

# The economic dimensions of malnutrition in young children

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One billion people, half the population of the developing world, live on diets that are deficient in essential calories. One third of them are children below the age of ten. This article discusses the magnitude of the problem, and reviews the economic implications of specific intervention programs designed to solve it.

What are the economic consequences of the large incidence of infant malnutrition observed today in the developing countries? Economists are increasingly turning their attention to this question for several reasons. There is a growing awareness that comparisons of welfare across countries and over time should not be made solely on the basis of gross national product. Improved health status, low mortality, and educational achievement have become objectives of development in their own right. Moreover, a more comprehensive definition of capital is being advocated. Human as well as physical capital affects the growth of national income and the distribution of national income among individuals. Since infant malnutrition has an impact on the future economic productivity of the individual, early nutrition becomes relevant.

Medical studies show that infant malnutrition adversely affects specific abilities in children that appear crucial for basic learning, thereby limiting the effectiveness of schooling at later stages in life and the eventual economic productivity of the individual (see Table 1). Moreover, infectious diseases are likely to be more severe and frequent in undernourished than in well-nourished children. To the extent that infectious diseases adversely affect the child's responsiveness to its environment, they will also affect cognitive development.

### Scale of the problem

The number of people with a caloric deficit in a country can be estimated from household food consumption surveys providing data on caloric deficits of individual households. (A caloric deficit is the difference between an individual's caloric intake and his requirements.) In the absence of such data, an approximate estimate of the average caloric deficit of subgroups in the population can be derived from aggregate caloric consumption data, information on the distribution of income, and the relationship between caloric consumption and

*For a more extensive presentation of this subject, see Malnutrition and Poverty: Magnitude and Policy Options, by the authors, published by the World Bank as Occasional Paper Number 23 (Johns Hopkins University Press, 1976). A version is also appearing in the Proceedings of the Athens International Symposium on the Child in the World of Tomorrow.*

the per capita income of households. Table 2 presents estimates based on the latter method (see Reutlinger and Selowsky, 1976). There are several reasons why the methodology used in deriving these estimates may have led to an upward bias. Interpersonal variations in both caloric intake and requirements should be taken into account. Moreover per capita caloric requirements of lower-income groups may be lower than the population as a whole. Alternative estimates that take these considerations into account yielded a share of the population with caloric intake below requirements of 30 per cent in Latin America, 59 per cent in Asia, 32 per cent in the Middle East, and 54 per cent in Africa. The share of the calorie-deficient population for all countries is 51 per cent.

At the world level, two observations are striking. First, the large number of people with caloric deficits—55 per cent of the population of the developing world. These people are concentrated in the poorest countries and in the lowest-income groups within countries. Second, the small size of the deficit in comparison with the world production of cereals. The fact that this deficit is only 2 per cent of the world's cereal production contradicts the widely held view that malnutrition is the inevitable result of an imbalance between world population and world food supplies. At the global level, malnutrition is the result of the inequitable distribution of world income and not the result of an insufficient supply of food. It is clearly a poverty problem and not a food problem.

Ideally, one would like to measure the incidence of child malnutrition in terms of its consequences and not in terms of the amount of food consumed by the individual. Mortality, health status, and indices of psychological achievements are some in-

Table 1  
Findings of studies on the effect of malnutrition on learning

Deficit in performance	Authors and country of study	Probable effect on consequent learning
Auditory-visual integration	Cravioto and de Licardie, (Mexico)	Reading ability
Visual-kinesthetic integration	Cravioto et al. (Mexico)	Writing and drawing abilities
Visual identification	Champakam et al. (India)	Reading abilities
Kinesthetic-visual, kinesthetic-haptic, haptic-visual, and auditory-visual integration	Cravioto et al. (Mexico, Guatemala); Guthrie, et al. (Philippines)	General learning abilities

Source: J. Cravioto and E. de Licardie, "The Effect of Malnutrition on the Individual," *Nutrition, National Development, and Planning*, ed. A. Berg et al. (Cambridge, Mass.: M.I.T. Press, 1973).

Table 2  
Afflicted population and size of the caloric deficit, 1975

Region	Population with consumption below caloric requirements		Cereal equivalent of the aggregate caloric deficit <sup>1</sup>	
	People (millions)	Per cent of population	Tons a year (millions)	As per cent of total cereal consumption <sup>2</sup>
Latin America	112	36	2.2	2.9
Asia	707	63	18.4	9.4
Middle East	61	33	1.6	2.6
Africa	193	61	5.2	14.7
Total	1,073	55	27.4	7.5
As per cent of world cereal production				2.0

Source: Reutlinger and Selowsky, 1976.  
<sup>1</sup> It is assumed a metric ton of cereals has 3.5 million calories.  
<sup>2</sup> This consumption figure includes cereals used in animal feeding.

dicators of these consequences. In practice, however, it is difficult to define underachievement precisely in some of these categories and to be able to associate these indices with malnutrition. If one has to settle for an index of food or nutrients to measure malnutrition, the best indicator is caloric consumption. For example, an approximate average per capita daily requirement of 2,400 calories was used in this study for Latin America, but requirements obviously vary between countries. Caloric deficits usually signal deficits in the intake of proteins and other nutrients; this is particularly true if one accepts the hypothesis that in these circumstances part of the protein is used as energy. Empirical evidence shows that in very few instances do individuals suffer from protein deficiency when caloric consumption approaches their energy requirement.

Caloric intake is closely related to per capita income, and malnutrition characterizes the poorest segments of the population. Because the lowest-income groups have larger families, the incidence of malnutrition among children is bound to be higher than the incidence among adults. On the basis of estimates of the number of households with caloric deficits and the number of children in these households, the incidence of caloric malnutrition in young children in Asia and Latin America is shown in Table 3.

### Perspectives

Can we, on the basis of current trends, expect caloric malnutrition to be eliminated in the poorest segments of the population of developing countries? Three factors will determine the answer: (1) the future income growth of the malnourished groups; (2) their propensity to use additional income to increase their caloric consumption; and (3) the future changes in the relative price of the main staples, basically cereals.

In the absence of major changes in food prices, future trends of consumption will largely depend on income growth and the propensity to allocate additional income to the purchase of calories. On the income side, annual per capita income growth in the lowest-income groups in India and Bangladesh (which account for two thirds of the global number of people with caloric deficit) is not expected to exceed 1.5 per cent a year. Evidence about the choice of diet suggests that the caloric intake will rise much more slowly than income even for the lowest-income groups. Empirical evidence suggests a proportion of 0.5; that is, the caloric intake will increase at approximately half the rate at which per capita income rises. On the basis of these assumptions, it would take 30 years before the

**Table 3**  
**Incidence of malnutrition in Asia and Latin America, 1975<sup>1</sup>**  
(In per cent)

	Asia	Latin America
Children (0-9 years)	69.2	55.4
Adults (over 9 years)	60.1	27.4
Average	62.8	35.8

<sup>1</sup> Derived by using the estimates of undernourished individuals in each income group (as estimated by Reutlinger and Selowsky, 1976) and the fraction of children in each of those income groups.

poorest 20 per cent of the population of these countries—whose members are at present experiencing a deficit of 450 calories a day—could reach an adequate level of caloric intake. During this time, consumption for the rest of the population will exceed nutritional requirements. Thus, to wait for the malnourished population's income to reach a level at which the calorie gap could be closed implies that malnutri-



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tion in the poorest groups will continue, even if there were a caloric surplus for the population as a whole in the country.

An alternative and widely suggested solution—to rely on accelerated food production—while acceptable, is, in most instances, not feasible either. Accelerated food production can be expected significantly to augment the caloric intake of low-income groups only if it can be translated into substantially lower consumer prices. Barring unforeseen developments in the cost of producing food, governments would have to subsidize the difference between a higher price to producers and a lower price to all consumers, rich and poor. In most cases this solution would soon be subject to serious fiscal constraints.

As we look ahead, future prospects are even less bright for the representative child in the lowest-income groups than they are for the representative adult. To the extent that women's participation in the labor force will increase as part of the process of development in general, and of urbanization in particular, infant nutrition could deteriorate. The main reason is that it will lead to a reduction in breast-feeding, the value of which to the infant may not be compensated for by food purchased out of the additional income accruing to the family. In this way, higher incomes of the household due to the mother's participation in the labor force could easily be accompanied by a deterioration in the nutrition of the child.

Other factors specifically associated with urbanization—and urbanization will be a distinctive feature of the future—will have an adverse effect on young children. Competing expenditures on such necessities as transportation, clothing, and housing become more important in urban areas and could reduce the share of income spent on food. In addition, food may tend to become more expensive. Finally, some adults might spend more on new categories such as entertainment and fashion at the expense of the share of income spent on food for children.

### Group-oriented programs

Our analysis of likely development scenarios suggests that the problem of malnutrition will not diminish at the desired speed without explicit measures to raise the level of caloric consumption of the undernourished groups in the population. The additional food needed for augmenting the consumption of the target group would have to come either from increases in the total food supply, or from reduced consumption by groups in the population that consume more than their caloric requirements.

There is a wide range of policies and programs that governments can initiate in order to augment the caloric consumption of children in the target population. The effectiveness of the programs depends on (1) the extent to which the programs increase the purchasing power of the family; (2) the extent to which they reduce the cost of calories in relation to the cost of other items in the family's budget; (3) the marginal propensity of the family to use additional income for purchasing calories for the children; and (4) the rate at which the family substitutes the purchase of calories for other items in response to a change in relative costs. The cost-effectiveness of programs is also determined by the costs of administration and the extent to which benefits can be aimed at reaching only intended beneficiaries.

The program which is least costly to administer is the transfer of cash to target households. Recognition of this, and a growing concern in recent years with the persistence of malnutrition and other symptoms of abject poverty, have indeed led many governments to initiate policies which would provide more remunerative rural and urban employment to the target

population. Few governments seem able or willing, however, to tax their constituents in order to make cash transfer payments to a large number of households. Food programs are politically more acceptable. Such programs are, in general, at least as effective as cash transfers. It must be asked, however, whether, given the financial constraints on the size of these programs and the special concern for improving nutrition, it is not possible to identify programs which are more cost-effective than cash transfers.

Target group oriented food programs are at present being carried out in several developing countries. These involve ration shops for specific population groups, and take home and on site feeding at schools and health centers. There are also experiments with other intervention programs, such as food stamps for certain groups. What is the effectiveness of these programs in increasing children's food consumption?

#### Income effects

An analysis of such programs would cover whether they contribute more or less than an equivalent cash transfer to the family; whether they simply replace nor-

mal purchased consumption; or whether food intended for children is diverted to others in the family. The analysis should begin with the proposition that consumers receiving any transfer in kind will attempt to convert the transfer into income. This re-establishes the control of the consumer on the composition of his expenditure. Any transfer of a food commodity in excess of what the household is prepared to consume will be sold for cash. If the resale price is comparable to the cost of the food to the government, the household has received an income transfer equivalent to the fiscal cost of the program (excluding administrative costs, of course). Such food programs will thus simply have an effect equal to an equivalent income transfer. (This is also true for food stamp programs to the extent the stamps can be sold.)

Several types of food programs can still operate like an income transfer, even if the concessionary food is not resold. For example, a program that transfers free or subsidized food to the family in amounts smaller than was previously being consumed will release purchasing power of a value equal to the amount of the food subsidy received. This is also true when sev-

## Atlas marks International Year of the Child



In recognition of the International Year of the Child, the World Bank has published a special atlas with maps and statistics on children in 185 countries. The United Nations General Assembly declared 1979 to be the International Year of the Child to "provide a framework for advocacy on behalf of children"; to enhance "the awareness of the special needs of children"; and "to promote recognition of the fact that programmes for children should be an integral part of economic and social development plans" (General Assembly Resolution A/31/169 of December 1976).

The *World Atlas of the Child* is patterned on the annual *World Bank Atlas*. It includes nine maps of the world, showing gross national product and population; number of children, from birth to 14 years of age; crude birth rates and number of births; life expectancy at birth; infant mortality; children in the labor force; primary and secondary school enrollment (female and total); and pupil-teacher ratios in primary education.

The data shown in the maps are mostly for 1975 and are classified by seven income groups. The statistical annexes carry data on 185 individual countries for 1960, 1970, 1975, and 2000.

Because concepts, definitions, and coverage are not standardized among countries, and data are not necessarily comparable from country to country or over time, care must be taken in interpreting the data. Nevertheless, a regional comparison in terms of median values shows:

- The number of children (14 years and below) will increase between 1975 and 2000 by about 72 per cent in Africa, 48 per cent in Asia, 47 per cent in South America, 10 per cent in the United States, and 4 per cent in Europe.

- Average life expectancy increased between 1960 and 1975 from 36 years to 44 years in Africa, from 46 to 56 in Asia, and from 56 to 62 in South America. In 1975 it was 69 years in the United States and 71 years in Europe.

- In Africa, the number of children per thousand of population who were working before the age of 14 was 27, in Asia 14, and in South America 6, compared with 1 in both Europe and the United States.

The Bank and its affiliate, the International Development Association (IDA), have committed a substantial amount of resources to projects, particularly in rural and agricultural development, that will improve the lives of children in the poor countries. It is estimated that 44.9 million children will benefit directly from 329 projects in agriculture and rural development that the Bank and IDA supported with \$10 billion in loans and credits during fiscal years 1973-78. Another 117.1 million children will benefit indirectly. These projects will help to reduce child malnourishment, illiteracy, and ill health in some of the poorest regions of the world, and in countries where the gap between the standard of living in rural and urban areas has been growing.

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*The World Atlas of the Child is available from the World Bank Publications Unit, 1818 H Street N.W., Washington, D.C. 20433, U.S.A.; the World Bank European Office, 66 Avenue d'Iena, 75116 Paris, France; IYC Secretariat, 866 United Nations Plaza, New York, N.Y., 10017, U.S.A.; and IYC Secretariat, Palais des Nations, CH-1211, Geneva 10, Switzerland.*

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ral foods are involved in the program and the amount of each food being distributed is smaller than the amount previously being consumed. These characteristics obtain for most of the ration shops and take-home programs at present in operation in most countries.

Under the same circumstances, a site feeding program for children (such as breakfast and lunches in schools) can have an effect on children's consumption—but the effect can be no larger than an equivalent income transfer. This will be true if the amount of each type of food being consumed on site is smaller than the amount of that food previously consumed by the child at home. The food on site will partly replace the food eaten at home, without changing the marginal rates of substitution among foods.

A food-stamp program providing stamps of less value than the initial (preprogram) amount of food consumed by the family can also be equivalent to an income transfer—even if the stamps are not resold. The income transfer would be equal to the concessionary component of the stamps, the difference between the value of the stamps, and the price charged for them. Most of the food-stamp programs provide stamps of less value than the initial amount of food consumption: as a result the effectiveness of many of these programs has been equal to equivalent income transfers.

### Substitution effects

For a food program to have a greater effect on consumption than would an equivalent transfer of income, two conditions must be met: the food must be made available at lower prices and in larger quantities than that previously consumed, and reselling of the food must be precluded. Thus, if the objective is to increase the consumption of wheat by a target population, it might be more cost-effective to make available wheat in unlimited quantities at the rate of 20 per cent below the market price rather than providing a rationed amount of wheat (say, in an amount equal to 50 per cent of the target population's current level of consumption) at the rate of 50 per cent below the market price.

Here it should be noted, however, that subsidization of a particular food does not necessarily lead to higher caloric intake by the family. Increased calories from the subsidized food could be offset by the family reducing the intake of calories from other foods. If that substitution is strong and the foods being substituted account for an important share of the initial total calories consumed by the family, the net effect of a subsidy on a particular food could be even

negative. While not enough is known about the rate at which foods are being substituted in households, it must be noted here that some currently implemented nutritional programs may have a negative effect on the total caloric intake of the target population.

A milk price subsidy or free distribution (take-home programs) of milk in amounts substantially above the previous consumption of the household could reduce the consumption of total calories. If resale is not possible, these policies will induce a substitution among food commodities. If we assume that children consume two basic foods—cereals and milk—the effect of those programs will be to increase children's consumption of milk and to increase or decrease children's consumption of cereals, depending on whether milk and cereals are complements or substitutes, respectively. If milk and cereals are substitutes (the decline in milk's implicit price decreases children's cereal consumption), total caloric consumption could decline if, as is usual, most of the calories are derived from cereals. It can be shown that, in this case, even a small degree of substitution between the two foods could induce a negative effect on caloric intake. Milk subsidies and programs for free distribution of milk are popular at present. Perhaps they were conceived with the basic objective of increasing the consumption of "high-quality" proteins. However, if calories are the major nutritional problem, a re-evaluation of milk programs along the lines described earlier becomes of prime importance.

The problem of predicting this substitution becomes even more difficult when a program introduces a food not previously consumed by children. In this case, any amount of the new food being distributed could reduce overall consumption of calories.

When a program distributes a small amount of a food previously being consumed, the released purchasing power is used to expand the consumption of all food commodities, by both adults and children. If the new food being introduced by the program can only be consumed by children (specific baby foods), or is fed directly to children (milk programs in schools when children were not previously consuming milk), the only mechanism by which the rest of the family can also benefit from the transfer is by withdrawing some other food from the child in question. The net effect on caloric consumption will again depend on the caloric content of the food being distributed relative to the caloric content of the foods whose consumption is being displaced. These considerations do apply to many nutritional intervention programs

being carried out today. Milk programs, distributing milk to be consumed in schools and health centers, are being implemented in areas where milk was not previously consumed at home.

It is clear that an increase in the effectiveness of these programs requires an understanding of this process of substitution among foods. Our present statistical knowledge is meager, and further experimenting with and monitoring of programs are required to evaluate their net effect on caloric intake. The conclusion is not that such programs should be discontinued but that programs where new or protein-intensive foods are being introduced should be evaluated carefully to ensure that they do not have an adverse effect on caloric intake. Some adjustments to these programs are sometimes easy to make, for example, by increasing the fat or oil content of the foods being distributed.

In our view, therefore, the high incidence of malnutrition among children of developing countries is not likely to be reduced with acceptable speed as part of the development process, that is, through realistically plausible rates of growth in the national product and food production. The only effective solution lies in either a more equitable income distribution or in supplying food to the target population at a price far below its normal supply price. Large transfers of income are not likely to be politically palatable. Selected foods could be made available at subsidized prices in unlimited or rationed quantities to the entire population or only to low-income households, to all children or only to nutritionally deprived children. More and better information about the administrative feasibility and cost effectiveness of these different forms of intervention would enable governments to institute policies which would significantly improve nutritional well-being and which could be implemented realistically. 

### Related reading

- H. Chenery, et al., *Redistribution With Growth*, Oxford University Press, London, England, 1974.
- Simon Maxwell, *Food Aid and Supplementary Feeding: Impact and Policy Implications*, Institute of Development Studies, University of Sussex, Brighton, England, November 1977.
- Shlomo Reutlinger, "Malnutrition: A Poverty or a Food Problem," *World Development*, Vol. 5, 1977.