Combating Malnutrition: A Working Model

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While the world food problem is still thought of primarily as one of agricultural production—and its solution most frequently stated in terms of fertilizer, high-yielding seed varieties, pesticides and agricultural credit—there is today increased consciousness of what might be labeled the qualitative side of the food problem. A number of articles, monographs and scientific reports written of late have posed this "quality" factor as a vital requisite—along with agricultural production (the "quantity") and population control—to any program seeking to successfully combat the basic threat of inadequate world food supply.

Once thought of almost exclusively as a humanitarian...
issue, nutrition has emerged in the late sixties as an issue commanding major policy attention. High level pronouncements, deliberations, and decisions now reflect a growing awareness that:

—malnutrition during childhood is responsible for a staggering rate of mortality.

—among most survivors malnutrition leaves the scar of physical and, recent evidence suggests, mental retardation.

—the toll of malnutrition takes on the bodies and minds of millions places a massive drag on a nation’s social and economic development.¹

Like the first settler in newly opened territory, the enlightened food policy leader knows where he wants to go and why it is important to get there. He knows there is more than one way to realize his destination and he knows there are difficulties. The early explorers have done much for him—and their work continues.

But in territory so unmapped, how does the policy leader go about charting the way to a national program? For the policy leader, unlike the early settler, advice comes freely from many quarters. Nary a nutrition conference passes without a catalog of directions drafted for his eye. But how do these mesh with reality? What are the relative economics of the various approaches? How does the policy-maker systematically weigh the many alternate means of achieving the predetermined targets? How, in short, does he design an operational plan to reach effectively the largest number of people for the smallest investment of resources in the shortest period of time?

These are the questions examined in recent months by the Government of India. The result is a Comprehensive Nutrition Plan, incorporating a minimum cost model which, to our knowledge, is the first of its kind ever constructed in the field of nutrition.²

Basically, the model seeks to estimate particular Indian deficiencies for the year 1970-71 and to compare a number of possible avenues to determine the most economical way to overcome these deficiencies. Estimates of deficiencies are based on projected availability of each category of food produced in 1970-71, less estimated waste. These estimates are categorized by age and income group. The nutrient contents of these foods have been calculated, so that a daily per capita intake of each nutrient could be estimated for each age and income group. Finally, the intake figures were subtracted from the official minimum daily requirements for each nutrient set by the Indian Council of Medical Research. For purposes of the Indian Plan, estimates were made only of deficiencies of protein, vitamin A and iron—those nutrients considered most critical by Indian nutritionists. A distinction was made between “animal grade” protein and total protein because of the general difference in nutritive value.

For purposes of the model, the population was divided into four income groupings, by and large homogeneous groups of households with similar food consumption patterns. It was decided to designate as a target group for the model the critical 1-6 age group in the lowest income category; this income category embraces more than 70 percent of the Indian population.

As determined from a computer exercise carried out by the Indian Institute of Public Opinion, the 1970-71 deficiencies for the low income, 1-6 age group were as follows:

<table>
<thead>
<tr>
<th>Deficiency per person per day</th>
<th>Total Protein</th>
<th>“Animal Grade” Protein</th>
<th>Vitamin A</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.9 gms</td>
<td>2.8 gms</td>
<td>3068.6 I.U.</td>
<td>12.5 mg.</td>
<td></td>
</tr>
</tbody>
</table>

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Given these deficiencies, the next step was to determine a minimum cost solution for the target group, one that could be implemented under Indian conditions. This was no easy matter. Unlike smallpox, malaria and other public health problems, there is no professional consensus on how best to attack malnutrition. There are, in fact, more than a dozen starting points, each with its own band of advocates. The aim of this linear programming exercise was to measure pros and cons of each of these possibilities, taking into consideration economies, cultural factors, and realistic administrative constraints.

The costs compared were for the most part alternatives of production and processing rather than distribution.

² Copies of the Plan may be obtained from the Nutrition Advisor to the Government of India, Ministry of Health and Family Planning, Nirman Bhavan, New Delhi.
For example, the exercise did not compute the costs of subsidies or other government devices which might be used to assure that the bulk of a given product would be consumed by those in greatest need. The findings do, however, provide a basis upon which both public and private investment decision-making vis-a-vis these alternatives can begin.

Here are some of the findings:

a) It is invariably more costly and in many (but not all) respects harder to combat deficiencies by relying solely upon stepped up food production. In the case of protein, it would take enormous increases in food production to close the gap solely by catering to conventional eating habits. It is possible that in time—with continued increases in foodgrain yields and perhaps with some form of subsidy—adequate amounts of protein will be available from cereals to meet the requirements of the target group. The quality of this protein, however, will not be adequate unless, for example, the quality is enhanced by the fortification of the cereals with amine acids.

In the case of vitamin A, a 297 percent increase in vegetable production or a 217 percent increase in fruit production would be required to meet the target group’s deficiencies through “conventional” foods.

b) The single most inexpensive means of meeting the protein deficiency of the target group is with edible-grade flour from oilseeds such as groundnut, cottonseed and soy. This flour can be used in low-cost high-protein foods (such as Bal Ahar). The flour can also be further refined into protein concentrates or isolates for more sophisticated foods, or liquefied into a protein solution which can stretch the supply of high fat buffalo milk through the process of “milk toning.” By coincidence, the amount of groundnut flour required to meet the deficiency of the target group is almost exactly that which could be produced if all groundnut cake produced in India were converted into edible flour.

c) The least expensive means of meeting the group’s animal grade protein deficiency is with fish protein concentrate—although only the nonvegetarian portion of the population could benefit.

d) When reasonable administrative, social and logistical constraints are taken into account, it is clear that there can be no single solution to the protein problem. The least cost solution instead calls for differing amounts—an optimum mix—of each of the foods described above.

e) The best solution to deficiencies in vitamin A and iron is the fortification of commonly consumed foods with these nutrients in their synthetic form. Imaginative new ways are being sought to introduce fortifying nutrients into the common diet. Work is currently under way in India, for example, on the fortification of salt and tea.

The Plan, presented by India’s Minister of State for Health and Family Planning to the National Nutrition Advisory Committee earlier this year, sets forth a three year program based on these results. While it is premature to measure the effect this Plan may have on future programs, it is clear that the model has focused attention of those concerned on the problem as a whole. It has provided thoughts on how and where a resource-scarce nation can concentrate its energies and resources. It has provided a basis for follow-up computer runs that would include such alternatives for the future as the development of new cereal strains with higher protein content and quality, of low-cost consumer protein foods in the commercial sector, and of single cell protein from petroleum and other sources. All of these now vary too greatly in price to have been included in this exercise. Perhaps as important as the short-term effects of the Indian Government’s Plan is the model it represents—a model which may be helpful to other developing nations trying to come to grips with the same problem.