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Technical Report No. 16

NUTRITIONAL STATUS OF RURAL POPULATION

REPORT OF NNMB SURVEYS 1994 - 95.
(NCAER)

NATIONAL NUTRITION MONITORING BUREAU
NATIONAL INSTITUTE OF NUTRITION
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CONTENTS

The mean heights and weights of the population surveyed were well below the NCHS standards. The extent of moderate and severe growth retardation (<75% of NCHS weight for age) in preschool children varied from 34% in Kerala to 74.2% in Gujarat.

[redacted]

Though the magnitude of "severe" degree of malnutrition was less among the 3-5 year old children, the overall nutritional situation seems to be comparable to that of 1-3 year old children. Further, the weight for age status of girls was marginally better than that of boys, contrary to the generally held belief. About 47% of adults (males as well as females) have BMI values less than 18.5, indicative of large scale prevalence of CED in the community.

When the data are analysed by occupation and community, differentials in the nutritional situation of these different sefMC 0.1570322w 22.468 0d weightssocietgicamardvide dtandi

[redacted]

2. INTRODUCTION

The National Council for Applied Economic Research (NCAER), New Delhi, undertook an United Nations Development Programme (UNDP) sponsored national survey on study of "Human Development Profile of Indians" in collaboration with the Planning Commission, Government of India. The objective of the study was to assess the relative positions of different strata of population in terms of human development, and the disparities in welfare across population groups. The underlying socio-economic, cultural and institutional factors for the observed disparities were to be elucidated. The study is expected to aid in formulating appropriate policy programmes and their implementation on the basis of priority and need.

At the request of NCAER, the National Nutrition Monitoring Bureau (NNMB) agreed to provide data on diet and nutritional status of population on a sub-sample of NCAER sample. In exchange, data on demography, education, income, morbidity, health seeking behaviours of the households will be provided by the NCAER, since NNMB has not been collecting the above information as exhaustively as NCAER. The outcome of the NCAER - linked survey would enable the Bureau to compute estimates of diet and nutrient intakes at the State level using appropriate multipliers, obtained from NCAER. In addition, it would facilitate a study of relationship of socio-economic indicators with diet and nutritional status in different States. The NNMB and NCAER linked survey was carried out in the year 1994.

2.1 OBJECTIVES

The following were the objectives :

i) To assess the pattern of food consumption among the rural households, in the States surveyed;

ii) To determine the nutritional status of population in terms of anthropometry and clinical status; and

iii) To relate the nutritional status with the socio-economic indicators.

3. METHODS

3.1 SAMPLING DESIGN

The NNMB-NCAER linked surveys were undertaken in the following eight States: Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu.

The NCAER sample served as the sampling frame. A multi-stage sampling design with districts as first stage units, villages as the second stage units and households as the third stage units was adopted. Taking into consideration the size of the SC and ST population at the State level, strata were formulated on the basis of community and the broad occupational categories such as marginal, small and large farmers; agricultural labourers and the remaining as "others". All the households, at the village level, were listed and categorized into these different strata by the NCAER. Appropriate stratum specific "weights" were arrived at and using these as "multipliers", estimates of consumption at the State level as well as by community and occupation categories, wherever defined, were computed.

3.1.1 Selection of districts

In each State, NCAER cross classified all the districts by income derived from agriculture and rural female literacy rate, so as to form homogeneous strata and selected about 50% of the total districts in each Strata for survey. For the purpose of NNMB survey, approximately 50% of these districts were chosen, taking care to see that at least one district from each stratum is selected.

3.1.2 Selection of villages

Keeping in view the constraints of time and personnel available, a total of 30-35 villages were selected in each state, adopting the probability proportional to the number of the villages.

3.1.3 Selection of households

At the village level, all the households covered by the NCAER were covered for the assessment of nutritional status using anthropometry and clinical examination. A sub-sample of 10 households were selected using circular systematic random sampling procedure,for diet survey.

3.2 INVESTIGATIONS

3.2.1 Household particulars

Socio-economic particulars like major occupation of the head of the family, family income, land possession, type of family and type of dwelling were recorded for all the families surveyed.

3.2.2 Diet Survey

In each selected village, of the 10 households chosen for diet survey, one day weighment method of household diet survey was done in five households to find out dietary intake of families, and oral questionnaire (24 hour recall) method of diet survey was carried out in the remaining five households for assessing the intakes of individuals in the households.

3.2.3 Nutrition Assessment

Anthropometric measurements of height, weight, mid-upper arm circumference and fat fold at triceps were taken using standard methods' on all the available members in the households surveyed. These members were also examined for presence of clinical signs of various nutritional deficiencies.

3.3 ANALYSIS

3.3.1 Food and Nutrient intake

3.3.1.1 One day Weighment Diet Survey

The food and nutrient intakes were expressed per consumption unit (CU) per day. The energy requirements of an adult man of 20-40 years age, weighing 60 kg, doing

sedentary work are considered as one consumption unit. The CUs for various age, sex, activity and physiological groups were worked out proportionately on the basis of their energy requirements. Nutritive value of each food item was computed using Food Composition Tables[2]. The mean food and nutrient intakes per CU/day were calculated for each household and compared with the Recommended Dietary Intakes (RDI)[3]. The means and standard deviations of food and nutrient intakes were calculated for each stratum as defined by the NCAER. State level estimates of mean consumption levels and their standard deviations were arrived at adopting the "weightages" provided by the NCAER. The finite population correction (fpc) factors were ignored in the calculation of the standard deviation of the estimate as the sample sizes were very small in relation to the "estimated size" of each of the stratum.

The households were categorised according to their protein-calorie adequacy status adopting the following procedure :

> The protein and energy requirement curves are assumed to follow a Gaussian distribution with a coefficient of variation of 15%. The Expert Committee of Indian Council of Medical Research (ICMR) has suggested for energy, the average of the distribution as the requirement. On the other hand, in the case of protein, the recommended "allowance", corresponds to Mean + 2SD of the requirement distribution. Hence, the levels of 2425 kcal for energy and 46 g for protein were taken as the mean requirements for comparison. To determine whether a particular household was consuming "adequate" amount of protein or energy, Mean - 2 SE was used as the cut-off, taking the number of CU in the household as the sample size to calculate the SE. If in a giyen household, the intake of protein or energy (per CU) was found to be equal to or above this cut-off, that household was considered as consuming adequate amount of that nutrient.

3.3.1.2 Individual Intake Diet Survey

Intra-family distribution of food was assessed using 24-hour recall method of diet survey. The individual intakes were calculated for different sub-groups based on age, sex,

activity and physiological status, so that the intakes could be compared with RDI suggested by the ICMP Expert Committee.

3.3.2 Anthropometry

3.3.2.1 **Mean heights and weights**

Means and standard deviations for height, weight, mid-upper arm circumference and fat fold at triceps measurements were computed according to age and sex.

3.3.2.2 Gomez Classification

The body weights of preschool children were expressed as percentage of National Center for Health Statistics (NCHS) standards[4] for categorising them into different grades of nutritional status adopting Gomez[5] classification as given below:

Per cent Weight for age of NCHS Standard	Nutritional Grade	
≥ 90	Normal	('Normal' Nutrition)
75 - 90	Grade I	('Mild' Undernutrition)
60 - 75	Grade II	('Moderate' Undernutrition)
< 60	Grade III	('Severe' Undernutrition)

3.3.2.3 **Standard Deviation (SD) classification**

The growth status of young children was also assessed in terms of height for age, reflecting of the degree of stunting; weight for age, indicating level of under weight, and weight for height which presents the level of wasting by adopting the SD classification procedure. Cut-off levels of NCHS served as standards for this purpose.

Percentage distribution of children (boys and girls) according to their nutritional grades is presented by sex separately for 1-3 year, 3-5 year age groups and for the pooled age group of 1-5 years.

3.3.2.4 Body Mass Index (BMI)

The Body Mass Index [Weight in kg/(Height in metres)^2] was used as an indicator of nutritional status of the adults. The adults were grouped according to different degrees of Chronic Energy Deficiency (CED), and Overweight/ Obesity as given below[6] :

BMI	Nutritional Grade
<16.0	III Degree CED
16.0 - 17.0	II Degree CED
17.0 - 18.5	I Degree CED
18.5 - 20.0	Low Normal
20.0 - 25.0	Normal
25.0 - 30.0	Over weight/Obese - Grade I
≥30.0	Obese - Grade II

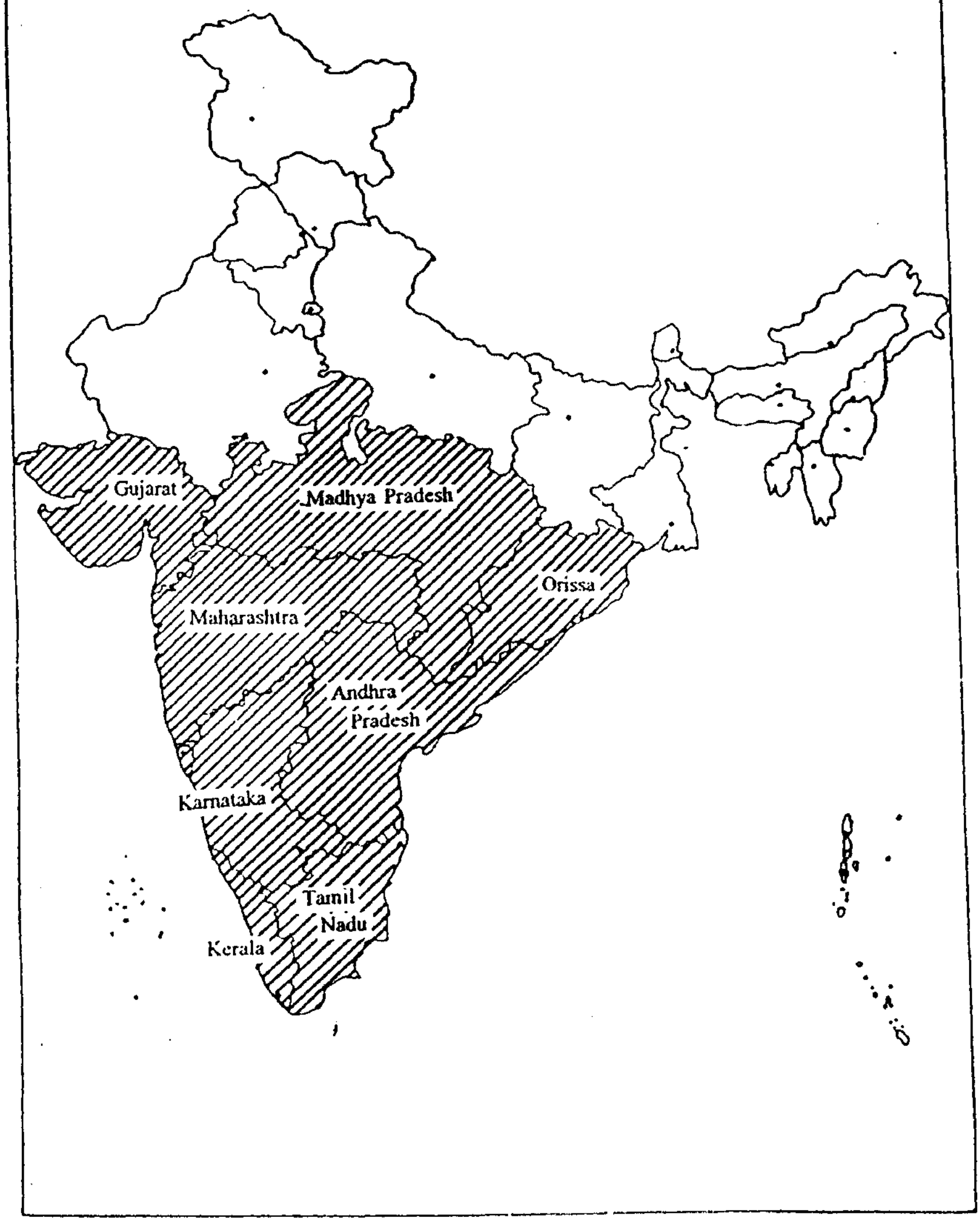
4. RESULTS

4.1 COVERAGE

The NNMB-NCAER linked survey was carried out in the States of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu (Fig. 1)

A total of about 1200 households (HHs) were covered for weighment diet survey, while 5746 individuals of different age, sex and physiological status were covered for assessment of individual intakes. About 16,000 subjects were covered for clinical and anthropometric assessment (Tables-1 and 2). In general, the sample covered for pregnant and lactating women in moderate and heavy activity groups is small in a majority of States. Wherever the coverage of individuals/househoslds in each of the stratum under consideration was adequate, estimates were calculated using the appropriate weights while in the other situation, only sample means arc presented and discussed.

Fig.1 MAP SHOWING STATES COVERED



4.2 Household Food and Nutrient intakes

4.2.1 Food consumption

State level estimates of consumption of foodstuffs (g/CU/day) in different States are presented in Table-3 and Fig.2.

4.2.1.1 Cereals and Millets

Cereals and millets formed the bulk of the dietaries. The average intake ranged from 366 g in Kerala to 542 g in Andhra Pradesh. The average intake of cereals and millets was below the suggested level of 460 g in the States of Kerala, Tamil Nadu, Maharashtra and Gujarat.

4.2.1.2 Pulses

The consumption of pulses was about 40 g, a level suggested in the balanced diets, in the States of Tamil Nadu, Karnataka and Maharashtra, while it was lower in the States of Andhra Pradesh (35 g), Gujarat (34 g), Madhya Pradesh (32 g), Orissa (29 g), and Kerala (19 g).

4.2.1.3 Green Leafy Vegetables (GLV) and Other vegetables

The consumption of green leafy vegetables (GLV), the least expensive and rich source of β-carotene and iron, was below the recommended 40 g in all the States. The intakes were less than one fourth (10 g) of RDI in the States of Andhra Pradesh, Gujarat, Kerala, Tamil Nadu and Maharashtra. Orissa had the highest intake (37 g) followed by Madhya Pradesh (29 g) and Karnataka (13 g).

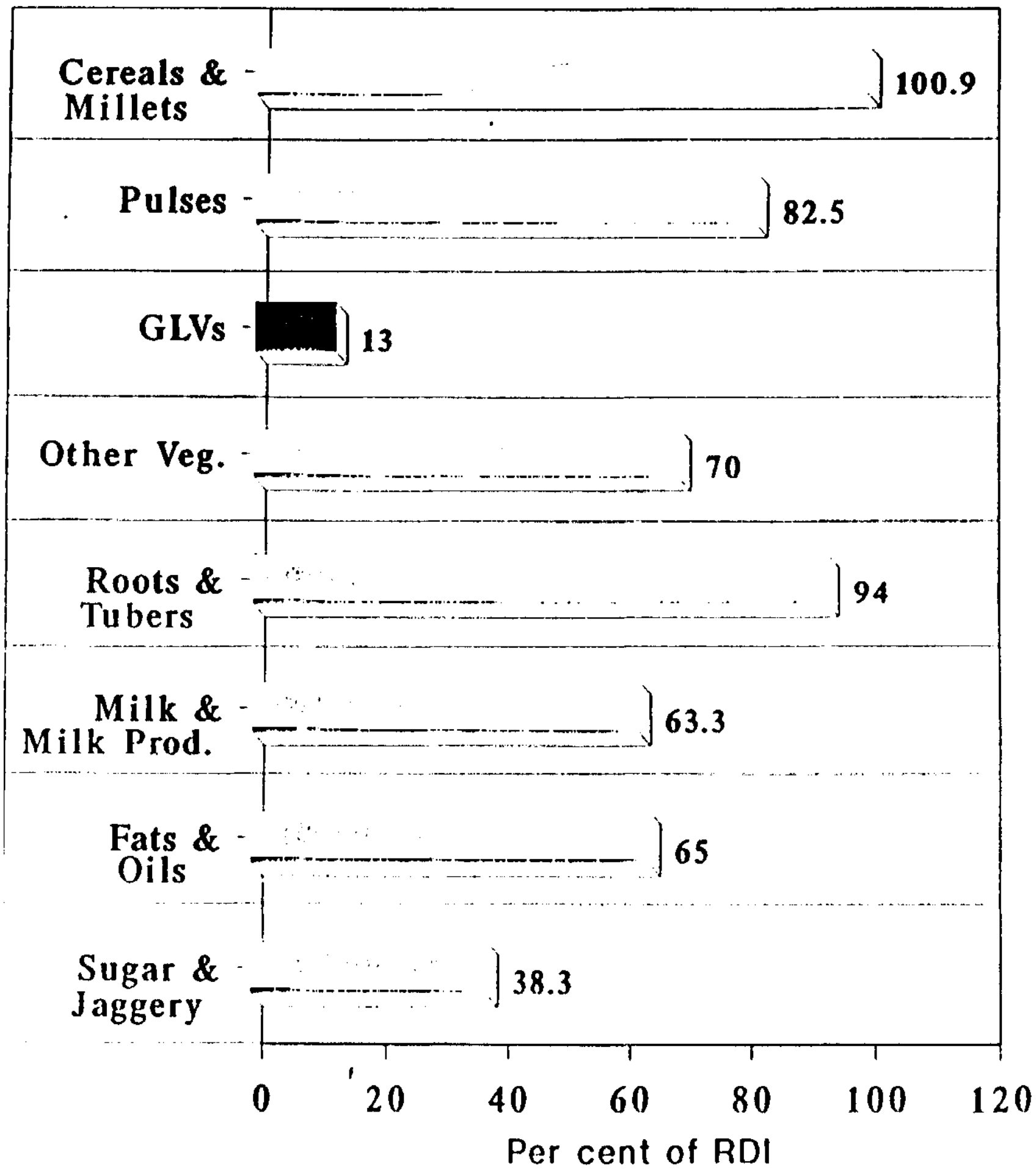
Consumption of 'other vegetables' like brinjal, ladies fingers, gourds etc. was better than that of GLV in all the States, though lower than the RDI. The average intake of 'other vegetables' ranged from 17 g in the State of Maharashtra to 83 g in the State of Kerala.

4.2.1.4 Roots and tubers

The higher consumption of tapioca in Kerala was reflected in higher intake of roots and tubers in the State (73 g). In the remaining States, potatoes and onions contributed

Figure-2

MEAN INTAKE OF FOODS - STATES POOLED



* Mean of Estimates as per cent of RDI

mostly to this food group, which ranged from 17 g in Maharashtra to about 50 g in the States of Gujarat, Orissa and Madhya Pradesh.

4.2.1.5 **Fats and Oils**

Dietary fat, apart from being a concentrated source of energy, facilitates absorption of fat soluble vitamins. It also provides essential fatty acids (linoleic and linolenic acids) which the body cannot synthesize. The RDI for visible fat is 20 g/day. The estimated mean intake of visible fat was above the RDI only in the State of Gujarat. In the States of Tamil Nadu, Karnataka, Madhya Pradesh and Orissa, the mean intakes ranged between. 7 and 9 g/CU, while in the remaining States of Kerala, Andhra Pradesh and Maharashtra, the mean intakes were between 12 and 16 g/CU/day.

4.2.1.6 Milk and Milk Products

Milk and milk products are the only dietary source of vitamin B_{l2} for pure vegetarians, and are also a good source of riboflavin. The mean intakes ranged from a low of 15 ml in Orissa to 158 ml in Gujarat. The consumption levels were about 100 ml or more in Kerala, Andhra Pradesh, and Tamil Nadu. The intakes were above the RDI only in the State of Gujarat. In all the other States the intakes ranged from 10% to 80% of RDI.

4.2.1.7 Flesh foods

In general, the average consumption of flesh foods (including fish and poultry) was negligible in all the States, except in Kerala (56 g), where fish constituted the major component.

4.2.1.8 Fruits

-Average consumption of fruits ranged from 7 g in Gujarat to 54 g in Andhra Pradesh, where it consisted mostly of ripe tomatoes.

4.2.1.9 Nuts and Oil Seeds

Nuts and oil seeds contribute significantly to invisible fat and higher energy. The average intake of nuts and oil seeds was highest in Kerala and consisted mostly of coconut. In the rest of the States, the consumption of this food group was negligible.

4.2.1.10 Condiments and Spices

Consumption of condiments and spices, which included chillies, tamarind, mustard seeds, fenugreek and cumin etc., was more than 10 g in the States of Andhra Pradesh (21 g), Karnataka (16 g), Tamil Nadu (14 g) and Kerala (13 g), while in the remaining States, it was less than 10 grams.

Foods like GLV, fish and other flesh foods are consumed only by a small number of families on the day of survey. Such a data base yields very low levels of mean intakes with large standard deviations at the community level. In situations wherein these families fall under only one stratum, a special property of such a data-base is noted, in that, the mean and its standard deviation tended to be almost identical particularly when estimates are calculated.

4.2.2 Nutrient Intake

The estimates of average consumption of various nutrients (per CU/day) in different States are presented in Table-4 and Fig.3.

4.2.2.1 Energy

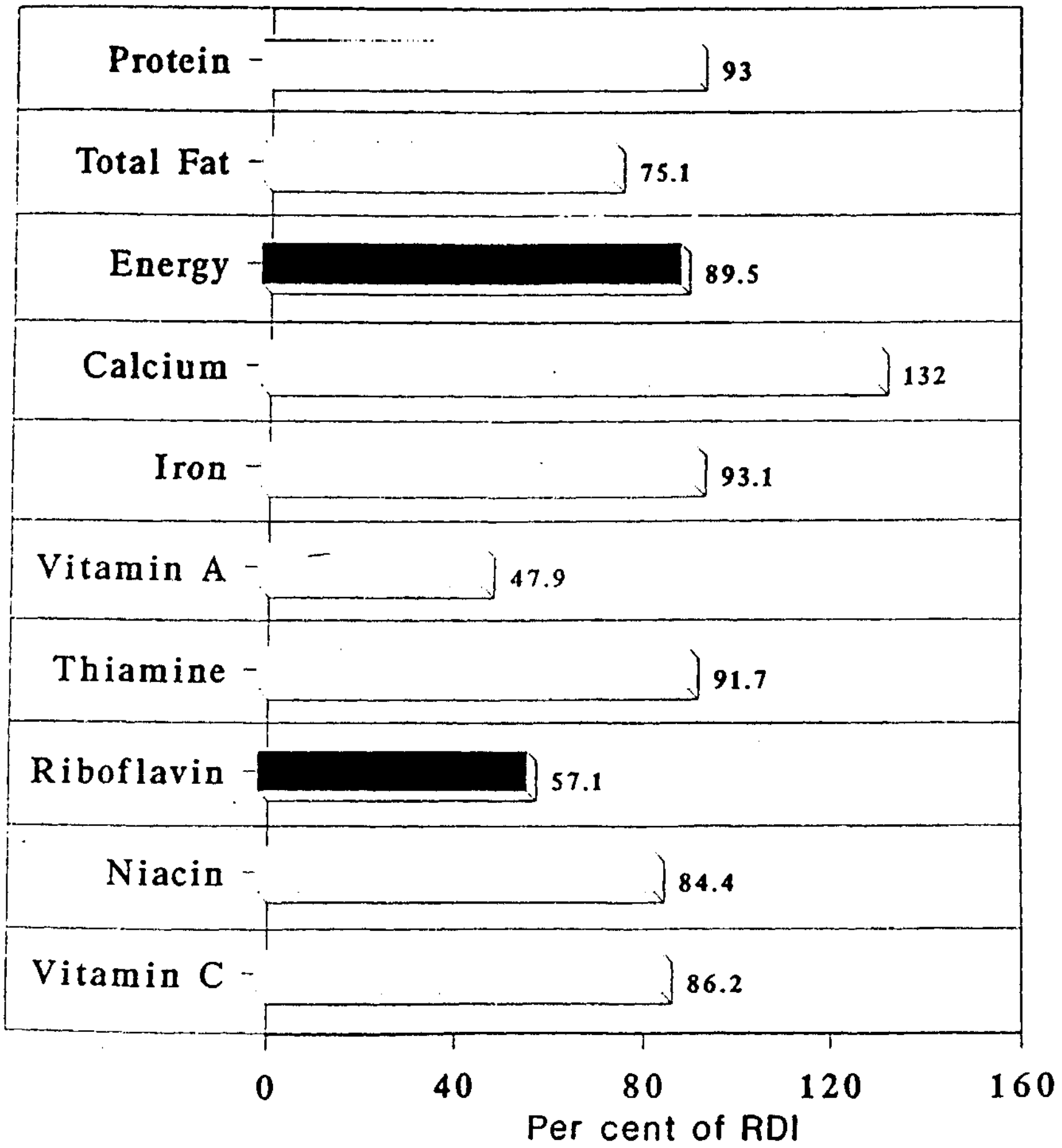
The mean intake of energy was below the RDI of 2425 Kcal in all the States except in the State of Andhra Pradesh. It ranged from a low 1814 kcal/CU in Tamil Nadu to 2430 kcal in Andhra Pradesh.

4.2.2.2 Protein

The average protein intake was below the RDI of 60 g in all the States except in the States of Maharashtra and Gujarat; the deficit ranging from about 4% in Andhra Pradesh to 26% in Tamil Nadu. Most of the protein is derived from vegetable foods such as cereals and pulses.

Figure-3

MEAN INTAKE* OF NUTRIENTS - STATES POOLED



* Mean of Estimates as per cent of RDI

4.2.2.3 Iron

The mean intake of iron was more than the RDI in Karnataka (30.6 mg), and Maharashtra (28.6 mg), while in the remaining States, the consumption was lower. The deficit ranged from about 5% in the States of Andhra Pradesh, Gujarat, Orissa and Madhya Pradesh to 28% in Tamil Nadu. It may be mentioned that about 30% of iron in the foods is contaminant iron which is last during washing of foodstuffs. Also, several substances like phytates, tannins etc., present in the diets interfere with iron absorption. The adequacy of iron intakes should be considered taking these into view.

4.2.2.4 Calcium

In general, except in the States of Orissa (381 mg) and Madhya Pradesh (354 mg), the mean consumption levels were above the RDI (400 mg) in all the States.

4.2.2.5 Vitamin A

In none of the States, the mean intakes of vitamin A were satisfactory. The average intake ranged from 184 µg in Tamil Nadu to 436 µg in Orissa - levels which are much below the RDI of 600 µg/CU/day.

4.2.2.6 Thiamine

Intakes of thiamine ranged from 0.7 mg in Kerala to 1.8 mg in Maharashtra. Except in the States of Karnataka, Maharashtra and Gujarat, where the staple was either wheat or millets, the consumption in all the other States was less than recommended level of 1.2 mg.

4.2.2.7 Riboflavin

In all the States, the consumption of riboflavin was below the RDI of 1.4 mg. The deficit varied from 18 per cent in Gujarat to 57% in Orissa.

4.2.2.8 Niacin

The average consumption of niacin was satisfactory only in Maharashtra, Gujarat and Madhya Pradesh. In the remaining States, the average intakes were below the RDI of 16.0 mg.

4.2.2.9 Vitamin C

The mean intake of Vitamin C (Ascorbic acid) varied from about 19 mg in Maharashtra to 50 mg in Kerala. The intakes were more than the RDI level of 40 mg in the States of Kerala, Orissa and Madhya Pradesh.

4.2.3 Protein-Energy adequacy status of households

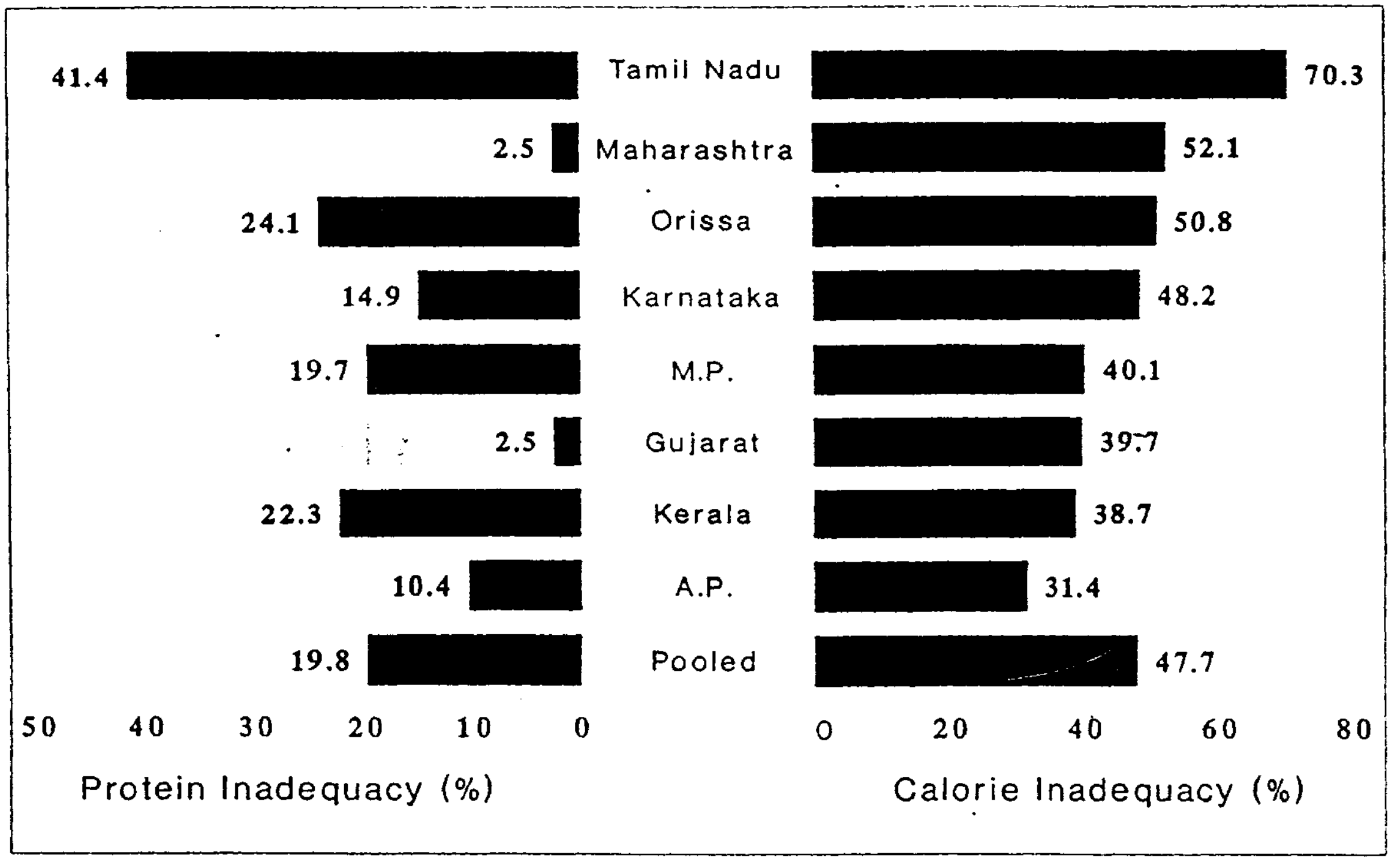
The estimated per cent distribution of households according to protein-energy adequacy status is presented in Table-5. The proportion of households with energy inadequacy was more (47.9%) than that of households with protein inadequacy (19.8%), indicating that the problem of energy deficit was of greater magnitude than that of protein in the Indian rural dietaries (Fig.4). The percentage of households showing adequacy of dietary protein as well as energy ranged from about 30 in Tamil Nadu to 69 in Andhra Pradesh. In the remaining households, the diets were deficient either in energy or protein or in both. Only in about 2.5% of the households in the State of Kerala, the diets were providing adequate level of calories, while their protein content was inadequate. This category of protein-calorie adequacy status was not seen in any of the remaining States.

4.2.4 Socio-economic factors and food and nutrient intakes

Food and nutrient consumption levels are known to be related to socio-economic conditions such as the size of land holdings, community etc. Therefore, estimates of consumption were attempted by socio-economic characteristics adopting the appropriate multipliers, whenever the sampling design had considered these factors at the time of stratifying households in each village.

Figure-4

Protein and Calorie Inadequacy in rural households



4.2.4.1 Occupational Status

The state level estimates of average intakes of various food groups and nutrients by occupation status of head of the family were calculated. At the aggregate level, consumption of foods like cereals, pulses, green leafy vegetables, fruits, milk, fats & oils, and sugar & jaggery show an increasing trend with the size of landholding when the families are categorised as marginal, small and large farmers. Most of these foods are known to be income-elastic (Fig.5). However, barring for cereals and pulses, among the small and large farmers; and sugar and jaggery in all occupation groups, consumption of the remaining foods were less than those suggested in the balanced diet. The levels of consumption of different foods by the marginal farmers and those of agricultural labourers were similar.

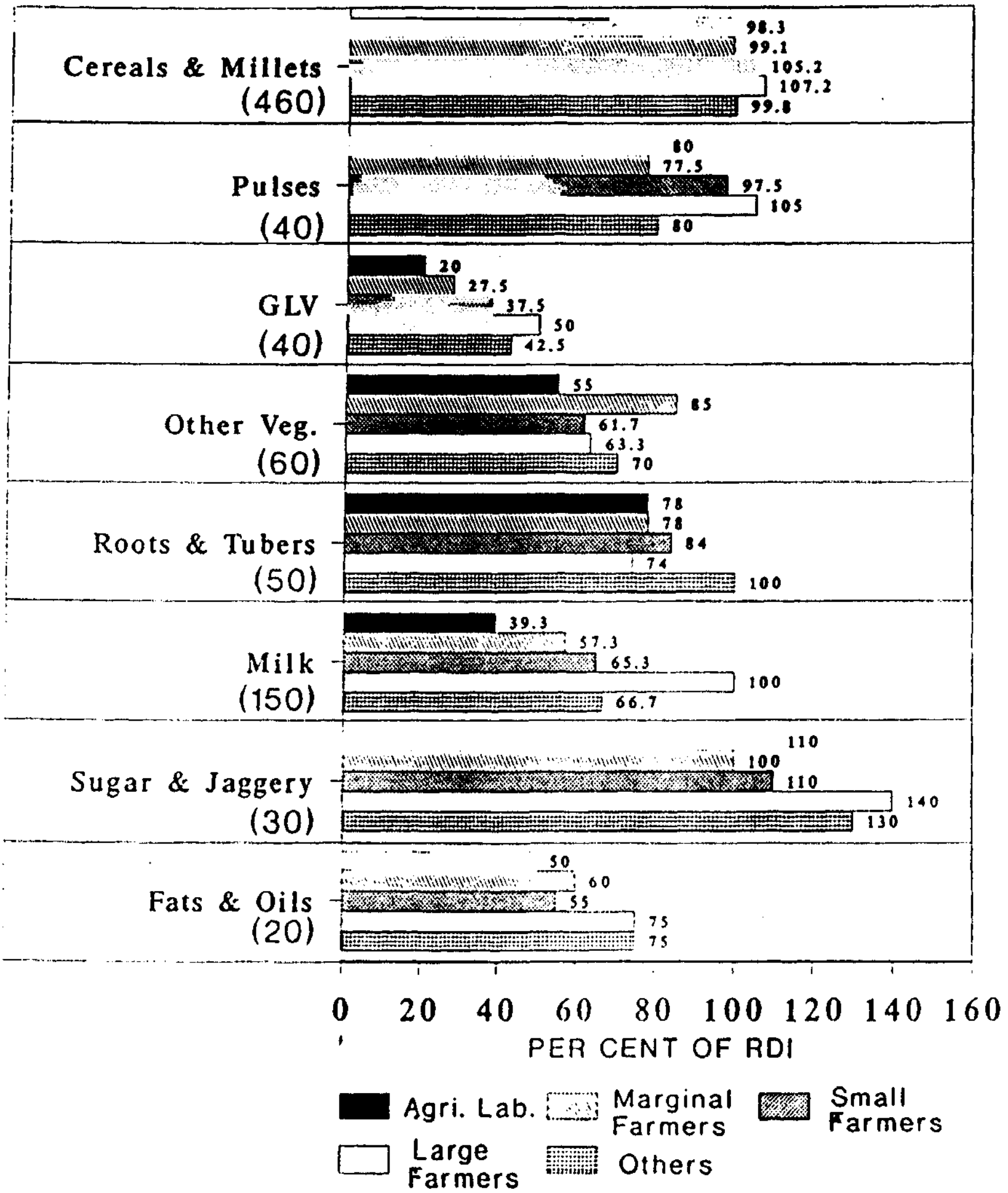
Further, irrespective of the size of land holdings, mean intakes of proteins and calories fell short of the RDA indicating thereby an overall food deficit among the different land ownership categories (Fig.6). The mean intakes of agricultural labourers were almost equal to that of the marginal farmers.

4.2.4.2 Community

The mean food and nutrient intakes were estimated in different social groups (by 'caste') for each state. Consumption levels of foods that contribute to 'quality of the diet' were observed to be less in the 'scheduled caste' group of families as compared to the "others" category (Fig.7). Foods such as pulses, vegetables, fruits and fats and oils are consumed in lesser quantities by the 'scheduled caste' families as compared to the 'others' category. The intake of various nutrients by the scheduled caste and scheduled tribe families are less than those seen among the 'others' (Fig.8). The mean intakes of Iron, vitamin 'A' and vitamin 'C' are relatively higher among the households of scheduled tribes, perhaps, due to higher intake of GLV among them. However, mean consumption levels of all the nutrients were less than the RDI in the three different community groups.

Figure-5

MEAN INTAKE*OF FOODS BY OCCUPATION

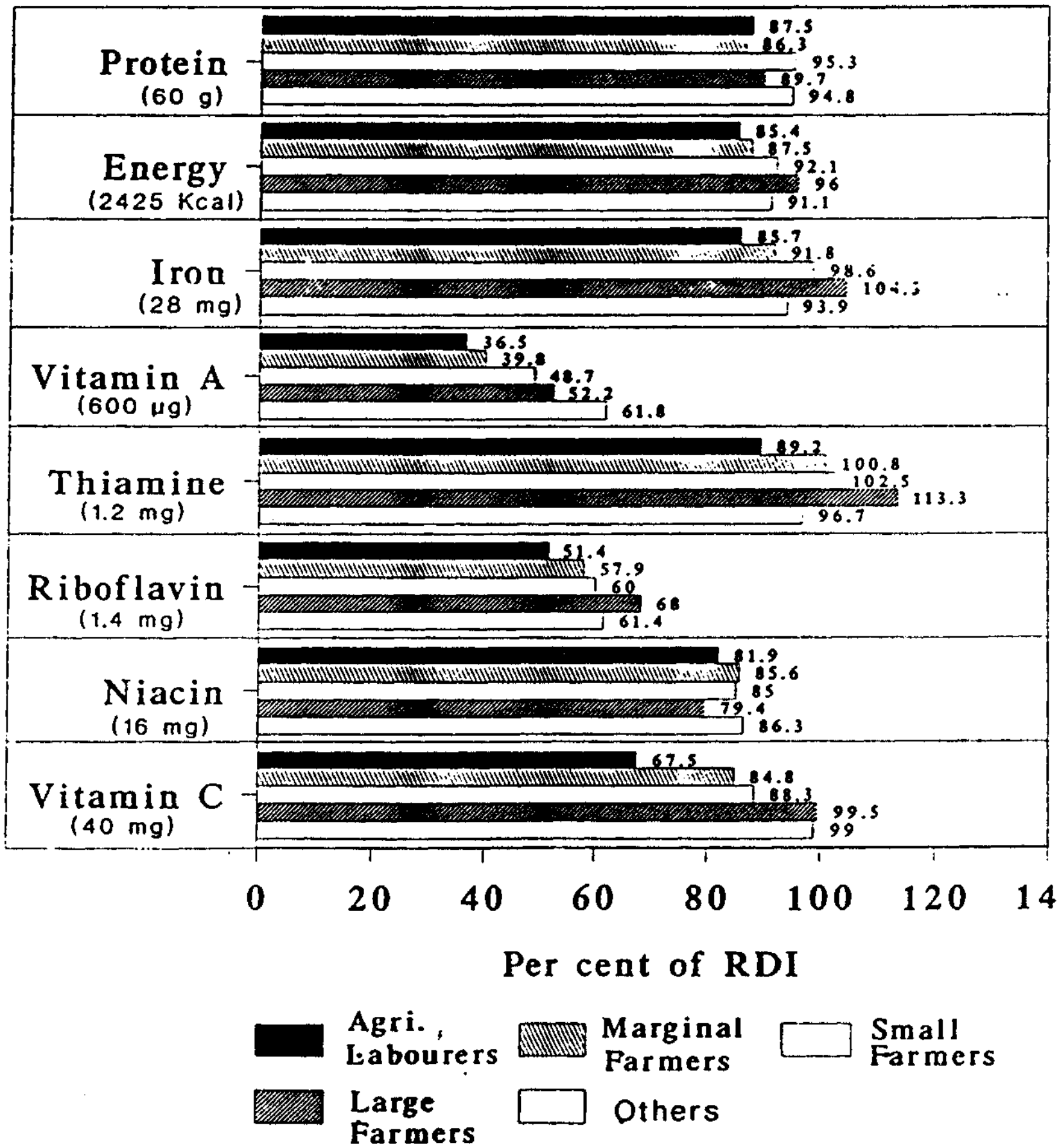


* Mean of Estimates as per cent of RDI

( ) Recommended Dietary Intakes (g/CU/day)

Figure-6

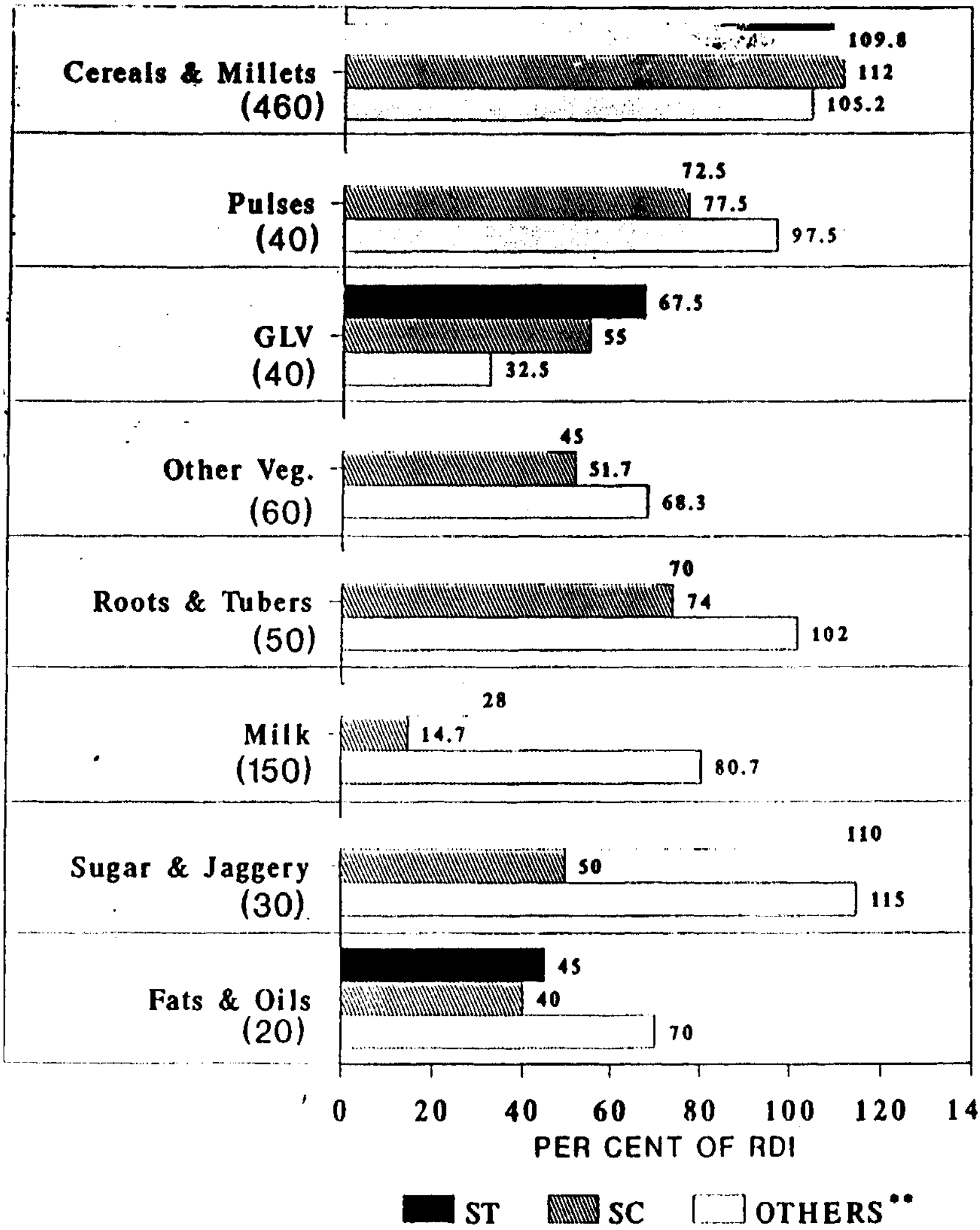
MEAN INTAKE* OF NUTRIENTS BY OCCUPATION



* Mean of Estimates as per cent of RDI
( ) Recommended Dietary Intakes (CU/day)

Figure-7

INTAKE* OF FOODS BY COMMUNITY



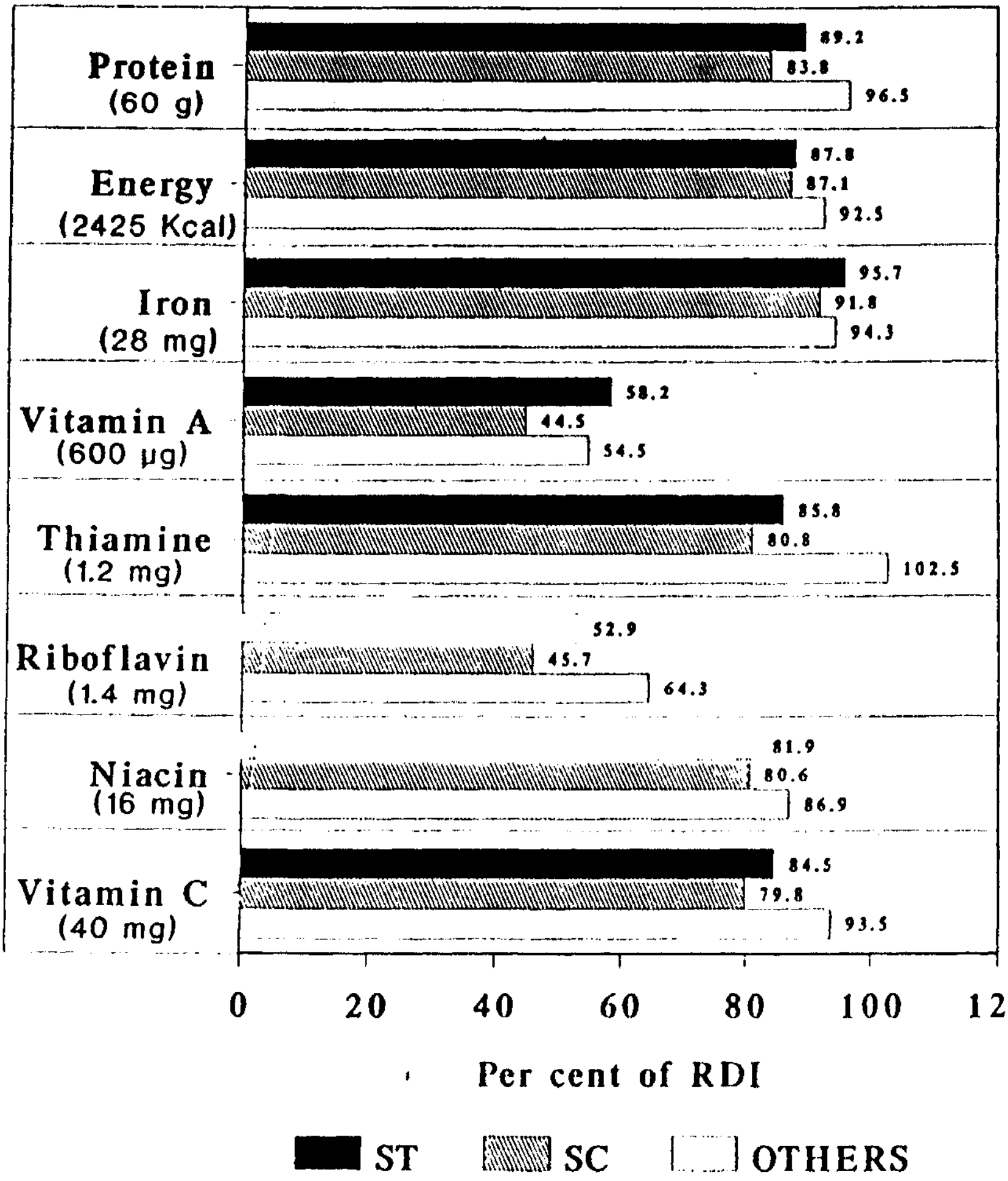
* Mean of estimates of food intake expressed as per cent of RDI

( ) Recommended Dietary Intakes (g/CU/day)

•• For details of coverage, refer foot note of Table-13

Figure-8

KlEAN INTAKE*OF NUTRIENTS BY COMMUNITY



* Mean of Estimates as per cent of **RDI**

( ) Recommended Dietary Intakes (CU/day)

4.2.4.3 Protein Calorie Adequacy (PCA) Status

State level estimates of PCA status of households by occupation and community are calculated and their simple average was considered to reflect the overall status.

At the aggregate level, the magnitude of P- C- was highest among the agricultural labourers followed by the marginal farmers, "others", large farmers and the small farmers categories in that order (Fig.9). When we consider the other end of the spectrum, namely, adequate consumption of Proteins and Calories (P+ C+), a mirror image of this ranking of P- C- is seen. Among the five occupational groups, the family consumption status of the marginal farmers and that of agricultural labourers seem to be fairly similar.

The PCA status of households by community (Fig. 10), reveals that about 40% of the SC, 51% of the ST and 55% of the "others" categories are on diets deficient either in calories alone or with proteins as well. Among these three groups, those belonging to the schedule castes seemed to fare better as the magnitude of P+ C+ is more and that of P- C- is the least.

4.3 Individuals' Food and Nutrient Intakes

The average daily intake of foods and nutrients by different family members was assessed using 24 hour recall method of diet survey. The mean intakes of 5746 individuals were calculated for different age, sex and activity groups. These individuals are grouped in accordance with those for which nutrient requirements are suggested by the ICMR Expert Committee. Estimates of consumption by these groups were not attempted due to inadequate sample size within each stratum. The salient observations on food and nutrient intakes are summarized in Tables-6 and 7.1 & 7.2 and discussed below :

There are large inter-state differences in the mean food and nutrient intakes within each of these age, sex and activity groups. At the aggregate level, the mean intakes in different age and sex groups of children and adolescents are below the RDI. However, the mean intakes of adults seem to be marginally better with respect to proteins, fat, calcium, thiamine and vitamin C. The remaining nutrients show varied levels of deficits - the largest

Figure-9

PER CENT DISTRIBUTION OF HHs ACCORDING TO PROTEIN CALORIE ADEQUACY STATUS BY OCCUPATION

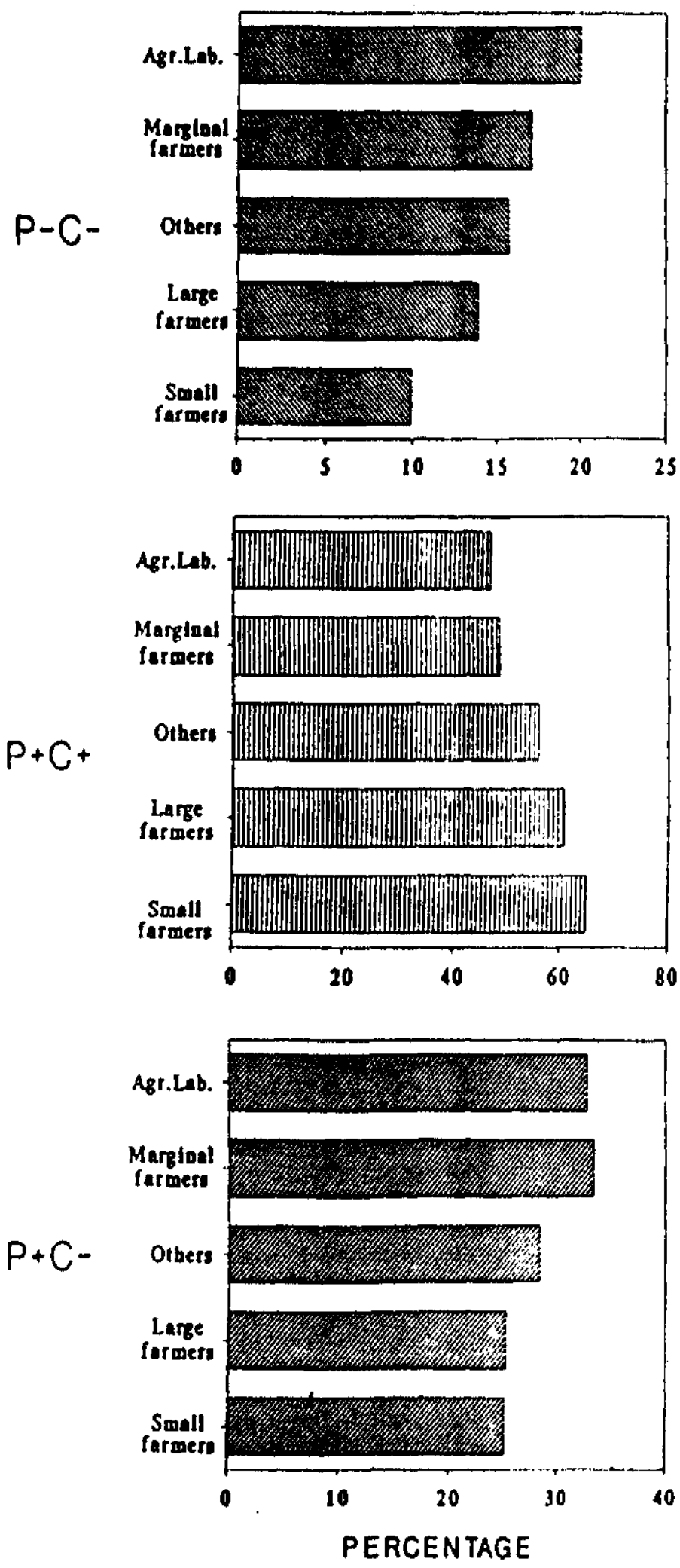
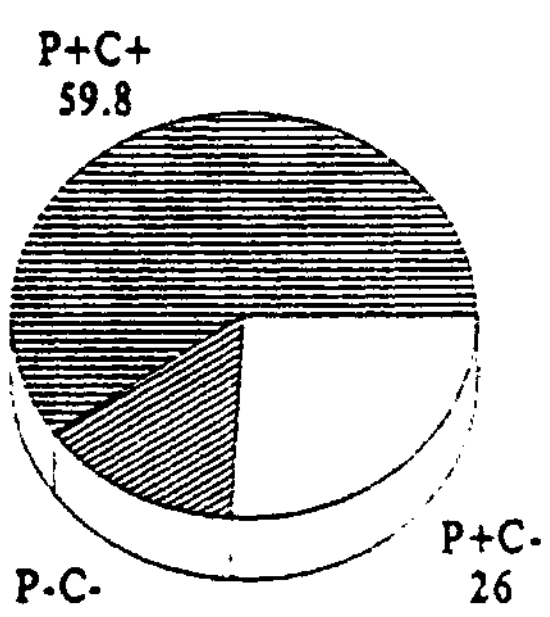
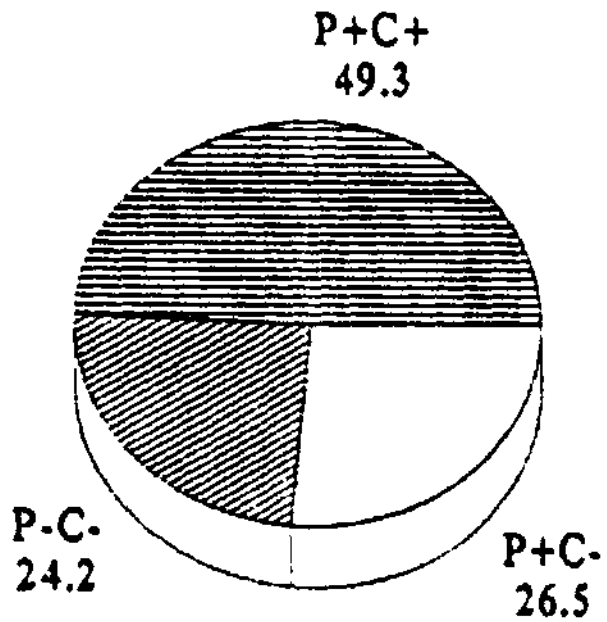


Figure-10

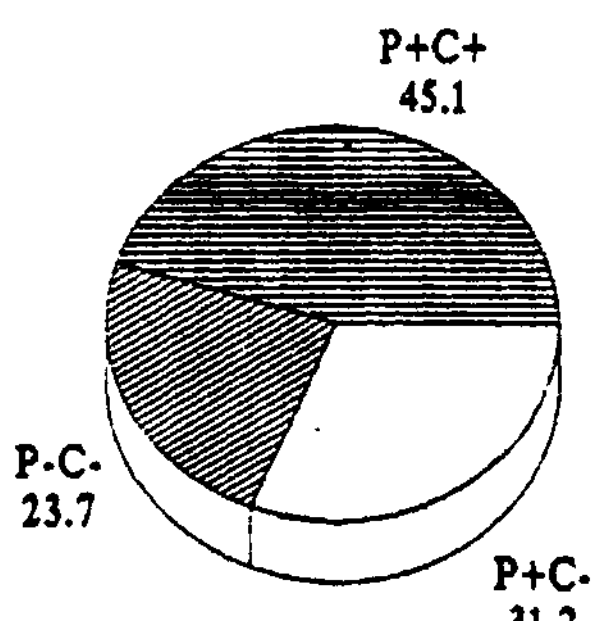
PER CENT DISTRIBUTION OF HHs ACCORDING TO PROTEIN CALORIE ADEQUACY STATUS BY COMMUNITY



Schedule Caste



Schedule Tribe



"Others"

deficit is seen with respect to vitamin 'A' (53%) followed by riboflavin (36%), iron (24%), energy and vitamin 'C' (12%) and niacin (9%) in that order.

The mean protein intakes are closer to the RDI than calorie intakes of children below the age of 10 years.

4.4 Nutritional Status

Due to inadequacy of sample size within each of the stratum for different age and sex categories, the results of nutritional status are presented for the sample only.

4.4.1 Anthropometry

4.4.1.1 Mean anthropometric measurements

The means and standard deviations of height, weight, mid upper arm circumference and fat fold at triceps were calculated according to age and sex for each State. The distance charts for height and weight of males and females are presented in Figs. 11-14. The average anthropometric measurements of the rural population surveyed were lower than those of age and sex matched NCHS values. There did not appear to be major inter-state differences in the mean values of anthropometric measurements.

4.4.1.2 Weight for Age

It is, generally, believed that the nutritional status of preschool children (1-5 years) reflects the nutritional status *of* the community, and children of 1-3 years are more vulnerable than children of 3-5 years. Hence, weight for age status of children was assessed adopting Gomez classification for these groups and the results are presented in Table-8.

The proportion of 'severe and moderate' forms of malnutrition (body weight less than 75% of standard) among the 1-3 year age group, ranged from around 26% in Kerala to 65% in Gujarat. At the aggregate level, this prevalence was about 50%.

Figure-11

DISTANCE CHART - HEIGHT (cm) - MALES

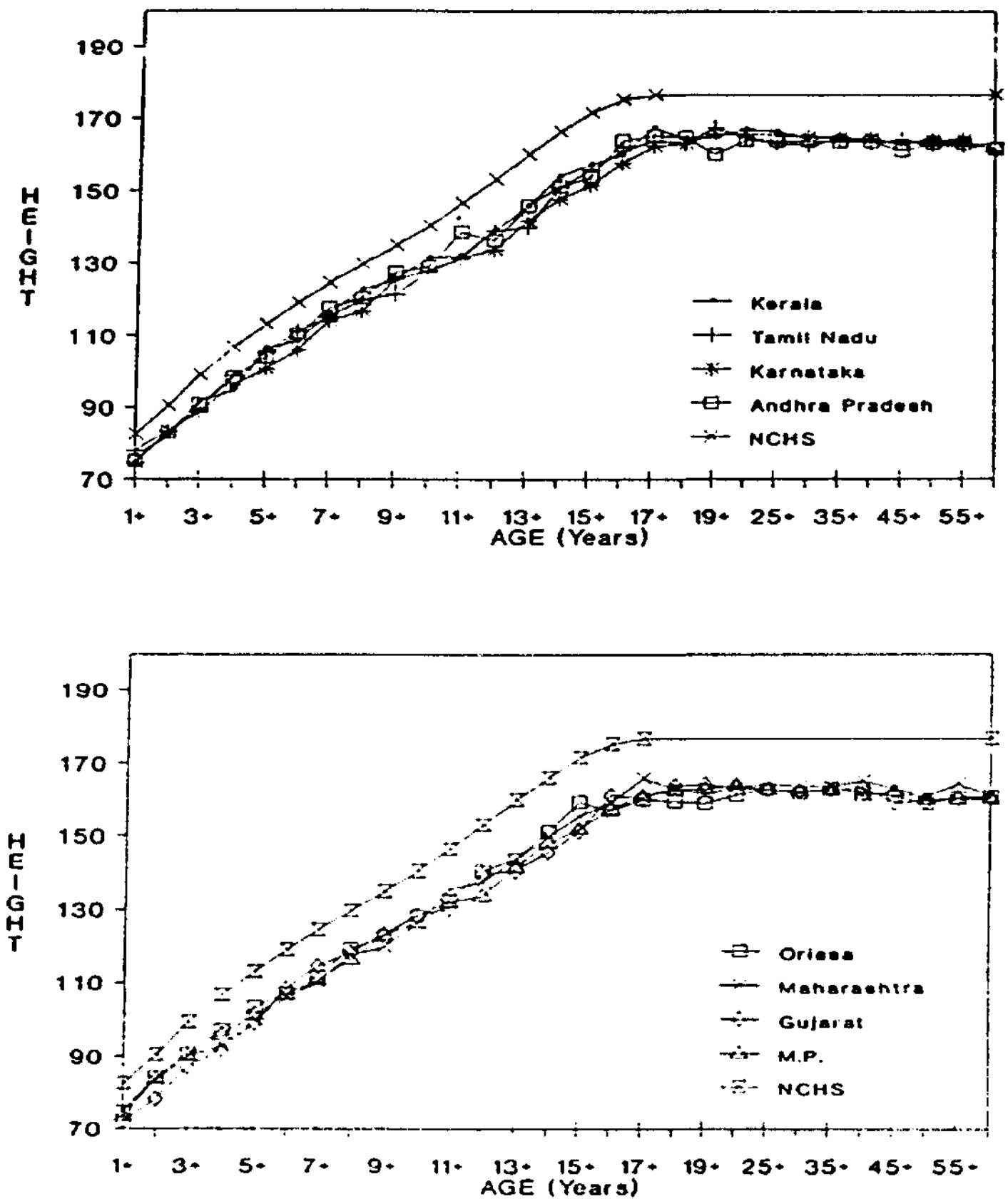


Figure-12

DISTANCE CHART - HEIGHT (cm) - FEMALES

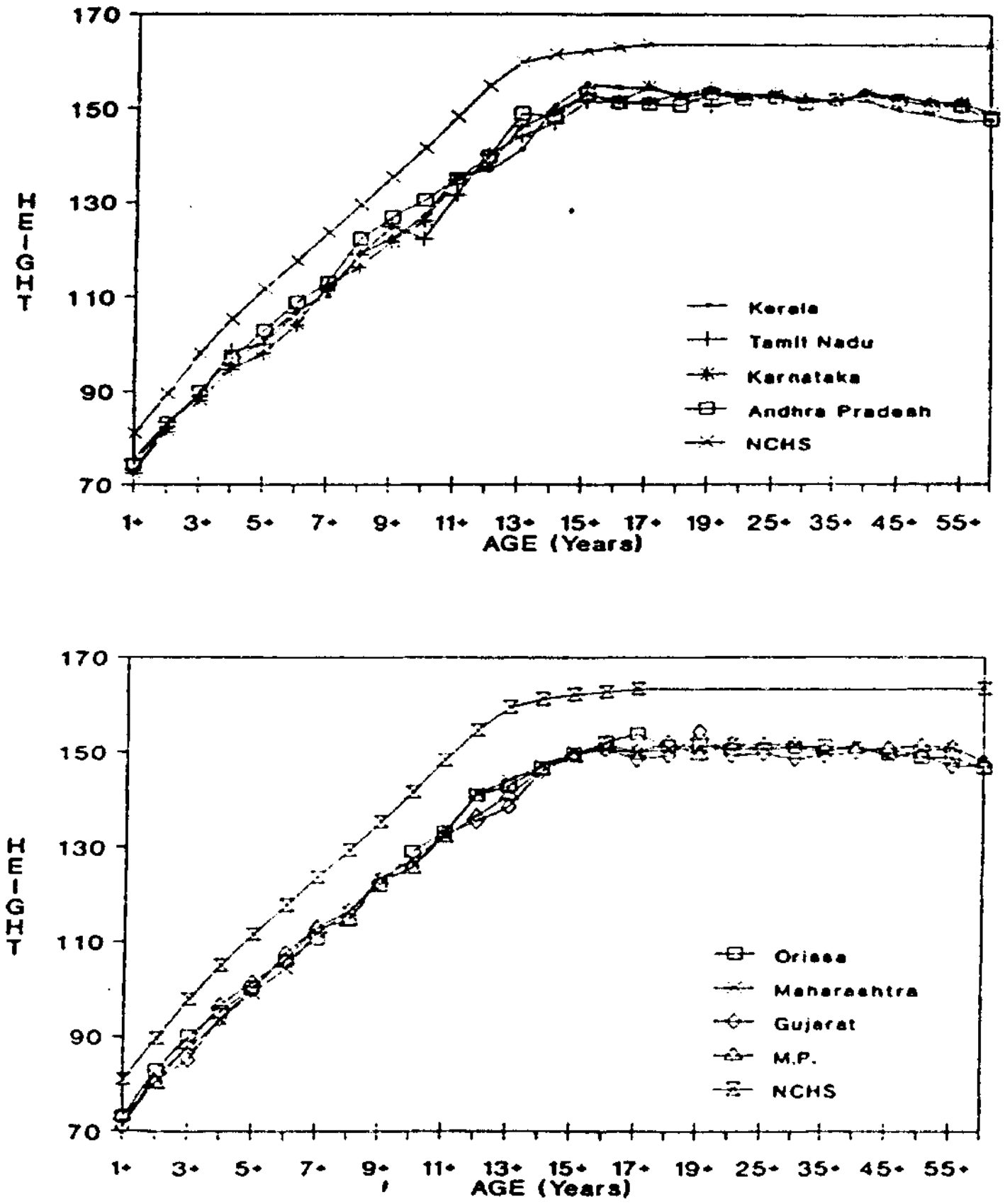


Figure-13

DISTANCE CHART - WEIGHT (kg) - MALES

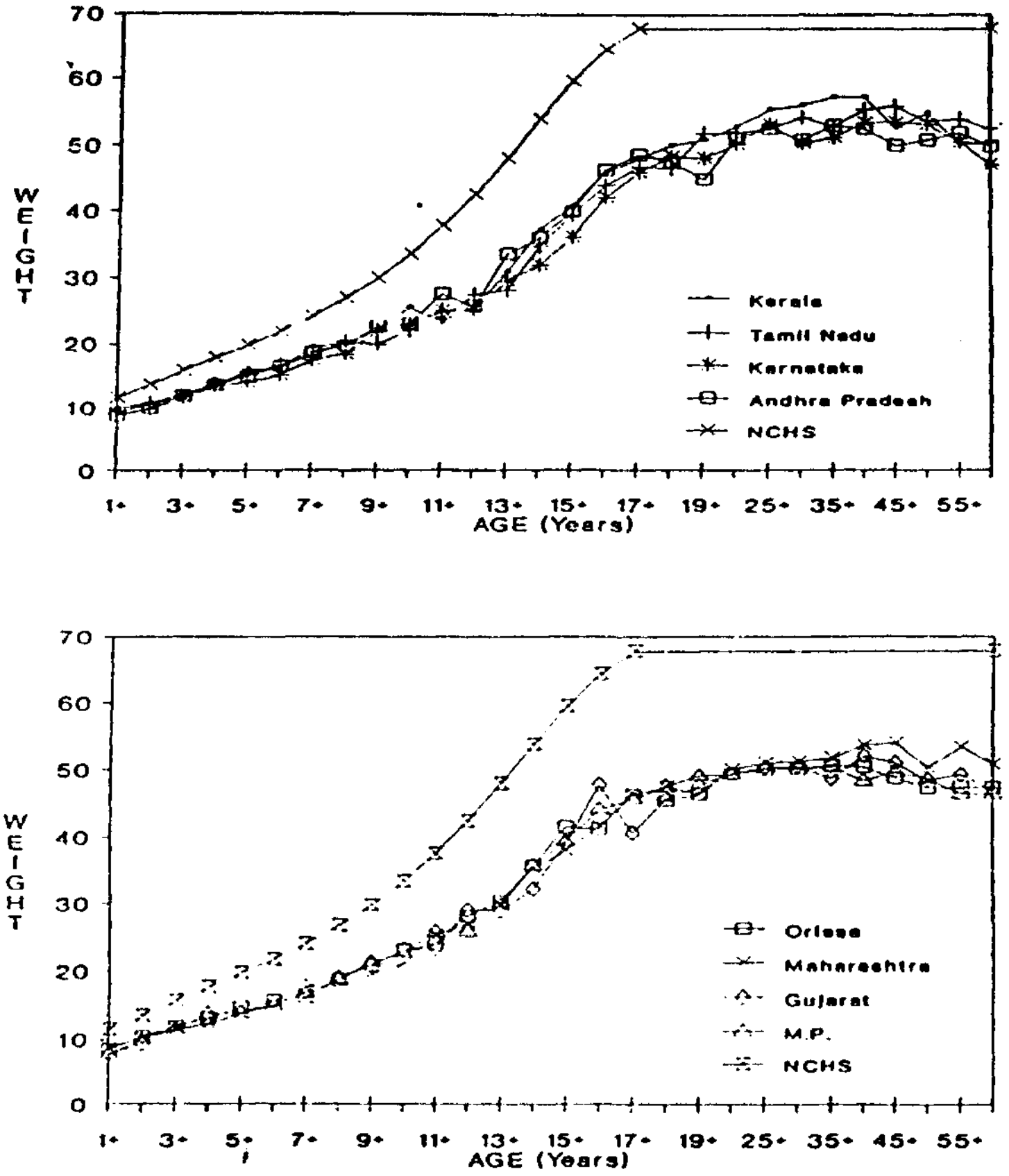
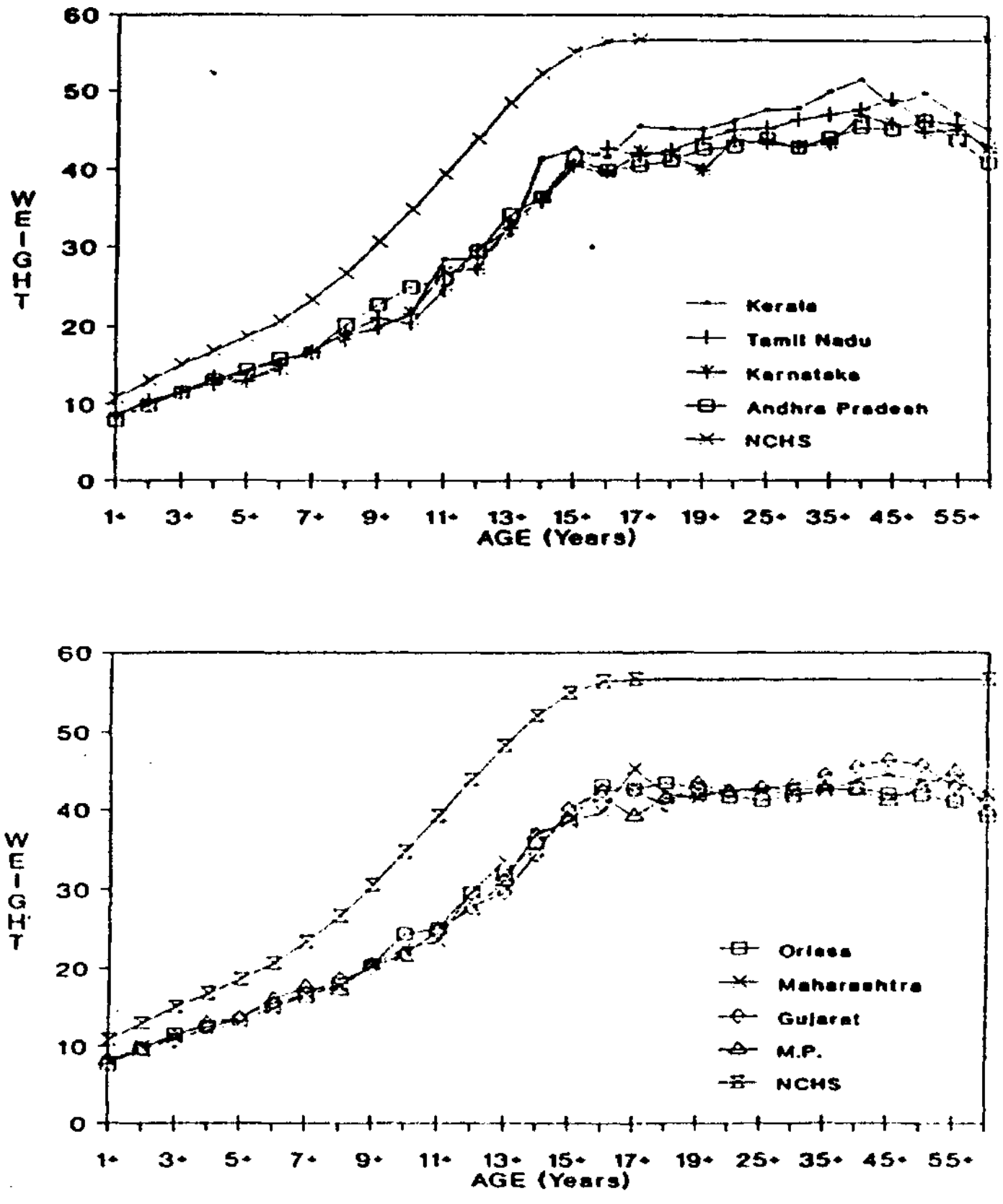


Figure-14

DISTANCE CHART - WEIGHT (kg) - FEMALES



Among children of 3-5 years group, prevalence of those with less than 75% of weight for age ranged from 44% in Kerala and Madhya Pradesh to 71% in Gujarat with an aggregate of 54%. A significant difference in the frequency distributions of nutritional grades of 1-3 and 3-5 year children is seen. Larger prevalence of normals and severely malnourished children are seen among the 1-3 year age group (Fig. 15).

At the aggregate level, differences in the prevalence of different nutritional grades of boys and girls are presented in Fig. 16. It may be seen that a larger percentage of girls have "normal" weight status for their age as compared to boys. Further, the magnitude of "severe" degree of growth retardation in girls is less than that seen in boys. In other words, the growth status of girls of preschool age is slightly better than that of boys of the same age. This is contrary to the commonly held view that the girls are more undernourished than the boys. These observations are similar to those observed in earlier NNMB surveys.

4.4.1.3 Standard Deviation (SD) classification

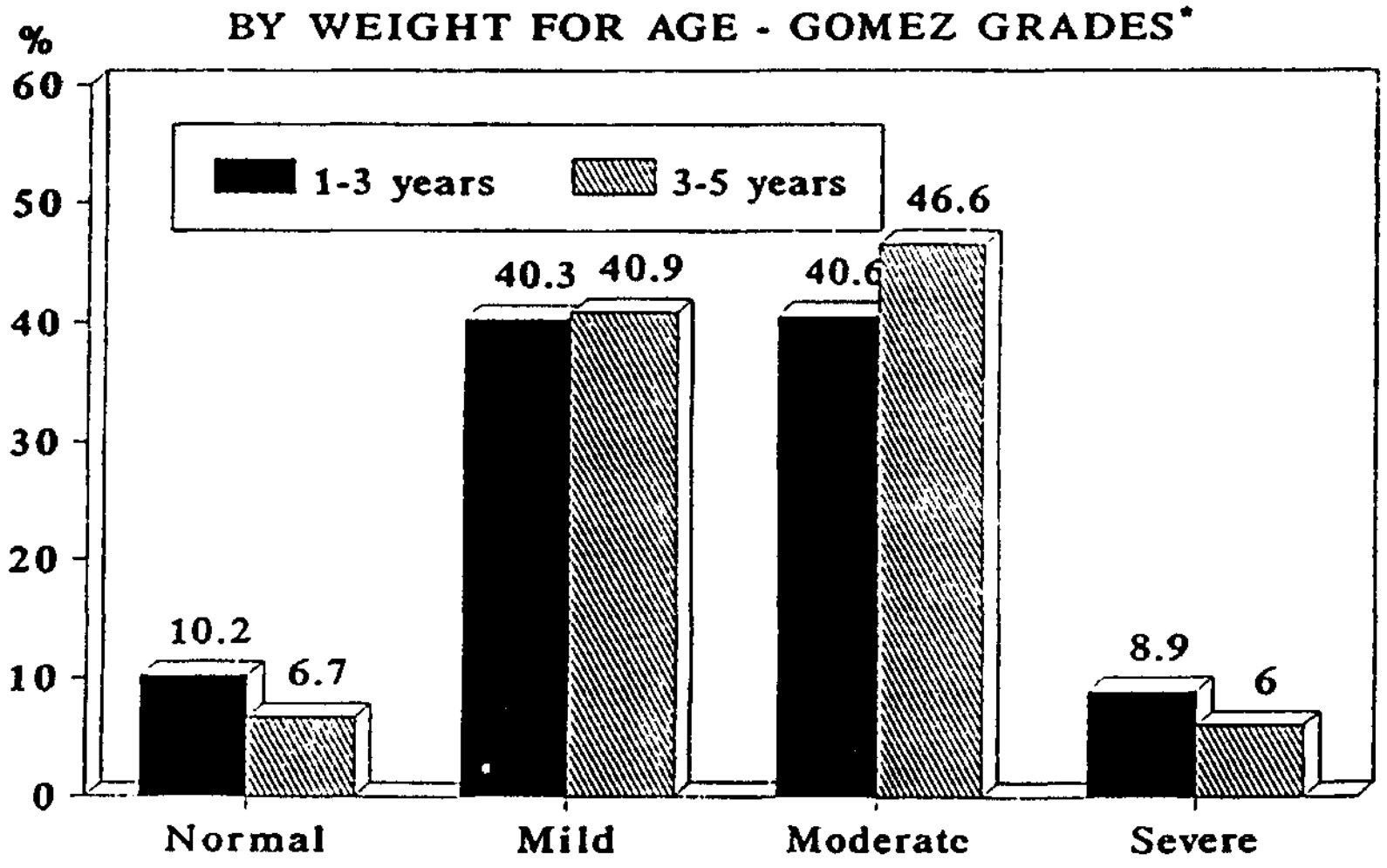
The growth status of 1-5 year children was also assessed adopting SD classification procedure using NCHS median values as standards for reference. The results, at the aggregate level, for height for age, weight for age and weight for height, by age and sex are presented in Tables-9 to 11 respectively (the State-wise information is not provided in this report). Only 4.8% of boys and 3.7% girls had height for age above the NCHS median values. Though about 63% of both the boys and girls were below the median-2SD level, slightly larger percent of girls had heights less than median-3 SD level indicating a marginally higher prevalence of stunting among girls than boys.

Only 2-3% of children had weights that are above the median values while about 23% of boys and 27% girls had "severe" degree of underweight (their weights being less than mcdian-3SD values of the standards). In fact, 64.2% of boys and 62.9% of girls fell below the median-2SD cut-off levels.

The magnitude of "wasting" in the community is assessed using weight for height as the criteria. About 10% of boys and 12% girls had values above the NCHS median

Figure-15

PER CENT DISTRIBUTION OF PRESCHOOL CHILDREN BY WEIGHT FOR AGE - GOMEZ GRADES*

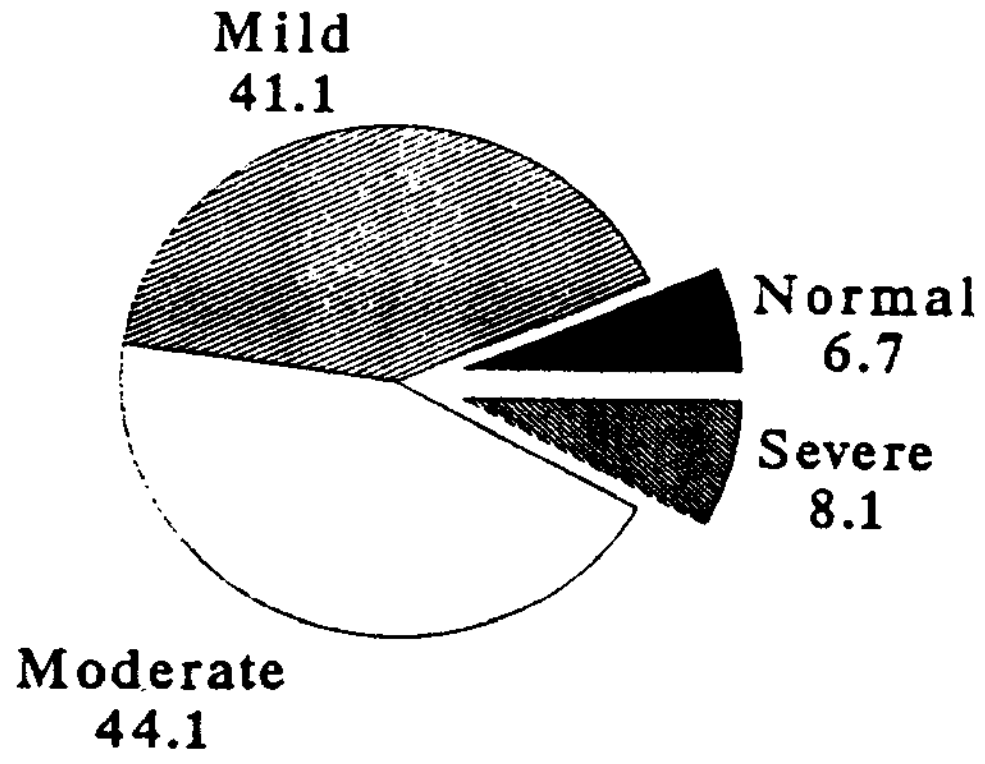


• By using NCHS Standards

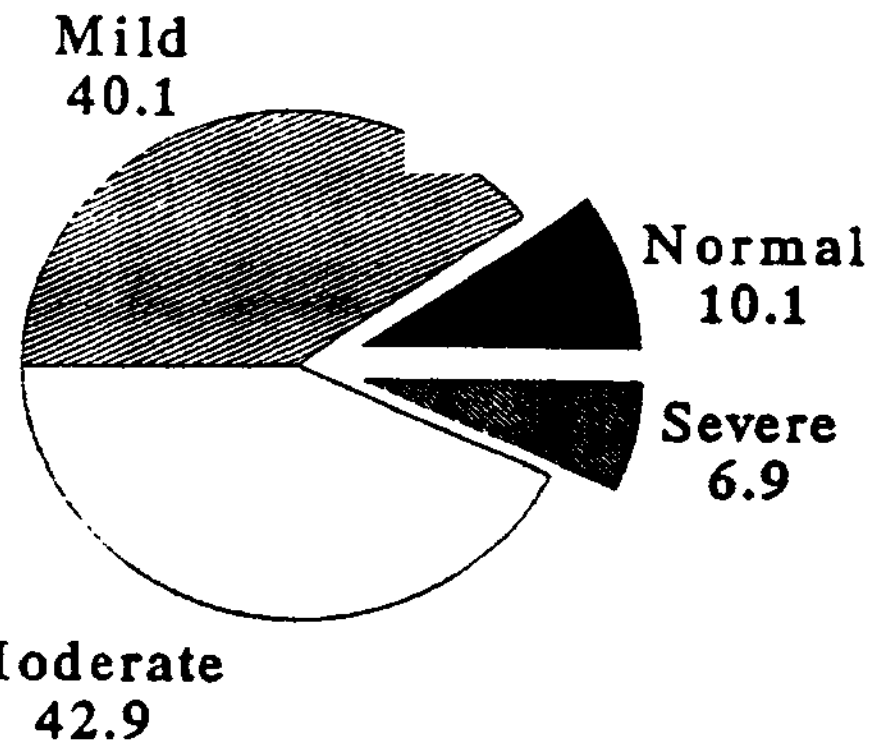
Figure-16

Sex differentials in Nutritional grades of preschoolers

(Percentage of Gomez grades)



BOYS



GIRLS

values, and only 2.6% of boys as well as girls are below the median-3SD cut-off level indicating the magnitude of "severe" degree of wasting among children of 1-5 years in the community. However, 19% of boys and about 14.5% of girls have weight for height values which are less than the median-2 SD values of the standard.

4.4.1.4 Body Mass Index **(BMI)**

Body Mass Index (BMI) describes the current nutritional status of adults. As there were adequate number of adults (19 years and above) on whom anthropometric data was collected within each of the stratum, estimates of prevalence of different grades of BMI were calculated at the State level using appropriate stratum specific multipliers. The results are presented in Table-12. Large inter-state variations are seen in the prevalence of various grades of BMI. At the aggregate level, 5% of the adults had BMI values of 25 and above, indicative of overweight/obesity, with normals and CED being equally distributed. One out of every 9 or 10 individuals had BMI value less than 16, indicative of "severe" degree of CED. The BMI distributions of males and females are fairly similar, except that the proportion of over weight/obese was more in females (6.6%) than in males (3.5%) (Fig. 17).

State level estimates of prevalence of nutritional grades of adults were also calculated in different occupational grades as well as community groups using appropriate multipliers. At the aggregate level, agricultural labourers constituted the high risk group with higher prevalence of CED which showed a decreasing trend with increase in size of land holding (Table 13). The percentage of those with "normal" BMI values varied in a narrow range of 43.8% among labourers to 48.2% among the "small" farmers. The prevalence of overweight/obesity (those with BMI of 25 and above) varied from 3.1% among labourers to about 8.5% of the "others" category (Fig. 18). These differentials in nutritional status of different sections of the community were more apparent when the population was categorized according to community, i.e., schedule caste, scheduled tribe and "others" (Fig. 19).

Figure-17

BMI Grades of Adults

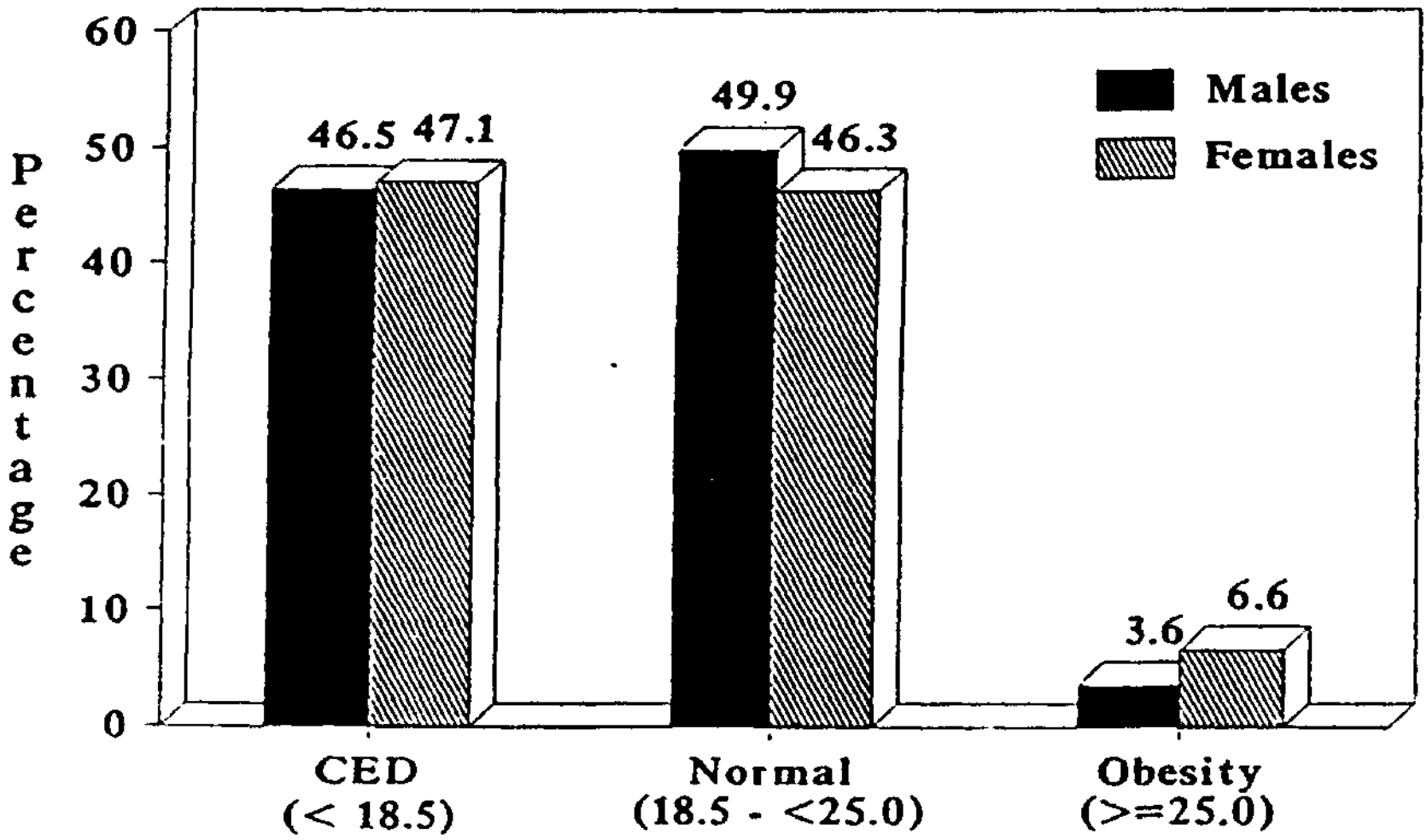
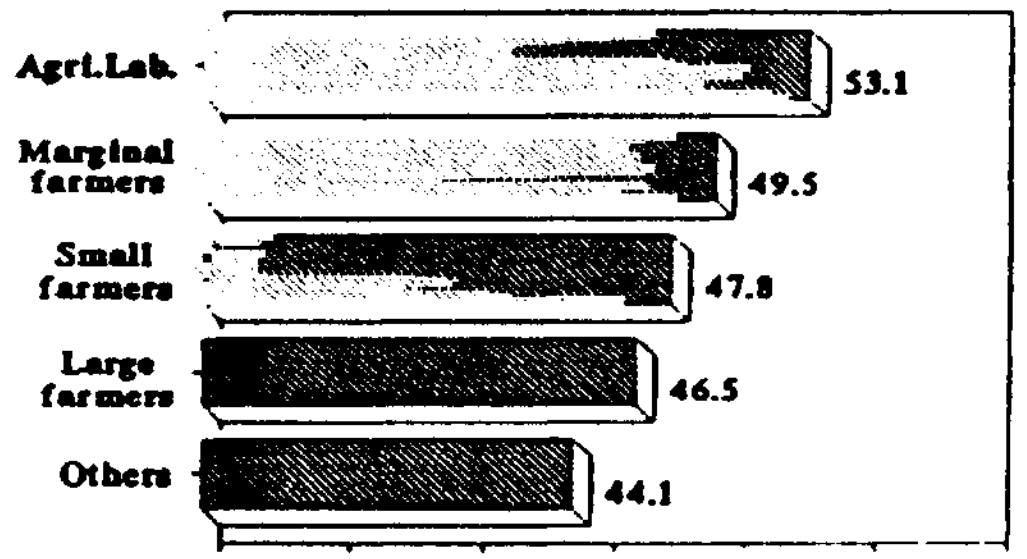


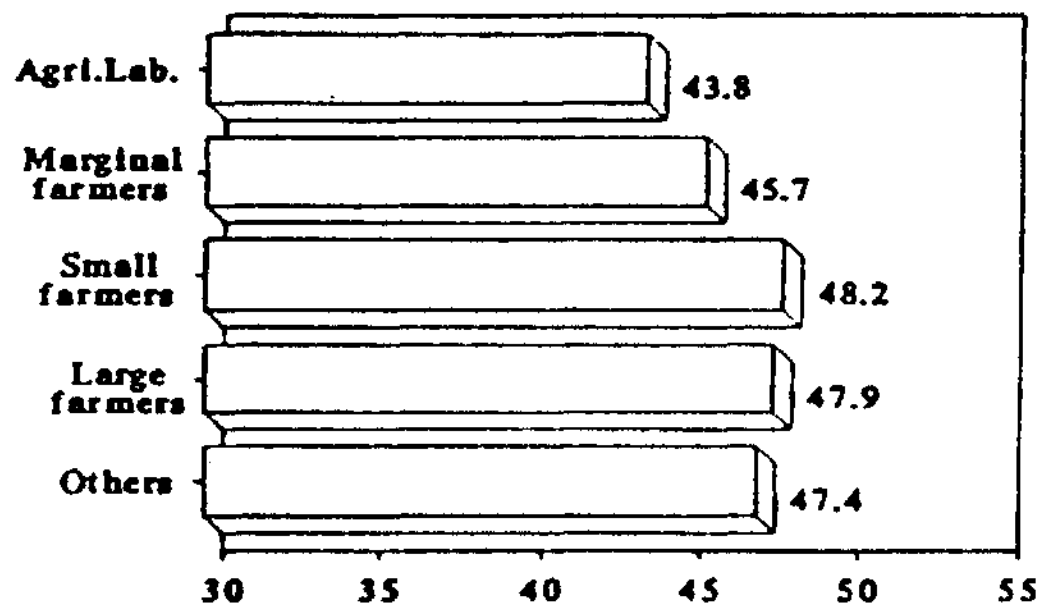
Figure-18

BMI Grades of Adults by Occupation

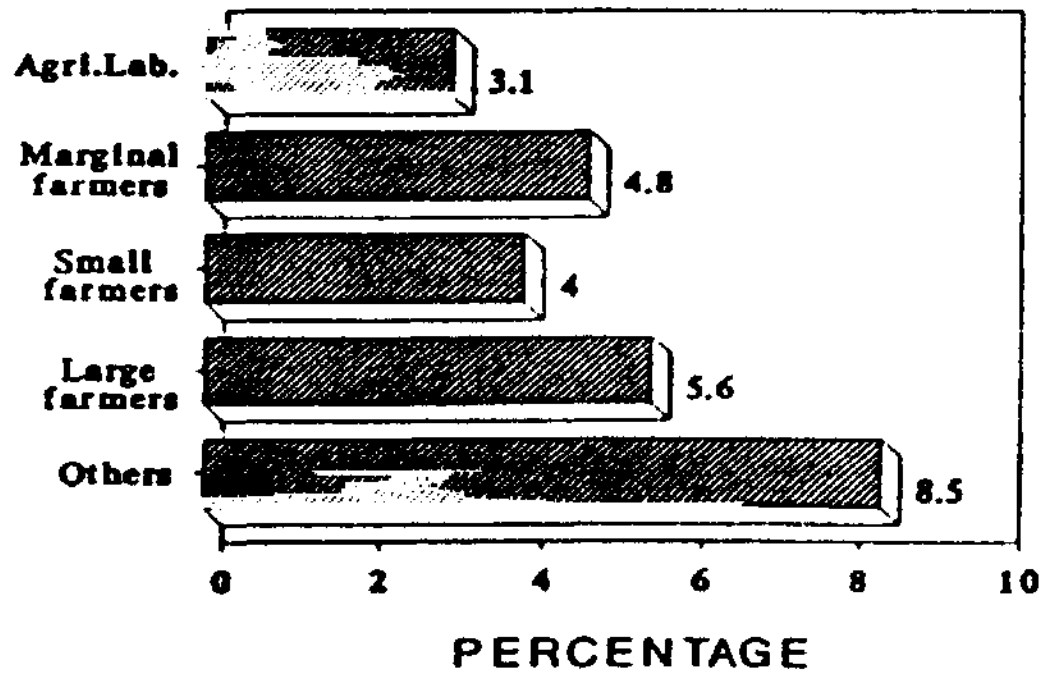
CED
(<18.5)



Normal
(18.5 - <25.0)



Obesity
(>=25.0)



4.4.2 Nutritional Deficiency Signs

4.4.2.1 Infants

None of the 460 infants examined in all the States exhibited any signs of nutritional deficiency except for two marasmic children, one each in the States of Andhra Pradesh and Maharashtra.

4.4.2.2 Preschool children

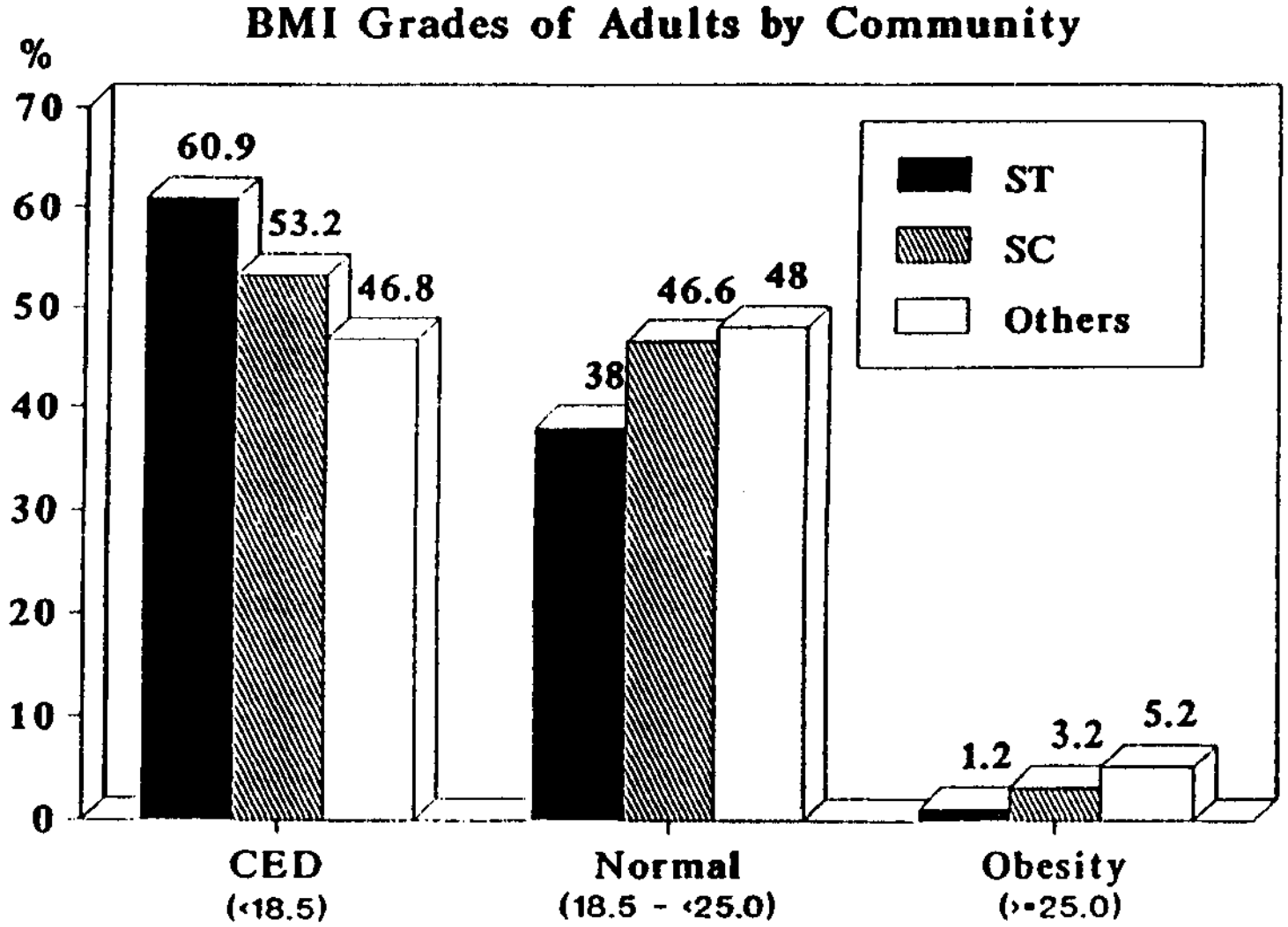
Among the 1828 pre-school children surveyed, the prevalence of protein energy malnutrition viz, kwashiorkor and marasmus was 0.2 and 0.4% respectively (Table-14). In fact, cases of kwashiorkor were seen only in Madhya Pradesh, where the prevalence was about 1.4%. However, marasmus was observed in 4 out of 8 States, the prevalence ranging from 0.4% in the States of Tamil Nadu and Andhra Pradesh to about 1.4% in the States of Madhya Pradesh and Orissa. The overall prevalence of Bitot spots, a sign of vitamin A deficiency, was observed to be 1.1%. While none of the children in Kerala, Andhra Pradesh and Gujarat had Bitot spots, its prevalence ranged from 0.4% in Karnataka and Orissa to 5.6% in Madhya Pradesh. The prevalence was more than 0.5%, a level suggestive of public health problem, according to WHO critcrion,in the States of Tamil Nadu (0.8%), Maharashtra (1.5%) and Madhya Pradesh (5.6%). In 6 out of 8 States, in the pre-school children, the prevalence of angular stomatitis, a sign of B-complex deficiency, ranged from 1 to 2% in the States of Maharashtra, Orissa, Karnataka and Andhra Pradesh to 4.6% in Madhya Pradesh.

4.4.2.3 School age children

The overall prevalence of Bitot spots among the school age children in the 8 States was 2.8% (Table-14). It ranged from 0.5% in the State of Kerala to about 6% in Madhya Pradesh. The prevalence of B-complex deficiency ranged from about 1-2% in the States of Gujarat and Maharashtra to a high of about 8 to 10% in the States of Madhya Pradesh and Tamil Nadu, with an overall prevalence of 4.5%. Barring the States of Kerala and Maharashtra, all the States exhibited prevalence dental fluorosis of varying degrees,

Figure-19

BMI Grades of Adults by Community



ranging from less than 1% in Orissa to 4.2% in Karnataka. While none of the children examined showed visible goitre (Grade II), prevalence of palpable goitre (Grade I) was observed in the States of Kerala (1.5%), Karnataka (2.9%) and Madhya Pradesh (7.4%), which is lower than the endemic level of 10%.

4.4.2.4 Adolescents

The prevalence of Bitot spots was observed to be high among adolescent boys (about 11%) of Tamil Nadu, while it ranged from 1-3% among adolescents of both sexes in the rest of the States (Table 15). About 3% of boys and 1.5% of girls had Angular Stomatitis, with a relatively high prevalence among the boys (about 6-7%) in the States of Tamil Nadu and Orissa, and girls (4%) in the State of Tamil Nadu and Madhya Pradesh. The prevalence of fluorosis appeared to be high in Karnataka (3% girls and 4.5% boys) as compared to the rest of the States. The total prevalence of Goitre was found to be about 10% in Madhya Pradesh, 6.8% in Kerala and 3.6% in Karnataka. However, almost all the cases belonged to grade I (palpable) except in Kerala where about 2% of boys and girls had grade-II (visible) goitre. The overall prevalence was marginally higher among girls (3.9%) as compared to boys (2.8%).

4.4.2.5 Adults

The overall prevalence of Bitot spots, angular stomatitis and dental fluorosis was found to be about 1 to 2% among both adult males and females (Table 16). The prevalence of total goitre was marginally higher among the females (2.8%) as compared to males (0.9%), and was mostly seen in the States of Kerala, Karnataka, Madhya Pradesh

5. COMMENTS

Food consumption survey on about 1200 households in eight States revealed that the diets were predominantly based on cereals and millets. The consumption of green leafy vegetables was very low. The diets in Kerala were qualitatively superior to those of the other States because of consumption of fish, vegetables and milk.

At the aggregate level, the energy intake (2187 Kcal) was below the RDI of 2425 Kcal. The intakes of other nutrients were also less than the RDI. The nutrient deficit was the highest with respect to vitamin A (52%) followed by riboflavin (43%).

The consumption of cereals declined with increase in the size land holdings. The intakes of income elastic foods like pulses, milk, fat, vegetables etc., however, increased with land size.

Growth retardation, as measured by weight for age, among pre-school children, was widely prevalent (34 to 68%). In the State of Kerala, the prevalence of moderate and severe degree malnutrition was the lowest.

Chronic Energy Deficiency (CED) in adults, as measured by BMI, was about 50% or more in all the States except in Kerala and Tamil Nadu. The States having higher prevalence of malnutrition in preschool children showed higher proportion of CED in adults.

In general, infants did not manifest clinical malnutrition. However, in the other age groups deficiency signs were observed. Vitamin A deficiency as evidenced by the prevalence of Bitot spots, appeared to be a public health problem in all the States as its prevalence among preschool children was more than the WHO cut-off level of 0.5% in the States of Tamil Nadu, Maharashtra and Madhya Pradesh. Prevalence of endemic goitre among the 5-12 year children was highest in the State of Madhya Pradesh (7.4%). However, the endemicity of IDD is known to be confined to certain geographical areas. Hence, there is a need for detailed district level surveys to map the problem areas and initiate appropriate intervention programmes.

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STATE-WISE INFORMATION ON :

* Foods and nutrient intakes by occupation and community;
* Protein-calorie adequacy status;
* Individuals nutrient intakes by age, sex and physiological status;
* Means & SDs of anthropometric measurements by age and sex;
* Magnitude of underweight, stunting and wasting in children; and
* Prevalence of chronic energy deficiency (CED) among adults by occupation and community

can be obtained on request from :

The Director
National Institute of Nutrition
Jamai-Osmnnia PO, Hyderabad-500 007, India

TABLES

Table-1

Particulars of coverage

State	Household Survey (HHs)	Diet Survey (HHs.)		Nutritional Assessment Survey (Individuals)
		Oral	Weighment	
Kerala	730	191	185	2214
Tamil Nadu	626	160	161	1989
Karnataka	556	147	142	2316
Andhra Pradesh	585	154	155	2035
Maharashtra	568	136	128	2270
Gujarat	445	160	140	1757
Madhya Pradesh	433	143	119	1777
Orissa	676	166	170	1782
Total	4619	1257	1200	16.140

Table - 2

Coverage of individuals for diet survey by Age/Sex/Physiological and activity status

Age Group (Yrs)	Sex	Physio-logical status	Activity	Kerala	Tamil Nadu	Karna-taka	Andhra Pradesh	Maha-rashtra	Gujarat	Madhya Pradesh	Orissa	Pooled
1-3	B + G			53	47	47	46	49	36	56	71	405
4.6	B + G			44	31	50	51	39	43	66	67	391
7-9	B + G			57	32	51	43	51	45	46	70	395
10-12	Boys			21	19	24	22	32	25	22	23	188
	Girls			24	16	33	28	28	25	30	36	220
13-15	Boys			22	13	23	18	24	25	24	28	177
	Girls			28	25	26	15	24	30	20	24	192
16-17	Boys			17	12	18	8	15	19	13	17	119
	Girls			16	11	13	9	7	23	8	22	109
18+	Males		Sedentary	147	52	78	49	63	48	36	61	534
			Moderate	133	132	102	133	134	208	160	205	1207
			Heavy	1	6	4				4	1	16
	Females	NPNL	Sedentary	238	102	110	56	79	121	52	157	915
			Moderate	14	80	43	90	83	83	62	55	510
			Heavy							1		1
		Preg.	Sedentary	10	5	6	2	5	6	3	8	45
			Moderate				2	4	2	4		12
			Heavy									0
		Lact.	Sedentary	35	31	25	14	15	33	25	36	214
			Moderate	1	6	6	22	17	7	25	12	96
			Heavy								Total	0
												5746

Table - 3
Estimates* of consumption of foods (g/CU/day)

State	No.of HHs		Average CU/ HH	Average Ind/ HH	Cereals and Millets	Pulses and Legumes	Leafy Veg.	Other Veg.	Roots and Tubers	Nuts and Oil seeds	Cond. and Spices	Fruits	Fish	Other Flesh Foods	Milk and Milk prod.	Fats and Oils
Kerala	185	MEAN	5.25	6.09	366	19	6	83	73	82	13	16	44	12	123	12
		SDE			9.12	2.52	2.56	8.18	8.57	2.86	0.35	2.95	4.16	4.07	13.25	0.76
Tamil Nadu	161	MEAN	4.46	5.12	394	39	4	43	27	3	14	26	**	**	98	9
		SDE			11.56	3.37	1.61	7.57	3.35	0.57	0.67	2.90	0.68	0.58	14.68	1.00
Karnataka	142	MEAN	6.34	7.36	496	39	13	40	33	11	16	16	**	3	78	8
		SDE			9.54	2.21	2.42	15.42	2.65	1.42	0.55	1.51	0.21	1.58	9.46	0.62
Andhra Pradesh	155	MEAN	4.79	5.92	542	35	5	38	36	4	21	54	2	9	116	14
		SDE			14.61	2.91	1.78	5.40	2.88	1.11	1.02	9.38	1.38	3.11	15.91	0.91
Maha-rashtra	128	MEAN	5.60	6.36	416	45	10	17	17	9	9	12	**	5	75	16
		SDE			7.80	2.94	2.78	2.60	1.68	1.15	1.24	2.60	0.10	2.67	8.23	1.03
Gujarat	140	MEAN	5.39	6.29	445	34	5	29	53	0	9	7	9	4	158	24
		SDE			11.33	2.69	2.30	3.45	4.40	0	0.50	2.68	6.29	3.09	14.65	1.47
Madhya Pradesh	119	MEAN	6.10	7.11	539	32	29	45	50	0	6	14	0	4	58	9
		SDE			15.07	5.18	6.26	8.16	6.76	0	0.44	2.33	0	3.78	12.54	1.00
Orissa	170	MEAN	4.72	5.60	524	29	37	21	53	**	3	12	6	2	15	8
		SDE			14.19	2.25	4.90	3.82	4.07	0.16	1.04	3.60	1.77	1.18	3.61	0.56
Pooled	1200		5.32	6.23	464	33	13	42	47	15	11	22	9	5	95	13
RDI					460	40	40	60	50	-	-	-	-	-	150	20

* : Using appropriate stratum specific multipliers. ** : Intake less than 1 g. SDE : Standard Deviation of Estimate.

Table - 4

Estimates* of nutrient intakes (Per CU/day)

State		Protein (g)	Tot-Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit-A (μg)	Thiamine (mg)	Ribo. (mg)	Niacin (mg)	Vit.C (mg)
Kerala	MEAN	57.1	58.8	2231	696	22.8	214	0.70	0.77	12.6	50.3
	SDE	2.29	2.20	54.26	43.43	0.93	25.60	0.04	0.03	0.51	3.47
Tamil Nadu	MEAN	44.4	20.1	1814	455	20.2	184	0.77	0.63	9.7	29.9
	SDE	1.66	1.68	51.65	29.89	0.72	19.51	0.05	0.03	0.42	2.88
Karnataka	MEAN	55.5	24.2	2196	839	30.6	286	1.54	0.89	12.2	32.7
	SDE	1.67	1.14	45.57	71.11	0.85	24.52	0.06	0.03	0.59	4.56
Andhra Pradesh	MEAN	57.6	28.3	2430	518	26.2	352	0.87	0.77	13.6	34.0
	SDE	1.52	1.56	56.74	36.83	0.86	69.72	0.04	0.03	0.41	2.67
Maha-rashtra	MEAN	61.1	33.8	2065	404	28.6	222	1.82	0.90	16.3	18.5
	SDE	1.22	1.70	37.56	27.37	0.67	24.72	0.04	0.02	0.42	1.84
Gujarat	MEAN	64.1	44.1	2298	536	26.6	263	1.70	1.15	15.9	25.4
	SDE	2.12	1.85	53.83	36.67	0.95	28.64	0.07	0.04	0.63	1.84
Madhya Pradesh	MEAN	57.9	17.7	2238	354	27.0	343	1.13	0.83	15.8	44.5
	SDE	2.17	1.61	63.28	26.88	0.98	54.04	0.07	0.04	0.63	4.49
Orissa	MEAN	49.4	13.4	2106	381	26.6	436	0.77	0.60	12.3	40.4
	SDE	1.17	0.62	49.09	19.06	0.66	49.82	0.03	0.02	0.28	3.17
Pooled		55.8	31.2	2172	528	26.1	288	1.10	0.80	13.5	34.5
RDI		60	40	2425	400	28.0	600	1.20	1.40	16.0	40

* : Using appropriate stratum specific multipliers

SDE: Standard Deviation of Estimate

Table - 5

Estimates* of per cent distribution of households by Protein Calorie Adequacy Status

State	P C - -	P C - +	P C + +	P C + -	Protein Inadequacy		Calorie Inadequacy	
					Estimate	SDE	Estimate	SDE
Kerala	19.9	2.4	58.9	18.8	22.3	3.5	38.7	3.9
Tamil Nadu	41.4	-	29.7	28.9	41.4	5.1	70.3	4.8
Karnataka	14.9	-	51.8	33.4	14.9	2.8	48.2	4.5
Andhra Pradesh	10.4	-	68.6	21.0	10.4	2.8	31.4	4.3
Maharashtra	2.5	-	48.0	49.5	2.5	1.6	52.1	4.8
Gujarat	2.5	-	60.3	37.3	2.5	1.1	39.7	5.4
Madhya Pradesh	19.7	-	59.9	20.4	19.7	3.6	40.1	4.7
Orissa	24.1	-	49.2	26.7	24.1	5.0	50.8	3.0
Pooled	19.5	0.3	52.0	28.2	19.8		47.7	

* : Using appropriate stratum specific multipliers
SDE: Standard Deviation of Estimate
P: Protein. C: Calories. +: Adequate. -: Inadequate.

Table - 6

Average Food Intake* (g/day) of individuals by Age group, Sex, Physiological Status & Activity

Age group (years)	Sex	Activity	Cereals	Pulses	Leafy Veg.	Other Veg.	Roots& Tubers	Nuts & O-Seeds	Condi& Spices	Fruits	Fish	Other F-Foods	Milk & M-Prod.	Fats & Oils	Sugar Jaggery	Other Foods
1-3	Boys+Girls		146	14	5	12	20	3	4	12	3	2	77	4	13	8
4-6	Boys+Girls		236	21	7	22	29	5	7	14	5	3	68	7	16	10
7-9	Boys+Girls		298	23	12	29	33	7	9	14	7	3	58	8	16	9
10-12	Boys		356	31	17	23	37	8	9	15	4	4	58	9	18	9
	Girls		339	25	7	32	35	7	10	16	8	5	58	9	16	9
13-15	Boys		430	31	15	40	47	12	11	27	5	2	69	12	19	11
	Girls		410	31	9	37	41	9	10	19	6	5	68	11	20	10
16-17	Boys		532	37	12	38	52	12	12	27	10	4	65	13	20	11
	Girls		442	34	9	44	41	12	11	18	4	5	59	17	17	13
18+	Males	Sedentary	475	39	15	51	53	14	13	32	11	6	99	17	23	14
		Moderate	560	37	14	48	55	14	14	22	9	5	72	14	20	17
18+	Females	Sedentary	403	33	12	33	47	11	12	23	7	5	93	14	22	14
	(NPNL)	Moderate	493	34	14	38	41	7	12	15	2	1	50	10	19	15
	(Preg.)	Sedentary	342	20	23	25	54	15	11	17	11	1	62	15	21	10
	(Lact.)	Sedentary	448	35	16	38	48	13	13	26	9	6	79	15	20	22

* Multiplier are not used.

Table · 7.1
Average Nutrient Intake of children by Age group

Age group (years)	Sex	Protein (g)	Tot-Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit-A (/ug)	Thiamine (mg)	Ribo. (mg)	Niacin (mg)	Vit-C (mg)
1-3	Boys+Girls	20.8	12.4	779	245	8.6	141	0.41	0.36	4.8	14.5
	RDI	22	25	1240	400	12	400	0.6	0.7	8	30
4-6	Boys+Girls	31.4	16.5	1165	318	14.0	168	0.69	0.48	7.4	21.1
	RDI	30	25	1690	400	18	400	0.9	1.0	11	40
7-9	Boys+Girls	37.2	18.5	1401	371	17.6	209	0.82	0.56	9.1	26.9
	RDI	41	25	1950	400	26	600	1.0	1.2	13	60
10-12	Boys	43.6	21.2	1654-	416	21.4	255	0.99	0.66	10.7	29.2
	RDI	54	22	2190	600	34	600	1.1	1.3	15	40
	Girls	41.4	20.2	1564	364	19.1	183	0.91	0.59	10.4	25.3
	RDI	57	22	1970	600	31	600	1.0	1.2	13	40
13-15	Boys	50.4	26.5	1991	431	23.9	288	1.05	0.71	12.5	37.8
	RDI	70	22	2450	600	41	600	1.2	1.5	16	40
	Girls	48.7	24.1	1892	395	22.0	227	1.01	0.70	12.2	30.1
	RDI	65	22	2060	600	28	600	1.0	1.2	14	40
16-17	Boys	61.1	28.6	2378	500	28.2	266	1.29	0.86	15.6	36.2
	RDI	78	22	2640	500	50	600	1.3	1.6	17	40
	Girls	51.0	31.4	2066	452	23.8	251	1.08	0.71	12.8	31.1
	RDI	63	22	2060	500	30	600	1.0	1.2	14	40

* Multipliers are not used.

Table - 7.2

Average Nutrient Intake* of adults by Sex, Physiological status & Activity

Age group (years)	Sex	Activity	Protein (g)	Total (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vit.A (µg)	Thiamine (mg)	Ribo-flavin (mg)	Niacin (mg)	Vit.C (mg)
18+	Males	Sedentary	59.4	35.2	2292	566	27.1	374	1.26	0.89	14.7	44.6
		RDI	60	20	2425	400	28	600	1.2	1.4	16	40
		Moderate	64.6	31.7	2515	577	30.7	291	1.43	1.18	16.3	40.5
		RDI	60	20	2875	400	28	600	1.4	1.6	18	40
18+	Females	Sedentary	50.2	29.6	1954	502	22.9	280	1.05	0.78	12.4	35.6
	(NPNL)	RDI	50	20	1875	400	30	600	0.9	1.1	12	40
		Moderate	53.0	21.8	2137	455	26.2	243	1.14	0.74	13.1	32.5
		RDI	50	20	2225	400	30	600	1.1	1.3	14	40
	(Preg.)	Sedentary	42.2	30.2	1704	483	21.1	378	0.98	0.69	11.2	36.4
		RDI	65	30	2254	1000	38	600	1.1	1.3	14	40
	(Lact.)	Sedentary	56.3	31.0	2161	525	26.1	313	1.24	0.83	14.4	38.0
		RDI	75	45	2425	1000	30	950	1.2	1.4	16	80

* Multipliers are not used.

Table - 8

Percentage* of 'Severe and Moderate' forms of malnutrition
(Weight less than 75% of NCHS Standards)

State	1-3 years		3-5 years		1-5 years	
	Boys	Girls	Boys	Girls	Boys	Girls
Kerala	25.9	26.8	45.3	42.9	34.4	34.2
Tamil Nadu	33.4	37.8	49.9	42.1	40.5	39.7
Karnataka	55.2	50.8	55.9	51.4	55.6	51.1
Andhra Pradesh	52.7	48.5	44.5	51.0	48.6	49.6
Maharashtra	44.2	48.0	64.3	65.5	52.7	55.6
Gujarat	80.0	53.2	66.7	72.2	74.2	61.8
Madhya Pradesh	67.3	59.5	47.0	42.0	57.9	49.6
Orissa	53.2	60.3	56.6	42.6	55.1	51.4

* Multipliers are not used

Table - 9

Distribution (%) of Preschool children by SD classification
Criterion: Height for age*

Age (yrs)	Sex	N	Below - 3 SD	- 3 SD to - 2 SD	- 2 SD to - 1 SD	- 1 SD to Med.	>= Med
1-3	Boys	471	40.1	25.3	17.0	12.1	5.5
	Girls	495	43.9	23.2	18.6	11.1	3.2
	Pooled	966	42.1	24.2	17.8	11.6	4.3
3-5	Boys	425	26.1	33.0	27.3	9.6	4.0
	Girls	441	31.3	28.3	22.0	14.1	4.3
	Pooled	866	28.8	30.5	24.6	11.9	4.2
1-5	Boys	896	33.5	28.9	21.9	10.9	4.8
	Girls	936	38.0	25.6	20.2	12.5	3.7
	Pooled	1832	35.8	27.2	21.0	11.7	4.3

Pooled data of 8 States.
Note : Multipliers are not used.
* : Using NCHS standards.

Table - 10

Distribution (%) of preschool children by SD classification
Criterion: Weight for age*

Age (yrs)	Sex	N	Below - 3 SD	- 3 SD to - 2 SD	- 2 SD to - 1 SD	- 1 SD to Med.	>= Med
1-3	Boys	471	26.1	37.8	25.9	7.2	3.0
	Girls	495	29.9	30.3	26.5	10.3	3.0
	Pooled	966	28.1	33.9	26.2	8.8	3.0
3-5	Boys	425	18.6	46.2	27.5	5.6	2.1
	Girls	441	23.1	42.7	26.5	6.6	1.1
	Pooled	866	20.9	44.4	27.0	6.1	1.6
1-5	Boys	896	22.5	41.7	26.7	6.5	2.6
	Girls	936	26.7	36.2	26.5	8.5	2.1
	Pooled	1832	24.7	38.9	26.6	7.5	2.3

Pooled data of 8 States.
Note : Multipliers are not used.
* : Using NCHS standards.

Table - 11

Distribution (%) of preschool children by SD classification
Criterion: Weight for Height*

Age (yrs)	Sex	N	Below - 3 SD	- 3 SD to - 2 SD	- 2 SD to - 1 SD	- 1 SD to Med.	>= Med
1-3	Boys	471	3.0	16.1	40.7	30.6	9.6
	Girls	495	2.8	12.9	42.1	28.5	13.7
	Pooled	966	2.9	14.5	41.4	29.5	11.7
3-5	Boys	425	2.1	16.7	49.7	21.6	9.9
	Girls	441	2.3	10.7	47.3	29.5	10.2
	Pooled	866	2.2	13.6	48.6	25.6	10.0
1-5	Boys	896	2.6	16.4	45.0	26.3	9.7
	Girls	936	2.6	11.9	44.5	28.9	12.1
	Pooled	1832	2.6	14.1	44.7	27.7	10.9

Pooled data of 8 States.
Note : Multipliers are not used.
* : Using NCHS standards.

Table - 12

Estimates* of per cent distribution of adult Males & Females by BMI grades

State	BMI Grade						
	CED			Normal		Obesity	
	<16	16-17	17-18.5	18.5-20	20-25	25-30	>=30
Kerala	6.9	7.6	18.7	18.0	38.5	9.2	1.1
Tamil Nadu	6.2	9.3	21.8	20.5	32.6	8.8	0.8
Karnataka	11.4	14.7	27.7	17.6	24.3	3.7	0.6
Andhra Pradesh	13.4	11.9	24.1	19.0	27.4	3.9	0.3
Maharashtra	12.3	12.3	26.4	20.2	24.4	4.0	0.4
Gujarat	14.2	13.7	25.2	17.1	25.0	4.0	0.8
Madhya Pradesh	11.7	11.4	30.2	22.9	23.1	0.7	0.0
Orissa	9.2	11.4	36.7	25.1	16.0	1.5	0.1
Pooled	10.7	11.5	26.3	20.1	26.4	4.5	0.5

* Using appropriate stratum specific multipliers.

Table - 13

Estimates* of magnitude (%) of CED (BMI<18.5) among adults by occupation & community

State	Occupation					Community		
	Agricultural Labourers	Marginal Farmers	Samll Farmers	Large Farmers	Others	SC	ST	Others**
Kerala	41.1	32.9	20.4	24.8	32.1	-	-	-
Tamil Nadu	37.5	39.8	34.9	46.1	33.1	44.0	-	34.4
Karnataka	58.9	61.1	59.5	41.9	47.2	50.7	-	55.9
Andhra Pradesh	52.8	55.2	47.7	45.7	44.8	54.9	-	47.6
Maharashtra	57.4	50.0	49.4	52.9	44.6	-	-	-
Gujarat	62.6	47.2	56.1	50.7	45.5	-	61.3	47.1
Madhya Pradesh	57.3	54.3	55.7	52.2	47.8	49.4	59.5	50.6
Orissa	57.0	55.7	59.7	57.7	58.4	67.3	61.9	44.9
Pooled	53.1	49.5	47.8	45.9	44.1	53.2	60.9	46.8

* Using appropriate stratum specific multipliers.

- : Not estimated because of lack of appropriate multipliers.

**: Note i) 'Others' include:
- other than SC & ST in case of Madhya Pradesh and Orissa
- other than SC in case of Tamil Nadu, Karnataka and Andhra Pradesh
- other than ST in case of Gujarat

ii) Stratification by community was not done for Kerala and Maharashtra, hence omitted.

Table - 14

Per cent Prevalence of Nutritional Deficiency Signs - Children

STATES:	Kerala	Tamil-Nadu	Karna-taka	Andhra Pradesh	Maha-rashtra	Gujarat	Madhya Pradesh	Orissa	Pooled
Age Group : 1 - 5 Years (Boys & Girls)									
Number	172	242	276	230	266	203	216	223	1828
NAD	98.8	89.9	93.5	88.7	93.2	97.0	75.4	89.2	88.6
Oedema	-	-	-	-	-	-	1.4	-	0.2
Marasmus	-	0.4	-	0.4	-	-	1.4	1.3	0.4
Bitot spots	-	0.8	0.4	-	1.5	-	5.6	0.4	1.1
Angular Stomatitis	-	2.8	1.5	1.8	1.2	-	5.0	1.4	1.7
Age Group : 5 - 12 Years (Boys & Girls)									
Number	204	255	384	319	378	240	323	361	2467
NAD	83.8	72.9	78.2	79.9	74.3	82.9	70.5	74.8	72.9
Bitot spots	0.5	6.3	2.9	2.2	1.6	1.3	5.9	1.9	2.8
Angular Stomatitis	-	9.8	4.2	5.6	1.9	1.3	8.4	4.4	4.5
Dental Fluorosis	-	1.2	4.2	2.2	-	1.7	1.5	0.3	1.5
Goitre : (Palpable)	1.5	-	2.9	-	-	-	7.4	-	1.5

Note: Multipliers are not used.

Table - 15

Per cent Prevalence of Nutritional Deficiency Signs - Adolescents

STATES:	Kerala	Tamil-Nadu	Karna-taka	Andhra Pradesh	Maha-rashtra	Gujarat	Madhya Pradesh	Orissa	Pooled
				Age Group : 12 - 18 Years (Boys)					
Number	87	74	111	77	109	71	106	85	720
NAD	83.9	85.7	77.5	88.3	84.4	88.7	69.8	89.4	80.1
Bitot spots	2.3	10.8	0.9	1.3	-	-	2.8	2.4	2.4
Angular Stomatitis	2.3	6.8	1.8	1.3	0.9	-	4.7	5.9	2.9
Dental Fluorosis	1.1	1.4	4.5	1.3	-	1.4	2.8	-	1.7
Goitre : Palpable	4.6	-	3.6	-	-	-	10.3	-	2.6
Visible	2.2	-	-	-	-	-	-	-	0.2
Total	6.8	-	3.6	-	-	-	10.3	-	2.8
				Age Group : 12 - 18 Years (Girls)					
Number	114	99	157	88	92	92	110	98	850
NAD	85.1	82.9	79.0	87.5	85.9	93.5	70.0	90.8	82.8
Bitot spots	-	2.0	0.6	-	2.2	-	2.7	-	0.9
Angular Stomatitis	-	4.0	-	-	1.1	1.1	3.6	3.1	1.5
Dental Fluorosis	-	2.0	3.2	-	-	-	-	-	0.8
Goitre : Palpable	7.0	-	8.3	-	-	-	9.1	-	3.7
Visible	1.8	-	-	-	-	-	-	-	0.2
Total	8.8	-	8.3	-	-	-	9.1	-	3.9

Note: Multipliers are not used.

Table - 16

Per cent Prevalence of Nutritional Deficiency Signs - Adults

STATES:	Kerala	Tamil-Nadu	Karna-taka	Andhra Pradesh	Maha-rashtra	Gujarat	Madhya Pradesh	Orissa	Pooled
Age Group : 18 Years & above (Males)									
Number	533	466	484	461	480	390	433	551	3799
NAD	88.6	83.0	79.1	77.0	73.8	83.6	73.7	94.6	82.0
Bitot spots	0.2	1.3	-	1.1	0.2	-	0.5	0.9	0.5
Angular Stomatitis	-	1.7	0.2	1.7	-	-	4.4	1.6	1.2
Dental Fluorosis	0.4	0.2	9.1	0.9	-	-	3.9	0.7	1.9
Goitre : Palpable	0.4	-	2.3	-	-	-	5.1	-	0.9
Visible	-	-	-	-	-	-	-	-	-
Total	0.4	-	2.3	-	-	-	5.1	-	0.9
Age Group : 18 Years & above (Females)									
Number	931	699	698	644	659	525	499	512	5170
NAD	85.4	70.4	78.9	73.4	72.8	83.8	66.5	89.8	77.7
Bitot spots	0.1	3.3	0.3	0.2	0.2	-	1.0	0.2	0.7
Angular Stomatitis	0.1	3.6	0.7	1.6	0.2	0.8	8.2	3.3	2.0
Dental Fluorosis	-	0.3	6.2	1.1	0.2	0.6	3.6	0.4	1.5
Goitre : Palpable	4.4	-	6.0	-	-	-	6.0	-	2.2
Visible	2.2	-	0.8	-	-	-	-	0.4	0.6
Total	6.6	-	6.8	-	-	-	6.0	0.4	2.8

Note: Multipliers are not used.