

## Hunger and Malnutrition

Challenge paper by Jere R Behrman<sup>1</sup>, Harold Alderman<sup>2</sup> and John Hoddinott<sup>3</sup>

### Introduction: the challenge of hunger and malnutrition

Alongside the tragedy of acute famine, frequently shown on our televisions, there is a much bigger problem of chronic hunger and malnutrition in developing countries. Although this carries a very real human cost, it is the purpose of this chapter to look purely at the economic aspects: assuring better nutrition can both reduce the economic drain on poor societies and help them become wealthier by increasing individuals' productivity.

This chapter reviews the nature and scale of the problem and the economic benefits which would flow from successful solutions. Four opportunity areas for effective use of resources to reduce malnutrition are then proposed:

1. Reducing the prevalence of Low Birth Weight
2. Infant and child nutrition and exclusive breastfeeding promotion
3. Reducing the prevalence of iron deficiency anaemia and vitamin A, iodine and zinc deficiencies
4. Investment in technology in developing country agriculture

Using resources to address these opportunities would yield benefits greater than the costs, so these opportunities are economically justified. Benefits would, of course, also be realized on a wider social and human scale.

### The nature of the challenge

Hunger has been described as “a condition, in which people lack the basic food intake to provide them with the energy and nutrients for fully productive lives”. Malnutrition, in its strict sense, can be associated with *over*-consumption of food, resulting for example in obesity, diabetes or heart disease. Such problems are of increasing importance in some parts of the developing world. However, currently malnutrition in the developing world is primarily associated with *undernutrition*.

Although some commentators believe the regular figures published by the Food and Agriculture Organisation of the United Nations (FAO) understate the true incidence of hunger, these nevertheless form the only relatively long-term global database. The figures indicate that the number of undernourished people in the developing world was 798 million in the 1999-2001 survey period: 17% of the total population of developing countries. Although this is an enormous problem, it should be seen against the background of their rapidly growing populations. There was an increase of 662 million people during the previous ten years (nearly twice the population of the 15-member European Union) while the number of chronically hungry people fell very slightly (by 18 million). Thus the prevalence of undernourishment has fallen substantially.

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90% of these people live in the Asia-Pacific region (505 million) or sub-Saharan Africa (198 million). Despite the larger number of people affected overall, the trend in Asia-Pacific has been a reduction in the number and percentage of hungry people, primarily due to better nourishment of people in China. In Africa, on the other hand, the overall number of malnourished people increased, and in some countries the proportion of the affected population also rose.

The socio-economic breakdown of malnutrition has been estimated by the Hunger Task Force as approximately:

- 50% in farm households
- 25% rural landless
- 22% urban
- 8% directly resource dependent (eg pastoralists and fishermen)

Development of a baby prior to birth (the gestational period) is crucial in determining its birth weight and affects childhood development. Mothers who are of small stature (directly affected by their own foetal development and childhood nutrition), poorly nourished and prone to endemic disease tend to give birth to small children, who are at a developmental disadvantage. This is commonly measured by the incidence of Low Birth Weight (LBW), where an infant weighs less than 2500g at birth. In 2000, it was estimated that 16% of newborn babies in the developing world – 11.7 million children annually – could be classified as of LBW. In parts of south Asia, the situation is especially acute: an estimated 30% of babies are of LBW.

LBW is one important factor in determining early childhood development. Another is poor infant nutrition, particularly during the first two to three years of life. This has itself been linked to reduced breastfeeding. The net effect is reflected in the estimate that, in 2000, 162 million children (about one in three) were stunted.

In addition to the negative effect of malnutrition (both of the child and mother) on physical growth of children, deficiencies in micro-nutrients can have a major impact on development of intelligence. Lack of both iodine and iron has been implicated in impaired brain development, and this can affect enormous numbers of people: it is estimated that 2 billion people (one-third of the total global population) are affected by iodine deficiency, including 285 million 6 to 12 year-old children. In developing countries, it is estimated that 40% of children aged 4 and under suffer from anaemia because of insufficient iron in their diets.

### **Potential benefits of meeting the challenge**

Reduction of the incidence of malnutrition would have a number of benefits. The most important ones identified are:

- Reduction in infant mortality rates associated with LBW and deficiencies in micronutrients. The World Health Organisation (WHO) estimates that malnutrition contributed to 3.4 million child deaths in 2000; 60% of total child deaths. Reporting in 2001, a WHO commission estimated that a 10% increase in average life expectancy at birth results in an additional 0.3-0.4% of economic growth per year.

- Those who survive the effects of long-term malnutrition are more susceptible to disease, which further compromises their welfare. This also is a direct drain on healthcare services.
- Poor nutrition can directly affect physical productivity. Reduction in chronic hunger increases an individual's capacity to do physical work and increases his or her earning power. For example, a study of workers in rural Brazil reported that a 1% increase in height (associated with improved nutrition) leads to a 2-2.4% increase in wages or earnings.
- For a variety of reasons, childhood malnutrition often leads to an individual receiving less schooling, which translates directly into lower lifetime earnings for the people affected.

## **Opportunities related to hunger and malnutrition**

### **Framework for considering opportunities**

While reduction in malnutrition would have clear economic benefits (in addition to human and social benefits), the purpose of the Copenhagen Consensus is to compare as objectively as possible these benefits with those delivered by meeting the other nine challenges.

This is done partly by comparing the overall net financial gain, which may sound relatively straightforward but is complicated by the fact that benefits accrue in many cases over long periods (the remaining lifetimes of children whose nutrition is improved, for example). To bring all projects to a common basis, an estimate must be made of the *current* value of all benefits to be received in the future. This is done by a process called *discounting*, which is simply an assumption of the future value of money compared with that of today. However, the choice of a particular discount rate will, over a period of ten years or more, make an enormous difference to the current value (what economists call the Present Discounted Value). Indeed, it can make the difference between an opportunity being seen as highly valuable and being rejected as having too small economic benefit to warrant the cost. There are other problems in making such estimates as well. Putting aside the question of discounting, for example, it is difficult to estimate the impacts of interventions given imperfect data that generally is generated by individuals' behaviours and it often is difficult to estimate costs given programs that bundle interventions and use accounting prices that differ from marginal scarcity prices. Finally, for the efficiency motive for public subsidies what is needed are differences between private and social rates of returns, but such estimates are difficult to make and rarely available.

In a nutshell, there are no easy answers which are likely to be universally applicable. It is expected that a more subtle analysis of costs and benefits at a country level – and their sensitivity to variables – would be necessary.

### **Opportunity 1: Reducing the prevalence of Low Birth Weight**

Some 12 million children in the developing world are born each year weighing less than 2500g, and are classified as Low Birth Weight. Increases in the proportion of babies of normal birth weight would have multiple benefits. In particular:

- Saving of lives. While placing a monetary value on human life is uniquely difficult, it has to be done to make an economic comparison. One method, used here, is to use the resource costs of alternative means of saving a life.
- Reducing costs of caring for newborn babies in hospital.
- Reducing healthcare costs for surviving LBW babies, who have a higher incidence of illness than heavier babies.
- Improved lifetime productivity, based both on better physical development by adulthood and longer schooling/better learning ability.
- Reducing costs of chronic diseases associated with LBW.
- Benefits to following generations. LBW mothers themselves give birth to small babies, continuing the cycle of disadvantage.

Taking all these into account, it has been estimated that the current value of actions which would result in one birth of a normal weight baby who would otherwise be LBW is \$580. Over half of this comes from increased productivity over the child's lifetime. This means that interventions which cost less than \$580 per child affected would be justified in purely economic terms.

A range of relatively simple, and in many cases inexpensive, actions has been suggested. These include provision of antibiotics and anti-parasitics, insecticide-treated bednets to reduce malaria incidence and supply of iron/folate dietary supplements. For example, it costs \$2 per patient to supply antibiotics to Ugandan women with sexually transmitted diseases. As well as the direct benefits of curing disease, for every hundred women treated, two cases of LBW are prevented: a cost of \$100 per case. Since each normal birth of an otherwise underweight baby is worth \$580, this has a benefit/cost ratio of 5.8.

In another study, dietary supplements of iron and folate for pregnant women in Nepal prevented one case of LBW for every 11 women treated. The cost of treatment in a large-scale programme is estimated as \$13 per patient, or less than \$150 for each LBW birth prevented: a benefit/cost ratio of about 4. Of course, such interventions may also be justifiable on other grounds.

The key point with Opportunity 1 is that a number of interventions have been shown to decrease the incidence of LBW at a cost which is far below the estimated value of the benefit received. This means that such initiatives are readily justifiable, even with significant changes to some of the assumptions made in the calculations.

### **Opportunity 2: Improving infant and child nutrition and exclusive breastfeeding promotion**

Nutrition in the first two years of life is second only to development in the womb in determining a child's healthy growth. Promoting breastfeeding in communities where incomes are low and food and water supplies are often contaminated can have significant benefits for childhood development and lifetime productivity. The gains are supplementary to those of opportunity 1 and of a similar magnitude. Costs of effective programmes in place already make such actions easily justifiable in economic terms. For example, studies conducted in Latin American hospitals, show benefit/cost ratios for breast feeding promotion of

about 4 for typical interventions. Community based growth promotion is also a promising intervention in some environments.

### **Opportunity 3: Reducing the prevalence of iron deficiency anaemia and iodine, vitamin A and zinc deficiencies**

Lack of iron not only has an influence on foetal and childhood development (and thus, for example, has a significant effect on the number of small babies born) but also has a direct negative effect on the productivity of adults.

Iodine intake also is an important factor in determining birth weight. In addition, lack of iodine in childhood reduces brain development: a study has shown, for example, that iodine-deficient individuals score an average of 13.5 points lower in IQ tests.

Vitamin A deficiency can permanently damage eyesight, even causing blindness. Dietary supplements not only decrease the incidence of blindness in children but also reduce deaths and severity of some illnesses. The direct benefits associated with the (relatively inexpensive) provision of vitamin A supplements are mainly in terms of this second category, reducing childhood mortality, but there is also a productivity gain during the lifetime of workers who would otherwise have been blind.

The benefits of zinc supplementation are to be seen in reduced LBW and improved physical development in childhood.

Delivery of additional micronutrients can be by a variety of routes. Flour fortification, supplementation with tablets, vitamin A as an addition to immunisation programmes or even boosting iron by supply of iron cooking pots can all be cost effective ways of improving nutrition. Dietary interactions are complex, but an adequate supply of important vitamins and minerals can make an important contribution to wellbeing at various stages of an individual's life. As an example, many studies have been done on vitamin A supplementation, and it has been shown to be one of the most cost-effective medical interventions known, with a benefit/cost ratio of over 140.

### **Opportunity 4: Investment in technology in developing country agriculture**

In an ideal world, all necessary nutrition should be obtainable from a readily-available, balanced diet. This opportunity therefore focuses on developing improved seed varieties and agricultural practices which can enable people to grow higher and more consistent yields of more nutritious food. This is not just a case of subsistence farmers growing more to eat: rather it is a question of more productive farming which gives farmers a better return on their investment, increases demand for the labour of landless people and reduces the price of food to make it more accessible to both rural and urban populations.

The “green revolution” of the 1960s and 70s is a clear example of how modern plant breeding advances can be widely employed for the benefit of the poor. In this case, high-yielding dwarf varieties of rice and wheat have vastly increased the supply of staple foods in Asia and South America. Similar advances could be derived using the best technologies available now, including biotechnological advances.

Returns on investment in this area are difficult to estimate accurately, but studies have shown that the relatively modest up-front costs of plant breeding can be quickly recouped, and that the benefits continue to accrue for many years until the seeds are displaced by the use of new varieties giving even higher benefits. Calculations on the economics of new cultivars with higher concentrations of micronutrients (for example, vitamin A precursor in “golden rice”) indicate that benefit/cost ratios can be very high – in the region of 15-20 – even with very conservative assumptions on uptake and effectiveness. Investment in agricultural technologies is the single most effective means of increasing the incomes of those groups in the developing world who suffer from chronic hunger.

## **Conclusions**

Taking up the opportunities presented here would make a major contribution to the welfare of the world’s poorest people; the 800 million who are chronically undernourished. While this can be regarded as a good in itself, the clear evidence is that all of the approaches described are also economically justified in the sense that the projected benefits outweigh the costs.