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**TACKLING MALNUTRITION: WHAT CAN TARGETED
NUTRITIONAL INTERVENTIONS ACHIEVE ?**

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ABSTRACT

While in the longer term the elimination of malnutrition and the associated poverty will clearly involve increasing the resources of the poor, their incomes and effective demand for food, it is imperative at least in the short term, given the extent of nutritional deprivation in India and other low-income countries, to implement policies of nutritional support. Food subsidies and nutritional feeding targeted to deprived groups are important components of such a policy. While the rationale for such an approach is easy to see in general terms, the issue of targeting calls for more specific analysis. A key question is: which groups should receive priority in a situation of constrained resources? Ideally the twin dangers of leaving out malnourished groups from the purview of the policy, and covering people who are not malnourished, are to be avoided. In practice, the policy analyst has to decide which of these errors to minimise, since attempts to reduce one are likely to exacerbate the other. The problem calls for a more careful delineation of the objectives and approaches to targeting than has been hitherto done.

Tackling malnutrition : what can targeted nutritional interventions achieve ?

The persistence of widespread malnutrition in large parts of the developing world despite substantial increases in average per capita incomes underlines the importance of formulating a coherent policy response to the problems of poverty and malnutrition. While in the longer term, lasting improvements in the nutritional situation may be dependent on an increase in incomes and effective demand for food, in the short to medium term at least, coordinated policies to ameliorate the situation remain essential. It is in this context that the role of various kinds of nutritional intervention schemes has to be considered. In this paper, we consider the relevance and rationale of interventions such as food subsidies, nutritional supplementation and child feeding - focusing especially on issues of targeting - and attempt to develop some general principles which might underlie their operation, with particular reference to the Indian context. The paper is organised as follows: Section I contains a general discussion of malnutrition, and an overview of its dimensions in India; this is seen as a necessary prelude to considering the policy responses appropriate to it. In Section II, the rationale underlying various schemes of intervention is discussed, and in particular, the important issue of targeting is addressed. In Section III the cost effectiveness of targeting schemes is discussed. The next section (Section IV) points to some of the problems of assessing nutritional interventions in the light of the preceding discussion. Finally Section V presents some conclusions.

I Malnutrition: concepts, estimation and policy responses¹

It is generally recognized that malnutrition is the result of inadequate energy in the diet, rather than insufficient protein. As the 1976 FAO/WHO joint report emphasised, nutritional deficiencies including protein malnutrition, 'are the results of inadequate intake of food, being thus unavoidably associated with inadequate intake of energy.' (FAO/WHO, 1976 p. 73) With some exceptions (notably certain types of African diets which are heavily dependent on cassava) adequate intakes of food generally assure the level of energy needed for maintaining normal activity levels.

The measurement of malnutrition is a more contentious matter, however. It is possible, broadly speaking, to identify two approaches to measurement. The first can be called an 'input' based measure in the sense that it judges nutritional status by comparing actual intake of nutrients by individuals or groups with some standards (such as the FAO/WHO energy and protein requirements recommendations). The extent of malnutrition is diagnosed by analysing the extent to which intakes fall short of such requirements.

The second approach can be broadly characterized as an 'output' based measure in the sense that it uses anthropometric indicators such as body weight, height, skinfold measurements, and judges nutritional status in relation to standards relating height to age, weight for age or height to weight. Such measurements are usually carried out on children, where malnutrition is diagnosed by the extent to which children fall short of standards for increases in height and weight by age. ^{2/}

Estimates based on both these approaches to nutritional assessment suggest that the problem of undernutrition in India is severe. Estimates of calorie intake in rural areas produced by the National Sample Survey (NSS) in the rounds conducted in the seventies have revealed that close to half the rural population consumes diets that fall below conventional estimates of nutritional requirements (Sengupta and Joshi, 1978, Dasgupta, 1984) ^{3/}

Nor has calorie intake increased in more recent years. Table 1 which shows intake data collected by the National Nutrition Monitoring Bureau (NNMB) in the period 1975 - 1982 from the rural areas of nine Indian states shows not only that average levels of calorie intake are below estimates of requirements in most states, but also no sign of any sustained increase in calorific intake in any of the regions surveyed.

The anthropometric evidence is not encouraging either. Comparisons of height for age data for 1956-57 and 1980 do not indicate any appreciable increase (Gopalan, 1986) and a look at NNMB data over the period 1975-82 shows that significant progress in reducing the incidence of severe malnutrition has been made only in two states, viz. Kerala and West Bengal. For the country as a whole, the NNMB Report for 1982 shows from a pooled analysis of weight-for-age data for eight states, that 42.4 and 34.8 per cent of children (aged 1 to 5 years) are in the mild and moderate categories respectively, 6.1 per cent being severely malnourished, and the rest 16.7 per cent being normal. Breakdowns by income and class are not available, but it would not be unreasonable to infer that such improvements in anthropometric indicators as have taken place in recent years have not on the whole accrued to households in the lowest income deciles; and that for these, the incidence of severe weight deficiency remains a sure indication of persistent poverty. ^{4/}

Table 1

CALORIE INTAKE IN RURAL INDIA DURING 1975-82

	1975	1976	1977	1978	1979	1980	1981	1982
Kerala	1926	2052	1722	1805	2019	2158	NA	2203
Tamil Nadu	NA	2249	2477	2411	2537	2196	2346	1964
Karnataka	2911	3058	2588	3008	2751	2992	2873	2711
Andhra Pradesh	2394	2569	2665	2527	2600	2391	2238	2061
Maharashtra	2203	2315	2407	2295	2282	NA	2472	2120
Gujarat	2203	2146	2177	2131	2327	2333	2162	2306
Madhya Pradesh	NA	2393	2045	2180	2205	NA	NA	NA
West Bengal	2144	2473	2381	2584	2177	2580	2477	2426
Uttar Pradesh	2283	2054	2292	1956	1983	2115	2193	NA
Average	2296	2369	2306	2341	2366	2404	2408	2243

Source: NNMB quoted in K. Ramachandran : Food Consumption in Rural Indian Households. Nutrition Foundation of India Bulletin January 1987.

The brief review of the nutritional scene in India that we have presented above suggests that whether judged by calorie-based or direct anthropometric measures, close to half the rural population is undernourished. This clearly makes the question of the appropriate mode of nutritional intervention a very pressing one indeed.

But how accurate is this picture of nutritional deprivation? As regards the input based approach, a number of writers have noted that the conventional calorie-based approach to measurement which produces the estimates quoted above is subject to certain limitations. Possibly the more important are:

- (i) Nutritional intakes are known to be variable and surveys with a short recall period cannot easily provide an accurate estimate of the long-term mean intake of the population
- (ii) Environmental and climatic factors may often reduce requirements and in consequence the use of a fixed energy norm may overestimate the extent of undernutrition. ^{5/}

Clearly, these and other limitations point to the need for more careful and regular surveying before estimates of malnutrition are computed, and for a range of nutritional norms to be used to gauge the sensitivity of the estimates derived to the different cut-off points used. They are, however, not sufficient to fundamentally cast doubt on either the methodology or the estimates of malnutrition used hitherto.

But a much stronger hypothesis has been advanced in recent years which challenges conventional nutritional theory in a much more fundamental way. This critique, essentially due to the work of P.V. Sukhatme, ^{6/} questions the very proposition that nutritional intakes of the kind attempted can yield accurate estimates of relevance for policy purposes. The argument put

forward is that in addition to variations in calorie requirements between individuals falling in the same age-sex category, there are self-regulating (or 'homeostatic') mechanisms for adjusting energy expenditure to intake which enable a given individual to maintain a normal level of activity despite variations in levels of calorie intake without any significant change in body weight or deterioration in health.

If true, this would mean that the estimates of malnutrition commonly used in the literature vastly overstate the extent of the problem, since it would not be possible to infer from the fact that intakes fall below requirements that an individual is malnourished. If his intake falls, but is still within a specified range (called the homeostatic range) the person may still avoid malnutrition by 'adapting' his requirements to the reduced intake by varying the efficiency with which his system processes nutrients. In identifying malnutrition, then, the question is the extent to which intakes can go down before this process of regulation ceases. Results from experiments testing for variability of requirements (Edholm et al, 1970) are invoked to derive more generally applicable estimates of such variability, which can then be applied to data on intakes. In a statistical sense, using the assumption of normality of requirements, the 'limits of homeostasis' can be shown to be the mean requirement lowered by two standard deviations. What this suggests then is that the nutritional norm used should be set at a lower level than the conventional norm - a level below which there is no possibility of any adjustment mechanism working, and in consequence the probability is high that low intake is evidence of malnutrition. Accordingly, the new norm advocated allows explicitly for the possibility of adaptation by weighting down the conventional norm by two standard deviations.

In the specific context of India, it is easy to see that the application of the new norm leads to substantially lower estimates of malnutrition. Sukhatme's attack here focuses on the requirement estimate of 2750 kilocalories per consumer unit (henceforth denoted as cal./cu) adopted by the National Sample Survey (NSS) of the Government of India. As we saw, on the basis of this figure, the proportion of the population that is undernourished was estimated to be in the region of 50 per cent.

However, the application of the new 'mean minus two standard deviations' norm which bring the old norm down to 2300 cal/cu results in estimates of undernourishment in India as low as 15-20 per cent (Sundaram and Tendulkar 1983 p. 1631) The results are equally dramatic for certain states: For Maharashtra, the estimates change from 66 per cent (with the old norm) to 33 per cent with the new one; in Punjab, the estimate goes down from 20 per cent to 10 per cent. (Dasgupta and Ray, 1986) The choice between the two approaches is, therefore, far from trivial.

Turning to the debates in anthropometry, a parallel set of criticisms has also produced lower estimates of the size of the problem. Thus, David Seckler (1982) has argued that the conventional scales which classify children as nutritionally deprived if they show evidence of stunting exaggerate the size of the class of malnourished children because in many cases stunted children may not suffer from any nutritional impairment: indeed their smaller size may be evidence of adaptation. In this view, it is wasting (relatively low weight for height) which is the more serious issue from the perspective of nutritional intervention. Even as regards wasting, Seckler appears to want to concentrate on manifestations of cases of severe weight loss. Once again the application of this 'small but healthy' proposition to the empirical data show greatly reduced levels of child malnutrition. As noted above, the Indian evidence is that the class of severely malnourished is substantially

smaller than that of the mildly malnourished or that of the moderately malnourished ^{7/}: whereas 6.1 per cent were severely malnourished in 1982, the mild and moderately malnourished together contain 77.2 per cent. Defining only the 'severe' group as the truly undernourished clearly alters one's picture of how serious the problem is.

The policy consequences, that flow from this view are quite clear. If malnutrition is diagnosed to be a less serious problem than it appeared from previous work, food supplementation per se becomes less important. Indeed, it may be wasteful in a situation of scarce resources to maintain large nutrition programmes which aim to cover a substantial proportion of the mild and moderately malnourished. As Sukhatme (1978 p. 384) notes:

'By including nearly twice as many households as poor when only the lower half of them are so we are in effect defeating the purpose of identifying those who are really poor and undernourished in as much as experience everywhere is that the relatively better off among the poor tend to capture the benefits of official programmes and to accumulate wealth while those who are really poor often remain as they were or become even worse off.'

A similar argument is made by Pacey and Payne (1985 p. 50) when they caution that exaggerating the dimensions of the problem of malnutrition may risk detracting attention from the correlates of malnutrition such as poverty, bad sanitation, inadequate hygiene and high levels of morbidity, which may deserve as much attention as food supplementation.

Finally, it has been argued from the perspective of the 'small but healthy' proposition that supplementary feeding programmes may be inappropriate for the purely stunted (as opposed to wasted) children. The reasoning is as follows: since moderately stunted children do not appear to have any obvious disabilities, it is a mistake to think that giving them more food will be beneficial. If the feeding programmes are aimed at getting them off the stunted growth path, and back to normal growth, they would have to be lengthy and expensive: a much more cost-effective way to benefit the needy is to tackle social disabilities which were originally responsible for causing the stunting. In sum, targeted programmes should be targeted primarily at 'wasted' children - the rest are best helped through other social policies.

It is true that at a certain level, the case for prioritising the severely undernourished can be made without entering into the details of the controversy over the measurement of malnutrition. But equally, it is undeniable that taking the Sukhatme view seriously radically alters one's views about the seriousness of the problem of malnutrition. And in this sense the challenge to orthodoxy has rather large implications for nutritional policy and intervention, and makes it important for us to consider the validity of this challenge. A detailed evaluation will not be attempted here, since that would take us beyond the remit of this paper. ^{8/} But the main hypotheses discussed above do seem to us both conceptually flawed and lacking in empirical support. The main reasons for our view are summarised below:

(1) the new norm of adjusting the mean requirement downwards by two standard deviations is not well-founded statistically. The occurrence of variability in requirement does not imply that requirement estimates ought to be brought down. Indeed, in certain cases, variability might mean that estimates ought to be increased, so that individuals whose requirements have gone up are not classed as healthy when they are actually undernourished.

(Rand and Scrimshaw, 1984)

(ii) The experimental evidence that formed the basis of estimates of the standard deviation used for defining the new cut-off point apply to army cadets in Britain. (Edholm et al, 1970) There are serious problems in using these results in the Indian context, as Sundaram and Tendulkar (1983, p. 1631) point out: 'Given the average standards of hygiene and sanitation, and the associated morbidity conditions in India, such an automatic transplantation of the results of the UK experiment may not be warranted. In particular, the energy losses caused by ill-health arising from the unsanitary and unhygienic environment are likely to be significant. 'This is another reason why allowance has to be made for the fact that requirements may increase.

(iii) While variability in requirement may occur for a number of reasons, the idea that subjects permanently obliged to subsist on calorie intake representing the lower limits of their normal variation can permanently adapt their requirement to this low intake without functional impairment is highly questionable. If such 'adaptation' takes place, the process involves a cost. These costs include greater susceptibility to infection and disease, and/or reduction in the capacity for sustained physical activity. (Gopalan, 1983 a, Dasgupta and Ray, 1986, Scrimshaw, 1987) In young children, both these are established defence mechanisms and can have an irreversible impact on their mental and physical capacities.

(iv) Evidence of small size - stunting - cannot be considered a costless form of adaptation in the face of reduced intakes. It has been pointed out that, 'stunting' even if it did not increase the morbidity and mortality risk of children is healthy only in the sense that scar tissue is healthy. Stunting, like scar tissue is a testimony of past wounds.' (Martorell, 1985 p. 25) Further,

growth retardation - taking the form of adaptation to low intake - is not a smooth process. Analysis of growth curves shows (Gopalan, 1983 b) that retardation brought about by dietary inadequacy is a painful process punctuated by frequent episodes of infection: in no meaningful sense then can it be called adaptation.

(v) A number of studies have shown that the incidence of disease and infant and child deaths increase as the degree of malnutrition increase, where malnutrition is measured as weight-for-height among children. (See e.g. Mosley and Chen, 1984, and Chen and Scrimshaw, 1983) While illness and death rates are greatest among the acutely malnourished, (Martorell and Ho, 1984, Chen, 1986) they are greater among the moderately malnourished than among normal weight children. There is a risk of moderately malnourished children on the borderline falling over into the severe category in the absence of any nutritional support schemes. This implies that we should be wary of strict demarcation points at which children cease to be at nutritional risk, or outside the purview of nutritional intervention.

It should be noted that in general a recurring theme of the criticisms of the conventional approach to nutritional policy is that food supplementation by itself may not be effective, and indeed divert scarce resources from their best use, in a situation where poor health and bad sanitation prevent nutrients from being properly utilised by the body. The emphasis on viewing nutritional intervention as part of a wider effort to attenuate social deprivation is certainly well taken, but this has never been denied, and indeed has been emphasized by writers broadly critical of the 'adaptationist' school. (e.g. Scrimshaw and Sahn, 1983) The point rather is that improving the environment by itself cannot solve malnutrition if this is not combined with proper food supplementation. Indeed, treatment of infection may require an increase in nutrient intake in many cases if it is to be effective. (Scrimshaw, 1977)

To summarize, then, little reason exists for supposing that the extent of malnutrition is any less serious than had been previously believed. It remains a public policy and health problem of the first magnitude, and in many of the poorer areas of the country will only have been exacerbated by the effects of the recent drought. In tackling it, many crucial questions are raised in an even more acute form: what is the right balance between different kinds of interventions, how should they be targeted and how they can be coordinated within an overall strategy against social deprivation? The rest of the paper is predominantly concerned with these issues.

II' Types of intervention and targeting

Certain policies are not normally regarded as nutritional interventions but which may potentially have a great impact on nutritional levels. This category includes land reforms and public works intended to generate employment, and with food or cash as methods of payment. Nutrition interventions proper can be divided into two types of operations: direct and indirect. The first consists in nutritional feeding in support of vulnerable groups like children; the second comprises food subsidies and the rationing of food.

In both these cases, there is a pressing issue that faces the policy analyst: how should these interventions be carried out? Should the attempt be to cover as much of the population as possible (e.g. generalised food subsidies) or should some groups be excluded so that the same resources can be concentrated on a 'target' group which is thought to be in greater need (e.g. pre-school feeding programmes)?

In general, the case for targeting in support of nutrition is a strong one. The same resource cost will achieve a greater impact in changing the conditions of the malnourished the more targeted the intervention, or alternatively the same impact can be achieved with a lower resource cost. Consequently, targeting is advocated by many observers as an essential aspect of interventions, while food subsidies are frequently criticised for their lack of targeting. ^{9/}

However, while the principle of targeting is widely accepted, and there is strong pressure on governments to replace generalised interventions by targeted ones, less attention has been paid to the precise mechanisms of targeting, and to the effects these different mechanisms may have. As a result, there has probably been an exaggeration of the effectiveness with which targeted interventions can replace more generalised interventions. What general considerations should guide the operation of these targeted schemes? The points below address this question: throughout we assume that even when interventions serve multiple objectives, two interconnecting aims, namely, reducing malnutrition and transferring income to the poor, are paramount.

(1) Defining objectives and characteristics

The first requirement is that the objective of the intervention and the characteristics of the target group are clearly defined. Yet this rarely occurs. For one thing, most food interventions serve a variety of functions, as shown in a recent comprehensive review (Pinstrup-Andersen ed. 1987). This survey of food subsidies and other interventions in a variety of countries shows that many other objectives besides the reduction of malnutrition determined the level of subsidy; these include inflation control, household food security, the holding down of

urban wages and income transfers to the poor. Clearly, the target group cannot be unambiguously defined until the objective is spelt out. In the majority of cases, the intervention serves a mixture of objectives and in consequence the target group can encompass a very large proportion of the population, particularly since different objectives may involve different target groups (e.g. holding down urban wages requires subsidies that reach urban workers, while nutritional objectives may require that the subsidies mainly go to the urban informal sector and the rural poor.) In such cases, a particular intervention may appear to be poorly targeted in terms of one objective (e.g. nutrition) although it is quite well targeted in terms of another (e.g. inflation control).

For some objectives, the relevant target group can easily be identified (e.g. urban formal sector workers, where the objective is holding down urban wages). But for others, defining the objective is only the beginning of a difficult process. A case in point is the reduction of malnutrition. As has been noted above, the issue of what measures of nutrition to take, and what should count as malnutrition is not easy to settle. It is nonetheless essential that a serious attempt be made to define the nutritional characteristics of the population before the form of targeting is determined.

(2) Differentiating within the target group

The issue of differentiating within the target group is an important one to consider when deciding on the type of schemes to be instituted. First, assessment of the effectiveness of the distribution mechanism ought to place particular weight on how far the worst deprived are reached: this is particularly relevant since, as we have seen, there is general agreement on the adverse effects on mortality and morbidity of acute malnutrition, but

more controversy about the impact of mild and moderate malnutrition. If data are available, a detailed typology on the nutritional status of the population might be useful for this purpose. However, for certain types of programmes, a simpler approach - namely a division of the target groups into two categories, the deprived and the ultra-deprived, may often be easier and more effective. Second, the distribution of the undernourished individuals or households in the population i.e. whether they are easily identifiable and correlated with other characteristics (e.g. no access to drinking water) or whether they are dispersed across the population is a valuable datum, crucial not only for logistical reasons, but also for a judgement on how to avoid different types of errors.

(3) Two types of mistakes in targeting

In terms of the efficiency of the targeting mechanism, there are two types of mistakes to which any intervention may be subject. The first is that of failing to reach the target population. We shall describe this type of mistake as an F - mistake i.e. a failure in the prime objective of the intervention. The second type of mistake is that made when the intervention reaches the non-target population; this we shall call an E-mistake (since what is involved is excessive coverage). A major criticism of nutritional schemes in general, and a fortiori of untargeted schemes, is that E-mistakes are high. The criticism of supplementary feeding of children who are stunted (and not wasted) made by Seckler that we discussed in the last section is essentially one of this type. Such criticisms can be made, however, without invoking any kind of adaptationist hypothesis. Thus in a study of targeting, Mateus (1983) argues that total costs are higher than they could be because of the high number of E-mistakes; he notes that in Morocco, it was estimated that 80 per cent of the budgetary costs

in the rural areas and 70 per cent in the urban areas 'increased the consumption of the already well-nourished.' (op. cit. p. 9)

In designing targeted interventions, attention has tended to be almost exclusively focused on mistakes brought about by excessive coverage, with much less attention on mistakes resulting from failures to reach the target group. Narrowly targeted interventions often show favourable cost-benefit ratios (Mateus op. cit) This arises from the smaller size of the target group and the fact that the more the intervention is restricted to groups in extreme deprivation, the greater one would expect the improvements from the intervention to be - measured say by gains in weight of malnourished children. But this apparently favourable cost-benefit ratio does not tell us the costs incurred by leaving out groups in need of nutritional supplementation. F-mistakes are particularly serious where it is the ultra-deprived who are left out, and are likely to be particularly large where malnutrition is widespread. This argument is especially relevant in a situation where detailed nutritional information on the condition of the malnourished is not readily available, and arbitrarily narrowing the target group risks missing certain groups clearly in need of nutritional support.^{10/} For the most part, then, pursuit of low E tends to raise F - mistakes. Further, the larger the proportion of the population which is malnourished, the higher the potential F-mistakes and the lower the potential E-mistakes. This is the basic reason why the controversy (discussed in Section 1) about the extent of malnutrition is so relevant to the design of nutrition interventions.

(4) Political support

Finally, political support for an intervention is essential for its sustainability. This may require that the

intervention be differently designed than if the only consideration were reaching the target group. Covering groups outside the target population may become necessary to achieve sustained political support for the intervention, since the very poor, who often form the prime target population, often lack political strength. The experience in the state of Kerala with public distribution is illustrative of both points. (George, 1979). A Colombian scheme, introduced in 1978, provides the converse instance. It was highly targeted to the very poor, it was effective in reducing malnutrition in the target population, and it was cost-effective. Yet it lacked strong political support and was withdrawn a few years later. The vicissitudes of the Sri Lankan intervention provide yet another example. (Edirisinghe, 1987) There are likely to be interconnections between the actual objectives any scheme serves, and political support for the interventions, with the choice and weighting of objectives being partly the outcome of political pressures. Both these considerations are difficult to handle systematically and precisely in assessing targeting mechanisms, but they may nonetheless be decisive.

III Cost-effectiveness and targeting

We turn now to making more precise several issues raised in the discussion above on the cost effectiveness of targeting. Cost effectiveness calculations are typically based on specifying a given objective, and then computing the minimum cost of achieving it. They have the advantage over cost-benefit analysis of not requiring quantification of benefits, but as noted above, the disadvantage is that they do not allow valuation of non-achievement of the objective. They generally do not differentiate within the target group.

Assume that there is a well-defined target population, numbering T , and that by increasing the incomes of each member of this group by DY the nutritional objective will be met. Assume a food intervention (food subsidy) is introduced which raises the incomes of all in the target group by D . The cost of the intervention will be:

$$C = DY.T + DY.E + A + X \dots\dots\dots(1)$$

and cost per head of the malnourished will be:

$$C/T = DY + DY.E/T + (A + X)/T \dots\dots\dots(2)$$

Where $DY.E$ is the cost of increasing the incomes of those outside the target population because of E -mistakes. A denotes administrative costs and X refers to indirect costs imposed elsewhere in the economy following the intervention e.g. disincentives to agricultural production, or disincentives to recipients to work. (World Bank, 1987 puts this more generally as 'the economic efficiency losses from the distortions in the incentive structure associated with the income transfer' These indirect effects could be positive - e.g. incentives to parents to bring their children to health clinics/schools where food is distributed in this way; or production from food for work schemes.

The approach commonly adopted in assessing the cost-effectiveness of alternative nutrition interventions is to consider how targeting affects the elements in equation (1) and then to compare cost-effectiveness on this basis (see e.g. Mateus, 1983 and Pinstrup-Andersen ed 1987). Targeting is then recommended as being a method of reducing E , although it is sometimes recognised that this can increase A . (For example, World Bank, 1987 argues that, 'preventing leakages may require a large administrative machinery, leading to bloated bureaucracies and/or demoralising corruption') And Rogers (in Pinstrup-Andersen ed op. cit) suggests that non-administrative mechanisms of targeting, even

if they allow more leakage, may result in lower overall expense, because of the saving in administrative cost.

However, as with all cost-effectiveness calculations, the approach represented by equations (1) and (2) assumes that the scheme effectively reaches all the target group. But as we have seen, F-mistakes may render this assumption invalid. Although the actual cost of the schemes would then be reduced by $f \cdot DY \cdot T$, where f is the proportion of the target group that is not covered, the scheme would not be meeting its prime objective. As efforts are made to extend the scheme to the whole target group (reduce f), there may be a tendency to get increasing excess coverage (higher E), and/or rising administrative costs (A) and, sometimes increased incentive costs and even moral hazard costs (as when some families deliberately maintain some children at substandard nutritional levels so as to qualify for subsidised food).

The potential conflict between reducing E and reducing F , A and X , arises because universal subsidies - which typically involve high E - mistakes - also tend to reach a high proportion of the target group. For example, the untargeted and universally available wheat subsidy in Egypt and the now-defunct wheat and rice subsidies in Sri Lanka were successful in raising nutritional levels (i.e., had low F-mistakes), but involved high costs because of the high degree of excess coverage. In Sri Lanka, replacement by a targeted intervention has had the effect of much reducing F , with significant adverse effects on the nutrition of some groups (Edirisinghe, 1987)

Consequently, in assessing any intervention it is essential to look at the size of the F-mistakes, as well as the cost-effectiveness elements of (1). While, as stated above there is a tendency for there to be some conflict between reaching the target group to a maximum extent and reducing excess coverage, there are

important instances where this does not occur. This is because most so-called 'universal' interventions are not universal and may not therefore reach the target population to the maximum extent. All interventions have uneven incidence (i.e. affect some more than others) and therefore involve some implicit targeting.

In sum, each type of intervention has different coverage and different costs and in general the coverage and costs will be country or region specific. What is needed therefore is an estimate of benefits (coverage of target population) and costs as in (1) for each region for each intervention.

Targeting mechanisms

Schemes may be targeted by:

1. Income, where food stamps are issued to those below a certain income, and or access to cheap shops are confined to those below a certain income.
2. Nutritional needs as identified by diet surveys or anthropometric measures.
3. Commodity: subsidising certain types of foods (e.g. basic or 'inferior' commodities)
4. Geography: locating subsidised foods in certain areas
5. Age: providing subsidies for all those of a certain age or status (e.g. under-fives, school age children, pregnant and lactating women)
6. Employment: through food-for-work schemes
7. Season: providing free or subsidised foods at certain times of the year.

This classification is obviously not mutually exclusive (schemes can and do provide food to children of low-income households at certain times of the year) nor is it in any sense exhaustive: Lipton (1983 p. 64) provides more specific guidelines for targeting schemes (intended for the 'ultra poor' category) so that the maximum nutritional impact is gained. In his view, projects should be directed to:

- (1) Times of food scarcity, whether due to bad seasons, or to 'bad patches' in a household's cycle of needs and capacities;
- (2) Activities directly reducing output fluctuations
- (3) Cheap calorie sources, if used for domestic human consumption
- (4) Rural areas;
- (5) Casual labour;
- (6) Acquisitions of assets by persons at nutritional risk;
- (7) Benefits -earnable, controlled or enjoyed -for particular groups: children, female-headed households (perhaps), pregnant and lactating women;
- (8) Reduction of undesirable caloric requirements.

Much depends of course on the amount of information about the status of the beneficiaries that is available. In the classification we have provided, the first two approaches differ from the remainder in being discretionary in that the administrators of the scheme decide in any particular case whether the person qualifies. This (i) inevitably involves high administrative costs (ii) may lend itself to corruption so that non-target groups receive some of the benefits sometimes diverting them away from the target group (E-mistakes); (iii) is likely to leave out some of the target group, especially the ultra-deficient who generally have other characteristics (e.g. low levels of education remote location) which make it particularly difficult for them to come forward and identify their claim (F-mistakes). These problems arise from bureaucratic requirements and the fact that much income, especially among the self employed, is not recorded, giving

rise to the possibility of corruption.

Discretionary schemes based on nutrition and administered by health workers have fewer disadvantages. There is less room for false declaration, and the administrative requirements, though heavy, have some independent advantages, since growth monitoring is thought to be important in its own right. However this process requires mothers to take their children to health clinics regularly which may not always be possible, especially among the poorest households, and is of course only a possibility where everyone has access to health clinics.

The remaining schemes are non-discretionary and are therefore sometimes described as 'self-targeting' being universally available, within a restricted category, and not requiring particular administrative decisions as to whether a person qualifies. How far they generate the two types of mistakes discussed here depends on the characteristics of the target group in comparison with those outside it. For example, if all and only the target group live in one remote region, then providing subsidies for everyone in this region and for no-one else would provide perfect targeting, avoiding both types of mistakes, assuming people could be prevented from travelling to the target area to benefit from the subsidies. (It should be noted from this example that targeting mechanisms generally encourage people to change their behaviour to qualify for the subsidy. This may raise X costs in equation (1) unless the behaviour in question is desired in itself, in which case, it would involve X -benefits.) It follows that in order to design good non-discretionary targeted interventions, it is necessary to know the characteristics of both target and non-target population.

Characteristics of target population

In order to estimate the extent of F and E.- mistakes likely to be associated with different interventions in particular contexts, it is necessary to know a good deal about both target and non-target populations. The matrix below indicates the sort of information needed.

<u>Characteristics</u>	Matrix of Characteristics			
	(1) Target- deficient Abso. % of nos. group	(2) Target- Ultra-deficient Abso. % of nos. group	(3) Non-target Abso. % of nos. group	
I. <u>Age and Sex</u>				
Under 5 F.M.				
5 - 15, F.M.				
15 - 60, F.M.				
60 +				
Pregnant & lactating				
II <u>Location:</u>				
Urban				
Rural				
III <u>Region</u>				
"North"				
"South"				
IV <u>Consumption</u>				
of staple 1				
as % income				
cons. of staple 2				
as % income				
V <u>Occupation</u>				
Formal sector, wage				
Informal sector				
landless agric. worker				
subsistence farmer				
small cash farmer				
VI <u>Season</u>				
Jan. - March				
April - June				
July - Sept.				
Oct. - Dec.				
VII Other, relevant				

Where there is a high proportion of the target population in any category, use of this as a basis for subsidies will involve low F-mistakes, while if there is a low proportion of the non-target population in the same category there will be low E- mistakes. The ratio of the proportion of the target group in any category to the proportion of the non-target group would be a summary measure of how good that category would be as a basis for targeting. It follows that 'good' targeting (low F, low E) will be easier the more different the characteristics of target and non-target groups. For example, if eating habits are very different and the target group consume a great deal of some particular, while the non-target eat very little of that food, then subsidising the 'inferior' food would be a good targeting mechanism. Combining characteristics- e.g. providing subsidised foods to under fives, in region X, who are children of landless agricultural workers - would reduce E- mistakes, but it would also raise F- mistakes.

In most countries, especially large countries, the target group will not be homogeneous with respect to these characteristics: e.g. while a high proportion of landless agricultural labourers may fall in the target group, the target group may also include female headed households in the urban informal sector. Both groups might be reached by certain types of subsidy: e.g. subsidised staples, or foods for all children under five. But this also involves a lot of E- mistakes. In such a context - which is typical - there is a choice between (i) reaching all via a single mechanism, but having high E- Costs (ii) having a variety of schemes to suit the variety of households in the target group, which may mean high administrative costs. (iii) failing to reach a large number of the target population. We assume that the last alternative is not acceptable, so that the choice is between the first two.

IV Problems of assessing nutritional interventions

K. Subbarao has in his contribution to this volume discussed the performance of nutritional interventions schemes in India in ~~some~~ detail, so we confine ourselves in this section to raising some more conceptual issues which devolve from our earlier discussion.

One problem in assessing certain large schemes is that they cannot be assessed solely from a nutritional perspective. This is especially true of the system of fair price shops in India. It is probably true to say that here the more important objectives from the Government's point of view are that it should maintain stability in food consumption and reduce fluctuations in food prices. Indeed, targeting mechanisms have included quite a few of the characteristics noted earlier in the matrix, viz. region, income, location, commodity and season. The following points broadly characterise the operation of the system:

- (a) The beneficiaries have been largely urban dwellers
- (b) The severely malnourished have not been the prime beneficiaries
- (c) These two effects have produced a combination of E-mistakes and F-mistakes.

As we have seen, a notable exception has been the public distribution system in Kerala, which, by virtue of its large coverage, seems to have far fewer F-mistakes than the others. Also, because of the dual-price system, with the coarser variety on ration, and the fact that an open market has been maintained, excessive coverage has been avoided and E-mistakes have been brought down. Lastly, the decentralized operation of the system seems to have been successful in reducing the A and X costs that, as discussed earlier, often increased with targeting.

For most states, the relatively small size of the subsidy involved together with the nature of the distribution system, has meant that the long term nutritional impact of the fair price shops has probably been negligible, and its main contribution seems to be to protect the urban poor from sharp seasonal fluctuations.

Multiplicity of objectives also becomes a problem in assessing direct nutritional feeding schemes, such as the Tamil Nadu Noon Meals Scheme (see Subbarao *op. cit.* and Harriss, 1985). For this amongst other reasons, the literature has been rather ambivalent about their potential.

For instance, a well-known review by Beaton and Ghasseimi (1982) gave evidence that the highest average weight gain from feeding is growth equivalent to storage of 20 calories a day. This implies that only a tiny fraction of the supplementary energy targeted at children is actually translated into weight: children seem not to grow as fast as would be expected if the food supplement were used for weight gain. The reasons for this widely observed phenomenon could be:

(i) a change in the child's activity level consequent to the supplement (ii) an increase in the metabolic rate (iii) the food supplement not reaching the child (iv) the food supplement being too small to have an observable impact.

While many feeding schemes in India are subject to these limitations, the feeding scheme in Tamil Nadu is a great improvement on most schemes for a number of reasons: the calorie supplement is larger, the age range is wide and extends to the young (though arguably not to those at the critical stage of growth); finally, the coverage over time is comprehensive and extends to all days except for national holidays.

It is therefore likely that F- mistakes are fewer in the Tamil Nadu scheme than in less comprehensive schemes (although as Harriss notes it did not reach a number of deprived households in the villages surveyed.) E-mistakes seem to be rather large since as noted earlier, the scheme has been expanded continuously since its inception and now includes such a large number of beneficiaries that serious targeting is impossible. In any cost-benefit analysis, therefore the gains arising from an improvement in the nutritional condition of particularly vulnerable groups like malnourished female children have to be balanced against the losses arising out of misdirection of resources in feeding people who on strict nutritional grounds ought not be receiving the supplements. Some of these losses are: (a) the budgetary cost of supervised feeding for millions (b) excessive weight on the rice distribution system in the state (owing to the huge demands made by the daily feeding) thereby reducing the quota of cheap rice in rural shops (c) diversion of scarce administrative manpower from other areas in order to supervise the feeding operations.

One way to view the issue is to ask to what extent these losses would be lower in an alternative, more highly targeted system. The key elements would then be (a) the reduction of the A and X costs discussed earlier (equ. (1)) and the resources thereby liberated being redeployed elsewhere (b) E-mistakes being reduced (c) the possibility of F-mistakes increasing.

The earlier discussion articulated the view that in a situation of widespread malnutrition, keeping F-mistakes low assumes great priority. In the case of the Tamil Nadu project, then it is arguable that whatever nutritional gains the interventions bring more than compensate the costs it imposes. This clearly assumes a value judgement about the absolute priority of meeting nutritional needs, but it is a value judgement we have tried to defend in the course of this paper.

V Conclusions

This section does not attempt to summarize the main arguments of the paper. Rather some general remarks are made in order to put the discussion as a whole in perspective:

(1) Nutrition intervention programmes are best viewed as part of a longer term effort to eradicate malnutrition and hunger. They can be seen as particularly important in a situation where economic growth has only had a marginal impact on the condition of the poorest, and where active intervention is therefore necessary if the condition of the destitute is to be alleviated.

(2) Discussion of policy alternatives in nutritional intervention must take into account the seriousness of the nutritional problem. While the accurate estimation of nutritional deprivation remains a difficult issue, estimates suggesting that the incidence of malnutrition is much less serious than previously believed should be treated with caution, since the conceptual basis on which these are constructed appears to be flawed.

(3) The size of the problem of malnutrition - and the severity with which certain vulnerable groups like children are affected - requires purposeful discussion as to the best means of tackling it. The identification of the malnourished is the first problem that has to be faced. Ways of targeting the benefits of programmes to those in need have then to be addressed.

(4) The common perception of targeting and cost effectiveness of food interventions tends to ignore the two types of mistakes to which such targeting and intervention may be subject, namely, those consisting of excessive coverage (E-mistakes) and those consisting in failure to reach the target group (F-mistakes). It

is arguable that in India, because of the extent of nutritional deprivation, more emphasis should be placed on reducing F- mistakes.

(5) Analysis of food interventions in India using this framework shows that most schemes are subject to both types of error to varying degrees; part of the problem of evaluation is to assess the relative significance of these mistakes. There is clearly a need for more studies of nutritional interventions which attempt to estimate the relative size of these errors.

(6) It is difficult to evaluate public distribution systems (such as the ration shop network in India) solely with reference to their nutritional impact, given the multiplicity of objectives which they aim to fulfil. Even the assessment of feeding programmes (which are primarily nutritional in nature) poses a number of problems. General reviews have found their impact greatest in severely malnourished groups, and barely perceptible in others. Political and other considerations have acted to expand the scheme substantially in recent years, and while this may reduce F-mistakes, it increases both E-mistakes and the costs associated with these. The compulsions on the part of groups in power to widen eligibility and increase popularity testify to what a politically difficult issue targeting can be.

(7) As a general rule, it would be foolish to suggest that the only criterion by which to judge interventions is the number of people they affect (since considerations of effectiveness, and alternative use of resources, amongst other things, are also involved). However it is essential that the nutritional (and in the longer term, human capital) cost of leaving out individuals and groups in deprived conditions be properly assessed. This is especially important in view of the fact that existing research has largely focused on the costs of including too many people.

Footnotes

- * In preparing this version of our conference^{paper}/we have benefited a great deal from the detailed comments of our discussant, Michael Lipton. We should stress, however, that we cannot implicate him in any of the views we express. We would also like to thank K. Subbarao, S. Guhan and A. Cornia for their comments on the conference version, and P.G.K. Panikar for his comments on a later draft.
1. Malnutrition is a broad term, defined as an impairment of the state of health due to nutritional causes. A distinction is sometimes made between malnutrition and 'undernutrition' where the latter term is taken to mean disability caused primarily by lack of food and energy. However, the distinction is in many cases problematic; in addition, the literature has used the two terms interchangeably. In what follows, therefore, malnutrition will be used synonymously with undernutrition in the broad sense noted above.
 2. However, insofar as anthropometry is influenced by physical habits, as well as the health environment, it is perhaps more accurately regarded as a 'throughput' rather than simply as an 'output', as Michael Lipton has emphasized to us.
 3. The estimate of average requirement used in many of these studies is 2750 kilocalories per consumer unit. This estimate corresponds closely to that of Dandekar and Rath (1971) who based their pioneering work on poverty measurement on a nutritional cut-off point of 2250 calories per capita (one individual being roughly equal to 0.8 consumer units). One main point of contention, as discussed below, is precisely the validity of the notion of fixed average requirement that Dandekar and Rath and others used in their measurement exercises.
 4. On this, see amongst others, Panikar and Soman (1986)
 5. For different views on these questions, see Lipton (1983) Pacey and Payne (1985) and Vaidyanathan (1985)
 6. See Sukhatme (1977) (1981) (1982) (1982 ed), Sukhatme and Margen (1982) Sukhatme and Narain (1983), and for a critique, Dandekar (1981, 1982)
 7. Gopalan (1987) notes that this holds for many Southeast Asian countries too, viz, one finds that generally less than 10 percent of the under-fives are in the severely malnourished class, whereas close to 75 per cent in the mild to moderate stages of malnutrition.

8. See Osmani (1987) for a detailed survey and an illuminating attempt to link nutritional issues with more general concerns in welfare and development theory. Dasgupta and Ray (1986) provide a critique of the 'adaption' hypothesis and Srinivasan (1987) a vigorous defence. Policy issues are discussed in Kumar (1986).
9. Of Pinstrop-Andersen ed (1987) : 'Targeting is a particularly important consideration because it is a means of reducing fiscal costs without reducing the benefits of the target group.' or World Bank (1986): 'Ideally a targeted intervention increases the real income and food consumption of a target population without the cost of bringing these benefits to the rest of the population.'
10. For an important theoretical discussion of options in poverty targeting in the presence of imperfect information about the characteristics of the target groups in question (which raises a number of issues discussed here) see Kanbur (1987). See also Akerlof's (1978) well-known discussion of the economics of 'tagging'.

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