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SRI LANKA NUTRITIONAL STATUS SURVEY, 1988/89

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Summary. A Survey of nutritional status in all districts in Sri Lanka except the Northern and Eastern Provinces was carried out between October 1988 and February 1989. The survey unit was a household with at least one child below 10 months of age. Heights and weights of pre-school children were measured and transformed to indicators of malnutrition, namely, weight-for-age and height-for-age, and the standard deviation expressed as z-scores.

The national estimates for deficits in height-for-age (stunting), weight-for-age (wasting) and both deficiencies occurring concurrently are 36.4, 18.4 and 5.2 respectively. The incidence of stunting is high in the administrative districts of Kandy, Matale, Badulla, Nuwara Eliya and Moneragala. Comparisons with results of the 1980/82 survey shows a stagnation in height gain between 1980/82 and 1989/90, except in Nuwara Eliya, where the incidence of stunting has fallen from 64.3% to 41.8%, probably due to several nutrition-related Projects carried out in the estates since 1980. The incidence of wasting has increased from 12.3% in 1980/82 to 18.4%. The incidence of concurrent stunting and wasting has increased two-fold since 1980/82 in Matale and Moneragala, a particularly disadvantaged population with a large section reporting monthly incomes less than Rs. 700/—.

Among the determinants of malnutrition are birth order of the child, the mother's educational level, the father's occupation and the family income.

Key words : Nutritional Status, HAZ and WHZ scores. Determinants of malnutrition.

INTRODUCTION

The first national anthropometric survey, carried out in 1975/76 by the Ministry of Health, in collaboration with the Centre for Disease Control (CDC) with technical assistance from the USAID (1), did not include socio-economic determinants necessary for formulating policies pertaining to public health and community nutrition. This deficiency was made good in the national survey carried out by the Food aud Nutrition Policy Planning Division (FNPPD) of the Ministry of Plan Implementation in 1980 / 82 (2). In addiion to providing nutritional assessments at district and sectoral levels, this survey provided data on socio-economic indicators such as infant mortality, the purchasing power of households and the effectiveness of health care delivery through the Mother and Child Health (MCH) clinic system.

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It was thought that such surveys of the population should be repeated once every 7 years, to obtain information regarding changes. if any, in the nutritional status (as provided by anthropometric measurements) as well as on exogenous factors that have a bearing on nutritional status.

This is a report of a survey carried out simultaneously in all districts, between October 1988 and February 1989. The civil disturbances prevailing in the country prevented the survey being carried out in the Northern and Eastern Provinces, in the metropolitan area in the Colombo district and in some of the estates in the Nuwara Eliya district.

METHODOLOGY

Sampling.

The sampling was based on a simple randomized selection of clusters. The survey unit was a household with at least one child below 60 months of age, which was also the unit used in the 1980 / 81 FNPPD survey. As in that survey each census block was identified as a cluster.

The sample size for each district was worked out so that the sampling error was maintained below 2 percent, It was related to the number of pre-schoolers that should be in the sample, and was modified to give that number of households, when surveyed, that would include the given number of pre-schoolers. For this purpose it was assumed that 40% of the households will have at least one pre-schooler, and that every such household would have an average of 1.237 pre-schoolers.

Census blocks were selected randomly, one at a time (without replacement) from each district until the required sample size was reached. The randomly selected census block was surveyed and information on nutrition and related data collected only from those households with at least one pre-schooler. Forms F1 and F2 maintained by the Department of Census and Statistics were used as the sampling frames. Form F 2 (listing the census blocks) was updated to include new settlements, before the sample was drawn. Form F 1, listing households within the census block, was updated in the field.

A further 40% sub-samplo was drawn randomly from the sample selected for each district, to collect food consumption data. For a given sector in a district the sampling procedure was unbiased.

Survey.

Heights and weights of pre-scool children were measured and transformed into indicators of malnutrition. Heights were recorded in cm, using portable wooden measuring boards; children under 24 months of age were measured in the horizontal position. For measuring weight a Salter scale, graduated to 0.1kg was used. Height-for-age, weight-for-age and weight-for-height were calculated and compared with corresponding values of the NCHS/WHO reference population, to identify the incidence of 'shortness' (stunting) and 'thinness' (wasting), and stunting and wasting occurring concurrently. The data were standardized by computing the standard deviation as z-scores.

$$Z = Mo - Me/SDe$$

Where Mo = observed measurement, e.g., height or weight, of the individual in a given age or height group.

Me = expected measurement, e.g., median of reference population distribution.

SDe = standard deviation of the reference population distribution.

The z - score technique circumvents problems associated with the use of percent values of the median as cut-off points (3).

The z - scores will always have a normal distribution. The probability of a z - score taking a particular value can be calculated: e. g., z - scores with values less than - 1.96 will have a probability of less than 2.5% of occurrence, if the population is normally distributed.

Implementation

Field investigations were conducted by District Development Officers (DDO) trained by the training division of the Central Bank in the collection of data relating to determinants of malnutrition, and by the Nutrition Division of the Medical Research Institute, in anthropometry.

Seventeen districts were surveyed over a period of 6 months. The work in each district was co - ordinated by a Planning Officer of the FNPPD, who was assisted by 2 Plan Implementation Officers. Each district had 10 DDOs forming 5 separate survey teams. The census blocks randomly selected for the survey were grouped into 4 clusters, according to proximity. The survey teams operated in each cluster for a period of one week, each census block being completed in 2 days. The team visited all the houses in the census block that had at least one pre-schooler, measured the pre-schoolers and collected data on food consumption, for a period of 7 days, on a sub-sample of 40% from the census block.

After completion of a day's work, the schedules were edited and coded by the Plan Implementation Officers. On the completion of the survey in each district the completed schedules were transferred to the Food and Nutrition Policy Planning Division where the data was fed to computers. The data was analysed using standard computer software, namely, the SPSS for statistical analysis, and the CDC package for anthropometric data.

RESULTS

The acceptability of the data was first investigated. Standard demographic indicators derived form the data collected were matched with the corresponding national averages.

The mean household size and adult equivalent for the household with at least one pre-schooler, obtained from the survey, were 5.28 and 3.46 respectively, which were very close to the national averages of 5.65 and 3.88. The male/female ratio was 1/1.03, which is similar to the national figure. The descriptive statistics of anthropometric measurements of the sample, shown in Table 1, did not provide any valid reason for rejecting the sample.

Table 1. Descriptive statistics of the sample studied

	Height cm	Weight kg	HAZ	WHZ
Mean	85.12	10.74	-1.58	-1.14
S.D.	11.89	2.69	1.39	1.05
Minimum	49.01	2.60	-6.00	3.98
Maximum	115.00	22.00	5.71	5.68
Skewness	-0.30	-0.08	0.12	0.89
Kurtosis	-0.47	-0.04	1.45	2.40

HAZ Height - for - age Z - score

WHZ Weight - for - height Z - score

The CDC computer package, while transforming the anthropometric data into "proxy" indicators, checked the accuracy of anthropometric measurements, and rejected those falling outside the tolerance range. About 900 of the 7100 records fed into the computer were thus rejected. The remaining data were carefully scrutinised and cleaned before statistical analysis.

Table 2. Incidence of Stunting, Wasting and Concurrent Stunting and Wasting, by districts.

District Code	District	Population 10 -3	Sample Size	Stunting HAZ < -2	Wasting WHZ < -2	Concurrent
1	Colombo	1698	292	28.4	15.9	5.5
2	Gampaha	1389	324	19.4	12.3	2 2
3	Kalutara	827	327	33.3	14.6	4.6
4	Kandy	1126	448	51.6	14.3	6.0
5	Matale	357	341	40.9	26.3	12.0
6	NuwaraEliya	522	348	41 8	16.1	6.0
7	Galle	814	393	31.8	19.5	6.9
8	Matara	614	363	22.9	21.5	6.1
9	Kurunegala	1212	293	26.7	17.5	3.4
10	Puttalam	493	315	32.1	16.2	4.1
11	Anuradhapura	587	453	29.6	22 3	6.8
12	Polonnaruwa	262	383	30.4	21.2	7.0
13	Badulla	642	1060	46.3	14.7	5.2
14	Moneragala	279	314	42.0	29.4	11.1
15	Ratnapura	796	268	35.6	18.9	6.0
16	Kegalle	682	223	37.4	18.8	5.4
	SRI LANKA	12754	6172	36.4	18.4	5.2

The national estimate for deficits in height - for -age (stunting), weight-for - height (wasting) and both deficiencies occurring concurrently (Table 2) are 36.4, 18.4 and 5.2, respectively. The incidence of stunting is high in the administrative districts of Kandy, Matale, Budulla, Nuwara Eliya and Moneragala. These districts have a sizable estate population. The lowest incidence of stunting is seen in the administrative districts of Gampaha and Colombo. The incidence of wasting is high in the administrative districts of Matale, Polonnaruwa, Anuradhapura and Moneragala. With the exception of Matale, these disrricts are in the dry zone, where the population may have faced hardship following recurrent crop failures during the 3 years preceding the survey.

The national estimate for stunting (36.4%) has to be compared with a value of 36.6% obtained in the 1980 / 82 survey. There has been a stagnation in height gain of pre - schoolers during the intervening period. However, in the district of Nuwara Eliya, the incidence has reduced from 64. 3% in 1980 / 82 to 41.% in 1988 / 89, probably due to several nutrition related projects carried out in that district since 1980. An improvement in height gain is seen in most districts except in Colombo, Kalutara, Kandy and Moneragala.

The incidence of wasting has increased from 12.3% in 1980/82 to 18.4%. This increase is observed in all districts, Matale and Moneragala being the worst affected.

The incidence of pre - schoolers concurrently stunted and wasted has increased two - fold since 1980/82 in the Matale and Moneragala districts. These districts are in the "intermediate zone" and the sample poulation has been economically disadvantaged. A large section of the population in Matale (43.7%) and in Moneragala (68.9%) reported a monthly income less than Rs. 700/-.

Table 3 compares the incidence of stunting, by age groups, in the two survey periods.

Table 3. Incidence of Stunting (HAZ) by age categories, in 1980/82 and 1988/89

Age Months	Survey periods 1990/82	1988/89
6 - 11.9	18.57	21.90
12 - 23.9	34.04	38.50
24 - 35.9	33.66	33.20
36 - 47.9	41.35	39.90
48 - 60	48.52	44.50
All	36.58	36.40

There was an increase in stunting with increase in age, in the 1980/82 study. This is a cumulative effect and has been noticed in most surveys carried out earlier. It does not indicate a high rate of stunting among older children. However, in the present study, some improvement in the incidence of stunting is seen between 24 and 60 months, suggestive of a long - term improvement in the environment since 1982. The increase in stunting seen in the very young (6-24 months) is a more recent occurrence, perhaps associated with the social unrest in the country during 1987/88.

Table 4. Incidence of Wasting (WHZ) by age Categories

Age Months	Survey periods 1980/82	1988/89
6 - 11.9	14.1	13.5
12 - 23.9	21.6	21.0
24 - 35.9	10.9	17.7
36 - 47.9	4.1	20.1
48 - 60	6.6	18.9
All	12.1	18.4

The incidence of wasting is high in children between 12 and 24 months (Table 4), probably due to faulty weaning practices. There has been an upward trend in the incidence of wasting in all age groups, suggesting a short-term deterioration of the socioeconomic environment immediately prior to the 1988/89 survey. Females are not disadvantaged as regards the allocation of household resources. The incidence of stunting is the same among female and male children (Table 5) and males are more wasted than the females. The differences are not significant.

Table 5. Comparison of Nutritional Status of male and female children (1988/89 Survey)

	Sample Size	Stunting	Wasting
Males	3131	36.5	19.6
Females	3028	36.5	17.3

Figs 1, 2, 3, and 4 compare the weights and heights of the pre-school children with the NCHS 3rd centiles. Heights of Sri Lankan children almost coincide with the 3rd centile curve, while Sri Lankans tend to be lighter than the 3rd centile of the NCHS population, after the 24th month in the case of girls and the 36th month in case of boys.

Table 5. Influence of birth order on the nutritional status of pre-school children

Birth Order	N	Stunting (HAZ)	Wasting (WHZ)
1	1810	32,7	16.5
2	1627	34.6	17.4
3	1238	36.8	20.5
4	673	40.3	19.0
5	347	41.2	21.6
6	135	47.4	19.3
7	90	48.9	15.6
8	44	34.1	22.7
9	22	45.5	18.2
10	18	55 6	16.7
11	15	46.7	13.3

The data in Table 6 suggests that the greater the birth order, the greater are the chances of a child being malnourished.

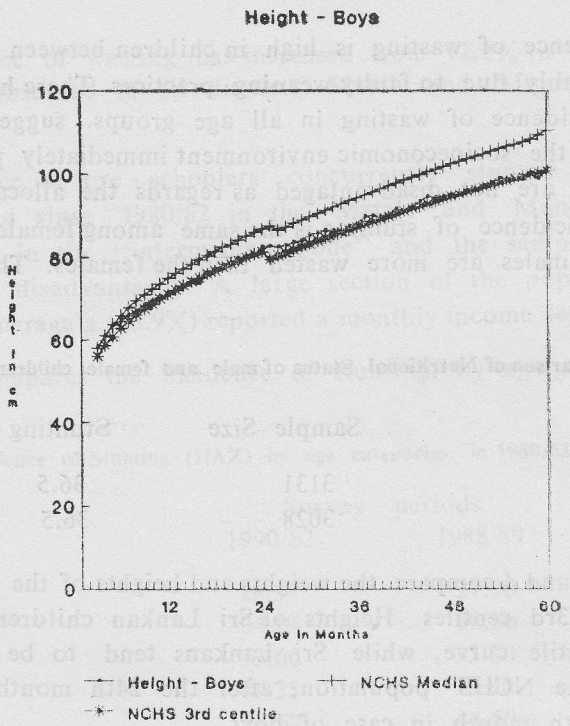

Fig. 1. Comparison of height distance curve of boys with NCHS curves

Table 7. Influence of the mother's educational level on the nutritional status of pre-school children

Educational level	N	Stunting (HAZ)	Wasting (WHZ)
No schooling	442	42.2	19.9
Grades 1 – 5	1314	39.2	17.9
Grades 6 – 8	1025	33.5	21.7
Grades 9 – 10	910	30.5	17.7
GCE (OL)	618	26.1	18.3
GCE (AL)	115	20.9	13.9
Degree	24	12.5	20.8

Table 7 shows that there is a close relationship between the educational level of the mother and the nutritional status of the child. The status is lowest among children whose mothers have had no schooling. The incidence of stunting decreases markedly with increase in the level of the mother's educational level.

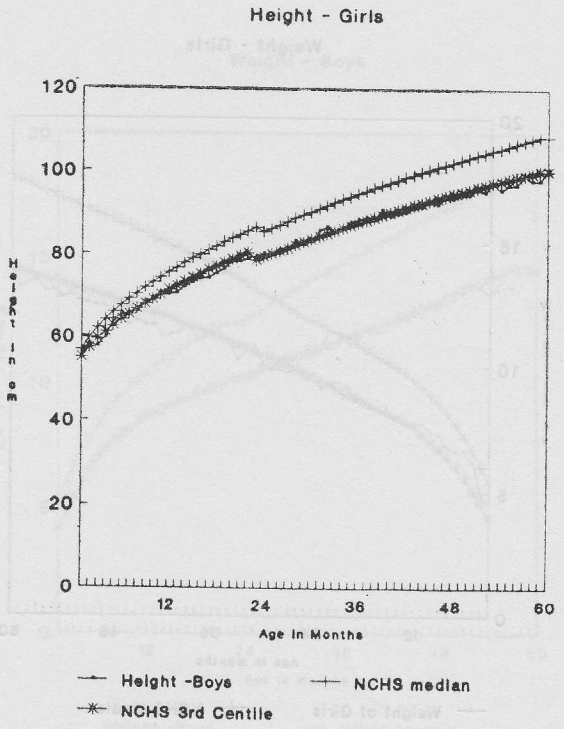

Fig. 2. Comparison of height distance curve of girls with NCHS curves

The mother's educational level is greatly influenced by her wealth the better educated mothers being more likley to have come from economically better households. Table 8 shows that the nutritional status of the child is greatly influenced by the level of income of the household. There is an improvement in the incidence of both stunting and wasting as income increases. The influence of poverty is greater at the lower end of income distribution.

Table 8. Influence of monthly household income on the nutritional status of pre-school children

Level of income Rs.	N	Stunting (HAZ)	Wasting (WHZ)
< 300	300	36.3	18.0
300 – 700	1190	41.1	21.4
700 – 1000	749	39.5	18.4
1000 – 1500	664	37.7	18.1
1500 – 2000	381	32.0	16.0
2000 – 2500	214	21.5	16.8
2500 – 3000	157	33.1	15.3
3000 – 5000	228	20.2	13.6

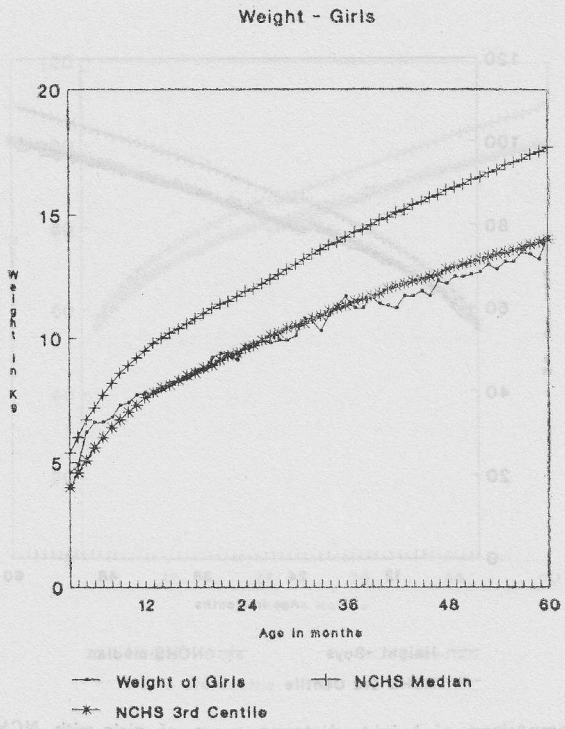

Fig. 3. Comparison of weight distance curve of boys wite NCHS eurves.

Table 9. Influence of the father's occupation on the nutritional status of pre-school children

Occupation	N	Stunting (HAZ)	Wasting (WHZ)
Professional	548	33·9	14·4
Middle – grade	232	25·9	15·1
Clerical	362	33·4	16·9
Minor–grade	88	35·2	18·2
Fisherman	72	43:1	22·2
Farmer	2246	39·1	20·4

The father's occupation, which would be influenced by the level of education of the father, is also a determinant of the child's nutritional status. Children in families where the bread-winner is a professional have a better chance of being well–nourished than children of farmers (Table 9). Children in fishing families are at a high risk of becoming malnourished.

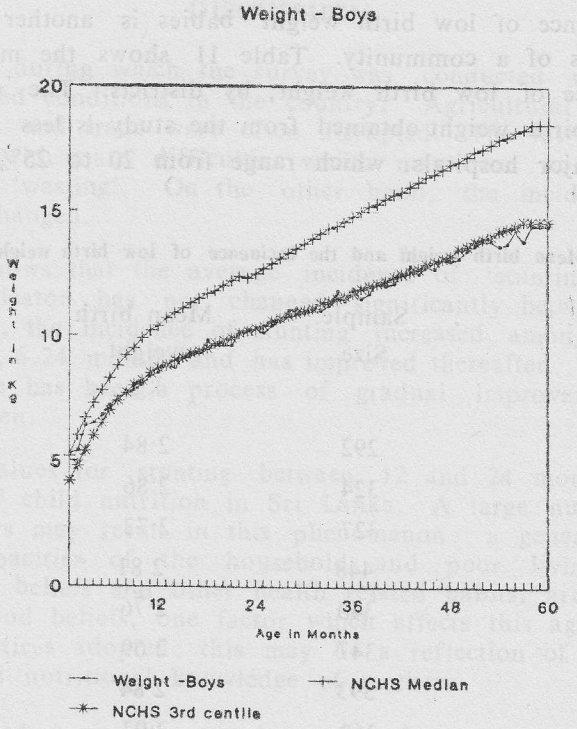

Fig. 4. Comparison of weight distance curves of girls with NCHS curves

Table 10. Influence of proxy indicators of wealth on the nutritional status of pre-school children

Proxy Indicator	N	Stunting (HAZ)	Wasting (WHZ)
Mud–house	1448	40·5	21·9
Cement–house	1730	26·6	15·9
Food–stamps	3605	39·4	19·6
No food–stamps	2418	30·6	16·1

Indicators of wealth are usefull in detecting children at high risk of malnutrition, and in trageting resources to arrest the problem of malnutrition in the family. Table 10 shows the effect of some indicators to income on the nutritional status of children.

The incidence of low birth weight babies is another indicator of the nutritional status of a community. Table 11 shows the mean birth weight and the incidence of low birth weight, by districts. The national figure of 18.5% for low birth weight obtained from the study is less than the incidence noted in the major hospitals, which range from 20 to 25%.

Table 11. Mean birth weight and the incidence of low birth weight, by districts

District	Sample Size	Mean birth weight kg	Incidence of low birth weight %
Colombo	292	2·84	18·2
Gampaha	324	2·86	18·4
Kalutara	327	2·72	23·5
Kandy	448	2·81	15·8
Matale	340	2·76	23·9
Nuwara Eliya	347	2·69	26·7
Galle	393	2·84	12·3
Matara	362	2·93	17·4
Hambantota	27	3·11	8·7
Kurunegala	292	2·78	18·1
Puttalam	315	2·63	28·6
Anuradhapura	453	2·86	15·6
Polonnaruwa	382	2·66	29·0
Badulla	1054	2·68	17·3
Moneragala	314	2·95	11·1
Ratnapura	267	2·78	20·5
Kegalle	222	2·85	20·5
SRI LANKA	6159	2·18	18·5

DISCUSSION

The period during which the survey was conducted was characterized by general unsettled conditions in the country. Agricultural production was low and transport and trade were often disrupted. The low income households were faced with many difficulties which may have contributed to the high incidence of 'wasting'. On the other hand, the incidence of stunting has remained unchanged.

The data shows that the average incidence of 'stunting' measured by height–for–age indicator has not changed significantly between 1980/82 and 1988/89. However, the incidence of stunting increased amongst the younger age categories i. e, 6–24 months and has improved thereafter. This observation suggests that there has been a process of gradual improvement of height gain among children.

The high values for stunting between 12 and 24 months depicts the central problem of child nutrition in Sri Lanka. A large number of elosely inter–related factors may result in this phenomenon: a generally low level of acquirement capacities of the household and poor living environment, coupled with food beliefs and other health related habits, are a few of these factors. Among food beliefs, one factor which affects this age group are the poor weaning practices adopted; this may be a reflection of available household resources and nutritional knowledge of mothers.

The continued increasing trend in the frequency of stunting as age increases reflects an inability to adequately catch up what has been lost in linear growth during the earlier years (Table 3).

The incidence of 'wasting' has been deteriorating over the observed period; however, the average incidence of the deficit of weight–for–height between 1980/82 and 1989/89 has been 52 percent. Except for the 6–12 months age category, all other age categories are shown to have a higher incidence of wasting in 1988/89 compared to 1920/82, indicating a short term deterioration of the factors affecting nutritional status of the children.

Unlike height–for–age. weight–for–height can improve with additional food intake. The magnitude of the weight–for–height deficit begins to lessen once solid food is introduced (Table 4).

Age – wise analysis of the data suggest that there has been an improvement in nurtitional status since 1990 / 82, and that some deterioration has taken place around the period of the present survey (1988 / 89). Matale and Moneragala are the districts worst affected. This could be due to poverty. In both districts a large proportion of the population have a monthly income less than Rs. 700. In Nuwara Eliya there has been a reduction in chronic undernutritlon, from 61.0% in 1980 / 82 to 41.8%.

The sex difference of malnutrition measured using the indicators of height – for – age deficit (stunting) and weight – for - height deficit (wasting) is not statistically significant, although the incidence of wasting appears to be higher among the males than among the females.

Among the determinants of malnutrition are the birth order of the child, the mother's educational level, the father's occupation and the family income. Some caution is necessary in the interpetation of the data in Table 6. A child with a high birth order may be undernourished due to reasons other than the birth order itself. Birth order is closely related to household size and the child dopendency ratio. The data in Table 8 suggest that the nutritional status of the child could be improved by increasing the family income. Though income alone is not the sole determinant of nutritional status of children, the data confirm the general finding that nutritional status is closely associated with the level of poverty, at least at the low income levels.

Judging by occupation, fishermen and farmers are nutritionally worse off than the rest (Table 9). These two sectors are subjected to crop failures and are not assured of a steady income. Crop insurance has not proved to be a success. There appears to be a need to formulate a more suitable form of insurance to look after these two sectors.

The incidence of low birth weight, which is a proxy indicator of maternal nutrition, was 18·5% for the country. This value is slightly lower than values reported from the larger hospitals, which lie between 20 and 25%.

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The sample was drawn by using the Census Department Sampling Frames. Mrs Lalitha de Alwis and Mrs J. A. P. Balasuriya, Statistical Officers of the Department of Census & Statistics, were responsible for drawing the sample households.

The coding of the questionnaires was prepared by Messrs G. D. Gunadasa, M. D. Wilfred and Miss S. Almeida, Plan Implementation Officers.

The data analysis and the preparation of the report was done by the staff of the Nutrition & Janasaviya Division.

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