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1. INTRODUCTION

An important aspect of hunger and malnutrition which has been much discussed is the intra familv distribution of food[1]. The empirical work relating to India and Bangladesh suggests some sex and age bias in the distribution of food within the family. However, the available nutritional evidence does not appear to be conclusive and requires further examination.

One way of the testing the existence of discrimination would be to compare the food intakes of females and males after adiusting for their reouirements. This procedure involves a number of conceptual and practical difficulties. The principal difficulty lies in the collection of accurate data on food intakes at individual levels. The second main difficulty rests on the fact that requirements of food may be different for males and females depending on their bodv weight, age and activitv levels. The accurate estimation of the energy requirement of an individual is a difficult task in view of the fact that there are both inter and intra individual variations in energy requirements (Sukhatme 1978).

An alternative procedure to measure malnutrition is to observe certain anthropometric measurements such as height and weight for age. The data on such measurements are likely to be less susceptible to errors than that on the food intakes of individuals. This procedure is based on the assumption that the inadequate consumption of energy (food) leads to lower weight and height for age. Sen (1984) clearly puts greater emphesis on this procedure than that on food intakes "It mav be more useful to look at the actual consequences of food disparity rather

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1. Among some of the important contributions are by Sen and Sengupta 1983), Kynch and Sen (1983), Sen (1984, 1985), Chen, Huq and D'Souza (1981) and more recently by Harriss (1986).

than trying to compare the intake disparity with the 'requirement' disparity".

In their study "Malnutrition of Rural Children and the Sex Bias" Sen and Sengupta (1983) measured the malnutrion of children by comparing their actual weights with the expected weights in relation to age. They constructed an index of undernourishment by giving a weight of 1 to slightly undernourished children, a weight of 2 to moderately undernourished, a weight of 3 to severely undernourished and a weight of 4 to disastrously undernourished. They applied this index to analyze malnutrition and sex bias in the two villages in rural West Bengal, viz., Shahajapur and Kuchli.

The main objective of this paper is to propose a new index of sex bias which is closely related to the famous Wilcoxon rank test (Wilcoxon 1945). The main advantage of this index is that its probability distribution is known and it can thus be used to test the hypothesis whether the sex bias is statistically significant. Needless to say how important it is to test such a hypothesis in order to establish the existence of sex bias.

The methodology developed in the paper is applied to analyze the sex bias in India. Three sources of data are used for this purpose. One relates to a survey carried out in 1979 of children affected by 1978 floods in West Bengal and the second to the nutritional survey of two villages conducted by Sen and Sengupta: The third data source is the diet and nutrition surveys conducted by the National Nutrition Monitoring Bureau in the calender year 1981 covering rural districts of seven states of India. These data allowed us to analyse sex bias at state level covering large population. The empirical results presented in the paper provide some new insight into the issue of sex bias.

2. INDEX OF UNDERNOURISHMENT USED BY SEN AND SENGUPTA

According to Sen and Sengupta, the total number of children are classified into five mutually exclusive groups, viz., 0, I, II, III and IV using "weight curves" from birth to five years of age. Group 0 corresponds to normal children who have weight 80 per cent or more of the international anthropometric standards, often called the "Harvard standard". Children falling in group I are referred to as "slightly undernourished", in group II, as "moderately undernourished" in group III as "severely undernourished" and in group IV as "disastrously undernourished".

In order to derive a single index of undernourishment, Sen and Sengupta gave weight of 1 for the slightly undernourished, 2 for the moderately undernourished, 3 for the severely undernourished and 4 for the disastrously undernourished and then normalized the total score so that the index lies between 0 (in the case everyone is normal) to 100 (in the case everyone is disastrously undernourished). Thus their index of undernourishment is given by

$$S = \frac{100 \times \sum_{i=1}^{4} i \, n_i}{4 \, n}$$

where n_i is the number of children falling in the i'th group and n the total number of children. In terms of this index, undernourishment score for Sahajapur girls is 54.5 and that of Sahajapur boys 52.5. From this, can we infer that the sex bias in Sahajapur is against girls? The answer depends on whether the difference between the two scores is significant. In the next section, we derive an index of sex bias which can be used to test the hypothesis whether the sex bias is statistically significant.

3. NEW INDEX OF MALNUTRITION DERIVED

Suppose the total number of children are divided into a group of m boys and n girls. Let X_i is the degree of malnutrition suffered by the i'th girl and Y_j the malnutrition suffered by the j'th boy. If we make pairs of boys and girls, it can be seen that the total number of pairs will be mxn. We assign each pair (X_i, Y_j) the score of 1 or 0 as X_i is greater or less than Y_j. When ties are present, i.e., $X_i = Y_j$ and it is then natural to assign the score $\frac{1}{2}$ to the pair (X_i, Y_j). Thus, we have

$$S(X_i, Y_j) = \begin{cases} 1 & \text{if} \quad X_i > Y_j \\ \frac{1}{2} & \text{if} \quad X_i = Y_j \\ 0 & \text{if} \quad X_i < Y_j \end{cases}$$

We wish to test the null hypothesis that there is no difference in the degree of malnutrition suffered by boys and girls against the alternative hypothesis that girls suffer greater malnutrition than boys.

Suppose the probability that a pair (X_i, Y_j) gets the score of 1 is p and 0 is q, obviously then the probability of a tie, i.e., $X_i = Y_j$ will be $(1 - p - q)$. Clearly, the null hypothesis would imply that $p = q$. A simple statistic to test this hypothesis will be the sum of scores of all possible pairs:

$$W^* = \sum_{j=1}^{m} \sum_{i=1}^{n} S(X_i, Y_j) \tag{1}$$

It can be seen that under the null hypothesis, $p = q$, $E[S(X_i, Y_j)] = \frac{1}{2}$ which gives

$$E\ (W^*) = \frac{1}{2}\, mn \tag{2}$$

Thus, we reject the null hypothesis if W is significantly different from E(W).

It is reasonable to say that if the degree of malnutrition suffered by all girls is greater than the most undernourished boy, the sex bias against girls is of extreme type. Under this extreme situation, W will be equal to mxn. Thus, normalizing W*, we obtain a new index of malnutrition as

$$K = \frac{2}{mn} \sum_{j=1}^{m} \sum_{i=1}^{n} S(X_i, Y_j) - 1 \tag{3}$$

which lies between -1 to 1. The negative values of K gives an indication of the bias against boys. If K is positive and significantly different from zero, it indicates that the sex bias is against girls.

In order to test the significance of K, it is necessary to derive its variance. It can be demonstrated that W* is related to the famous Wilcoxon statistic W as (Lehmann 1975):

$$W^* = W - \frac{1}{2} n(n + 1) \tag{4}$$

where W is asympotitically normally distributed with mean $\frac{1}{2}$ n(m + n + 1) and variance

$$\text{var } (W) = \frac{mn(m + n + 1)}{12} - \frac{mn \sum_{i-1}^{e} (d_i^3 - d_i)}{12(m + n)(m + n - 1)} \tag{5}$$

where e is the number of distinct values and that d_1 of the (m + n) observations are equal to the smallest value, d_2 to the next smallest, d_e to the largest. From (4) we note that the variance of W* is equal to that of W. Thus, the statistic K (which is related to W) will be asymptotically normally distributed with zero mean (under the null hypothesis) and the variance

$$\text{var}(K) = \frac{4}{m^2 n^2} \text{ var } (W) \tag{6}$$

which provides a reasonably good approximation for computing critical values and significance probabilities when both m and n are greater 10.

3. COMPUTATION OF NEW INDEX FROM THE GROUPED DATA

If the individual observations on the degree of malnutrition suffered by boys and girls are available, one can easily compute K from (3), Since these observations are not available to us, we resort to estimating K from the grouped data given in Sen and Sengupta (1983). The data are typically given in the following form

	Normal	Slightly under-nourished	Moderately under-nourished	Severely under-nourished	Disastrously under-nourished	Total
Boys	m_1	m_2	m_3	m_4	m_5	m
Girls	n_1	n_2	n_3	n_4	n_5	n
Total	N_1	N_2	N_3	N_4	N_5	N

Since we are using only the grouped data, it will be necessary to assume that all boys and girls falling in the same group suffer exactly the same degree of undernourishment.

To compute K it will be easier to calculate first the mid-ranks of each group. The mid-rank of the first group is $\frac{N_1+1}{2}$ and the second group $N_1 + \frac{1}{2}(N_2 + 1)$. So, the general expression of the mid-rank of the i'th group will be

$$a_i = N_1 + N_2 .+N_{i-1} + \frac{1}{2}(N_i + 1)$$

then K given in (3) can be easily obtained as

$$K = \frac{2}{mn} \sum_{i-1}^{5} a_i n_i - 1 \qquad (7)$$

the variance of which is computed from (5) and (6), given $d_i = N_i$ for i = 1 to 5. The standard error of K reported in the next section is the squareroot of the variance of K. This information is sufficient to test the null hypothesis of no sex bias against girls.

5. SEX BIAS IN A SITUATION OF ECONOMIC DISTRESS

Is the sex bias greater or smaller in a situation of economic distress? If it is true that the food needs of males get first priority in intra-family distribution of food, one would expect greater sex bias when the family is in a situation of economic distress. In order to test this hypothesis we considered the data obtained from a survey carried out in 1979 covering the areas damaged by the 1978 floods in rural West Bengal. The children were classified into four groups, viz., normal and suffering respectively from grades I, II and III undernutrition. The numerical results on the sex-bias index and its standard error are presented in Table 1.

It can be seen from the table that the sex bias is highly significant (at 1 % level of significance) among children up to four years of age. The difference in the degree of malnutrition suffered by females and males is particularly very high among children less than one year of age. However, the sex bias is insignificant (even at 5 % level) among children in the age groups 49-60 months and 61-72 months. These results provide a strong evidence for the existence of sex bias among younger children. It is odd that the sex bias is so much reduced (even it becomes insignificant) among older children (5 to 6 years old). Why should families discriminate against younger girls and not the older ones in a situation of economic distress? The available data are insufficient to provide definitive explanation for such a phenomenon.

6. SEX BIAS IN THE TWO VILLAGES

The analysis in this section is based on the studies of nutritional conditions of children below 5 years in the two villages of Sahajapur and Kuchli (Sen and Sengupta 1983).

First of all we test the hypothesis of no difference in the nutritional conditions of children in the two villages against the alternative that Kuchli has the better over-all nutritional record. The significance of this hypothesis can be tested in the same way as the non-existence of sex bias. The same index is used for this purpose but we refer to it as the village bias index. The numerical results are presented in Table 2.

TABLE 1 : MALNUTRITION AND SEX BIAS: WEST BENGAL 1979

Grades of Malnutrition	0-12 months		13-24 months		25-36 months		37-48 months		49-60 months		61-72 months		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Severe (III)	7.1	11.3	18.2	26.2	9.4	16.6	6.0	10.5	6.5	7.6	4.1	10.3	9.2	14.6
Moderate (II)	14.3	16.5	24.0	30.3	26.3	31.6	23.6	36.9	24.3	29.6	14.8	30.7	22.6	30.0
Slight (I)	38.1	47.4	44.8	32.8	43.3	36.4	41.2	26.8	39.0	35.9	48.7	25.7	42.1	34.8
Normal	40.5	24.8	13.0	10.7	21.0	15.4	29.2	25.8	30.2	26.9	32.4	33.3	26.1	20.6
Sex Bias Index	17.33		14.56		14.86		15.21		6.70		14.48		13.75	
Standard error	6.77		5.82		5.07		5.49		6.22		10.82		2.51	
Test statistics	2.56*		2.50*		2.93*		2.77*		1.08		1.34		5.48*	

* Significant at 1 % level of significance.

TABLE 2: MALNUTRITION AND VILLAGE BIAS

Grades of Malnutrition	Girls		Boys		All children	
	Sahajapur	Kuchli	Sahajapur	Kuchli	Sahajapur	Kuchli
Disastrously	9	8	6	7	7	8
Severely	35	40	33	12	34	27
Moderately	27	27	32	33	30	30
Slightly	23	15	23	26	23	20
Normal	6	10	6	21	6	16
Village bias index	-2.78		27.20		10.42	
Standard error	10.56		10.67		7.48	
Test statistic	-.26		2.55*		1.39	

* Significant at 1 % level.

The negative value of the village bias index indicates a better nutritional condition of girls in Sahajapur than in Kuchli, but the value of index is statistical insignificant. Thus, the hypothesis of no difference in the nutritional condition of girls in the two villages can not be rejected. But in the case of boys, the index is highly significant at 1 % level indicating that the boys are better nourished in Kuchli than in Sahajapur. The value of village bias index for all children is not significant at 5 % level. Hence the hypothesis of no difference in nutritional conditions of children in the two villages can not be rejected in favour of the alternative hypothesis that Kuchli has the better over-all nutritional record. This observation at least casts doubt on Sen and Sengupta's statement that the children in Kuchli are

TABLE 3 : MALNUTRITION AND SEX BIAS: SAHAJAPUR LANDED STATUS

Grades of Malnutrition	Landed		Landless		Total	
	Boys	Girls	Boys	Girls	Boys	Girls
Disastrously	11	4	2	13	6	9
Severely	33	34	32	35	33	35
Moderately	23	27	41	27	32	29
Slightly	25	23	20	23	23	21
Normal	8	12	5	2	6	6
Sex Bias Index	-8.23		13.75		4.51	
Standard error	14.46		12.11		9.25	
Test statistics	-.57		1.13		.49	

better nourished than those in Sahajapur.[2]

Tables 3 and 4 present the calculations of sex bias index according to the landed status of households in Sahajapur and Kuchli, respectively. The results indicate the existence of a sharp sex bias in Kuchli (significant at 1 % level) whereas in Sahajapur, the sex bias is statistically insignificant (even at 5 % level). In Sahajapur, the sex bias among landed households tends to favour girls whereas among landless households it is against girls. But the magnitude of sex bias in both cases is not significant.

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2. Sen and Sengupta arrived at this conclusion on the basis of a more general criterion of Lorenz curve dominance but still the difference in the nutritional condition of children in the two villages can be statistically insignificant.

TABLE 4: MALNUTRITION AND SEX BIAS: KUCHLI LANDED STATUS

Grades of Malnutrition	Landed		Landless		Total	
	Boys	Girls	Boys	Girls	Boys	Girls
Disastrously	6	3	14	33	7	8
Severely	14	38	0	45	12	40
Moderately	29	28	57	22	33	27
Slightly	28	18	15	0	27	15
Normal	23	13	14	0	21	10
Sex Bias Index	25.35		63.49		31.99	
Standard error	13.12		28.75		11.90	
Test statistics	1.93*		2.21*		2.69*	

In Kuchli, the sex bias is highly significant among both landed and landless households. Why is sex bias so much higher in Kuchli than Sahajapur? One of the reasons could be that in Kuchli the land reform policy has been much more successful, resulting in the fact that only 18 per cent of the children now belong to landless families, as opposed to 60 per cent in Sahajapur (Sen and Sengupta 1983). The numerical results tend to indicate that the sex bias is higher among landless families than that among landed families. Hence Kuchli which has considerable larger number of landed families must show lower sex bias than Sahajapur. But quite opposite picture emerges.

TABLE 5 : MALNUTRITION AND SEX BIAS: SAHAJAPUR - MOTHER'S EDUCATION

Grades of Malnutrition	Literate Mothers %		Illiterate Mothers %	
	Boys	Girls	Boys	Girls
Disastrously	0	0	8	13
Severely	29	26	32	36
Moderately	30	41	33	28
Slightly	29	13	21	23
Normal	12	20	6	0
Sex Bias Index	-6.19		11.58	
Standard error	18.85		10.73	
Test statistics	-.33		1.08	

We performed some further statistical tests and found that the difference in sex bias among landed and landless families was insignificant at 5 % level in both villages. Thus these results suggest that the landed status of families is not the reason for the existence of high sex bias in Kuchli.

Tables 5 and 6 present results on sex bias according to the education of mother in the family. It can be seen that in Sahajapur, families with illiterate mothers show greater sex bias than those with literate mothers. This is not surprising because it is generally believed that the education of mothers reduces the sex bias, against female children. However, in both cases the sex bias is insignificant at 5 % level.

TABLE 6: MALNUTRITION AND SEX BIAS: KUCHLI - MOTHER'S EDUCATION

Grades of Malnutrition	Literate Mothers %		Illiterate Mothers %	
	Boys	Girls	Boys	Girls
Disastrously	6	6	8	10
Severely	7	44	15	37
Moderately	25	28	39	26
Slightly	43	16	15	14
Normal	19	6	23	13
Sex Bias Index	47.57		23.33	
Standard error	19.48		15.12	
Test statistics	2.44*		1.54	

* Significant at 1 % level of significance.

In Kuchli village, the sex bias is highly significant among families with both literate and illiterate mothers. However, the most surprising conclusion that emerges is that the sex bias is considerably higher among families with literate mothers (not with illiterate mothers as was the case in Sahajapur). Thus, these results do not suggest any definitive association between the mother's education and sex bias within the family.

Finally we present the numerical results on sex bias according to the caste groups (Tables 7 and 8). There are three caste groups, viz., Hindu, schedule caste and schedule tribe. Among the Hindu families of Sahajapur, the sex bias appears to be favouring girls rather than boys but the magnitude is statistically insignificant. The sex bias is also insignificant among schedule cast and schedule tribe families. But in Kuchli the sex bias is significant at 5 % level among Hindu and schedule tribe families but it is insignificant among schedule cast families.

TABLE 7: MALNUTRITION AND SEX BIAS: SAHAJAPUR - CASTE GROUPS

Grades of Malnutrition	Caste Hindu		Schedule Caste		Schedule Tribe	
	Boys	Girls	Boys	Girls	Boys	Girls
Disastrously	11	0	4	5	4	20
Severely	22	32	40	48	34	28
Moderately	30	27	34	36	35	24
Slightly	26	23	22	11	19	28
Normal	11	18	0	0	8	0
Sex Bias Index	-9.26		13.25		14.31	
Standard error	16.24		16.31		15.74	
Test statistics	-.57		.81		.91	

In Kuchli, the sex bias is highest among schedule tribe families with a value of 47.22 % whereas in Sahajapur its value is only 14.31 % (which is statistically insignificant). One of the explanation of it (provided by Sen and Sengupta) is that Sahajapur has a public feeding programme covering all schedule tribe children which does not discriminate against girls the way in which families would do, whereas in Kuchli such a programme of public intervention does not exist.

It is interesting to note that among schedule caste children the sex bias is insignificant in both the villages despite the fact that these children are not covered by the public intervention programme in either of the two villages. What are the features of schedule caste families which prevent the existence of sex bias? It is difficult to provide any definitive explanation of it without knowing the internal structure of

TABLE 8: MALNUTRITION AND SEX BIAS: KUCHLI - CASTE GROUPS

Grades of Malnutrition	Caste Hindu		Schedule Caste		Schedule Tribe	
	Boys	Girls	Boys	Girls	Boys	Girls
Disastrously	13	0	0	9	13	22
Severely	6	53	17	23	12	56
Moderately	31	23	33	36	38	11
Slightly	38	18	22	18	12	0
Normal	12	6	28	14	25	11
Sex Bias Index	31.98		26.26		47.22	
Standard error	19.70		17.95		27.91	
Test statistics	1.62*		1.46		1.69*	

* Significant at 5 % level of significance.

these families. Furthermore, there exists no convincing explanation of sharp sex bias among Hindu children in Kuchli and almost no sex bias among the same caste children in Sahajapur. These are important issues and require further research.

It is interesting to note that most of the conclusion emerging from our analysis are similar to those arrived by Sen and Sengupta. Thus, our analysis provides a rigorous support to their results.

7. SEX BIAS AT STATE LEVEL: INDIA 1981

This section presents the analysis of sex bias at state level. The data for this purpose was obtained from the diet and nutrition surveys conducted by a National Nutrition Monitoring Bureau (at the National

Institute of Nutrition, Hyderabad) in the calender year 1981. The surveys relate to the rural districts of seven states, viz., Tamil Nadu, Andhra Bradesh, Utter Pradesh, Orrissa, Maharashtra, Karnataka and West Bengal. The analysis presented here relates to the nutritional conditions of children (both boys and girls) of 1-5 years. The body weights of all the pre-school children in different states were expressed as percentage of standard weight (Indian well-to-do) and grouped into four different nutritional grades, viz., normal, mild, moderate and severe (Gomez´s classification).

First of all we test the hypothesis of no difference in the nutritional conditions of children in different states. This was done by making all possible pairwise conparisons of different states. As an example, let consider two states Tamil Nadu and Maharashtra, then our null hypothesis is that there is no difference in the nutritional conditions of children in the two states against the alternative that Tamil Nadu has greater malnutrition than Maharashtra. Again, the sex bias index developed in this paper can be used to test the significance of this hypothesis. The numerical results are presented in Tables 9, 10 and 11.

For instance in Table 9, the hypothesis of no difference in nutritional conditions of children in the following pairwise comparisons could not be rejected at 5 % level or significance.

Maharashtra	-	Karnataka
Maharashtra	-	Orrissa
Karnataka	-	Orrissa
Karnataka	-	Andhra Pradesh
Orrissa	-	Andhra Pradesh
Orrissa	-	West Bengal
Andhra Pradesh	-	West Bengal

TABLE 9: PAIRWISE COMPARISONS OF NUTRITION STATUS OF INDIAN STATES 1981: ALL CHILDREN

States	Tamil Nadu	Maharashtra	Karnataka	Orrissa	Andhra Pradesh	West Bengal	Utter Pradesh
Tamil Nadu	-	6.73**	8.922*	13.16*	13.52*	17.63*	24.09*
Maharashtra		-	2.01	6.21	6.47**	10.48*	16.88*
Karnataka			-	4.28	4.54	8.61**	15.23*
Orrissa				-	2.12	4.25	10.88**
Andhra Pradesh					-	4.07	10.83*
West Bengal						-	6.86**
Utter Pradesh							-

* Significant at 1 % level.

** Significant at 5 % level.

TABLE 10: PAIRWISE COMPARISON OF NUTRITION STATUS OF INDIAN STATES 1981: GIRLS

State	Tamil Nadu	Orrissa	Maharashtra	Karnataka	Andhra Pradesh	West Bengal	Utter Pradesh
Tamil Nadu	-	4.77	7.59	10.81**	18.50*	19.38*	30.72*
Orrissa		-	2.59	5.52	12.83**	13.68**	24.56*
Maharashtra			-	2.58	9.71**	10.55**	21.64*
Karnataka				-	7.50	8.38	20.44*
Andhra Pradesh					-	.90	13.67*
West Bengal						-	12.81**
Utter Pradesh							-

* Significant at 1 % level.

** Significant at 5 % level.

TABLE 11: PAIRWISE COMPARISON OF NUTRITION STATUS OF INDIAN STATES 1981: BOYS

States	Tamil Nadu	Maharashtra	Karnataka	Andhra Pradesh	West Bengal	Utter Pradesh	Orrissa
Tamil Nadu	-	6.95	7.20	9.24**	15.51*	20.13*	21.43*
Maharashtra		-	.24	2.27	8.55	13.12**	14.54**
Karnataka			-	2.02	8.29	12.85*	14.29**
Andhra Pradesh				-	6.28	10.84**	12.33**
West Bengal					-	4.50	6.11
Utter Pradesh						-	1.81
Orrissa							-

* Significant at 1 % level.

** Significant at 5 % level.

and the remaining 14 pairwise comparisons the differences were significant at 1 % level (except in the case of Orrissa - Utter Pradesh the difference was significant at 5 % level).

These three tables led to the following ranking of states according the nutritional conditions of girls, boys and all children.

GIRLS	BOYS	CHILDREN
Tamil Nadu	Tamil Nadu	Tamil Nadu
Orrissa	Maharashtra	Maharashtra
Maharashtra	Karnataka	Karnataka
Karnataka	Andhra Pradesh	Orrissa
Andhra Pradesh	West Bengal	Andhra Pradesh
West Bengal	Utter Pradesh	West Bengal
Utter Pradesh	Orrissa	Utter Pradesh

It can be seen that Tamil Nadu has the highest degree of malnutrition among children and Utter Pradesh the lowest (except in the case of boys, Orrissa has the lowest degree of malnutrition). The ranking of states changes substantially when they are ranked according to the nutritional status of girls, boys or children (girls and boys together).

The numerical values of sex bias index are presented in Table 12. It can be seen that the sex bias index is negative and highly significant (at 1 % level) in all states except in Orrissa, where it is positive and insignificant (even at 5 % level). These results suggest the existence of a strong sex bias against male children. This is indeed very surprising in view of the common belief that there is discrimination against females in intra-family food allocation.

Indian demographic data show that death rates are sustantially higher for females than for the males upto the age of mid-thirties (Sen 1985). India is also one of the exceptional countries in the world in

TABLE 12: SEX BIAS IN INDIAN STATES 1981

Grades of Malnutrition	Tamil Nadu		Karnataka		Andhra Pradesh		Maharashtra		Orrissa		West Bengal		Utter Pradesh	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Severe	9.6	7.1	6.1	5.0	4.9	2.8	5.6	6.5	1.8	4.9	1.8	2.4	.6	2.3
Moderate	42.8	34.5	41.3	28.4	41.0	23.9	42.6	32.7	32.8	37.7	39.9	23.8	35.5	18.0
Mild	38.9	46.7	41.3	49.5	42.1	53.8	40.0	39.9	50.9	37.7	44.0	53.7	50.9	48.4
Normal	8.7	11.7	11.3	17.1	11.9	19.5	11.8	20.9	14.5	19.7	14.3	20.1	13.0	31.3
Sex bias index	-11.51		-15.16		-21.10		-11.71		4.47		-16.10		-24.59	
Standard error	5.22		4.96		4.62		5.84		10.03		5.84		6.30	
Test statistic	-2.21*		-3.06*		-4.59*		-2.00*		.45		-2.76*		-3.90*	

* Significant at 1 % level.

which female life expectancy is lower than male. Clearly these observations are not consistent with the existence of strong sex bias against males. One possible explanation may be that weight for age is not a suitable measure of malnutrition suffered by children. One of the major problems with anthropometric measurements relates to the difficulty of classifying children in different grades of malnutrition (other than severe) because of interinidividual variation in genetic potential (Harriss 1986). Moreover, the determination of exact age of children is always problematic particularly in rural areas.[3]

If male children do suffer greater degree of malnutrition than female children. the incidence of morbidity must also be higher among male children than that among female children. Unfortunately, data on morbidity for children are not available. we present in Table 13 incidence of morbidity figures for all males and females in selected states (derived from the 28th round of NSS). These figures clearly show that males are considerable more morbid than females are, thus supporting in a partial way our conclusion of strong sex bias against males. But before we jump to such a conclusion, it must be pointed out that morbidity data are subject to many limitations arising from the difficulty of defining and identifying morbidity (Vaidyanathan 1985). Moreover, there is some evidence that boys get more medical attention than girls, therefore, illnesses suffered by girls will be reported less frequently than those of boys, which will clearly lead to underestimation of incidence of morbidity among girls.

In this section we have arrived at a very controversial conclusion that there exist a strong sex bias against males. This conclusion must be qualified, however, because it is based on small samples compared to size of populations. Thus, the analyses presented here would serve the purpose of stimulating further careful research on this important subject.

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3. Sen and Sengupta (1983) point out the difficulty of getting accurate age data. In their empirical study they paid special attention to collect these data accurately, including double-checking the age information with the help of persons resident in the village familiar with exact history of every family. It is doubtful if so much attention could have been paid in the collection of such data at state level.

TABLE 13: INCIDENCE OF MORBIDITY

State	Incidence Rate		Prevalence Rate	
	Male	Female	Male	Female
West Bengal	12.4	10.3	30.6	24.7
Maharashtra	20.0	14.7	31.6	23.9
Tamil Nadu	20.2	21.1	34.6	33.3
Orrissa	17.7	11.4	29.1	19.4
Andhra Pradesh	21.9	19.8	32.8	30.9
Karnataka	8.6	8.2	16.1	13.7
Utter Pradesh	9.3	6.3	15.2	10.9

Source: Sarvekshana, July-October. 1980.

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