TECNICAL REPORT -11

# NATIONAL NUTRITION MONITORING BUREAU

## REPORT OF THE
## NNMB-NSSO LINKED SURVEY

## (1983-84)

**NATIONAL INSTITUTE OF NUTRITION**
Indian Council of Medical Research
Hyderabad - 500 007

# NATIONAL NUTRITION MONITORING BUREAU

# Report of the NNMB-NSSO Linked Survey (1983-84)

## NATIONAL INSTITUTE OF NUTRITION
### (Indian Council of Medical Research)
### Hyderabad - 500 007
### INDIA

**NATIONAL NUTRITION MONITORING BUREAU**

DIRECTOR : B.S. NARASINGA RAO

CENTRAL REFERENCE LABORATORY

Dr. N.Pralhad Rao

Sri J.Gowrinath Sastry

Dr. K.Vijayaraghavan

Dr. G.N.V.Brahmam

Sri G.Radhaiah

Sri T.Ramnath

| State | Officer-in-Charge | Medical Officer | Dietetian |
|---|---|---|---|
| Andhra Pradesh | Dr. N.Pralhad Rao | Dr.C.Rama Rao | Smt. Chandrakala Omkar |
| Gujarat | Dr.P.C.Shah | Dr. R.K.Gyani | - |
| Karnataka | Dr.(Mrs.) Jalaja Sundaram | - | |
| Kerala | Dr.(Mrs.) K.Malathy | | Smt. T.C.Chandraprabha |
| Madhya Pradesh | Dr. T.M.Khan | Dr. Maya Arora | Smt. M.G.Srikumari |
| Maharashtra | Dr. N.P.Barve | Dr. Dafal | Smt. S.J.Khan |
| Orissa | Dr.(Miss) Lilabati Pattanaik | - | Smt. S.A.Nandanwar |
| | | | Ms. Sukhalata Paikaray |
| Tamil Nadu | Dr. S.Mayurnath | Dr. A.K.Mishra | |
| | - | | Smt. K.Rajalakshmi |
| Uttar Pradesh | | Dr. T.Venkat Rao | |
| | | - | -- |
| West Bengal | Dr.(Mrs.) Reba Gupta | Dr. N.C. Saha | Miss J.Sengupta |

# TECHNICAL STAFF AT CENTRAL REFERENCE LABORATORY

1. Sri K.M. Kullah
2. Sri P.V.Parthasarathy
3. Sri M.Vijayaprasada Rao
4. Sri P. Venkateswara Rao
5. Smt. L.Panjamani
6. Sri P.M. Ramuloo
7. Sri V.Radhakrishna Rao
8. Sri S. Prabhakar
9. Sri Ch. Nagambika Prasad
10. Sri U.D. Awasthi
11. Sri D.P.R.Vithal
12. Sri K. Nageswara Rao
13. Sri Mohd. Yousuff

# CONTENTS

The National Nutrition Monitoring Bureau (NNMB), with the Central Reference Laboratory at NIN, Hyderabad, was established in 1971. The main objectives of the Bureau are to collect information on diet and nutrition situation at the State level annually, and to conduct periodic evaluation of the ongoing national nutrition programmes.

The Bureau has been operating in 10 States, viz. Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. Every year, each State unit has been conducting diet and nutrition surveys covering 500 households in rural areas and 250 households from five selected groups of urban population. In the year 1983, on the recommendations of the Scientific Advisory Committee, the NNMB surveys were linked with the consumer expenditure surveys conducted by the National Sample Survey Organization (NSSO).

The main objectives of the linked surveys were:

i) To test the feasibility of utilising the sample design of NSSO to NNMB operations.

ii) To examine the association between per capita expenditure data of NSSO and calorie consumption data of NNMB.

In this connection, several consultations were held with the Central Statistical Organization (CSO), New Delhi and the Indian Council of Medical Research (ICMR). Taking into account the manpower and other resources available with the NNMB, it was decided that the linked surveys could be undertaken by the NNMB in four States, covering a sample of 1500 households in each State.

STATES COVERED UNDER NATIONAL NUTRITION MONITORING BUREAU



States in which linked
Survey was carried out

* Shaded ones are the
States in which NNMB
in operation
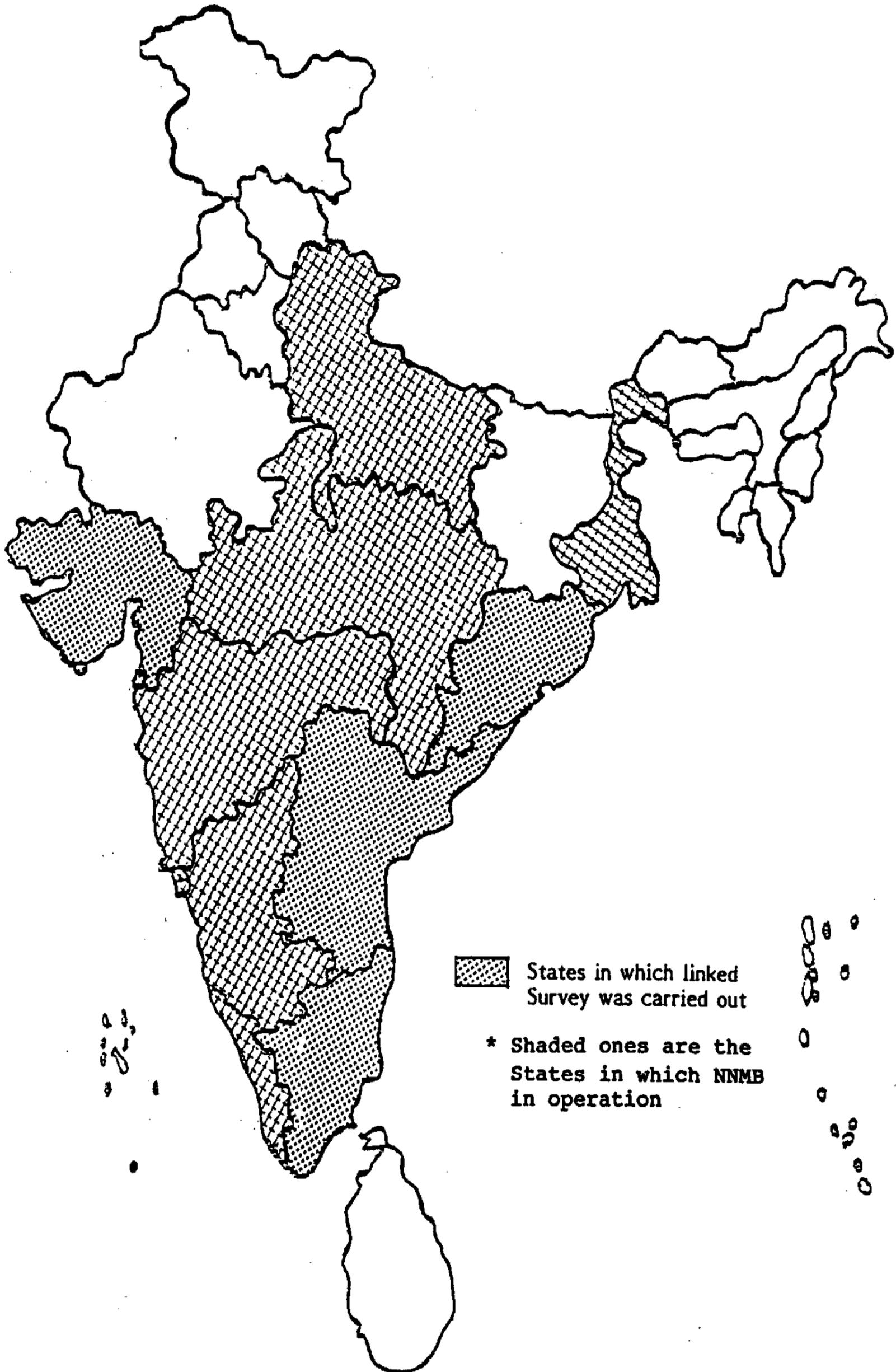
The teams from the ten State units of the NNMB were reorganised into four larger teams and each team* was assigned one State for the surveys.

## METHODOLOGY

The NNMB-NSSO linked surveys were undertaken in four States namely, Andhra Pradesh, Gujarat, Orissa and Tamil Nadu using the NSSO central sample as the sampling frame. From this frame, about 150 villages were selected in each State and were distributed equally in the four sub-rounds . In fact, the sample of villages was drawn from the master list prepared by the NSSO** representing agro-economic regions within each State. Since the coverage of villages by the NSSO was based on the total population, the number of villages varied from State to State. Therefore, the coverage of a fixed number of villages by the NNMB team resulted in different proportions of the central sample. These proportions were 25% in Andhra Pradesh, 33% in Tamil Nadu, 40% in Orissa and 53% in Gujarat of the NSSO Central Sample. The selection of the districts in each region was done randomly and the villages within each of these selected districts were also chosen on a random basis, so as to obtain the required

---

* Each team consisted of 2 Medical Officers, two Nutritionists and four Field Assistants and was provided with two vehicles.

** 'Note on sample design and estimation procedures' 38th sub-round Sample Design and Research Development, NSSO, Government of India 1983.

number of villages (150/State).   The list of districts selected is given in Table-1.

Coverage of Households

In each of the selected villages, all the ten households surveyed by the NSSO were covered for diet and nutritional assessment by the NNMB teams.

Out of the ten households, seven households were canvassed for one-day weighment diet survey which provided food consumption at the household level, while in the remaining three households oral questionnaire (24 hour recall) method of diet survey was employed to assess intra-family distribution of food.

In addition to food consumption, the survey included assessment of clinical and anthropometric status of population covered for the dietary assessment by NNMB.

The teams had some difficulty in locating the households surveyed by the NSSO as the time gap between the NNMB & NSSO surveys turned out to be fairly large (3-6 months) as against 4-6 weeks originally envisaged. This undue delay had been due to the fact that the State teams had to be reorganised and transferred to the four selected States. This entailed administrative delays, consequently during the actual survey, a number of households were found locked. To makeup this loss, the locked households were substituted by covering  the

neighbouring household belonging to the same ML code. The sample particulars are given in Table-2.

Analysis

The intakes were expressed in terms per Consumption Unit (CU) according to per capita expenditure(PCE) class. The following procedure was adopted to determine the adequacy or otherwise of the intakes of protein and calories at the household level.

The requirement of 2400 Kcal and 42.31 g (Requirement X 1.3=55) were taken to represent respectively the average calories and protein per CU (as suggested by the ICMR Expert Committee in 1981, Appendix I) The requirement curves were assumed to follow a Gaussian distribution with a coefficient of variation of 15%. To determine whether a particular household were consuming adequate amount of protein and calories, Mean-2SE was used as the cut-off level and if the intake of protein or calories per CU was found to be above this cut-off level, the household was considered to be consuming adequate amount of the particular nutrient. All the households were, thus, classified into different categories of protein-calorie adequacy and inadequacy.

Multipliers /Weighing Factors

The present study was carried out on a sample of households. The parameter estimates-can be obtained by different methods. The prominent among them are :

i) simple averages of district estimates and ii) weighted averages . The latter type of giving weightage to various characteristics which influence the estimate is called 'weighing factor' or 'multiplier'. In the present case the weights are: i) the size of the village ii) number of villages in the distrct and iii) population of the district. The 'multipliers' for each district in a given State are available with NSSO. The number of households surveyed in a village varied between NSSO and NNMB. In NSSO the number of households in a village is fixed ie.10 HH/village. Where as in NNMB , out of ten households, 7 households were covered under weighment method of diet survey and 3 households were surveyed under oral questionnaire (24 hour recall) method of diet survey. So with appropriate modifications (Appendix II), these multipliers were utilised in arriving at the estimates of i) food and nutrient intakes per comsumption unit ii) distribution of body weights of children according to Gomez classification iii) mean anthropmetric measurements (height, weight, upper mid arm circumference, fat fold at triceps) according to age and sex iv) protien and calorie adequacy and inadequacy status at household level and v) food and nutrient intakes according to per capita expenditure classes, at State level.

RESULTS

Expenditure Pattern

The monthly expenditure pattern i.e. the amount spent (Rs.) on all the consumer items as well as the money spent exclusively on food at the household level and per capita basis is presented in Table-3. In the States of Andhra Pradesh and Gujarat the per capita total expenditure was higher (around Rs.124) than that of the figure (around Rs.108) observed in the States of Tamil Nadu and Orissa. However, the per capita expenditure on food was found to vary within a narrow range of Rs.73-80 per month. Percentage of money spent on food to the total expenditure was found to be highest in Orissa(70.7%) followed by Tamil Nadu (67.8%),Gujarat (65.5%) and Andhra Pradesh(60.2%).

Food Consumption

The average daily consumption of foodstuffs (g) per consumption unit are presented in Table-4.

Cereals & Millets

In all the States, consumption of cereals and millets(g/cu/day) formed the bulk of the dietaries and their average intake ranged from a low 500 g in Tamil Nadu and Gujarat to a high level of 676 g in Orissa with 600 g in Andhra Pradesh.

Pulses

The average intake of pulses was around 30 g in the States of Andhra Pradesh, Tamil Nadu and Gujarat while in Orissa it was 35 g/cu/day.

Vegetables

In general, consumption of vegetable was far better in Orissa (109) compared to the other States with intakes ranging from about 50 g each in Andhra Pradesh and Gujarat to about 70 g in Tamil Nadu. The proportion of green leafy vegetables (considered to be rich and least expensive source of iron and B-carotene) to the total consumption of vegetables was very low in Tamil Nadu (9.6%) followed by Gujarat (9.8%), Andhra Pradesh (12.0%) and Orissa (27.5%).

Roots & Tubers

The maximum consumption of roots and tubers was seen in Orissa (68 g) followed by Gujarat (51 g), Tamil Nadu (41 g) and Andhra Pradesh (29 g).

Fruits

Average consumption of seasonal fruits ranged from 14 gm in Gujarat to 34 g in Andhra Pradesh with 16 and 18 g/cu/day respectively in Tamil Nadu and Orissa.

Flesh Foods

About ten to fifteen grams of flesh foods, including fish and eggs, were consumed in the States of Andhra Pradesh, Tamil Nadu and Orissa while in Gujarat their consumption was negligible (2g/cu/day).

<u>Milk & Milk Products</u>

Highest  consumption of milk and milk products was observed in Gujarat (182 ml) followed by Andhra Pradesh (63 ml), Tamil Nadu (44 ml) and Orissa (20 ml).

<u>Fats & Oils</u>

Consumption  of  visible  fat  varied  between  a narrow range of 7 to 15 g the intakes being 15 and 12 g respectively in Gujarat and Andhra Pradesh while in Orissa and Tamil Nadu the consumption was a low level of 7 g per cu per day.

When the invisible fat available in foodstuffs was also taken into account, the total fat intake showed two fold increase in the States of Gujarat (38 g), Andhra Pradesh (26 g) and Orissa (14 g) and in Tamil Nadu   the   rise   was   almost   three   fold.

<u>Sugar & Jaggery</u>

While  the  maximum  consumption  of  33  g  of sugar/jaggery   was   observed   in   Gujarat,   lowest consumption of 9 g was noticed in Andhra Pradesh and in Tamil Nadu & Orissa the intakes were 16 g in each State.

<u>Nuts, Oil seeds Condiments & Spices</u>

Except in Tamil Nadu, where consumption of nuts and  oil  seeds  per  day  was  about  10  g  ,  in  the remaining States the intake was negligible (0.3 g in Orissa to 3.0 g in Gujarat).

The highest consumption of condiments and spices which included chillies, tamarind and seeds of mustard, fenugreek, and cumin etc., was seen in Andhra Pradesh (25 g) followed by Tamil Nadu (22 g). The intakes were less than 10 g in Gujarat (8 g) and Orissa (5 g).

Thus, the food consumption pattern suggested that the diets in general, were predominently based on cereals and millets. The consumption levels were more than what has been suggested in least cost balanced diets (460 g/cu/day)) formulated by the ICMR. The consumption levels of pulses were low compared to the recommended levels of 40 g/cu/day, the consumption levels of protective foods like fruits, flesh foods and green leafy vegetables were also very low, compared to the levels suggested in least cost balanced diet. The intake of milk and milk products in all the States, except in Gujarat, was far below the figure (150 g) suggested in 'balanced diet'. The consumption of fats and oils was less in all four States compared to the recommended figure of 40 g.

Nutrients

The average intakes of various nutrients (per cu per day) derived from the above diets are given in Table-5 according to the States surveyed.

## Protein

In all the States, protein intakes were satisfactory. In three of the States viz. Andhra Pradesh, Gujarat and Orissa, the intakes were much above the recommended levels of 55 g/cu/day, while in Tamil Nadu it was just 55 g. Highest mean intake was observed in Gujarat (72 g).

## Energy

The average intake of energy varied from a low 2170 Kcal in Tamil Nadu to a maximum of 2750 Kcal in Orissa with Andhra Pradesh and Gujarat showing intake levels of about 2500 and 2370 Kcal per CU per day respectively. The intake levels in Andhra Pradesh and Orissa were much above the recommended level of 2400 Kcal, while in Tamil Nadu and Gujarat these were low. The deficit was about 10% in Tamil Nadu and 1% in Gujarat.

## Calcium

Except in the State of Orissa, where the calcium intake was marginally inadequate (390 mg) compared to the recommended level of 400 to 500 mg, in the rest of the three States the level of consumption was more than RDI.

## Iron

The average intake of iron in all the four States was around 30 g/cu/day which was higher than the level recommended by the ICMR expert committe (24 g).

<u>Vitamin A</u>

In none of the States, the intake levels of vitamin A were satisfactory . The average intake ranged from 230 ug in Tamil Nadu to 381 ug in Orissa- the levels much below the RDI level of 750 ug/cu/day.

<u>Vitamin B group</u>

In general, the intakes of Thiamine (Vitamin Bl) and Niacin appeared to be satisfactory in all the States. In the case of Riboflavin (Vitamin B2), the intakes were deficient in the States of Andhra Pradesh, Tamil Nadu and Orissa and satisfactory in Gujarat, which showed an intake of 1.39 mg/cu/day a level comparable to RDI.

<u>Vitamin C</u>

The average intake of vitamin C (Ascorbic acid) varied from about 32 mg in Gujarat to 58 mg in Orissa with Andhra Pradesh and Tamil Nadu having intakes of 33 and 39 mg/cu/day respectively. It may be mentioned that in the computation of vitamins, the cooking losses were not taken into account.

<u>Nutrient intakes according to percapita expenditure</u>

Means of the 11 nutrients in each of the 5 per capita expenditure classes are presented in Table – 6 to-9 (The number of per capita expenditure classes have been reduced from 13 classes to 5 classes so as to have adequate number of households in each class interval). In general a positive trend in the major nutrient

Vitamin A

In none of the States, the intake levels of vitamin A were satisfactory . The average intake ranged from 230 ug in Tamil Nadu to 381 ug in Orissa-the levels much below the RDI level of 750 ug/cu/day.

Vitamin B group

In general, the intakes of Thiamine (Vitamin Bl) and Niacin appeared to be satisfactory in all the States. In the case of Riboflavin (Vitamin B2), the intakes were deficient in the States of Andhra Pradesh, Tamil Nadu and Orissa and satisfactory in Gujarat, which showed an intake of 1.39 mg/cu/day a level comparable to RDI.

Vitamin C

The average intake of vitamin C (Ascorbic acid) varied from about 32 mg in Gujarat to 58 mg in Orissa with Andhra Pradesh and Tamil Nadu having intakes of 33 and 39 mg/cu/day respectively. It may be mentioned that in the computation of vitamins, the cooking losses were not taken into account.

Nutrient intakes according to percapita expenditure

Means of the 11 nutrients in each of the 5 per capita expenditure classes are presented in Table - 6 to 9 (The number of per capita expenditure classes have been reduced from 13 classes to 5 classes so as to have adequate number of households in each class interval). In general a positive trend in the major nutrient

of energy deficit was of greater magnitude than that of protein in the dietaries of rural population.

## Anthropometry

The means of four anthropometric measurements, viz., height, weight, mid-upper arm circumference (MUAC) and fat fold at triceps (FFT), are presented according to the age and sex for all the four States separately in Tables 11 to 18. The distance charts for height and weight are also presented in Figs. 1 to 4. In general, the anthropometric measurements for young children and adolescents belonging to Andhra Pradesh tended to be better than that of Tamil Nadu. However, in case of Orissa and Gujarat such clear cut differences were not visible as evidenced by the criss-crossing of the lines seen in figures.

## Weight for Age Status

The body weights for age of children (1-5 years) were compared against two different 'standards' - (i) Hyderabad well to do children representing local standards and (ii) NCHS representing International standards. The children were classified into different nutritional grades of Gomez : 'normals', 'mild' (Grade-I), 'moderate' (Grade-II) and 'severe' (Grade-III) malnutrition. Results of the distributional analysis using Hyderabad well-to-do standards are given in Table-19. The results showed that the State of

Fig-1.DISTANCE CHART FOR WEIGHT (MALES)

WEIGHT (Kg.)

AGE (Yrs.)

□ NCHS     + AP     ◇ GUJ     △ ORISSA     ✕ T.NADU
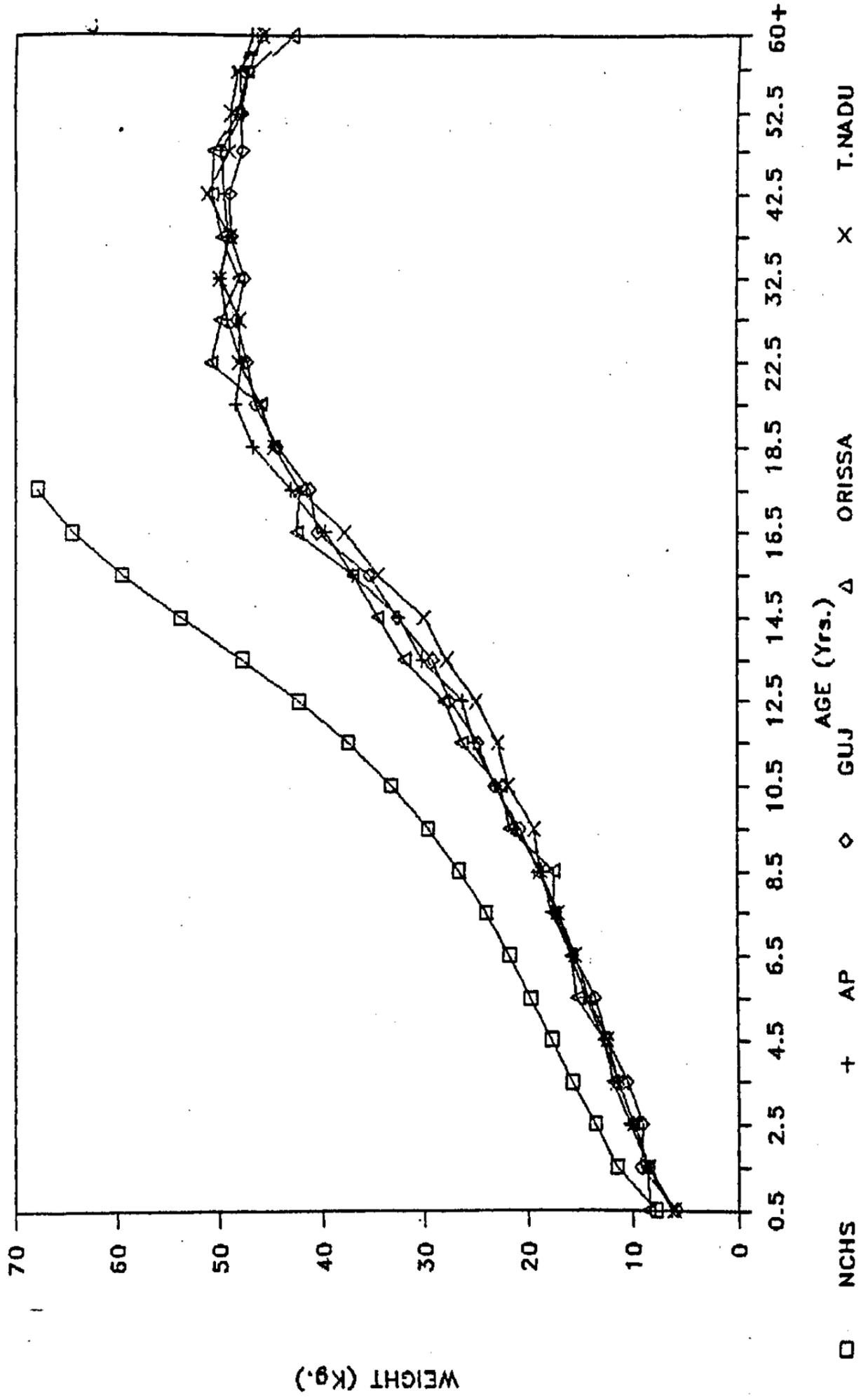
NCHS : NATIONAL CENTRE FOR HEALTH STATISTICS

Fig-2. DISTANCE CHART FOR WEIGHT (FEMALES)

WEIGHT (Kg.)

AGE (Yrs.)

□ NCHS    + AP    ◇ GUJ    △ ORISSA    × T.NADU
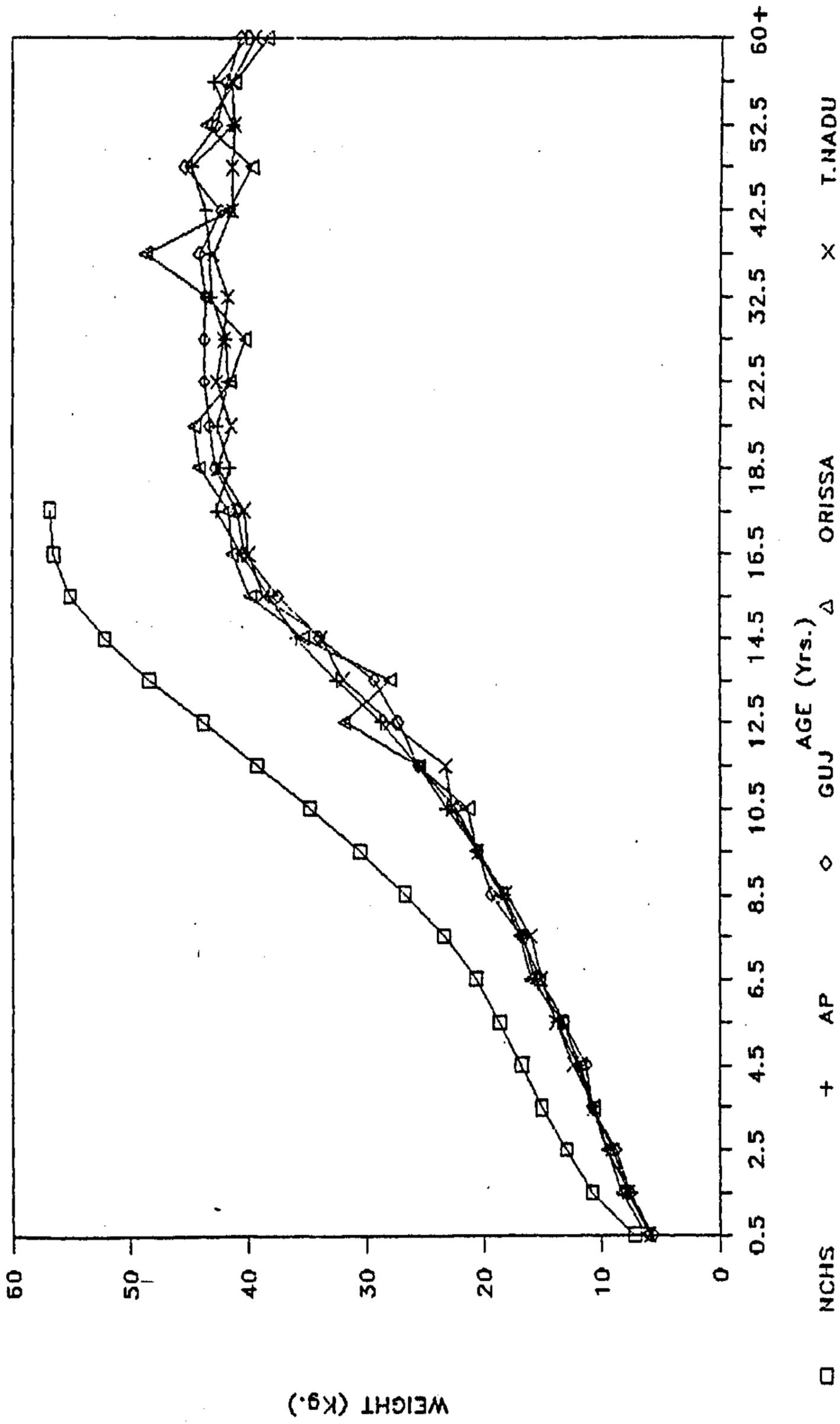
NCHS : NATIONAL CENTRE FOR HEALTH STATISTICS

# Fig-3. DISTANCE CHART FOR HEIGHT (MALLS)

HEIGHT (cm.)

180 —
170 —
160 —
150 —
140 —
130 —
120 —
110 —
100 —
90 —
80 —
70 —
60 —
50 —

0.5   2.5   4.5   6.5   8.5   10.5   12.5   14.5   16.5   18.5   22.5   32.5   42.5   52.5   60+

AGE (Yrs.)

□ NCHS        + AP        ◇ GUJ        △ ORISSA        × T.NADU
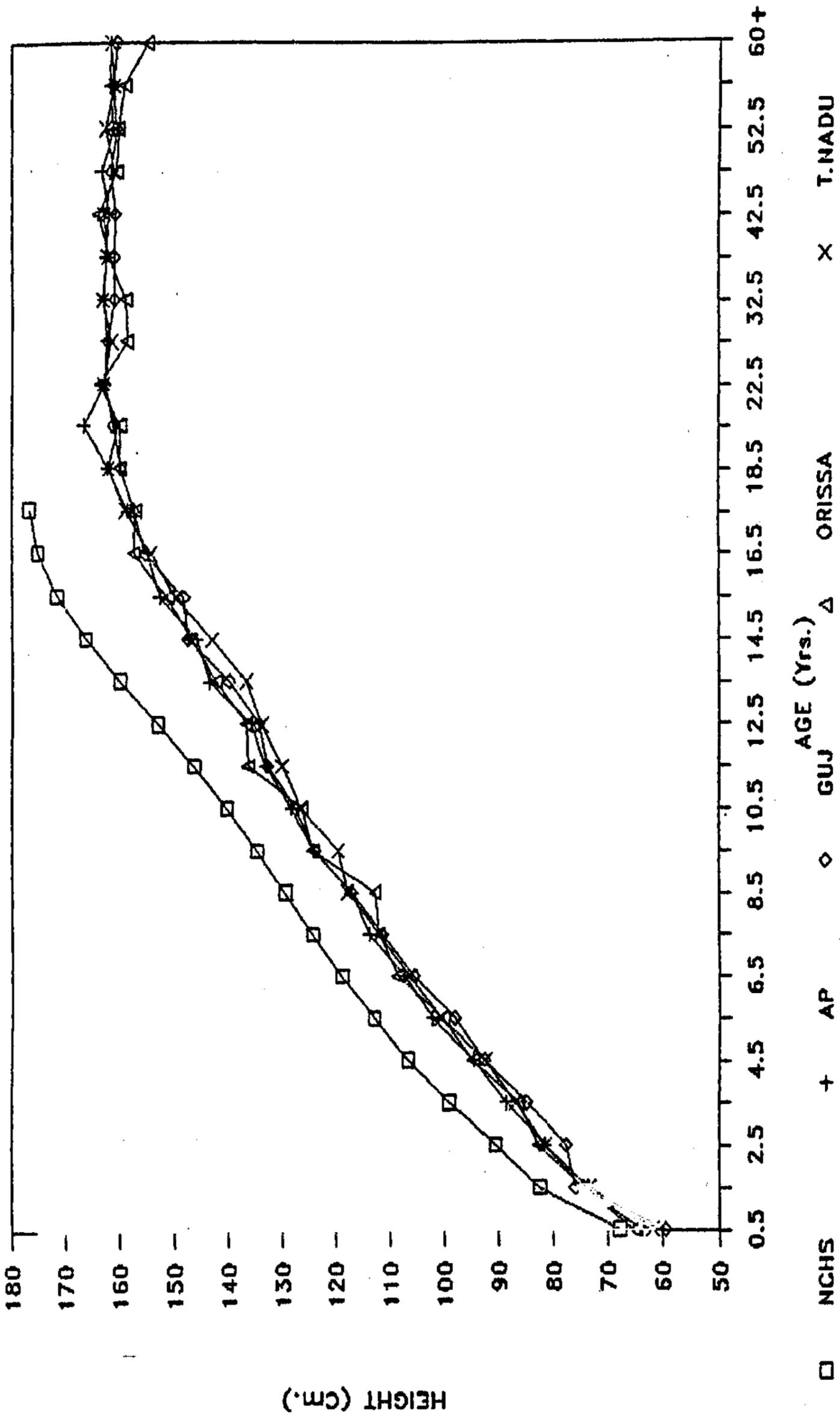
NCHS : NATIONAL CENTRE FOR HEALTH STATISTICS

# Fig-4. DISTANCE CHART FOR HEIGHT (FEMALES)



NCHS : NATIONAL CENTRE FOR HEALTH STATISTICS

□ NCHS  + AP  ◇ GUJ  △ ORISSA  × T.NADU
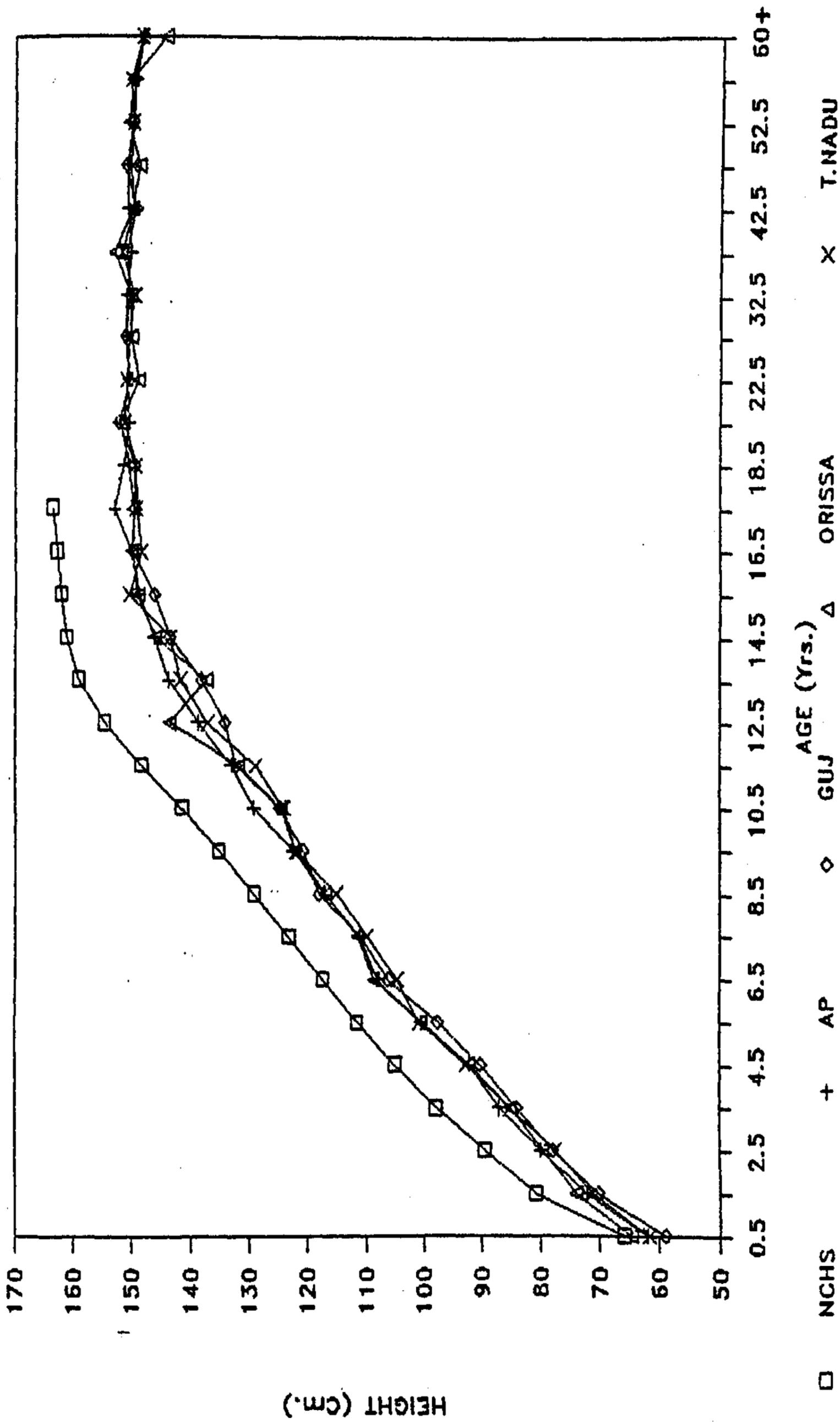
Gujarat had highest prevalence of (11.7%) 'severely' malnourished children followed by Tamil Nadu (6.3%) , Andhra Pradesh (4.3%) and Orissa (4.1%). When 'severe and moderate' forms of malnutrition were considered together, which from the stand point of health, constitute 'at risk' group (with body weight less than 75% of standard), the Gujarat with the highest proportion (51%) of 'at risk' children stood out as nutritioinally backward State, compared to the other three States in which the proportions of 'at risk' children were respectively 38%, 37%, 23% in Andhra Pradesh,Tamil Nadu and Orissa.

When the NCHS values were considered as Standards (Table - 20) though a higher extent of malnutrition was seen, the pattern was essentially similar i.e. Gujarat had not only the highest proportion of severely malnourished children (22.5%) compared to the other three States (having 7 to 14% severely malnourished) but also the highest 'at risk'group (71.2%) as compared to the other States (45 to 62%).

However, it is interesting that the distinct sex differences seen in the prevalence of malnutrition when Hyderabad well-to-do standards were applied (girls being better than the boys) tend not only to narrow down (as in Orissa and Tamil Nadu) but also show a reverse picture (as in Andhra Pradesh). The reasons for this discrepency are, however, not clear.

Nutritional Deficiency Signs

The clinical nutritional deficiency signs indicative of protein energy malnutrition (PEM), vitamin A and B-complex deficiencies etc., are presented according to the age-groups like infants, preschool children, school age children, adolescents and adults in Tables 21 to 31.

In all the four States, 84 to 93% of the infants did not have any overt deficiency signs. The prevalence of marasmus indicating severe PFM was 0.6% in the States of Andhra Pradesh to 1.1% in Orissa. Kwashiorkor, another form of severe PEM, was not seen. So also, vitamin A and B-complex deficiencies were observed in infants of Gujarat, Orissa and Tamil Nadu (0.9 to 4.4%). In the preschool age group, both the types of PEM, namely, kwashiorkor and marasmus were seen. The magnitude of kwashiorkor was much less compared to marasmus. The prevalence of vitamin A and B-complex deficiency signs among preschoolers was higher than that of the infants. These ranged from 0.5 to 9.9% in all the States.

Among the school age children (5-12 years), the common deficiency signs were those of vitamin A and B-complex deficiency. The extent of prevalence was the highest compared to infants and preschoolers. Dental caries and-mottling of teeth (suggestive of fluorosis) were also noticed in this age group. These rates were

less in girls compared to boys.   Similar findings were observed in adolescents also.   However, in adults vitamin deficiency signs which were the most common nutritional disorders ranged from 0.4% to 5.8%. The females, in general, had higher prevalence than the male counterparts - an observation in line with earlier reports.

Comments

1.   The present exercise of NNMB-NSSO linked surveys, undertaken by the NNMB in four States, suggested that the survey of food consumption and nutritional status ,using sampling design of NSSO, is technically feasible. However, it may be mentioned here that this could be achieved only by re-organising all the 10 NNMB State units into 4 'larger' units. One team consisting of the medical officer,one dietician/nutrinist with additional supporting staff of ANM/social worker, in each State, can cover a maximum sample of 750 households in an year. If the Bureau has to under take a similar survey in all the States, the inputs will have to be doubled. This also requires intensive planning, well in advance, for ensuring smooth co-rdination  between NNMB and NSSO.

2.   The estimates arrived on the basis of simple averages with respect to food consumption and nutrional status were found to be similar to the ratio estimates obtained by using NSSO 'multipliers'.

SUMMARY

A survey of food consumption and nutrional status was carried out on about 5068 households in four States of Andhra Pradesh, Gujarat, Orissa and Tamil Nadu during the year 1983-'84, This is a sub-sample of NSSO central sample of the '38th round'.

The results showed that cereals formed the bulk of the rural diets. Consumption of protective foods like pulses, green leafy vegetables and milk was below the levels recommended by ICMR. Energy inadequacy was predominant and ranged from 19% in Orissa to about 40% in Tamil Nadu. The consumption of Protein was by and large adequate. An increasing trend in the intakes of energy and protein was observed with increasing per capita expenditure (PCE||. The consumption of vitamin A was found to be inadequate, on an average, in all States.

The mean heights and, weights of the population surveyed were well below the NCHS standards. The extent of moderate to severe growth retardation, less than 75% of normal weight for age, varied from 45% in Orissa to 71% in Gujarat. Signs of protein energy malnutrion,vitamin A and B-complex deficiencies were observed in children below 5 years. In older children,adolescents and adults, only vitamin deficiencies were noticed.

Table - 1
LIST OF DISTRICTS SELECTED UNDER NNMB-NSSO LINKED OPERATION

| State | | ------------Agro-Economic Region ------------ (Climate) | | | |
|---|---|---|---|---|---|
| TAMIL NADU (20) | 201 (Coastal Northern) | 202 (Coastal) | 203 (Southern) | 204 (Inland) | |
| | Chingalpattu (02) South Arcot (04) | Tiruchirapalli(11) Pudakkottai | Tirunelveli(15) Kanyakumari(16) | Coimbatore(08) Nilgiris (09) | |
| ANDHRA PRADESH (02) | 021 (Coastal) | 022 (Inland Northern) | 023 (South Western) | 024 (Inland Southern) | |
| | Vizianagaram (02) East Godavari(04) Krishna (05) Prakasam (08) Nellore (09) | Adilabad (19) Nizamabad (18) Warangal (21) Nalgonda (23) Ranga Reddy(15) | Kurnool (13) | Chittoor (10) | |
| ORISSA (16) | 161 (Coastal) | 162 (Southern) | 163 (Northern) | | |
| | Cuttack (06) | Kalahandi (10) Bandh Khondmals (08) | Sambalpur (01) Keonjhar (03) Mayurbhanj (04) | | |
| GUJARAT (05) | 051 (Eastern) | 052 (Plains Northern) | 053 (Plains Southern) | 054 (Dry areas) | 055 (Saurashtra) |
| | Sabarkantha(09) Vadodara (15) Bharuch (16) Valsad (18) | Sabarkantha (09) Gandhinagar (11) Kheda (13) | Vadodara (15) Bharuch (16) Valsad (13) | Surendra- nagar (03) Banaskanta (08) | Jamnagar (01) Amrel (05) |

Figures refer to the NSSO code numbers

Table – 2
COVERAGE

| State | No.of Villages | | Percentage of villages not covered | Coverage of sample households | | |
|---|---|---|---|---|---|---|
| | Proposed | Covered | | Proposed | Covered | Weighment diet surveys* |
| Tamil Nadu | 156 | 156 | – | 1560 | 1560 | 1284 |
| Andhra Pradesh | 156 | 152 | 2.6 | 1560 | 1222 | 1053 |
| Orissa | 152 | 117 | 23.0 | 1520 | 1102 | 777 |
| Gujarat | 148 | 135 | 8.8 | 1480 | 1184 | 934 |
| Total | 612 | 560 | 8.5 | 6120 | 5068 | 4048 |

* Includes substituted households

Table – 3
COVERAGE, FAMILY SIZE AND EXPENDITURE

| State | Individual/ HH* | Consumption Units/HH | Number of HH | Expenditure (Rs.) on | | Percapita Exp.on | | % Expenditure on food |
|---|---|---|---|---|---|---|---|---|
| | | | | Food/HH | Total/HH | Food | Total | |
| Tamil Nadu | 4.43 | 3.92 | 892 | 325.21 | 479.37 | 73.41 | 108.20 | 67.84 |
| Andhra Pradesh | 4.76 | 4.28 | 847 | 357.60 | 594.07 | 75.17 | 124.88 | 60.20 |
| Orissa | 5.31 | 4.66 | 750 | 410.13 | 579.98 | 77.25 | 109.24 | 70.72 |
| Gujarat | 5.92 | 5.25 | 754 | 476.47 | 727.83 | 80.48 | 122.94 | 65.46 |

*HH : Household

## Table - 4
### ESTIMATES OF AVERAGE CONSUMPTION OF DIFFERENT FOOD STUFFS (G/CU/DAY)

|  | TAMIL NADU | ANDHRA PRADESH | ORISSA | GUJARAT | BALANCED DIETS* |
|---|---|---|---|---|---|
| No. of HHs. | 1057 | 1008 | 739 | 852 | |
| Cereals & Millets | 502 | 600 | 676 | 498 | 460 |
| Pulses | 30 | 29 | 35 | 30 | 40 |
| Leafy Vegetables | 7 | 6 | 30 | 5 | 40 |
| Other Vegetables | 66 | 44 | 79 | 46 | 60 |
| Roots & Tubers | 41 | 29 | 68 | 51 | 50 |
| Fruits | 16 | 34 | 18 | 14 | |
| Fish & Flesh foods | 11 | 17 | 13 | 2 | |
| Milk & Milk Products | 44 | 63 | 20 | 182 | 150 |
| Fats & Oils | 7 | 12 | 8 | 15 | 40 |
| Sugar & Jaggery | 16 | 9 | 16 | 33 | 30 |
| Nuts & Oil seeds | 9 | 1 | 0.3 | 3 | |
| Condiments & spices | 22 | 25 | 5 | 8 | |

* Nutritive Value of Indian Foods , ICMR, 1981.

## Table-5
### ESTIMATES OF AVERAGE NUTRIENT INTAKES (CU/DAY)

| Nutrients | RDA* | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|-----------|------|------------|----------------|--------|---------|
| Protein (g) | 55.0 | 54.6 | 61.9 | 65.3 | 71.6 |
| Energy (Kcal) | 2400 | 2170 | 2504 | 2748 | 2373 |
| Calcium (mg) | 450 | 581 | 483 | 387 | 588 |
| Iron (mg) | 24.0 | 28.5 | 30.3 | 31.9 | 30.9 |
| Vitamin A ( /ug) | 750 | 230 | 266 | 381 | 351 |
| Thiamine (mg) | 1.20 | 1.10 | 1.13 | 1.02 | 2.00 |
| Riboflavin (mg) | 1.40 | 0.78 | 0.79 | 0.75 | 1.39 |
| Niacin (mg) | 16.0 | 12.6 | 15.0 | 17.6 | 16.4 |
| Vitamin C (mg) | 40 | 39 | 33 | 58 | 32 |

* Recommended Dietary Allowances, ICMR,1981.

## Table 6
### ESTIMATES OF AVERAGE INTAKE OF NUTRIENT (PER CU/DAY) IN DIFFERENT PERCAPITA EXPENDITURE CLASSES
### STATE : TAMIL NADU

| PERCAPITA EXPENDITURE (Rs./MONTH) | PROTEIN (g) | TOTAL FAT (g) | ENERGY (Kcal) | CALCIUM (mg) | PHOSPHORUS (mg) | IRON (mg) | VITAMIN A (ug) | THIAMINE (mg) | RIBOFLAVIN (mg) | NIACIN (mg) | VITAMIN-C (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| < 60 | 49.4 | 15.9 | 1996.6 | 551.6 | 1205.1 | 27.4 | 264.1 | 1.140 | 0.755 | 11.57 | 39.8 |
| 60+ | 51.9 | 17.9 | 2021.0 | 620.9 | 1262 5 | 28.0 | 203.2 | 1.163 | 0.766 | 12.04 | 36.1 |
| 80+ | 50.9 | 19.2 | 2028.9 | 511.0 | 1205.6 | 26.8 | 192.0 | 1.000 | 0.719 | 11.81 | 38.7 |
| 100+ | 59.6 | 22.1 | 2371.4 | 601.9 | 1393.2 | 30.8 | 203.2 | 1.165 | 0.804 | 13.79 | 38.8 |
| 150+ | 62.7 | 33.4 | 2473.9 | 694.1 | 1437.5 | 30.1 | 316.5 | 1.070 | 0.890 | 14.05 | 46.3 |

## Table - 7
### ESTIMATES OF AVERAGE INTAKE OF NUTRIENTS (PER CU/DAY) IN DIFFERENT PERCAPITA EXPENDITURE CLASSES
### STATE : ANDHRA PRADESH

| PERCAPITA EXPENDITURE (Rs/MONTH) | PROTEIN (g) | TOTAL FAT (g) | ENERGY (Kcal) | CALCIUM (mg) | PHOSPHORUS (mg) | IRON (mg) | VITAMIN-A (ug) | THIAMINE (mg) | RIBOFLAVIN (mg) | NIACIN (mg) | VITAMIN-C (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| < 60 | 56.6 | 16.6 | 2290.1 | 407.1 | 1306 2 | 29.3 | 188.9 | 1.135 | 0.713 | 13.98 | 26.4 |
| 60+ | 57.9 | 18.8 | 2364.5 | 391.0 | 1321.7 | 30.2 | 291.9 | 1.120 | 0.734 | 14.50 | 31.2 |
| 80+ | 62.6 | 22.8 | 2480.6 | 476.9 | 1410.6 | 31.6 | 265.7 | 1.195 | 0.802 | 15.39 | 31.8 |
| 100+ | 64.3 | 26.2 | 2602.4 | 486.6 | 1433.7 | 30.5 | 240.0 | 1.115 | 0.801 | 15.44 | 33.8 |
| 150+ | 68.2 | 34.9 | 2775.2 | 581.3 | 1519.3 | 31.0 | 365.3 | 1.112 | 0.895 | 16.15 | 41.8 |

**Table-8**

**ESTIMATES OF AVERAGE INTAKE OF NUTRIENTS (PER CU/DAY) IN DIFFERENT PERCAPITA EXPENDITURE CLASSES**

**STATE : ORISSA**

PERCAPITA

| EXPENDITURE (Rs./MONTH) | PROTEIN (g) | TOTAL FAT (g) | ENERGY (Kcal) | CALCIUM (mg) | PHOSPHORUS (mg) | IRON (mg) | VITAMIN-A (ug) | THIAMINE (mg) | RIBOFLAVIN (mg) | NIACIN (mg) | VITAMIN-C (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| < 60 | 53.6 | 9.1 | 2289.3 | 334.3 | 1205.0 | 29.7 | 519.6 | 0.74 | 0.636 | 14.35 | 62.7 |
| 60+ | 57.3 | 9.9 | 2544.3 | 362.6 | 1319.1 | 29.4 | 338.8 | 0.87 | 0.651 | 15.67 | 45.1 |
| 80+ | 63.3 | 11.4 | 2659.3 | 327.9 | 1432.8 | 31.0 | 305.8 | 0.98 | 0.704 | 17.67 | 52.0 |
| 100+ | 67.4 | 19.3 | 2725.4 | 467.5 | 1464.8 | 31.6 | 456.4 | 1.08 | 0.813 | 17.92 | 61.6 |
| 150+ | 82.0 | 20.8 | 3486.5 | 369.8 | 1854.2 | 37.8 | 227.6 | 1.40 | 0.896 | 22.13 | 62.8 |

**Table-9**

**ESTIMATES OF AVERAGE INTAKE OF NUTRIENT (PER CU/DAY) IN DIFFERENT EXPENDITURE CLASSES**

**STATE : GUJARAT**

PERCAPITA

| EXPENDITURE (Rs./MONTH) | PROTEIN (g) | TOTAL FAT (g) | ENERGY (Kcal) | CALCIUM (mg) | PHOSPHORUS (mg) | IRON (mg) | VITAMIN-A (ug) | THIAMINE (mg) | RIBOFLAVIN (mg) | NIACIN (mg) | VITAMIN-C (mg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| < 60 | 66.2 | 32.7 | 2195.6 | 438.9 | 1680.6 | 28.9 | 263.9 | 1.924 | 1.251 | 14.59 | 28.4 |
| 60+ | 70.3 | 38.9 | 2296.9 | 529.7 | 1742.1 | 31.1 | 271.3 | 2.000 | 1.400 | 15.72 | 24.7 |
| 80+ | 67.2 | 42.0 | 2269.2 | 583.2 | 1685.3 | 29.9 | 399.6 | 1.867 | 1.289 | 14.31 | 33.4 |
| 100+ | 71.4 | 42.6 | 2355.1 | 586.1 | 1716.3 | 30.7 | 329.4 | 1.929 | 1.131 | 16.42 | 31.5 |
| 150+ | 76.7 | 52.3 | 2584.1 | 698.1 | 1916.6 | 31.6 | 481.8 | 2.158 | 1.506 | 19.00 | 39.2 |

Table -10
PERCENTAGE DISTRIBUTION OF HOUSEHOLDS ACCORDING TO
PROTEIN CALORIE ADEQUACY STATUS

| State | P C -- -- | P C -- + | P C + -- | P C + + | P -- | C -- |
|-------|------|------|------|------|------|------|
| Tamil Nadu | 13.87 | 25.79 | 60.34 | 13.87 | 39.66 | |
| Andhra Pradesh | 7.31 | 16.09 | 76.60 | 7.31 | 23.40 | |
| Orissa | 5.72 | 13.38 | 80.90 | 5.72 | 19.10 | |
| Gujarat | 3.77 | 34.09 | 60.60 | 3.77 | 37.86 | |

**Table -11**
**MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE**

State : Tamil Nadu                                         Sex:Males

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps (ran) |
|-------------|-----|-------|------|------|------|
| 00+ | 75 | 61.8 | 6.0 | 11.2 | 8.2 |
| 01+ | 91 | 73.3 | 8.5 | 12.2 | 7.8 |
| 02+ | 71 | 81.5 | 9.9 | 12.5 | 7.8 |
| 03+ | 83 | 86.9 | 11.4 | 13.2 | 8.4 |
| 04+ | 68 | 92.4 | 12.4 | 13.3 | 8.7 |
| 05+ | 66 | 100.7 | 14.2 | 13.6 | 7.4 |
| 06+ | 61 | 106.3 | 15.4 | 13.9 | 6.5 |
| 07+ | 72 | 112.0 | 17.1 | 14.0 | 5.8 |
| 08+ | 76 | 117.9 | 18.8 | 14.4 | 5.4 |
| 09+ | 71 | 119.7 | 19.4 | 14.6 | 6.1 |
| 10+ | 69 | 126.5 | 21.9 | 15.3 | 5.8 |
| 11+ | 51 | 130.2 | 22.9 | 15.5 | 5.5 |
| 12+ | 68 | 134.0 | 25.0 | 16.2 | 6.0 |
| 13+ | 52 | 136.8 | 27.9 | 16.8 | 5.9 |
| 14+ | 50 | 143.1 | 30.1 | 17.3 | 6.1 |
| 15+ | 36 | 149.8 | 34.6 | 18.6 | 5.9 |
| 16+ | 45 | 154.2 | 37.9 | 19.4 | 6.4 |
| 17+ | 35 | 158.9 | 42.2 | 20.1 | 6.4 |
| 18+ | 40 | 162.1 | 44.8 | 20.4 | 6.7 |
| 19+ | 34 | 160.5 | 46.0 | 22.0 | 5.9 |
| 20-24 | 121 | 163.1 | 48.2 | 22.2 | 6.1 |
| 25-29 | 129 | 161.6 | 48.2 | 22.5 | 5.8 |
| 30-34 | 96 | 163.3 | 50.1 | 22.7 | 5.7 |
| 35-39 | 124 | 162.4 | 49.1 | 22.6 | 6.1 |
| 40-44 | 99 | 163.0 | 51.3 | 22.5 | 6.9 |
| 45-49 | 112 | 161.1 | 49.2 | 22.6 | 6.1 |
| 50-54 | 81 | 162.7 | 49.0 | 22.1 | 6.1 |
| 55-59 | 91 | 161.1 | 48.4 | 22.0 | 6.7 |
| >=60 | 147 | 161.7 | 46.0 | 21.0 | 6.1 |
| >=20 | 1000 | 162.2 | 48.7 | 22.2 | 6.1 |

## Table -12
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State : Tamil Nadu                                        Sex:Females

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps(mm) |
|---|---|---|---|---|---|
| 00+ | 64 | 61.7 | 5.9 | 11.3 | 7.2 |
| 01+ | 78 | 71.2 | 7.8 | 11.8 | 7.6 |
| 02+ | 82 | 77.6 | 9.1 | 12.3 | 8.5 |
| 03+ | 79 | 85.3 | 10.7 | 13.0 | 8.9 |
| 04+ | 63 | 92.8 | 12.4 | 13.5 | 8.7 |
| 05+ | 68 | 100.9 | 13.9 | 13.7 | 8.0 |
| 06+ | 61 | 104.7 | 15.1 | 13.9 | 7.4 |
| 07+ | 68 | 109.7 | 16.0 | 13.9 | 6.7 |
| 08+ | 72 | 115.2 | 18.1 | 14.9 | 6.8 |
| 09+ | 50 | 122.2 | 20.5 | 15.1 | 7.0 |
| 10+ | 58 | 124.2 | 22.7 | 16.2 | 7.8 |
| 11+ | 49 | 128.9 | 23.2 | 16.0 | 7.0 |
| 12+ | 83 | 137.1 | 27.9 | 16.9 | 7.0 |
| 13+ | 56 | 141.7 | 31.9 | 18.0 | 8.0 |
| 14+ | 41 | 143.5 | 33.7 | 18.3 | 8.2 |
| 15+ | 51 | 150.4 | 38.7 | 19.5 | 9.8 |
| 16+ | 49 | 148.3 | 39.9 | 20.2 | 10.8 |
| 17+ | 45 | 149.1 | 40.2 | 20.3 | 9.7 |
| 18+ | 54 | 149.3 | 42.5 | 21.1 | 10.8 |
| 19+ | 58 | 151.1 | 41.4 | 20.5 | 10.3 |
| 20-24 | 240 | 151.0 | 42.6 | 21.0 | 10.1 |
| 25-29 | 253 | 150.4 | 42.0 | 20.6 | 9.7 |
| 30-34 | 195 | 149.6 | 41.7 | 20.8 | 9.2 |
| 35-39 | 208 | 151.7 | 42.9 | 21.1 | 9.7 |
| 40-44 | 138 | 149.8 | 41.3 | 21.3 | 9.8 |
| 45-49 | 156 | 150.1 | 41.3 | 21.2 | 10.0 |
| 50-54 | 113 | 149.8 | 41.1 | 21.1 | 10.1 |
| 55-59 | 97 | 150.1 | 41.4 | 21.1 | 9.7 |
| >=60 | 167 | 148.3 | 39.4 | 20.4 | 8.7 |
| >=20 | 1567 | 150.2 | 41.7 | 20.9 | 9.7 |

# Table -13
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State  : Andhra Pradesh                                    Sex:Males

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps (mm) |
|---|---|---|---|---|---|
| 00+ | 77 | 63.7 | 6.3 | 12.4 | 8.2 |
| 01+ | 81 | 74.7 | 8.5 | 13.0 | 8.1 |
| 02+ | 88 | 81.5 | 9.9 | 13.5 | 8.5 |
| 03+ | 87 | 88.5 | 11.4 | 13.8 | 8.5 |
| 04+ | 85 | 94.6 | 12.7 | 14.4 | 8.1 |
| 05+ | 64 | 102.2 | 14.4 | 14.4 | 7.2 |
| 06+ | 55 | 107.2 | 15.8 | 14.4 | 6.8 |
| 07+ | 67 | 114.0 | 17.7 | 14.9 | 6.4 |
| 08+ | 62 | 117.1 | 18.7 | 14.9 | 5.9 |
| 09+ | 56 | 124.2 | 21.2 | 15.7 | 6.1 |
| 10+ | 60 | 128.4 | 23.1 | 16.2 | 6.1 |
| 11+ | 37 | 133.1 | 25.2 | 16.7 | 6.0 |
| 12+ | 57 | 135.9 | 26.4 | 36.9 | 5.9 |
| 13+ | 28 | 143.6 | 30.3 | 18.5 | 6.2 |
| 14+ | 39 | 146.0 | 32.5 | 18.6 | 5.8 |
| 15+ | 40 | 152.6 | 37.1 | 20.0 | 6.3 |
| 16+ | 36 | 154.9 | 39.7 | 21.2 | 5.9 |
| 17+ | 22 | 158.5 | 43.1 | 22.3 | 5.6 |
| 18+ | 37 | 162.3 | 46.8 | 23.2 | 5.5 |
| 19+ | 22 | 166.7 | 48.5 | 23.3 | 7.2 |
| 20-24 | 143 | 162.9 | 47.9 | 23.7 | 6.2 |
| 25-29 | 161 | 162.5 | 49.4 | 24.2 | 6.4 |
| 30-34 | 137 | 163.0 | 50.6 | 25.0 | 6.5 |
| 35-39 | 121 | 162.6 | 49.3 | 24.2 | 6.7 |
| 40-44 | 102 | 162.1 | 49.7 | 24.5 | 6.9 |
| 45-49 | 125 | 163.4 | 50.6 | 23.8 | 6.5 |
| 50-54 | 93 | 161.2 | 48.1 | 23.5 | 6.8 |
| 55-59 | 84 | 161.8 | 48.1 | 23.6 | 6.6 |
| >=60 | 165 | 161.6 | 47.1 | 22.5 | 7.1 |
| >=20 | 1131 | 162.4 | 48.8 | 23.9 | 6.6 |

# Table -14
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State : Andhra Pradesh                                    Sex:Females

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps (mm) |
|---|---|---|---|---|---|
| 00+ | 83 | 62.0 | 5.8 | 12.0 | 7.6 |
| 01+ | 70 | 72.2 | 7.6 | 12.6 | 8.6 |
| 02+ | 74 | 80.0 | 9.5 | 13.2 | 8.5 |
| 03+ | 83 | 87.1 | 10.8 | 13.6 | 9.1 |
| 04+ | 82 | 92.2 | 12.0 | 14.0 | 7.6 |
| 05+ | 76 | 100.6 | 13.8 | 14.4 | 7.5 |
| 06+ | 72 | 108.1 | 15.7 | 14.6 | 7.0 |
| 07+ | 63 | 111.2 | 16.7 | 14.9 | 7.1 |
| 08+ | 79 | 117.2 | 18.3 | 15.3 | 6.9 |
| 09+ | 53 | 122.7 | 20.6 | 15.9 | 6.6 |
| 10+ | 73 | 129.2 | 23.1 | 16.6 | 6.7 |
| 11+ | 30 | 133.0 | 25.4 | 17.3 | 7.5 |
| 12+ | 75 | 138.8 | 28.7 | 18.2 | 8.1 |
| 13+ | 33 | 143.7 | 32.5 | 19.4 | 8.7 |
| 14+ | 42 | 146.2 | 35.9 | 25.3 | 9.3 |
| 15+ | 39 | 148.6 | 38.2 | 21.1 | 10.4 |
| 16+ | 54 | 150.0 | 40.5 | 21.7 | 10.1 |
| 17+ | 29 | 152.9 | 42.6 | 21.9 | 10.3 |
| 18+ | 59 | 151.3 | 41.5 | 22.0 | 9.0 |
| 19+ | 24 | 150.4 | 42.5 | 21.7 | 9.5 |
| 20-24 | 243 | 150.7 | 41.7 | 21.9 | 9.1 |
| 25-29 | 245 | 151.0 | 41.9 | 21.9 | 9.6 |
| 30-34 | 153 | 150.9 | 43.1 | 22.8 | 9.6 |
| 35-39 | 175 | 150.2 | 43.2 | 22.8 | 9.6 |
| 40-44 | 124 | 150.7 | 43.6 | 22.9 | 10.0 |
| 45-49 | 117 | 150.7 | 44.7 | 23.6 | 10.6 |
| 50-54 | 105 | 149.9 | 41.3 | 22.4 | 9.9 |
| 55-59 | 100 | 149.4 | 42.9 | 22.7 | 9.7 |
| >=60 | 186 | 148.1 | 40.1 | 21.5 | 8.3 |
| >=20 | 1448 | 150.2 | 42.3 | 22.4 | 9.5 |

## Table -15
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State : Orissa                                                    Sex:Males

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps (mm) |
|---|---|---|---|---|---|
| 00+ | 48 | 65.3 | 8.5 | 13.2 | 6.1 |
| 01+ | 58 | 74.4 | 8.6 | 13.0 | 6.4 |
| 02+ | 45 | 82.7 | 10.2 | 13.4 | 6.3 |
| 03+ | 54 | 86.2 | 11.8 | 13.6 | 6.8 |
| 04+ | 59 | 94.7 | 12.7 | 13.8 | 6.1 |
| 05+ | 63 | 100.3 | 15.2 | 14.0 | 5.7 |
| 06+ | 55 | 108.6 | 15.8 | 14.2 | 5.3 |
| 07+ | 51 | 112.0 | 17.5 | 14.3 | 5.6 |
| 08+ | 70 | 112.8 | 17.5 | 14.5 | 4.8 |
| 09+ | 60 | 124.4 | 21.7 | 15.6 | 5.5 |
| 10+ | 63 | 126.3 | 22.6 | 16.1 | 5.6 |
| 11+ | 49 | 136.4 | 26.4 | 16.5 | 5.5 |
| 12+ | 67 | 136.7 | 28.1 | 17.3 | 5.6 |
| 13+ | 37 | 142.4 | 32.0 | 18.1 | 5.6 |
| 14+ | 50 | 147.0 | 34.6 | 19.0 | 5.5 |
| 15+ | 45 | 151.2 | 37.1 | 19.7 | 5.7 |
| 16+ | 36 | 157.3 | 42.5 | 21.3 | 5.5 |
| 17+ | 25 | 157.0 | 42.2 | 21.2 | 6.0 |
| 18+ | 37 | 159.9 | 44.8 | 22.4 | 6.2 |
| 19+ | 26 | 159.9 | 46.1 | 22.5 | 5.8 |
| 20-24 | 147 | 163.8 | 50.9 | 23.7 | 5.7 |
| 25-29 | 136 | 158.6 | 50.0 | 24.0 | 6.5 |
| 30-34 | 113 | 158.9 | 48.3 | 23.3 | 5.8 |
| 35-39 | 96 | 162.1 | 49.9 | 23.9 | 5.8 |
| 40-44 | 115 | 164.0 | 50.9 | 24.1 | 5.9 |
| 45-49 | 84 | 160.6 | 50.7 | 23.1 | 6.8 |
| 50-54 | 80 | 160.2 | 48.4 | 23.5 | 5.7 |
| 55-59 | 80 | 159.1 | 47.5 | 24.0 | 6.3 |
| >=60 | 127 | 154.8 | 43.1 | 22.0 | 5.6 |
| >=20 | 978 | 160.2 | 48.8 | 23.5 | 6.0 |

# Table -16
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State : Orissa                                                    Sex:Females

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) | Fat Fold at Triceps (mm) |
|---|---|---|---|---|---|
| 00+ | 42 | 64.7 | 6.2 | 11.9 | 6.0 |
| 01+ | 59 | 73.9 | 8.3 | 11.8 | 6.1 |
| 02+ | 53 | 79.6 | 9.5 | 13.3 | 6.6 |
| 03+ | 56 | 85.2 | 10.6 | 13.2 | 6.9 |
| 04+ | 50 | 92.3 | 11.8 | 13.5 | 6.2 |
| 05+ | 62 | 100.5 | 13.3 | 13.3 | 6.0 |
| 06+ | 65 | 108.8 | 16.0 | 14.2 | 5.9 |
| 07+ | 62 | 111.7 | 16.9 | 14.3 | 5.5 |
| 08+ | 71 | 117.1 | 18.5 | 15.1 | 5.8 |
| 09+ | 44 | 122.3 | 20.6 | 15.4 | 5.5 |
| 10+ | 50 | 124.6 | 21.3 | 15.5 | 5.4 |
| 11+ | 44 | 131.8 | 25.4 | 17.0 | 6.2 |
| 12+ | 79 | 143.5 | 31.8 | 17.9 | 6.2 |
| 13+ | 39 | 137.3 | 27.9 | 17.4 | 5.6 |
| 14+ | 63 | 146.0 | 35.3 | 19.6 | 6.4 |
| 15+ | 57 | 149.0 | 39.8 | 21.3 | 7.3 |
| 16+ | 66 | 149.8 | 41.3 | 21.9 | 7.5 |
| 17+ | 38 | 149.7 | 41.6 | 21.9 | 7.2 |
| 18+ | 54 | 150.3 | 44.1 | 22.6 | 7.8 |
| 19+ | 33 | 159.9 | 44.5 | 21.3 | 7.8 |
| 20-24 | 197 | 148.8 | 41.5 | 21.3 | 7.0 |
| 25-29 | 160 | 150.1 | 40.2 | 20.7 | 6.0 |
| 30-34 | 177 | 150.2 | 43.5 | 22.2 | 7.2 |
| 35-39 | 126 | 153.0 | 48.6 | 23.0 | 6.9 |
| 40-44 | 139 | 150.0 | 41.6 | 22.0 | 6.9 |
| 45-49 | 116 | 148.6 | 39.6 | 22.4 | 7.2 |
| 50-54 | 106 | 150.6 | 43.5 | 21.7 | 7.2 |
| 55-59 | 60 | 150.0 | 41.1 | 22.0 | 7.1 |
| >=60 | 148 | 144.4 | 48.3 | 21.0 | 7.4 |
| >=20 | 1229 | 148.6 | 41.3 | 21.7 | 7.0 |

## Table -17
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

**State : Gujarat**                                                    **Sex : Males**

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) |
|---|---|---|---|---|
| 00+ | 56 | 59.4 | 5.8 | 12.0 |
| 01+ | 66 | 75.9 | 9.2 | 12.2 |
| 02+ | 66 | 77.6 | 9.0 | 12.4 |
| 03+ | 83 | 84.8 | 10.5 | 12.9 |
| 04+ | 65 | 92.6 | 12.4 | 13.2 |
| 05+ | 91 | 98.1 | 13.5 | 13.5 |
| 06+ | 80 | 105.6 | 15.6 | 13.7 |
| 07+ | 58 | 111.4 | 17.3 | 14.4 |
| 08+ | 113 | 117.3 | 19.0 | 14.4 |
| 09+ | 39 | 124.0 | 20.8 | 15.1 |
| 10+ | 93 | 127.6 | 23.2 | 15.1 |
| 11+ | 44 | 132.9 | 24.8 | 16.0 |
| 12+ | 66 | 134.5 | 27.6 | 16.5 |
| 13+ | 57 | 139.9 | 29.2 | 17.3 |
| 14+ | 59 | 147.6 | 32.7 | 18.3 |
| 15+ | 69 | 148.3 | 35.5 | 19.0 |
| 16+ | 53 | 155.2 | 40.5 | 19.9 |
| 17+ | 49 | 157.3 | 41.2 | 20.6 |
| 18+ | 54 | 159.8 | 44.5 | 22.0 |
| 19+ | 28 | 161.2 | 46.6 | 22.2 |
| 20-24 | 187 | 162.8 | 47.4 | 22.3 |
| 25-29 | 184 | 162.3 | 48.5 | 22.9 |
| 30-34 | 183 | 161.1 | 47.7 | 22.8 |
| 35-39 | 170 | 161.0 | 49.0 | 23.0 |
| 40-44 | 126 | 160.9 | 49.1 | 23.1 |
| 45-49 | 130 | 161.6 | 47.9 | 22.4 |
| 50-54 | 104 | 160.7 | 48.0 | 22.7 |
| 55-59 | 69 | 161.3 | 47.4 | 22.2 |
| > = 60 | 158 | 160.5 | 46.2 | 21.3 |
| > = 20 | 1311 | 161.4 | 47.9 | 22.5 |

FFT could not be measured

## Table -18
## MEAN ANTHROPOMETRIC MEASUREMENTS BY AGE

State : Gujarat

Sex : Females

| Age (Years) | N | Height (cm) | Weight (kg) | Arm Circ. (cm) |
|---|---|---|---|---|
| 00+ | 54 | 59.0 | 5.6 | 11.2 |
| 01+ | 66 | 70.3 | 7.6 | 12.3 |
| 02+ | 62 | 78.0 | 8.8 | 12.3 |
| 03+ | 77 | 84.2 | 10.8 | 13.0 |
| 04+ | 60 | 90.3 | 11.3 | 12.9 |
| 05+ | 87 | 97.7 | 13.2 | 13.6 |
| 06+ | 65 | 106.2 | 15.2 | 13.5 |
| 07+ | 71 | 111.1 | 16.8 | 14.3 |
| 08+ | 82 | 118.1 | 19.3 | 15.5 |
| 09+ | 44 | 120.9 | 20.5 | 14.8 |
| 10+ | 85 | 124.8 | 22.3 | 15.8 |
| 11+ | 30 | 132.2 | 25.4 | 16.7 |
| 12+ | 95 | 134.1 | 27.2 | 17.1 |
| 13+ | 59 | 138.1 | 29.3 | 17.6 |
| 14+ | 42 | 143.6 | 33.9 | 19.1 |
| 15+ | 57 | 146.2 | 37.5 | 20.0 |
| 16+ | 55 | 149.8 | 40.2 | 20.8 |
| 17+ | 39 | 149.4 | 40.9 | 21.8 |
| 18+ | 61 | 149.5 | 42.7 | 21.8 |
| 19+ | 40 | 152.2 | 43.2 | 21.8 |
| 20-24 | 242 | 150.4 | 43.7 | 22.0 |
| 25-29 | 232 | 151.1 | 43.7 | 22.0 |
| 30-34 | 232 | 150.4 | 43.6 | 22.1 |
| 35-39 | 189 | 151.0 | 44.1 | 22.2 |
| 40-44 | 131 | 149.4 | 42.2 | 22.1 |
| 45-49 | 138 | 150.9 | 45.3 | 22.6 |
| 50-54 | 120 | 149.9 | 42.6 | 22.2 |
| 55-59 | 85 | 149.6 | 41.8 | 21.4 |
| >=60 | 143 | 148.0 | 40.6 | 21.0 |
| >=20 | 1512 | 150.2 | 43.3 | 22.0 |

FFT could not be measured

## Table - 19
### PERCENT DISTRIBUTION OF PRESCHOOL CHILDREN (1-5 YEARS)
### ACCORDING TO GOMEZ CLASSIFICATION

| STATE | SEX | N | - WEIGHT FOR AGE AS % OF STANDARD * - | | | |
|---|---|---|---|---|---|---|
| | | | >=90 NORMAL | 75-89 MILD | 60-74 MODERATE | < 60 SEVERE |
| TAMILNADU | BOYS | 313 | 16.45 | 43.08 | 31.13 | 9.34 |
| | GIRLS | 302 | 18.26 | 46.66 | 29.45 | 3.02 |
| | POOLED | 615 | 17.34 | 45.60 | 30.79 | 6.28 |
| ANDHRA | BOYS | 341 | 15.12 | 43.17 | 37.16 | 4.55 |
| PRADESH | GIRLS | 309 | 20.90 | 39.90 | 27.53 | 3.61 |
| | POOLED | 650 | 17.85 | 43.76 | 34.08 | 4.30 |
| ORISSA | BOYS | 216 | 11.37 | 64.00 | 19.24 | 5.39 |
| | GIRLS | 218 | 10.58 | 67.69 | 17.87 | 2.68 |
| | POOLED | 434 | 10.98 | 66.28 | 18.68 | 4.06 |
| GUJARAT | BOYS | 280 | 8.33 | 32.96 | 45.32 | 13.38 |
| | GIRLS | 265 | 16.78 | 35.49 | 29.38 | 8.60 |
| | POOLED | 545 | 12.29 | 36.36 | 39.68 | 11.67 |

* Mean values of Hyderabad Well-to-do children

## Table - 20
### PERCENT DISTRIBUTION OF PRESCHOOL CHILDREN (1-5 YEARS)
### ACCORDING TO GOMEZ CLASSIFICATION

| State | Sex | N | Weight for Age as % of Standard* | | | |
|---|---|---|---|---|---|---|
| | | | >=90 Normal | 75-89 Mild | 60-74 Moderate | <60 Severe |
| Tamil Nadu | Boys | 313 | 5.77 | 33.60 | 47.65 | 12.98 |
| | Girls | 302 | 6.70 | 28.47 | 47.47 | 14.38 |
| | Pooled | 615 | 6.23 | 31.54 | 48.33 | 13.90 |
| Andhra | Boys | 341 | 6.16 | 32.59 | 52.77 | 8.48 |
| Pradesh | Girls | 309 | 4.96 | 27.98 | 47.21 | 10.15 |
| | Pooled | 650 | 5.60 | 31.91 | 52.68 | 9.81 |
| Orissa | Boys | 216 | 4.96 | 61.61 | 25.42 | 8.02 |
| | Girls | 218 | 2.38 | 40.23 | 48.87 | 7.24 |
| | Pooled | 434 | 3.68 | 51.26 | 37.39 | 7.68 |
| Gujarat | Boys | 280 | 5.16 | 20.98 | 50.17 | 23.70 |
| | Girls | 265 | 5.76 | 22.95 | 41.55 | 18.65 |
| | Pooled | 545 | 5.44 | 23.33 | 48.72 | 22.51 |

*NCHS Values were used as standards

## Table-21
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL) - INFANTS

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 139 | 162 | 92 | 117 |
| NAD | 84.2 | 92.0 | 87.0 | 93.2 |
| Marasmus | 0 | 0.6 | 1.1 | 0 |
| Emaciation | 2.2 | 1.2 | 0 | 0 |
| PEM* | 2.2 | 0 | 0 | 0 |
| Vitamin A | 2.2 | 0 | 0 | 0.9 |
| Vitamin B-Complex deficiency | 0.8 | 0 | 4.4 | 0 |

*Children having two or more signs of PEM

## Table-22
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL) PRESCHOOLERS

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 616 | 654 | 435 | 555 |
| NAD | 67.2 | 81.2 | 70.8 | 91.9 |
| Kwashiorkor | 0.3 | 0.2 | 0 | 0 |
| Marasmus | 2.4 | 0.3 | 0 | 0.4 |
| Emaciation | 0 | 0.9 | 0 | 0 |
| PEM* | 1.8 | 0.3 | 0.7 | 0.5 |
| Vitamin A | 9.9 | 4.9 | 6.0 | 0.7 |
| Vitamin B Complex | 8.0 | 2.8 | 8.5 | 0.5 |

*Children having two or more clinical signs of PEM

## Table-23
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL) 5-12 YEARS (BOYS)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 467 | 405 | 417 | 525 |
| NAD | 55.7 | 57.5 | 41.3 | 92.6 |
| Oedema | 0 | 0 | 0 | 0 |
| Emaciation | 0.2 | 0 | 0 | 0 |
| Vitamin A | 15.4 | 13.8 | 7.4 | 2.1 |
| Vitamin B Complex | 18.2 | 14.3 | 32.1 | 0.8 |
| Caries | 12.6 | 7.2 | 13.4 | 1.0 |
| Fluorosis | 8.6 | 4.2 | 2.9 | 1.0 |

## Table - 24
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### 5-12 YEARS (GIRLS)

| Nutritional Disorders | | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|---|
| Number | | 426 | 447 | 405 | 465 |
| NAD | | 39.6 | 71.8 | 42.0 | 93.8 |
| Oedema | | 0 | 0 | 0 | 0 |
| Emaciation | | 0 | 0.5 | 0 | 0 |
| Vitamin A | | 12.2 | 7.4 | 10.9 | 0.7 |
| Vitamin B | Complex | 13.9 | 7.4 | 23.5 | 0.2 |
| Caries | | 13.2 | 9.2 | 7.9 | 0.7 |
| Fluorosis | | 6.1 | 3.1 | 3.2 | 0.2 |

## Table - 25
### PERCENT PREVALENCE OF NUTRITIOINAL DISORDERS (CLINICAL)
### 5-12 YEARS (BOYS AND GIRLS)

| Nutritional Disorders | | Tamil Nadu | Anhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|---|
| Number | | 893 | 852 | 822 | 990 |
| NAD | | 57.6 | 65.0 | 41.6 | 93.1 |
| Oedema | | 0 | 0 | 0 | 0 |
| Emaciation | | 0 | 0.2 | 0 | 0 |
| Vitamin A | | 13.8 | 10.5 | 8.4 | 13.1 |
| Vitamin B | Complex | 15.8 | 10.6 | 27.0 | 0.5 |
| Caries | | 12.9 | 8.2 | 10.7 | 0.8 |
| Fluorosis | | 7.4 | 3.6 | 3.0 | 0.6 |

## Table - 26
### PERCENT PREVALENCE OF NUTRITIOINAL DISORDERS (CLINICAL)
### 12-21 YEARS (BOYS)

| Nutritional Disorders | | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|---|
| Number | | 387 | 346 | 325 | 492 |
| NAD | | 71.1 | 66.5 | 75.4 | 96.3 |
| Vitamin | A | 4.9 | 11.6 | 2.5 | 1.0 |
| Vitamin B | Complex | 11.9 | 9.8 | 10.0 | 0 |
| Caries | | 7.8 | 5.5 | 4.3 | 0.4 |
| Fluorosis | | 5.2 | 9.8 | 1.2 | 0.6 |

## Table - 27
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### 12-21 YEARS (GIRLS)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 505 | 429 | 429 | 505 |
| NAD | 71.3 | 75.5 | 74.6 | 94.9 |
| Vitamin A | 6.5 | 6.8 | 1.9 | 0.8 |
| Vitamin B | 9.3 | 5.1 | 7.2 | 0.2 |
| Caries | 6.7 | 1.6 | 6.3 | 0 |
| Fluorosis | 3.4 | 5.8 | 0 | 0 |

## Table - 28
### PRECENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### 12-21 YEARS (BOYS AND GIRLS)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 892 | 775 | 754 | 997 |
| NAD | 71.2 | 71.5 | 74.9 | 95.6 |
| Vitamin A | 5.9 | 8.9 | 2.1 | 1.0 |
| Vitamin B | 10.4 | 7.1 | 10.2 | 0.1 |
| Caries | 7.6 | 3.4 | 3.5 | 0.6 |
| Fluorosis | 4.2 | 7.6 | 0.5 | 0.3 |

## Table - 29
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### ADULTS (MALES)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 975 | 1073 | 982 | 1285 |
| NAD | 70.7 | 70.9 | 89.2 | 90.8 |
| Vitamin A | 4.7 | 4.8 | 0.2 | 4.0 |
| Vitamin B Complex | 2.4 | 4.4 | 3.6 | 0.7 |
| Caries | 9.0 | 5.0 | 0.4 | 0.5 |
| Fluorosis | 3.3 | 3.0 | 0.1 | 0.3 |

## Table -30
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### ADULTS (FEMALES)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 1504 | 1380 | 1230 | 1457 |
| NAD | 46.7 | 64.0 | 50.6 | 82.5 |
| Vitamin A | 6.6 | 3.9 | 0.5 | 3.5 |
| Vitamin B Complex | 5.6 | 4.4 | 6.0 | 4.7 |
| Caries | 15.8 | 6.7 | 5.5 | 0.7 |
| Fluorosis | 5.1 | 2.1 | 0.1 | 0.4 |

## Table - 31
### PERCENT PREVALENCE OF NUTRITIONAL DISORDERS (CLINICAL)
### ADULTS (MALES AND FEMALES)

| Nutritional Disorders | Tamil Nadu | Andhra Pradesh | Orissa | Gujarat |
|---|---|---|---|---|
| Number | 2479 | 2453 | 2212 | 2742 |
| NAD | 56.1 | 67.0 | 67.7 | 86.4 |
| Vitamin A | 5.8 | 4.3 | 0.4 | 3.7 |
| Vitamin B Complex | 4.3 | 4.4 | 4.9 | 2.8 |
| Caries | 13.1 | 6.0 | 3.3 | 0.6 |
| Fluorosis | 4.4 | 2.5 | 0.1 | 0.4 |

Appendix-I

<u>NOTE</u> <u>ON</u> <u>CUT-OFF</u> <u>LEVELS</u> <u>FOR</u> <u>PROTEIN</u> <u>AND</u> <u>CALORIE</u> <u>ADEQUACY</u>

The adequacy or inadequacy of protein and calorie intakes of a house-hold(per CU) were estimated as follows:

Calories = Recommended intake - 2 S.D./ SQRT.(CU)

Protein = Mean Recommended intake - 2 S.D./SQRT.(CU)

If the house-hold intake of calorie and protein per CU is greater than or equal to cut-off values, then the house-hold is classified as adequate with respect to calorie and protein otherwise it is termed as inadequate. The house-holds were classified based on adequacy and inadequacy as given below:

|  |  | CALORIES | |
|---|---|---|---|
|  |  | Adequate | Inadequate |
| PROTEIN | Adequate | P+C+ | P+C- |
|  | Inadequate | P-C+ | P-C- |

Appendix II

## ESTIMATION OF AGGREGATES(RURAL SECTOR)

The formulae for stratum /district level estimation of aggregates of variable (say y) for rural sector are given below:

$$Y_s = (P_s/n_s) * \left( \sum_{i=1}^{n_s} D_{si}/(p_{si}*c_{si}) *y_{si} \right) \quad ------ (i)$$

Where,

Ps = Total population of the stratum

ns = Number of sampled villages in the stratum

Dsi = Number of hamlet groups in the village

psi = Population of the sampled village

csi = It assumes the value either '1' or '2' depending on village census code as it refers to 1981 or 1971.

ysi = Aggregate value of the characteristic for the village 'i'

$$Y_s = \frac{P_s}{n_s} \sum_{i=1}^{n_s} \frac{D_{si}}{c_{si} \, p_{si}} \frac{H_{si}}{h_{si}} \sum_{j=1}^{h_{si}} y_{sij} ------(ii)$$

Where Hsi = Number house-holds in the 'i'th village,
hsi = Number of house-holds covered in the 'i'th village.

The underlined factor is called the 'multiplier' for the ith village. For all villages surveyed, the multipliers are available with NSSO. This multiplying factor for each village is based on 10 house-holds. But the number of house-holds covered in NNMB surveys was about 7 . For example, in a particular village say 'i'th village ,NNMB covered 7 house-holds, then the 'multiplier' is modified

accordingly (using hsi =7). This 'modified multiplier' is used to get the aggregate value of the characteristic for the 'i'th village.