undernutrition has a whole range of effects that impede not only children's nutrition and development in the short term, but also their cognitive abilities and productivity in adulthood, with measurable economic impacts. They have also shown that the window of opportunity for addressing child nutritional needs in ways that produce healthy, productive adults lasts from conception through age two. After that, the effects of undernutrition are largely irreversible. By addressing the large and severe problem of early childhood undernutrition in many poor countries, policymakers could maximize the effectiveness of investments designed to achieve overall development goals.

## The Costs of Early Childhood Undernutrition

In preschool children, nutritional status is often assessed in terms of their height given their age and gender. Low height-for-age, or stunting, reflects the cumulative impact of events affecting nutritional status. In 2005, an estimated 32 percent of all children in developing countries under age five—178 million children—were stunted, with the prevalence of stunting highest in South Asia and Sub-Saharan Africa. Wasting—low weight-for-height—is also a major public health problem, with 10 percent of children under age five affected. A further dimension of undernutrition consists of micronutrient deficiencies, particularly deficiencies in iron, iodine, and vitamin A. Globally, approximately 2 billion people are affected by iodine deficiency, including 285 million children aged 6 to 12 years. More than 40 percent of children age four and under in developing countries suffer from anemia (of which approximately half is due to iron deficiency), and vitamin A deficiencies are estimated to affect 140 million preschool children.

Stunting, along with wasting, intrauterine growth restrictions leading to low birth weight, and deficiencies in vitamin A and zinc, are responsible for 3.1 million deaths annually of children under five years old. Zinc deficiency causes an estimated 176,000 deaths from diarrhea, 406,000

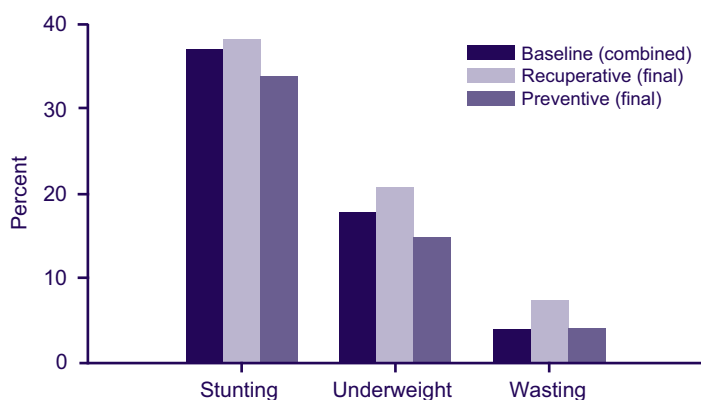
deaths from pneumonia, and 207,000 deaths from malaria worldwide. In addition, iodine and iron deficiencies adversely affect cognitive function and development, severe vitamin A deficiency leads to blindness and death, and zinc deficiency increases the risks of poor growth, infectious diseases, and death. The damage resulting from undernutrition in the first two years of life is largely irreversible.

Less well known are the high economic costs of childhood undernutrition. These costs include the resources required to deal with diseases and other problems related to undernutrition in both the short term and the long term (childhood undernutrition is linked to increased risk of chronic disease in adulthood, such as diabetes, coronary heart disease, and obesity). Other costs are indirect, arising from links between nutritional status and cognitive development, nutritional status and schooling, and subsequent links between schooling, cognitive ability, and adult productivity. Poorly nourished children may have delayed motor and cognitive development, which can lead parents to postpone the start of their schooling. These same children may progress through school more slowly, demonstrate poorer academic achievement, and perform less well on cognitive achievement tests when in school and later on during adulthood. Adults who were malnourished as children have been found to be less physically and intellectually productive, have lower educational attainment, and be more vulnerable to chronic illness and disability. One study that followed children in Zimbabwe from birth to adolescence found that those children stunted as preschoolers lost, on average, 0.7 grades of schooling and started school seven months later than comparable children who were not stunted. The loss of school years and the delay in starting school there translates into a 12 percent reduction in lifetime earnings.

## New Evidence on the Benefits of Early Intervention

Traditionally, programs to improve the nutrition of children begin by identifying undernourished children and then directing nutritional interventions to them. Recent evidence from several countries shows, however, that programs using this approach may be acting too late. Such interventions can miss the crucial window of opportunity for providing

**Figure 1—Prevalence of stunting, underweight, and wasting in children in recuperative and preventive nutrition interventions**



Source: M. T. Ruel, P. Menon, J.-P. Habicht, C. Loechl, G. Bergeron, G. Pelto, M. Arimond, J. Maluccio, L. Michaud, and B. Hankebo, Age-based preventive targeting of food assistance and behavior change and communication for reduction of childhood undernutrition in Haiti: A cluster randomized trial, *Lancet* 371 (2008): 588–95.

nutrition that will produce a healthy and productive adult that starts at conception and runs through age two years. During this window, infants and children have particularly high nutritional requirements that must be met to allow for rapid growth, the building of a healthy body, brain development, and resistance to disease. The consequences of missing this window are irreversible.

Rather than attempting to restore the nutritional status of preschoolers who are already undernourished, therefore, interventions should focus on preventing malnutrition in mothers during pregnancy and in infants and young children during their first two years of life. A study of two nutrition interventions in Haiti showed that a preventive approach targeting all children between 6 and 24 months of age reduced the children's stunting, wasting, and underweight (low weight-for-age) by 4–6 percentage points more than a recuperative approach, which targeted all children under five years of age once they had become underweight (Figure 1). Both packages of interventions provided food assistance and behavior change and communication on early child feeding and care practices to pregnant and lactating women as well as to the targeted children.

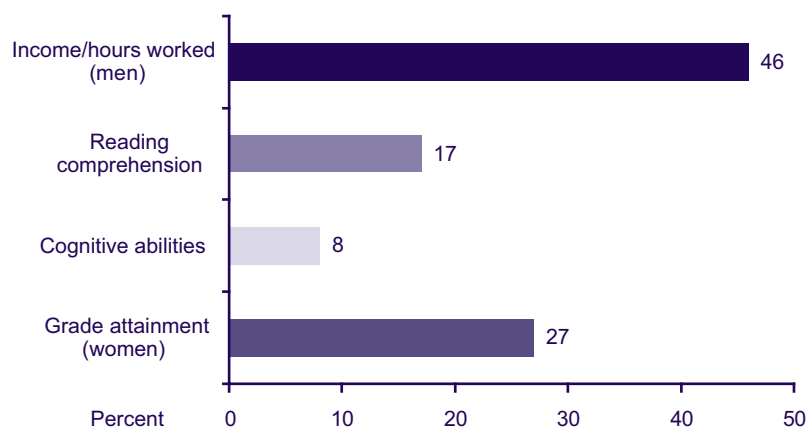
Although these results point to the intrinsic value of interventions to prevent malnutrition, they do not by themselves speak to the economic

rationale for investing in nutrition. The results of a 40-year longitudinal study in Guatemala provide strong evidence, however, that interventions such as these have persistent effects on schooling and economic productivity. Researchers looked at the long-term effects of providing a highly nutritious supplement to children from birth to 36 months of age. They found that men and women who had been exposed to the supplement had improved reading comprehension and nonverbal cognitive ability as adults. Women who had been exposed completed 1.2 more grades than did nonparticipants. Moreover, participation in the program from age zero to two years was associated with an increase of US\$0.67 in men's hourly wages, which translated into a 46 percent increase in average wages (Figure 2). No such increase occurred for those who were exposed to the nutrition intervention after age three.

### Program and Policy Options

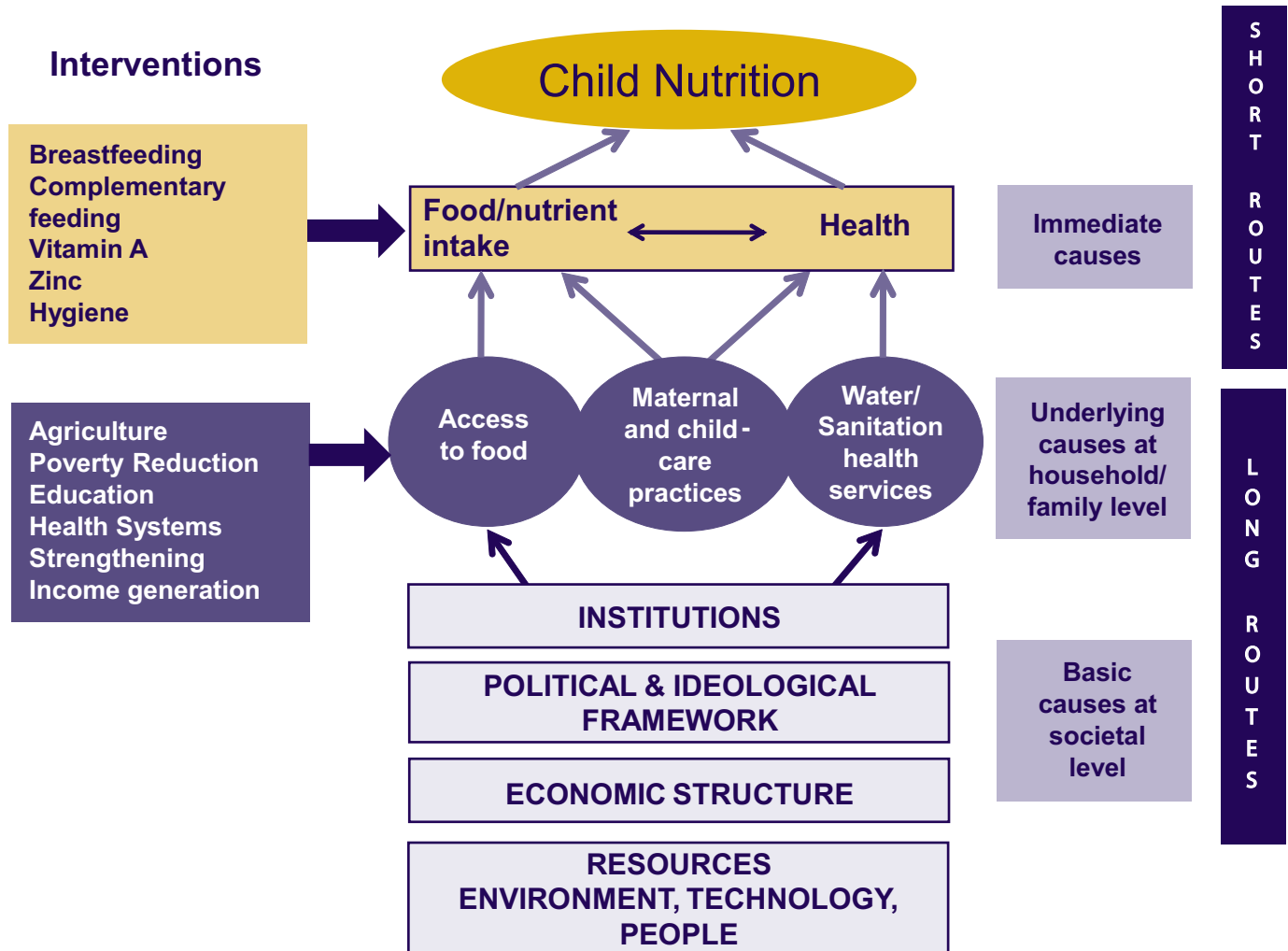
To achieve significant improvements in child nutrition, health, and survival, countries need to develop a comprehensive policy that includes actions to address the immediate causes of child undernutrition (inadequate food and nutrient intake and poor health) as well as the underlying causes (poverty, lack of access to food, inadequate maternal and child care, low education, and limited access to water, sanitation, and health facilities (see Figure 3). By combining programs and policies that address the environment in which undernutrition occurs (characterized by poverty, food insecurity, gender inequity, and low access to services) with direct, targeted nutrition interven

**Figure 2—Effects of early childhood nutrition interventions on adult education, cognition, and economic productivity**



Source: Adapted from J. Hoddinott, J. A. Maluccio, J. R. Behrman, R. Flores, and R. Martorell, Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults, *Lancet* 371 (2008): 411–16.

Figure 3—Determinants of child nutrition and examples of interventions to address them



Source: M. Ruel, Addressing the underlying determinants of undernutrition: Examples of successful integration of nutrition in poverty-reduction and agriculture strategies, *SCN News* 36 (2008): 21–29.

tions, developing countries can generate an enabling environment for sustained improvements in nutrition and derive enormous benefits for individuals and for their whole economy.

### *Interventions to Address the Immediate Causes of Undernutrition*

The *Lancet Series on Maternal and Child Undernutrition* published in early 2008 identifies a series of effective targeted nutrition interventions, which, if implemented at scale during the window of opportunity (from pregnancy through the child's second birthday), could reduce the undernutrition-related mortality and disease burden by 25 percent in the short term. The recommended interventions focus on preventing undernutrition through improved maternal nutrition during pregnancy, optimal and timely

infant and young child breastfeeding, and complementary feeding practices combined with vitamin A and zinc supplementation and hygiene interventions. Universal salt iodization and interventions to improve the nutritional status of mothers (especially with respect to iron, folate, zinc, and vitamin A) during preconception and lactation are also essential, as are childhood immunization programs, the prevention and control of infectious diseases, the use of oral rehydration salts with zinc supplementation during diarrhea, the promotion of appropriate feeding during and after illnesses, and the treatment of severe acute malnutrition at the community level. Appropriate feeding and health management of children exposed to HIV/AIDS is also a key priority in many countries with a high burden of undernutrition.

## *Interventions to Address the Underlying Causes of Undernutrition*

Improving nutrition in a sustainable way requires a focus on the global context in which undernutrition occurs. Significant and sustained improvements in maternal and child nutrition can be achieved only if, in addition to targeting the immediate causes of undernutrition, programs and policies also incorporate actions to address the underlying determinants of undernutrition. These underlying causes include poverty, food insecurity, low education, inadequate maternal and child care, gender inequality, and the lack of access to high-quality health care, hygiene, and sanitation services.

Examples of programs that combine short-route and long-route interventions include agricultural interventions (such as programs promoting homestead food production), conditional cash-transfer programs, and credit-with-education programs. All three types of programs aim at alleviating poverty and food insecurity. They usually target women in order to promote gender equity and empower women by giving them training, skills, or financial resources that they control. Many of these programs also incorporate direct nutrition interventions such as education and behavior change communication to improve infant and young child feeding practices; distribution of specially formulated (or fortified) foods for pregnant or lactating women, infants, and young children; and direct linkages with the health system or requirements that households make regular preventive health care visits in order to receive the program benefits (as in the case of conditional cash-transfer programs).

## **Conclusion**

Overcoming early childhood undernutrition requires investing in targeted nutrition interventions for immediate impacts, as well as investing in packages of interventions

that address the immediate and underlying determinants of undernutrition simultaneously. Policies and investments must develop an enabling environment that will allow nutrition gains to be maintained sustainably in the long term. Building such an environment will require more effective collaboration among all of the sectors that bear on early childhood undernutrition, such as agriculture and rural development, water and sanitation, gender, and social development.

Nutrition interventions are rarely discussed, much less vigorously pursued, by developing-country policymakers, in part because nutrition does not fit neatly within any one government sector. In addition, because undernutrition is a quiet crisis, ignoring it rarely imposes political costs on leaders. Nutrition, which has few outspoken advocates, needs policy champions among senior officials in developing countries.

The evidence shows that avoidable undernutrition among young children reduces the effectiveness of investments in education and economic development; advocates for early childhood nutrition could thus expect large payoffs from their efforts. Proven interventions to improve the nutrition of mothers and young children are available and have been shown to not only save lives and increase individual well-being, but also boost overall economic growth. Indeed, the benefit-cost ratios for nutrition interventions range from 5 to 200. The Copenhagen Consensus examined returns to 17 potential development investments and concluded that the returns to nutrition interventions are among the highest, surpassing investments in trade liberalization, malaria, and water and sanitation. Research and experience support making early childhood nutrition one of the most common interventions in poor countries, rather than one of the rarest.

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*Marie Ruel* is director of the Food Consumption and Nutrition Division (FCND) at IFPRI. *John Hoddinott* is a senior research fellow in FCND at IFPRI. This brief draws on research that appears in papers published by the authors in the *Lancet* journal in early 2008, and the *Lancet* Series on Maternal and Child Undernutrition, 2008.

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