

INTRA-HOUSEHOLD FOOD AND NUTRIENT ALLOCATION

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INTRODUCTION

Individuals eat food, but it is mostly purchased and prepared at household level. Between preparation and eating comes intra-household allocation, where individuals get their share of the household's food. Intra-household food allocation (IHFA) follows norms which include assumptions about the quantity, type and quality of food to be given to men, women and children (Rizvi, 1978; Wheeler & Abdullah, 1988). IHFA studies involve separate measurement of the food intake of all household members, and the analysis of household members' shares of the total.

Even in industrialized societies, where food is often eaten outside the home and not in family groups, there are occasions when IHFA is important as a social activity. When food supplies are limited and inadequate, IHFA is one of the household's survival strategies. IHFA is a research area where nutritionists and social scientists meet with the common question: 'Who gets what, and why?' One of the features of the literature dealing with

IHFA is that few nutritionists have worked in this area, and that many of the statements on IHFA are not backed by quantitative measurements of food intakes. The validity of statements such as: 'more food will be served to him [the head of household] as a token of respect and appreciation' (reported by Chimwaza, 1982) can and should be tested, as can theories as to the impact of food shortage on the sharing of food within households. The relative shares of family food received by men, women and children must have impact on their nutritional state, and this is a research area where nutritional techniques are highly useful. One purpose of the present review is to stimulate more nutrition research on IHFA, in a range of societies and social groups. The applications of such research range from health education to social policy.

The studies reviewed here have mostly been done in Asia, and in the context of chronic food shortages. They shed light on debates about the treatment and dietary problems of different age-sex groups, and about the basis for norms of food allocation, not only in one continent but generally.

IHFA studies are not just an expensive way of finding out which age-sex groups suffer the most from malnutrition or over-nutrition. Like many dietary studies, they illuminate the process by which observed malnutrition occurs. Specifically, they can confirm or refute popular views on the relative feeding of different age and sex groups. For example, it is a truism among nutritionists and others working in South Asian countries that women and children suffer because they rank low in the distribution of nutrient-rich foods (Gopaldas *et al.* 1983; Sen & Sengupta, 1983). An IHFA study can ask to what extent one age-sex group receives less of a food or nutrient, and how much difference this makes to the satisfaction of nutrient requirements. Such studies are increased in value by the addition of the social dimension and by awareness of the cultural and economic forces driving the allocation process, and the rationale given by households for their behaviour (Harriss & Watson, 1987; Senauer *et al.* 1988).

THEORETICAL FRAMEWORKS FOR ANALYSIS OF IHFA

Differential food allocation does occur; at the simplest level, most adults are given more to eat than most small children. The phenomenon has been discussed using three models, which may be designated 'functional', 'cultural', and 'resource-control' (Wheeler & Abdullah, 1988). A 'functional' or 'physiological' model of food allocation regards the household as a unit whose overall aim is to survive and to reproduce itself, and which allocates resources to that end. Thus, a ranking of 'productiveness', the capacity to earn, or to produce goods, would be the scale against which decisions were made on food allocation. This model would predict that in times of plentiful food, approximately equal shares would go to all household members, with a progressive favouring of the most 'productive' members in times of shortage. In the Tamil Nadu Nutrition Survey (Cantor Associates, 1979) it was found that the overall pattern of IHFA did not vary with economic status, but seemed to be related to perceptions of work capacity based on body size: 'It appears as though food was allocated according to the relative two-dimensional size of family members... [there was] lack of perception of additional food needs for growth, for reproductive function in the female... lactating women were perceived as non-productive' (Cantor Associates, 1979). In this model, the children of the family are seen as future producers, (if they are not already working), and sex discrimination may be expected if daughters leave the home at a relatively early age, and after only a short period of contributing to the family work-force.

A 'cultural' approach to food behaviour in a given society regards the system of production, preparation and distribution of food as a model of the structure and relations

of that society. Social categories are continually expressed and redefined through the presentation and exchange of food, and in the prioritization of access to food(s). The status of an individual in the household and in society is reflected in the amount and kind of food eaten, and in the extent to which individual tastes and preferences are met (Atkinson, 1980; Douglas, 1982).

A 'resource control' model focusses on the material and power relations among household members: 'Inequalities of power between husband and wife become manifest in the various arrangements by which the goods, services and/or income of both husband and wife are allocated. Overall, a woman's effective possession of the resources she had either produced, or earned, within the household is determined by her power *vis-à-vis* other household members, especially her husband' (Whitehead, 1981). Here again, food allocation is taken to reflect the hierarchy of a household, but the focus is not so much on how food follows status, as on who controls the food resources and/or the food budget. Access to food follows the general pattern of material relations.

The 'cultural' model would predict, in the majority of societies, that men, and older adults, would have priority over women (especially young women) and children, since the majority of societies have a patriarchal element. In the 'resource control' model, earning, or productive capacity, gives control over foods: thus, where women have more wage-earning or productive opportunities, they would be expected to have better access to foods. However, where men control the products of women's labour, as well as their own, they would again have priority. Children hardly enter the picture of control over food, since what they earn or produce is generally regarded as a resource over which adults have rights. The 'functional' model assumes that there is a food allocation system which relates to productive capacity: here, working adults of both sexes would rank highly, followed by children, the old, and any other adults regarded as unproductive. In times of shortage it would be logical to divert a higher proportion of scarce resources to productive members, in order to ensure family survival. Productiveness should logically include women's capacity to produce the next generation of labour.

Thus, all three models suggest that adult working men are likely to fare well in food allocation, but there is some divergence as to the likely priority given to women, children, and elderly non-productive adults.

DEFINITIONS

NOMENCLATURE OF INTAKES AND REQUIREMENTS

When all intakes of the members of a household have been measured, and requirement estimates are available for all, then: for any individual member, *i*, of an age-sex group, *g*, containing N_g individuals, let I_{ig} be the intake of energy/nutrient and R_{ig} the requirement; let I_{im} and R_{im} be the intake and requirement for adult males for any household, let I_{id} and R_{id} be the intake and requirement for the head of household, or senior adult member (if male, then $I_{id} = I_{im}$ and $R_{id} = R_{im}$) and then for that household, $I_h = I_{id} + \sum I_{ig}$, and $R_h = R_{id} + \sum R_{ig}$.

CONSUMPTION UNITS AND MAN-VALUES

Aggregate household food intake measurements are easily confused with measures of IHFA. In an aggregated household survey, all the food consumed in the household is measured, but individual portions are not. The concept of the consumption unit, man-value, or Lusk coefficient was developed to allow comparison of aggregate household intakes with some standard (United States Department of Agriculture, 1899; Dunluce &

Table 1. Consumption unit values for energy used in the evaluation of household intakes, 1899–1986

Age–sex group ...	Adult		14–15 years		10–13 years		6–9 years		2–5 years		< 2 years	
	M	F*	M	F	M	F	M	F	M	F	M	F
Reference												
USDA (1899)	1.0	0.8	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.4
Atwater quoted in MRC (1924)	1.0	0.8	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3
Cathcart & Murray (1931)†	1.0	0.83	0.83	0.83	0.8–0.9 (both)		0.6	0.6	0.4–0.5 (both)		0.2–0.3 (both)	
Abdullah & Wheeler (1985)‡§												
Heavy work	1.0	0.63	1.0	0.63	0.53	0.56	0.53	0.56	0.42	0.38	0.42	0.38
Light work	1.0	0.71	1.0	0.71	0.60	0.66	0.60	0.66	0.49	0.45	0.49	0.45
Nelson (1986)	1.0	0.83	1–1.03‡		0.82–0.83‡		0.74	0.72	0.74	0.72	0.50	0.51

* Assume non-pregnant, non-lactating.

† Suggest one scale might be used when the father is doing ‘heavy’ work, and one for lighter work.

‡ By male head of household.

§ Consumption units calculated using subjects’ body-weights.

Greenwood, 1917). Using estimated requirements for all individuals in a household, a composite index is computed which reduces that household to adult male equivalents. If there are no adult males in the household, the consumption unit total is still calculated with R_{im} as the denominator:

$$\text{consumption unit (man-value) total for a household} = R_n/R_{im}.$$

All this has nothing to do with the allocation of food within a household: the consumption unit is a ratio of estimated requirements. However, consumption units are used as a standard against which IHFA data are evaluated. Table 1 summarizes some man-values dating back to the 1900s, and shows that there have been considerable changes in the expected (theoretical) distribution of nutrient needs within households.

The terms ‘man-value’ and ‘Lusk coefficient’ were current until the 1940s, until they were superseded by ‘consumption unit’. Recently, Nelson had used ‘man-value’ to describe the ratio, mean intake of any age–sex group in a survey: that of the adult male group (Nelson, 1986):

$$\text{man-value (Nelson)} = 100 \times \Sigma I_{ig} / \Sigma I_{im}.$$

INDICES OF IHFA

Nutrient/energy share

Individual intake expressed as a percentage of the household total. Without some correction for differences in requirements among household members, this ratio is meaningless:

$$\text{nutrient/energy share} = 100 \times I_{ig}/I_n.$$

Nutrient/energy adequacy ratio

These compare intakes with requirements. After the definition of age–sex groups, the intakes of all members of these groups are averaged and compared with the recommended dietary allowance for that group:

$$\begin{aligned} \text{individual adequacy ratio} &= 100 \times I_{ig}/R_{ig}, \\ \text{group adequacy ratio} &= 100 \times (\Sigma I_{ig}/N_g)/R_{ig}. \end{aligned}$$

Table 2. Mean sharing indices* for energy and nutrients: summary of published data for women

Area/season	No. of households	Energy				Iron				Vitamin A				Reference
		Male intake		Female		Male intake		Female		Male intake		Female		
		(MJ)	P/L	NP/PL	P/L	(mg)	NP/PL	P/L	(µg)	NP/PL	P/L	NP/PL	P/L	
Kenya†	98	—	85-90	—	89	27.8	89	—	430	148	—	—	van Steenberg <i>et al.</i> (1984)	
Malawi††	27	6.56	94	—	92	11.0	92	—	290	103	—	—	Chimwaza (1982)	
Japan‡	6	9.20	83	—	60	15.0	60	—	350	82	—	—		
UK	79	11.70	89	—	75	—	—	—	2102	123	—	—	Takagi <i>et al.</i> (1979) Nelson (1986)	
India	45	12.50	100	—	72	13.9	75	—	220	70	—	—	Gopaldas <i>et al.</i> (1983)	
Gujarat	100	11.90	70	—	76	30.4	76	—	400	43	—	—	Sharma (1983)	
Rajasthan	500	8.99	88	93	—	50.0	72	—	—	—	—	—	Cantor Associates (1979)	
Tamil Nadu	50	7.10	90	—	—	—	—	—	165	164	—	—	Sadasivan <i>et al.</i> (1980)	
Bangladesh	50	11.30	77	—	—	—	—	—	—	—	—	—	Hassan & Ahmad (1984)	
Average work	50	14.20	83	—	—	—	—	—	230	207	—	—	Abdullah (1983)	
Heavy work	50	10.40	83	—	—	9	311	—	750	100	—	—	Food and Agriculture Organization (1967, 1970, 1973)	
Light work	50	60-70	—	—	—	—	—	—	—	—	—	—		
Requirement (consumption unit)														

P, pregnant; L, lactating; NP/PL, non-pregnant, non-lactating.
 * Sharing index (family value) = individual's intake/intake of (male) head of household.
 † Recalculated from aggregated data.
 ‡ Doing agricultural work.

The outcome is a table of adequacy of intake by age–sex group (as in van Steenberg *et al.* 1984; Hassan & Ahmad, 1984). This method is unsatisfactory, as it makes no use of the intra-household aspect of the data and only presents cross-sample comparisons of age–sex groups.

Sharing index

Each household member's intake is expressed as a percentage of the head of the household's (an adult male in most situations). This index can be compared with the mean or range of consumption unit values for the group, as in Tables 2 and 3. Nelson (1986) uses the term 'family-value' for the sharing index:

$$\text{sharing index (family value)} = 100 \times I_{ig}/I_{id}; \quad \text{cf. } 100 \times R_{ig}/R_{id}.$$

A disadvantage is that consumption units are calculated on the basis that all requirements are being met, which may not be the case. If the household head is receiving only 80% of theoretical requirements, is the child's intake correspondingly scaled down? This in itself is a valid research question (Abdullah & Wheeler, 1985). Another problem arises in comparing households with male and female heads, since consumption units calculated on a 'male' and 'female' basis differ.

Relative adequacy ratios

As well as the individual nutrient adequacy ratio, the same ratio can be calculated for the whole household (using household consumption unit as the denominator). The individual's ratio is divided by that of the household, expressing his/her relative share (Senauer *et al.* 1988). If an individual's adequacy ratio exceeds 1, this implies that he/she is being preferred over other household members in food allocation:

$$\text{relative adequacy ratio} = (I_{ig}/R_{ig})/(I_h/R_h).$$

The advantage of this index is that no assumptions are being made about the sex of the household head, and satisfaction of his/her requirements is not an issue. However, as with the sharing index, interpretation depends on the value of the denominator, which shows whether the household's needs are satisfied overall, or not. Moreover, there is no simple way of comparing this ratio with any standard value, beyond suggesting that in conditions of equitable distribution all individuals' ratios would be ≥ 1 . Considerable interest would derive from comparing the relative adequacy ratio from households in nutrient/energy deficit with those which are not. The ratio is a useful tool for econometric analysis, but not so useful for the nutritionist who may need to categorize households and make recommendations based on some standard values. In practice, IHFA study data allow calculations of household adequacy ratios and sharing indices, yielding a range of information about allocation decisions.

Taking the three theoretical approaches (functional, cultural, and resource-control), what values of these indices and ratios would be predicted? The functional model will see men, fertile women and older children as the prime producers, younger children as long-term investment, and the elderly as marginally productive. Working/fertile adults and teenagers, then, would have the most favourable shares of food. In the resource-control model, older men, and possibly older women, might take precedence over younger adults and certainly over children, in the rural societies where much of this work has been done. However, the age at which adults control the products of their labour varies. In the cultural model it would be necessary to examine the cultural norms of a group before making

Table 3. Mean sharing indices* for energy and nutrients: summary of published data for young children

Area/season	No. of households	Energy				Iron				Vitamin A				Reference			
		Male intake (MJ)	4-6 years		1-3 years		Male intake (mg)	4-6 years		1-3 years		Male intake (µg)	4-6 years		1-3 years		
			M	F	M	F		M	F	M	F		M		F	M	F
Kenya†	98		41-50	32-33		27.8		—	33		430					van Steenberg <i>et al.</i> (1984)	
Malawi‡	27																
Early rains		6.56	62	43		12.0		—	42		290						
Late rains		9.20	60	31		25.0		—	24		350					Chimwaza (1982)	
Japan‡	6																
Heavy work		16.7	—	26	20	—											
Light work		12.5	42	14-15													
UK	79	11.90	50	48	50	48	13.9	52	52	52	2102	—	—	68	43	Takagi <i>et al.</i> (1979) Nelson (1986)	
India																	
Gujarat	45	8.40	48	40		30.4		—	33		220		—	43		Gopaldas <i>et al.</i> (1983) Sharma (1983)	
Rajasthan	100	12.10	41	37		50.0		—	27		400		—	29		Cantor Associates (1979)	
Tamil Nadu	500	8.99	—	30-50												Sadasivam <i>et al.</i> (1980)	
Tamil Nadu	50	7.10	53	59													
Bangladesh																	
Average work	50	11.30	—	30	25											Hassan & Ahmad (1984)	
Heavy work	50	11.20	—	35	30												
Light work	50	10.40	—	35	35											Abdullah (1983)	
Requirement (consumption unit)			50	48	32-44§												
			56	54	38-52				111					33		Food and Agriculture Organization (1967, 1970, 1973)	

* Sharing index (family value) = individual's intake/intake of (male) head of household.
 † Recalculated from aggregated data.
 ‡ Doing agricultural work.
 § Adult male doing heavy work.
 || Adult male doing light work.

predictions, but certainly in northern India and Bangladesh the cultural dominance of males would suggest that men and boys would receive preferential shares.

METHODOLOGY

THE DIETARY MEASUREMENTS

Instead of measuring the intake of one household member, it is necessary to measure or estimate them all, including small children: this is the main methodological problem, whether weighed or recording methods are adopted. In most studies the strategy adopted has been to allot a field worker to the household with the task of measuring all food obtained and prepared, with the shares allotted to each individual at each eating occasion (e.g. Sadasivan *et al.* 1980; van Steenberg *et al.* 1984; Abdullah & Wheeler, 1985). A version of this strategy is to measure the household total intake by weighing, and then to use calibrated household measures for recording individual intakes (Nelson, 1986). Another approach is to measure household food consumption (not intake) by the 28 d household purchase method, and then to administer 24 h recalls to individual household members (Bull, 1989). The latter study is not reviewed further because of the methodological difference.

All these methods are subject to the same caveats as any dietary intake measurements: they may bias the subjects' behaviour, and apprehensive subjects may provide false information. In some ways the complexity of the IHFA study increases its likely reliability, as a field worker must keep an exceptionally close watch on the household. However, the likelihood of subject reaction is increased.

A particular problem in measuring all household members' intakes is to allow for breast-feeding. Usually breast-fed children under 12 months old would be excluded from the calculation. The amounts of breast milk received by older children are small in relation to their total intake, and minute in relation to a household intake, yet they may provide significant amounts of micronutrients. In most studies a fixed allowance is made for breast milk intake by still breast-fed children aged > 1 year.

WHAT FOODS ARE INCLUDED IN THE MEASUREMENT?

In planning an IHFA study it is important to predefine the term 'household food'. A serious problem arises when individuals eat meals outside the home, and especially when the household head does so. Should his/her 'outside food' be included in what is shared within the family? If not, his/her intake will appear low, affecting the calculation of sharing index and adequacy ratio. A careful record of 'outside foods', using calibrated diaries, must be kept for or by each household member. One solution is to recalculate the sharing index for each meal, taking the most appropriate adult present as the basis for the calculation. This problem may be one reason why very few IHFA studies have been done in industrialized countries, where meals taken outside the home are common.

If household food allocation only means the sharing-out of food at meal-times, it has limited value to the nutritionist. Meal-time distribution is of great sociological importance, as it is here that household members' status, power and preferences are recognized and perhaps re-stated. But to the nutritionist the entire food resources of the household are important. The distribution of snacks and drinks, and entitlement to free meals at work or school, are as significant as meals in the home. In IHFA studies the researcher must be explicit about the range of meals and food events that will be included in the analysis, and about the reasons for these decisions.

REQUIREMENT DATA

Much of the discussion in the present review depends on the use of requirement estimates: at the time of writing many of them are undergoing revision. Table 1 shows how views have changed about the relative needs of different age-groups. There has not been a consistent view of the theoretical shares required by women and children. In view of the discussion later in the present paper on how children's needs are perceived, it is particularly noteworthy that in the 1920s the share of a young child was estimated to be as little as 0.3 of an adult's, whereas now the estimate is 0.4–0.5. There has been a broad consensus that the average woman's requirements are about 80% of an average man's, but consumption units for teenagers have varied between 0.63 and 1.0. Much depends on assumptions about the activity level of the reference adult male (as in Cathcart & Murray, 1931), and also on assumptions about body-weights (which account for the lower values used by Abdullah & Wheeler, 1985). However, the conclusions drawn from the data in Tables 2 and 3 are unlikely to be altered except by very considerable changes in requirement estimates.

REVIEW OF DATA

Unless otherwise stated, all studies reviewed have involved measuring the intakes of all household members, either by weighing or by calibrated diaries. With one exception (Nelson, 1986) the data come from tropical countries, and the majority from South Asia. In both reported African studies, data were presented only as group adequacy ratios (Chimwaza, 1982; van Steenberg *et al.* 1984). In these cases an aggregated sharing index has been calculated as $100 \times \Sigma I_{ig} / \Sigma I_{im}$. Tables 2 and 3 summarize the sharing index values for women and young children for energy, iron and vitamin A. The two micronutrients are selected because their deficiencies are known to occur in tropical countries, and because they are derived from varying ranges of foods. These sharing indices may be compared with the consumption units also given.

An obvious but noteworthy point is that consumption units for nutrients do not follow the same pattern as those for energy. For example, an adult woman's Fe requirement is 3.11 of an adult man's, compared with 0.6–0.8 for energy. Many studies have simply used energy consumption units as a basis for comparison.

WOMEN

Table 2 shows that in all the countries studied, the mean value of the energy sharing index for women exceeded the consumption unit value. In several cases corrections have been made for body-weights and activity, but the conclusion holds across all the studies. This calls in question the commonly held belief that South Asian women, in particular, suffer discrimination in food allocation. This illustrates the value of food allocation studies. Sen & Sengupta (1983) have argued from anthropometric measurements that since South Asian women are thinner and shorter than males, they must have suffered adverse differential food allocation. However, growth is the result not only of food intake but of other inputs such as health care and sleep time; the data of Sen and Sengupta (1983) may indicate that girls are less well cared for, overall, than boys, but not necessarily that they are worse fed, at least in energy terms. However the index for Fe tells a different story: here women's needs are greater and their share is lower. Vitamin A (which includes carotene) shows the reverse picture: women get more than men. The conclusion must be that although the outcome of the total allocation of all energy-yielding foods is that women's needs are met, the allocation of specific nutrient-rich foods is biased. The field studies of Chimwaza

Table 4. *Distribution of choice foods among household members*

Study*	First choice of food by adult males?	Foods eaten mainly by*			Not eaten by young children	References
		Men	Women	Children		
Kenya, 1970	No	—	—	Milk	—	van Steenberg <i>et al.</i> (1984)
Malawi, 1980	Yes	Maize, beer	Cucurbits, root crops, fruit	Fruit	Beer	Chimwaza (1982)
Japan, 1950	Not stated	—	—	—	Beans, oil	Takagi <i>et al.</i> (1979)
Rajasthan, 1982	Yes	—	Vegetables	—	—	Sharma (1983)
Bangladesh, 1982	Yes	Special portions of meats and fish, most attractive fruits	—	—	—	Abdullah (1983)

* Other foods eaten by all groups.

(1982) in Malawi and Abdullah (1983) in Bangladesh both showed that meat was preferentially allocated to elders generally and to men; while women and children got a high share of green vegetables. Abdullah (1983) reported that specially large and fine portions of meat, fish and fruits would be reserved for adult men. Table 4 summarizes statements about the allocation of more and less preferred foods, derived from several studies. These observations help to explain the nutrient shares, with men better supplied with nutrients derived from animal foods (Fe, and fat-soluble vitamins) and women better supplied with carotene and vitamin C from plant foods.

CHILDREN

The sharing indices for young children in Table 3 indicate that in the tropical countries studied there was a general trend for children under 3 years to receive a lower share of energy and nutrients than their consumption unit requirements. This age-group presents special problems of measurement, especially when still breast-fed, but the findings are consistent. The highest sharing index for young children was recorded in the UK; the next highest were in surveys where low adult energy intakes had been recorded, indicating that in 'hungry' seasons and periods of shortage, it may be the adult's rather than the child's intake that is restricted. The Bangladesh data provide a little support for the view that female children receive a lower share of family food than males: but when the adult males' intakes were lowest, the male and female children received similar shares.

The sparse data on micronutrients indicate the same pattern as for women: high sharing indices for vitamin A, and low ones for Fe, with probably the same explanation.

DISCUSSION

IHFA is a subject of considerable interest to social scientists and others who study the dynamics of families, and their practical outcomes. Gender bias in the allocation of food to women and children has been described as if it unquestionably occurs, and as if it simply parallels the same bias in access to medical care or education. The problem for the

nutritionist is the paucity of data on which to base discussions of the differentials in allocation of food and, therefore, of nutrients: this paucity is shown in Tables 2 and 3.

At the level of the household, two kinds of allocation occur: of basic or staple foods, and of prestigious accompanying foods. From the data reviewed here, women appear to receive a share of total energy appropriate to their 'functional' needs, as assessed by the nutritionist: less than men, but scaled according to their size and needs for work and reproduction. The energy share of young children is less than their 'functional' need in several instances. This fits with both a 'functional' and a 'cultural' approach. Women and children in most cultures are of inferior status to men. They are smaller, and often undertaking less heavy work; but productive women's needs are met. (The argument about work is complicated by the fact that although women expend less energy/unit time than men, their total hours of work are longer, as documented by Bleiberg *et al.* (1981) among others). The non-productive children, however, are relatively underfed in that whether or not adults are meeting their energy needs, the children's share is below their consumption unit requirements. The question of gender bias in allocation of food to children cannot be answered until more studies are undertaken which differentiate boys' from girls' intakes.

Studies which include data on consumption of accompanying foods, often the providers of micronutrients, show that the 'cultural' model best describes the allocation process. The greater needs of women and children for Fe and vitamin A are met or not met fortuitously according to the prestige value of the foods which contain them. Explanations for the high prestige value of animal foods are outside the scope of the present review; anthropologists have documented the male-female division of labour into 'hunting' larger animals and 'gathering' minor animal foods and plants, which occurs in pre-agricultural societies and may be of relevance (e.g. Lee & DeVore, 1969).

FURTHER RESEARCH NEEDS

The data reviewed here raise the question of how parents perceive the needs of young children. 'It appears as though food was allocated according to the two-dimensional size of family members ...' (Cantor Associates, 1979) is a supposition that calls for investigation. Table 5 summarizes some of the differentials in body measurements between adults and young children, which support the suggestion that if children are perceived as growing in length rather than in volume, their additional needs could be underestimated. This mechanistic model, however, bypasses all cultural norms about the upbringing of children, and could only provide a partial explanation of relative underfeeding. Moreover, it would apply to energy, not micronutrients. Research is needed on the perceptions of parents about children's food needs, in different cultures.

Choice between the three analytical frameworks has important implications for research on methods and messages in nutrition and health education. To take one specific example from the present review, it appears that women and children are not allocated sufficient Fe-containing foods for their relatively high needs. In the 'functional' model, all that needs to be done is to inform people clearly about the high needs of women for animal foods, and the adverse effects of anaemia on work capacity. In the 'resource-control' model, women would need to have more access to animal foods, or to sufficient resources to purchase them. In the 'cultural' model, a profound change in society's attitudes to the nature of a prestigious group of foods would be required.

An economist recently stated that: 'In recent years our understanding of household behaviour as it affects food consumption and nutrition has been greatly extended. This new evidence can serve as an improved guide to policy choice' (Senauer, 1990). Yet a nutritionist who takes a critical attitude to the data will conclude that it is impossible at the

Table 5. Comparison of body dimensions and energy needs* of infants, children and adults (50th centiles, NCHS†)

	Female child 1 year	Female child 5 years	Adult	
			Female	Male
Body-wt (kg)	9.5	17.7	60	65
% adult male value	15	27	92	
Height (m)	0.74	1.08	1.64	1.79
% adult male value	41	60		
Surface area (W ² /3)	4.5	6.8	15.3	16.2
% adult male value	27	42	94	
Energy requirement (MJ)	3.99	7.43	10.2	12.3
% adult male value	32	60	83	
Energy requirement (MJ/kg)	0.42	0.42	0.17	0.19
% adult male value	220	220	89	

* Food and Agriculture Organization (1973).

† World Health Organization (1983).

present time to give an authoritative and comprehensive answer to the question 'Under what circumstances are women and children discriminated against in food and nutrient allocation?', although the data have allowed some tentative conclusions. Although the broad pattern of allocation among men and women seems to be consistent there are a number of unanswered questions, which call for careful measurement of food intakes as well as behavioural observation. How does food allocation proceed in female-headed (e.g. lone-parent) households, especially if there are teenage boys? Where a woman is the 'breadwinner' of a household, males being unemployed or incapacitated, how does food allocation reflect the socio-economic situation? Where young children are economically active, are they rewarded with adult-style food allocation? What happens in situations of moderate and severe food shortage? What is the nature of allocation of food to aged family members, and does it reflect the prestige of old age in different societies?

Attempts to answer these questions will not only shed more light on the social dimensions of nutrition, but will contribute to the formation of food and nutrition policy.

REFERENCES

- Abdullah, M. (1983). Dimensions of intra-household food and nutrient allocation: a study of a Bangladesh village. PhD Thesis, London University.
- Abdullah, M. & Wheeler, E. F. (1985). Seasonal variations and the intra-household distribution of food in a Bangladeshi village. *American Journal of Clinical Nutrition* **41**, 1305-1313.
- Atkinson, P. (1980). The symbolic significance of health foods. In *Nutrition and lifestyles (British Nutrition Foundation Annual Conference, 1979)* pp. 79-89. [M. Turner, editor] London: Applied Science Publishers.
- Bleiberg, F., Brun, T. A., Gohman, S. & Lippman, D. (1981). Food intake and energy expenditure of male and female farmers in Upper Volta. *British Journal of Nutrition* **45**, 505-515.
- Bull, N. L. (1989). The development and field-testing of a simple method of dietary evaluation. MPhil Thesis: London University.
- Cantor Associates (1979). *The Tamil Nadu Study*. Haverford, Pa.: Cantor Associates.
- Cathcart, E. P. & Murray, A. M. T. (1931). A study in nutrition. Medical Research Council Special Report Series no. 151. London: HMSO.
- Chimwaza, B. (1982). Food and nutrition in Malawi. PhD Thesis: London University.
- Douglas, M. (1982). *In the Active Voice*. London: Routledge and Kegan Paul.
- Dunluce, Viscount & Greenwood, M. (1917). An enquiry into the composition of dietaries. Medical Research Council Special Report Series no. 13. London: HMSO.
- Food and Agriculture Organization (1967). Requirements of vitamin A, thiamine, riboflavine and niacin. Nutrition Meetings Report Series no. 41. Rome.

- Food and Agriculture Organization (1970). Requirements of ascorbic acid, vitamin D, vitamin B₁₂, folate, and iron. Nutrition Meetings Report Series no. 47. Rome.
- Food and Agriculture Organization (1973). Energy and protein requirements. Nutrition Meetings Report Series no. 52. Rome.
- Gopaldas, T., Saxena, K. & Gupta, A. (1983). Intrafamilial distribution of nutrients in a deep forest-dwelling tribe of Gujarat, India. *Ecology of Food and Nutrition* **13**, 69–73.
- Harriss, B. & Watson, E. (1987). The sex ratio in southern Asia. In: *Geography of Gender in the Third World* [J. H. Momsen & J. Townsend, editors]. London: Hutchinson.
- Hassan, N. & Ahmad, K. (1984). Intrafamilial distribution of food in rural Bangladesh. *Food and Nutrition Bulletin* **6** (4), 34–42.
- Lee, R. B. & DeVore, I. (editors) (1969). *Man the Hunter* (Symposium, 1966). New York: Academic Press.
- Medical Research Council (1924). Report on nutrition of miners and their families. Special Report Series no. 87. London: HMSO.
- Nelson, M. (1986). The distribution of nutrient intake within families. *British Journal of Nutrition* **55**, 267–277.
- Rizvi, N. (1978). Effects of food policy on intra-household food distribution in Bangladesh. *Food and Nutrition Bulletin* **5**, 30–34.
- Sadasivam, S., Kasthuri, R. & Subramaniam, S. (1980). Nutritional survey in a village of Tamil Nadu. *Indian Journal of Nutrition and Dietetics* **17**, 245–250.
- Sen, A. K. & Sengupta, S. (1983). Malnutrition of rural Indian children and the sex bias. *Economic and Political Weekly* **18**, 855–864.
- Senauer, B. (1990). Household behaviour and nutrition in developing countries. *Food Policy* **15**, 408–417.
- Senauer, B., Garcia, M. & Jacinto, E. (1988). Determinants of the intra-household allocation of food in the rural Philippines. *American Journal of Agricultural Economics* **70**, 170–180.
- Sharma, S. (1983). Food distribution pattern in farm families. MSc Thesis, Sukhadia University, Udaipur, Rajasthan.
- Takagi, K., Masuda, T. & Kida, N. (1979). A report of the food intake of farmers in single and double crop districts before the introduction of power cultivators. *Journal of the Science of Labour* **46**, 593–626.
- van Steenberg, W. M., Kusin, J. A., Nordbeck, H. J. & Jansen, A. A. J. (1984). Food consumption of different household members in Machakos, Kenya. *Ecology of Food and Nutrition* **14**, 1–9.
- United States Department of Agriculture (1899). Chemical composition of American food materials. Bulletin no. 84. Washington, DC: Government Printing Office.
- Wheeler, E. F. & Abdullah, M. (1988). Food allocation within the family. In: *Coping with Uncertainty in the Food Supply*, [I. de Garine and G. A. Harrison, editors]. Oxford: Clarendon Press.
- Whitehead, A. (1981). *Of Marriage and the Market*. London: CSE Books.
- World Health Organisation (1983). Measurement of Nutritional Impact. Geneva: WHO.