Nutritional assessment of rural villages and estates in Peninsular Malaysia[*] II. Nutritional status of children aged 18 years and below

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ABSTRACT

This paper presents the results of anthropometric assessment of 2,364 boys and 2,415 girls aged 18 years and below drawn from the estates and rural community groups engaged in padi farming, rubber planting, coconut cultivation and fishing. The children were mainly Malay, however in the estates, Indians predominated. The results showed that the percentage of boys who have normal weight-for-age, height-forage and weight-for-height were respectively 69.4%, 68.3% and 88.8%. Among girls, the percentage with normal values for weight-for-age, height-for-age and weight-for-height were 73.8%, 72.6% and 89.5% respectively. This study also showed the persistence of underweight, stunting and wasting amongst children in the study communities. Overall, the prevalence of underweight among boys was 29.8% and for girls 25.5%. The prevalence of stunting was 31.3% for boys and 26.9% for girls, while wasting was found in 9.3% boys and 8.5% girls. By age groups, the prevalence of underweight was lowest among the infants (16.8% for boys and 13.3% for girls), and highest among children aged above 1 to 6 years old (32.6% and 35.9% for boys and girls respectively). Children from the fishing, rubber and padi villages showed a higher prevalence of acute and chronic undernutrition than those from the coconut and the estate communities. In contrast, the mean prevalence of overweight in the five community groups did not exceed 2%. When compared with another peninsula-wide nutritional assessment of poverty villages undertaken in 1979-1983, it is found, over the past decade, that the prevalence of underweight in rural communities appeared to have decreased somewhat while that of stunting showed a more substantial decline. The persistence of current undernutrition has led to the manifestation of children who were too thin for their "non-stunted" height, thus giving rise to an apparently higher prevalence of wasting as found in this study. The implications of these results are discussed.

INTRODUCTION

Assessment of the physical growth of children in Malaysia has been undertaken as early as in the 1930s when nutritional concern was directed at children from poor households in the villages and rubber estates (Williams, 1934; Williams, 1938; Barrowman, 1941). Severe protein energy malnutrition (PEM) as exemplified by clinical symptoms of marasmus and kwashiorkor were

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reported (Will, 1949; Thomson, 1954; Mohd Said, 1955). It is well recognized that PEM manifests in children and adults alike when energy and protein requirements of the body are not met over a period of time. The reasons for failing to meet these dietary requirements may be biological, social, economic, cultural or a combination of these factors.

With the attainment of independence in 1957, the country has undergone vast and rapid socio-economic changes and implemented various social programmes aimed at uplifting the socio-economic status of the under-served communities. These social programmes have included nutrition intervention programmes such as the food supplementary programme for school children, young children and expecting mothers, and a national nutrition rehabilitation programme in the form of a monthly donation of basic food items for malnourished young children. Compared to the pre-independent era, the nutritional status of Malaysian children in general has improved. Frank cases of severe PEM are rare and none has been reported in nutritional studies conducted at the community level, although occasional cases of severe PEM have been reported in the pediatric wards (Chen, 1974; Balakrishnan, 1978; George *et al.,* 1981).

Nonetheless, nutritional assessment studies carried out in the 1970s and 1980s have indicated the persistence of poor growth attainment in children particularly those from the rural areas (Chong & Lim, 1975; Rampal, 1976; Chen *et al.,* 1981; Chong *et al.,* 1984; Wan Manan & Low, 1989). For example, the prevalence of underweight and stunted children under 12 years ranged from more than one-third to almost half of the total number of children examined in 14 very poor villages in the Peninsula (Chong *et al.,* 1984). In a national nutrition surveillance study that involved tens of thousands of children, it was reported that the mean prevalence of severely underweight (weight-for-age of less than 60% of the Harvard Reference) infants, toddlers and preschoolers were 0.4%, 0.5% and 1.1% respectively, while the levels of moderate underweight (60-79% of the Harvard Reference) in these three age groups were 6.1%, 29.3% and 38.1% respectively (Ministry of Health Malaysia, 1989).

The studies by Chong *et al* (1984) and the national nutrition surveillance have provided useful information on the nutritional situation in the late 1970s and 1980s. In the light of the rapid socio-economic changes that have taken place in the country in the past decade or so, it was deemed timely to undertake another comprehensive assessment of the nutritional status of Malaysians. This study was initiated in 1991/1992 with the overall objective of assessing the nutritional status of various communities in the rural and urban areas.

The communities selected for study comprised the padi farmers, rubber smallholders, coconut smallholders, fishermen and estate workers. This report focuses on the nutritional status of children from these five communities.

METHOD

Selection of the study villages and estates

The selection of the study villages and estates is described in detail in the preceding article by Chee, Khor and Tee (1997). Briefly, the padi, rubber and coconut households were selected by a multi-stage sampling method based on the 1990 census of the Department of Agriculture Malaysia. Likewise, the fishing households were selected from the 1991 list of the Fisheries Development Authority Malaysia (Lembaga Kemajuan Ikan Malaysia). The estates were chosen from a list of estates in Peninsular Malaysia provided by the National Union of Plantation Workers.

Based on past reports on the prevalence of malnutrition in the Peninsula, 600 households were

computed as the sample size required for each type of community in this study.

In every village and estate selected, all the households were interviewed using a structured questionnaire. All residents of all age groups were asked to attend a centre set up specifically for the study, usually located in a community-based place such as the village community hall or KEMAS preschool. In the centre, anthropometric measurements, biochemical tests and clinical examinations were carried out. A medical doctor from the research team performed clinical examinations, including the measurements of blood pressure, and providing medicines for minor illnesses.

All the children of ages 18 years and below who came to the community-based centres had their anthropometric measurements taken. It is to be noted that, although the anthropometric results here are presented according to padi, rubber, coconut, fishing and estate households, the data included children from all households in the selected villages. For example, while a study village selected for the padi crop may comprise of a majority of the households involved in padi farming, there were also some households which did not meet the study's criteria as belonging to padi households. These criteria required that at least one member of the household earned a living from padi farming, or at least one half of the household income was derived from padi farming. Regardless of the type of household they belonged to, all children from a selected village or estate were measured as described below.

Anthropometric measurements and classification of nutritional status

Only the body weight and stature results are presented in this report.

Infants and toddlers were weighed on a KUBOTA or SECA pediatric scale (maximum weight 12 kg) to the nearest 50 gm. When it was not possible to weigh the child by himself/herself, the weight of the child was obtained by subtracting the weight of the mother from the combined weight of the mother and child. Weight of older subjects were taken to the nearest 0.1 kg on a TANITA or SECA electronic balance. Subjects were weighed barefooted and the approximate weight of their attire was deducted based on a list of weights recorded for different types of attire normally worn by adults and children in rural areas. In general, 250 gm was deducted for children's clothing.

Heights were recorded in cm by the use of a microtoise tape (Stanley-Mabo Besancon) to the nearest 0.1cm. The tape was suspended two metres from the floor against a straight wall or pillar.

The body weight and stature measurements of the children were compared to the reference values of the National Centre for Health Statistics (NCHS), and classification of the nutritional status was based on the recommendations of WHO (1983) as follows:

Underweight   : weight-for-age below minus 2 SD from the NCHS median.

Overweight   : weight-for-age above plus 2 SD from the NCHS median

Stunted   : height-for-age below minus 2 SD from the NCHS median

Wasted   : weight-for-height below minus 2 SD from the NCHS median.

Weight-for-age, height-for-age and weight-for-height values that were between minus 2 SD and plus 2 SD of the NCHS median were considered as normal growth attainment.

RESULTS AND DISCUSSION

A total of 4,779 children aged 18 years and below were anthropmetrically assessed. They comprised 2,364 boys and 2,415 girls. Table 1 shows the distribution of these children by gender and their community origin. Table 2 shows the distribution of children by gender and age groups.

Table 1. Distribution of children by gender and type of community

Type of community	Boys (N)	Girls (N)	Total (N)
Fishing	519	556	1,075
Rubber smallholding	522	501	1,023
Padi	64	659	1,263
Coconut smallholding	361	361	722
Estates	358	338	696
Total	2,364	2,415	4,779

Table 2. Distribution of children by gender and age group

Age group (years)	Boys (N)	Girls (N)	Total (N)
Below 1.0	95	98	193
1.0 to 6.0	700	727	1427
Above 6.0 to 12.0	1057	1069	2126
Above 12 to 18.0	512	521	1033

The ethnicity of the children was predominantly Malay for the padi, rubber, coconut and fishing communities. However, in the estates, 60.5% of the households were Indian and 35.1% Malay. Chinese households constituted only 1.7% of the total study population with most of them located in the coconut community.

Nutritional status of children

Weight-for-age

The weight-for-age of children reflects their current nutritional status, whereby current or recent episodes of undernutrition could lead to weight loss resulting in body weight which is lighter than that appropriate for his/her age. In this study, the weight-for-age of the majority of the children may be described as normal (Table 3). For all the communities combined, the mean prevalence of boys and girls with normal weight-for-age was 69.2% and 73.8% respectively. Comparing among the five communities, it is seen that the prevalence of boys with normal weight-for-age ranged from 65.5% in the fishing villages to 76.2% in the coconut villages, while among the girls, the range was from 70.4% in the fishing villages to 80.4% in the coconut villages.

Nonetheless, underweight was evident in all the study communities. The mean prevalence of underweight for all the communities combined was 29.8% for boys and 25.5% for girls. The range for the prevalence of underweight among the boys varied from 22.2% (coconut community) to 33.3% (fishing), while underweight for the girls ranged from 19.1% (coconut) to 28.5% (padi).

Table 3. Distribution of weight-for-age of children aged 18 years and below in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys	N = 519	N = 604	N = 522	N = 361	N = 358	N = 2364
< -2sd	173 (33.3%)	181 (30.0%)	164 (31.4%)	80 (22.2%)	106 (29.6%)	704 (29.8%)
-2sd to NCHS median	317 (61.1%)	383 (63.4%)	321 (61.5%)	238 (65.9%)	225 (62.9%)	1484 (62.8%)
> NCHS median to +2sd	23 (4.4%)	33 (5.5%)	33 (6.3%)	37 (10.3%)	24 (6.7%)	150 (6.4%)
> +2sd	6 (1.2%)	7 (1.1%)	4 (0.8%)	6 (1.7%)	3 (0.8%)	26 (1.1%)
Girls	N = 556	N = 659	N = 501	N = 361	N = 338	N = 2415
< -2sd	137 (24.6%)	188 (28.5%)	138 (27.6%)	69 (19.1%)	83 (24.6%)	615 (25.5%)
-2sd to NCHS median	356 (64.0%)	410 (62.2%)	309 (61.7%)	258 (71.5%)	213 (63.0%)	1546 (64.0%)
> NCHS median to +2sd	59 (10.6%)	54 (8.2%)	51 (10.2%)	32 (8.9%)	41 (12.1%)	237 (9.8%)
> +2sd	4 (0.8%)	7 (1.1%)	3 (0.6%)	2 (0.6%)	2 (0.6%)	17 (0.7%)

In comparison, the prevalence of overweight children was small and did not exceed 2% in any community. The mean prevalence of overweight among the boys ranged from 0.8% (padi, rubber and estates) to 1.7% (coconut), whilst among the girls, the level of overweight varied from 0.6% (rubber, coconut and estates) to 1.1% (padi).

In general, the pattern of the current nutritional status (weight-for-age) of the children in the fishing, padi, rubber and estate communities appeared to be quite similar (Figures 1 and 2). The fishing, rubber, padi and the estate communities have a higher prevalence of underweight than the coconut community. The latter group appears better off in having the lowest prevalence of underweight, and with a relatively high prevalence of children with a satisfactory weight-for-age. The coconut community also showed the highest prevalence of overweight (especially among the boys), albeit the level is small for all the communities.

Height for age

Like weight-for-age, the majority of the children have normal height-for-age. The prevalence of normal height-forage was 68.3% for the boys and 72.6% for the girls in all communities (Table 4). Comparing the different communities, the proportion of boys with normal height attainment ranged from 62.0% in the fishing villages to 78.6% in the estates. In the case of girls, the range was between 68.3% in the rubber villages to 76.2% in the coconut villages.

Low height-for-age indicates "long term, cumulative inadequacies of health or nutrition" (WHO, 1995). Stunting in children indicates the failure to reach optimal linear growth potential. The prevalence of stunted children in the rural communities may be described as rather high, averaging 31.1% and 26.9% in the boys and girls respectively for all the communities combined (Table 4). The mean prevalence of stunting varied from 20.6% in the estates to 37.6% in the fishing villages in the case of boys, and from 21.9% in the estates to 31.4% in the rubber villages among the girls. In general, the estates and coconut villages showed a lower mean prevalence of stunted boys and girls than the other communities (Figures 3 & 4).
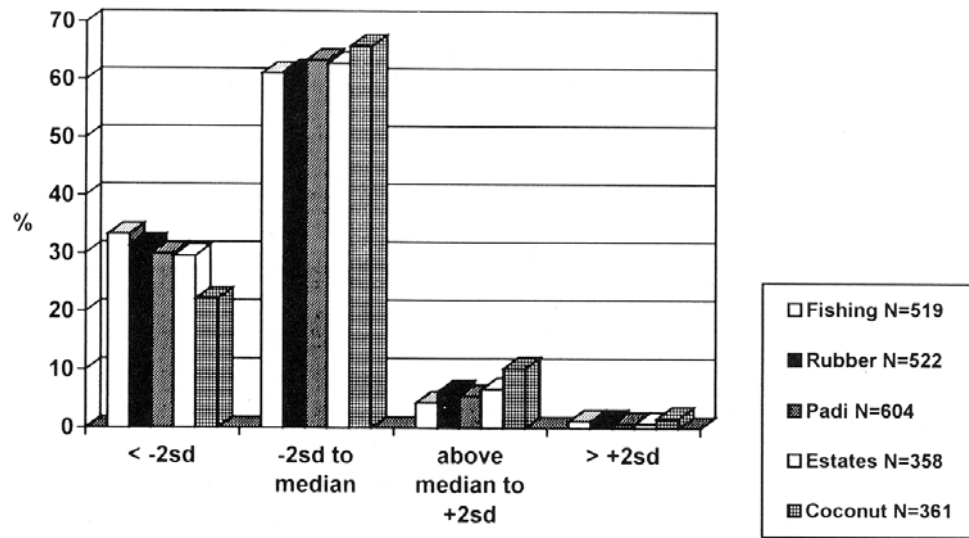
Figure 1. Weight-for-age of boys 18 years and below in different types of communities.
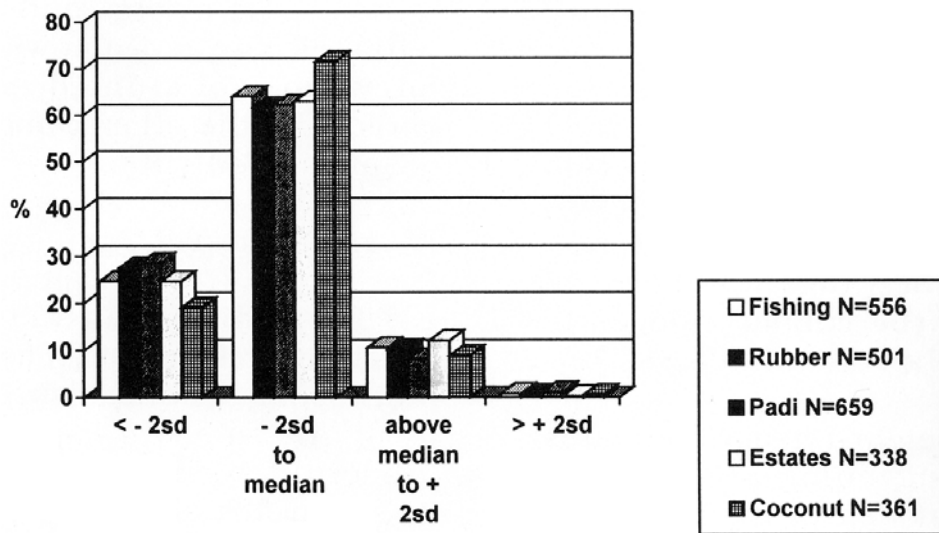

Figure 2. Weight-for-age of girls 18 years and below in different types of communities.

Table 4. Distribution of height-for-age of children aged 18 years and below in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys	N = 503	N = 596	N = 507	N = 360	N = 355	N = 2321
< -2sd	189 (37.6%)	203 (34.1%)	177 (34.9%)	80 (22.2%)	73 (20.6%)	722 (31.1%)
-2sd to NCHS median	285 (56.7%)	365 (61.2%)	304 (60.0%)	237 (65.8%)	249 (70.1%)	1440 (62.0%)
> NCHS median to +2sd	28 (5.3%)	24 (4.0%)	24 (4.7%)	40 (11.1%)	30 (8.5%)	146 (6.3%)
> +2sd	1 (0.2%)	4 (0.7%)	2 (0.4%)	3 (0.8%)	3 (0.8%)	13 (0.6%)
Girls	N = 533	N = 645	N = 494	N = 360	N = 338	N = 2370
< -2sd	132 (24.8%)	194 (30.1%)	155 (31.4%)	83 (23.1%)	74 (21.9%)	638 (26.9%)
-2sd to NCHS median	357 (67.0%)	421 (65.3%)	314 (63.6%)	245 (68.1%)	214 (63.3%)	1551 (65.4%)
> NCHS median to +2sd	42 (7.9%)	28 (4.3%)	23 (4.7%)	29 (8.1%)	48 (14.2%)	170 (7.2%)
> +2sd	2 (0.4%)	2 (0.3%)	2 (0.4%)	2 (0.6%)	2 (0.6%)	10 (0.4%)

Weight-for-height

The indicator of weight-for-height is presumed to reflect acute nutritional alterations such as due to an acute episode of undernutrition, resulting in the failure of the child to gain weight relative to his/her height. In general, the majority of the children from all the communities were not in such a 'wasted" category. Among the boys, the proportions with normal weight-for-height ranged from 84.2% in the estates to 93.3% in the rubber villages, while the corresponding figures for the girls ranged from 87.6% in the fishing villages to 95.1% in the estates.

The overall mean percentage of boys and girls who could be defined as wasted were 9.3% and 8.7% respectively of all the communities combined (Table 5; Figures 5 & 6). The estates had the highest proportion of boys and girls who were wasted. In view that the estates showed the lowest proportion of stunted children, it would appear that acute or current malnutrition was more prevalent in the estate children than chronic malnutrition. In contrast, the fishing villages showed a relatively high prevalence of stunted children especially boys, and this community also showed a relatively high prevalence of wasted children. These children were not only stunted reflective of chronic undernutrition, but they were also too thin for their lack of height, thereby indicating the presence of acute and current undernutrition as well. Based on these indicators, the fishing villages can be described as having the least satisfactory nutritional status followed by the padi and rubber villages.

Table 6 summarises the prevalence of malnutrition among boys and girls in the various communities as indicated by the percentage levels who were underweight, stunted and wasted. More than one-quarter of the children were underweight, more than one-quarter to nearly one-third were stunted while about one-tenth were wasted. Figures 7 and 8 illustrate the relative proportions of underweight and stunted boys and girls in the five communities.
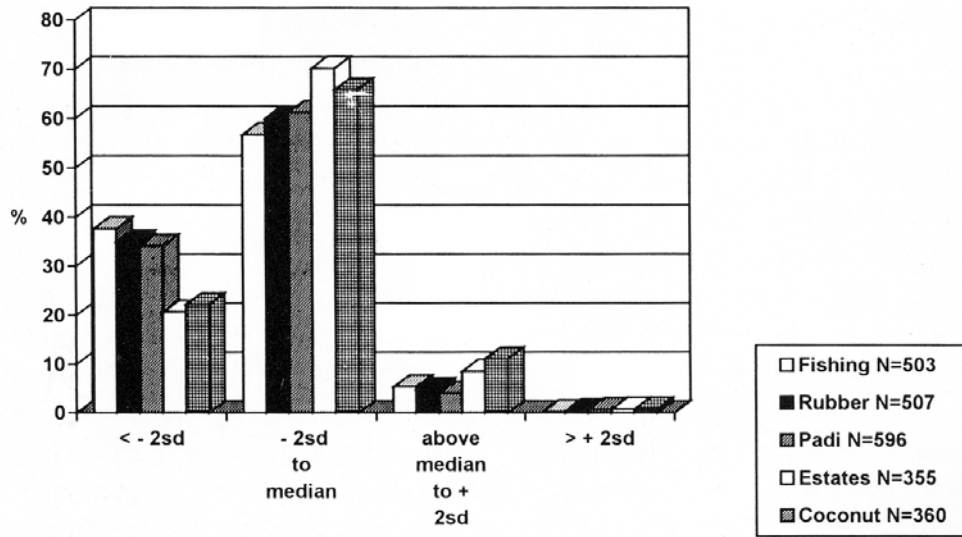
Figure 3. Height-for-age of boys aged 18 years and below in different types of communities
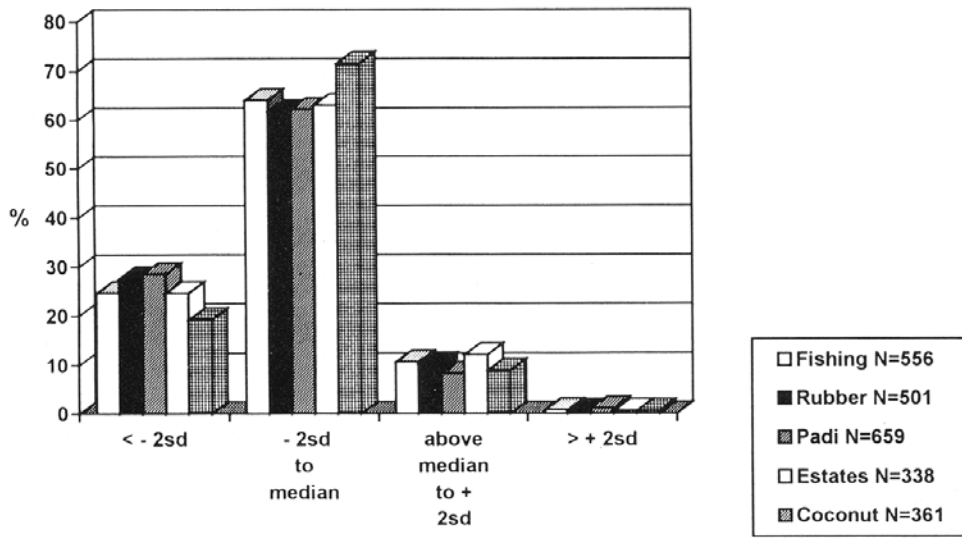

Figure 4. Height-for-age of girls aged 18 years and below in different types of communities

Table 5. Distribution of weight-for-age of children aged 18 years and below in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys	N = 377	N = 476	N = 372	N = 259	N = 247	N = 1731
< -2sd	46 (12.2%)	43 (9%)	20 (5.4%)	16 (6.2%)	36 (14.6%)	161 (9.3%)
-2sd to NCHS median	265 (70.3%)	330 (69.3%)	278 (74.7%)	174 (67.2%)	169 (68.4%)	1216 (70.3%)
> NCHS median to +2sd	58 (15.4%)	98 (20.6%)	69 (18.6%)	56 (21.6%)	39 (15.8%)	320 (18.5%)
> +2sd	8 (2.1%)	5 (1.1%)	5 (1.3%)	13 (0.5%)	3 (1.2%)	34 (2.0%)
Girls	N = 338	N = 452	N = 332	N = 214	N = 208	N = 1544
< -2sd	31 (9.2%)	33 (7.3%)	22 (6.6%)	19 (8.9%)	29 (13.9%)	134 (8.7%)
-2sd to NCHS median	249 (73.7%)	342 (75.7%)	236 (71.1%)	144 (67.3%)	148 (71.2%)	1119 (72.5%)
> NCHS median to +2sd	47 (13.9%)	71 (15.7%)	68 (20.5%)	47 (22.0%)	29 (13.9%)	262 (17.0%)
> +2sd	11 (3.3%)	6 (1.3%)	6 (1.8%)	4 (1.9%)	2 (1.0%)	29 (1.9%)

Table 6. Prevalence of malnutrition among children aged 18 years and below in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys						
Weight-for-age	N = 519	N = 604	N = 522	N = 361	N = 358	N = 2364
*Underweight	173 (33.3%)	181 (30%)	164 (31.4%)	80 (22.2%)	106 (29.5%)	704 (29.8%)
Height-for-age	N = 503	N = 596	N = 507	N = 360	N = 355	N = 2321
**Stunted	194 (38.6%)	203 (34.1%)	177 (34.9%)	80 (22.2%)	73 (20.6%)	727 (3 1.3%)
Weight-for-height	N = 377	N = 451	N = 372	N = 259	N = 246	N = 1705
***Wasted	46 (12.2%)	40 (8.9%)	20 (5.4%)	16 (6.2%)	36 (14.6%)	158 (9.3%)
Girls						
Weight-for-age	N = 556	N = 659	N = 501	N = 361	N = 338	N = 2415
Underweight	137 (24.6%)	188 (28.5%)	138 (27.6)	69 (19.1%)	83 (24.6%)	615 (25.5%)
Height-for-age	N = 533	N = 645	N = 494	N = 359	N = 338	N = 2369
Stunted	132 (24.8%)	194 (30.1%)	155 (31.4%)	83 (23.1%)	74 (21.9%)	638 (26.9%)
Weight-for-height	N = 338	N = 416	N = 332	N = 214	N = 208	N = 1508
Wasted	31(9.2%)	27 (6.5%)	22 (6.6%)	19 (8.9%)	29 (13.9%)	128 (8.5%)

*	Underweight	: weight-for-age <-2sd NCHS median
**	Stunted	: length-for-age <-2sd NCHS median
***	Wasted	: weight-for-length/height <—2sd NCHS median

Table 7. Prevalence of malnutrition among infants (aged 1 year and below) in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys						
Weight-for-age	N = 24	N = 17	N = 21	N = 17	N = 16	N = 95
Underweight	8 (33.3%)	2 (11.8%)	4 (19.0%)	1(5.8%)	1(6.3%)	16 (16.8%)
Height-for-age	N = 22	N = 17	N = 15	N = 17	N = 16	N = 87
Stunted	4 (18.2%)	4 (23.5%)	2 (13.3%)	1 (5.9%)	1 (6.3%)	12 (13.8%)
Weight-for-height	N = 23	N = 17	N = 15	N = 17	N = 16	N = 88
Wasted	5 (21.7%)	1(5.9%)	0	1(5.9%)	3 (18.8%)	10 (11.4%)
Girls						
Weight-for-age	N = 21	N = 24	N = 23	N = 14	N = 16	N = 98
Underweight	3 (14.3%)	2 (8.3%)	5 (2 1.7%)	3 (2 1.4%)	0	13 (13.3%)
Height-for-age	N = 20	N = 24	N = 19	N = 14	N = 16	N = 93
Stunted	4 (20.0%)	1 (4.2%)	3 (15.8%)	2 (14.3%)	0	10 (10.8%)
Weight-for-height	N = 20	N = 24	N = 19	N = 14	N = 16	N = 93
Wasted	2 (10.0%)	4 (16.7%)	1(5.3%)	5 (35.7%)	2 (12.5%)	14 (15.1%)

Malnutrition by age

One year old and below

The total number of infants measured was approximately 200 with about equal number of boys and girls. The overall mean prevalence of underweight was 16.8% for male infants and 13.3% for female infants. It has been reported that breast-fed infants tend to grow more rapidly in the first 2 months and less rapidly from 3-12 months when compared with the current NCHS reference (WHO, 1994). In the light of this revelation, it is likely that this study has over-estimated the proportion of underweight infants, since breast feeding is virtually universal at birth among Malay mothers in the rural communities and they continue to provide breastmilk solely throughout the first month (Haaga, 1986). The mean duration of breast feeding by rural Malay mothers has been reported to be 7 months (Subbiah and Looi, 1988).

The prevalence of infants who were stunted and wasted were similar as the prevalence of infants who were underweight. Among the male infants, 13.8% were stunted and 11.4% were wasted, while the figures for the female infants were 10.8% and 15.1% respectively. The levels of malnutrition among infants, although relatively low, merits public health concern. To what extent is this problem the outcome of genetic or environmental influence? What proportion of the mothers had inadequate maternal care during pregnancy that may have a negative impact on birthweight? The infants may not have received adequate breast milk if the mothers themselves are mal nourished.
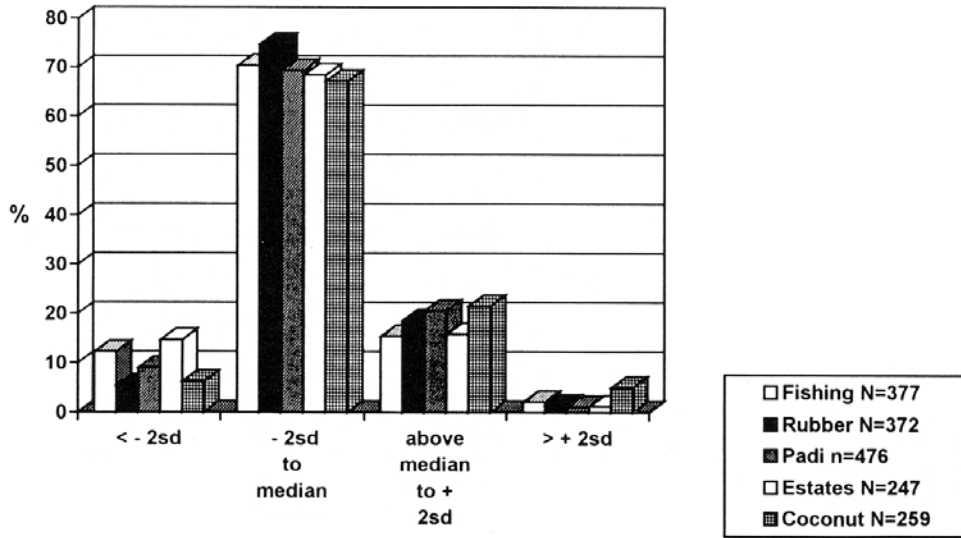
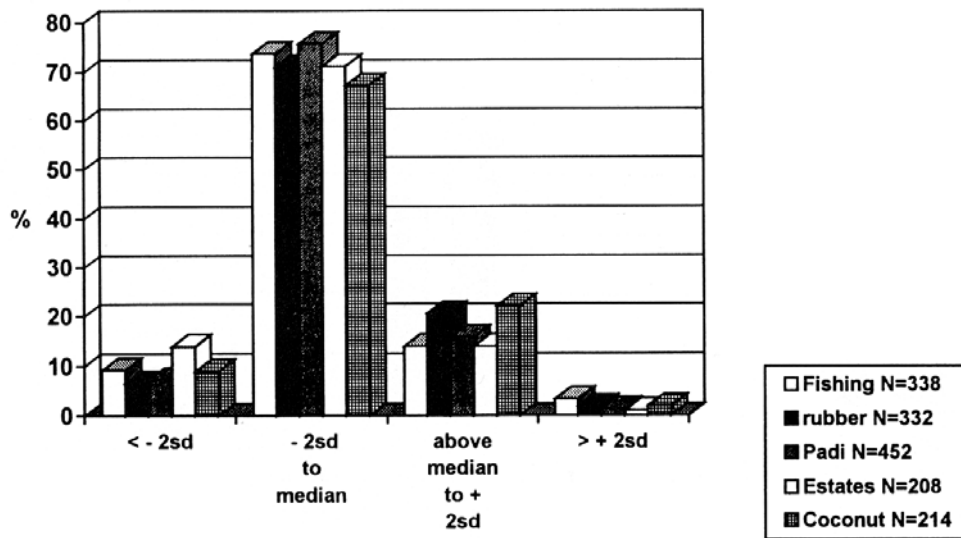**Figure 5.** Weight-for-height of boys aged 18 years and below in different types of communities

Figure 6. Weight-for-height of girls aged 18 years and below in different types of communities
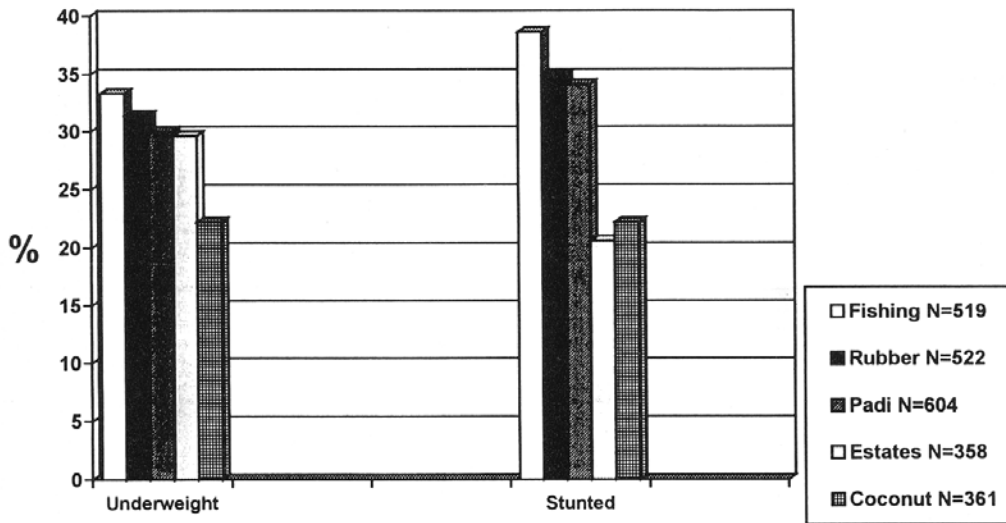
Figure 7. Prevalence of underweight and stunting among boys aged 18 years and below in different types of community
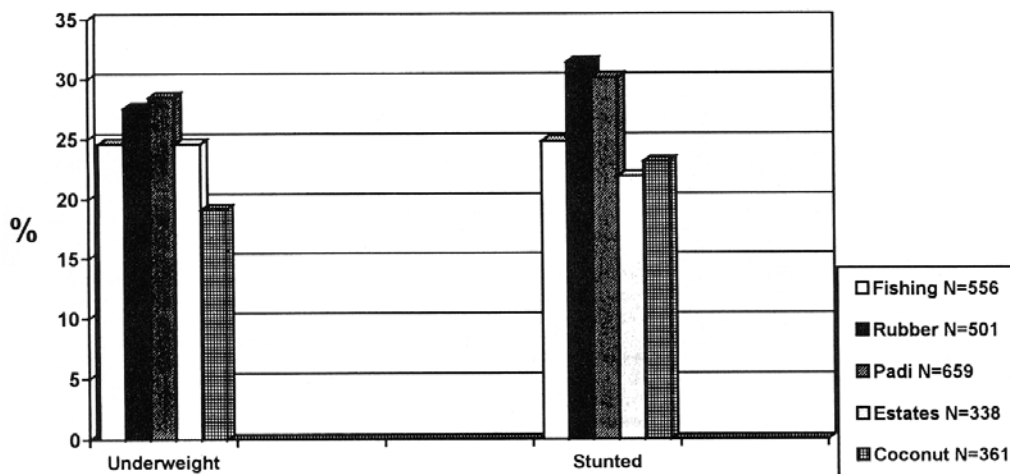

Figure 8. Prevalence of underweight and stunting among girls aged 18 years and below in different types of community

Above 1 year to 6 years old

This age group comprises toddlers and preschoolers who are nutritionally vulnerable due to several factors. They are usually already weaned of breastmilk and proper weaning foods may or may not be provided. This age group may be neglected as their mothers may have to look after younger children; or mothers may be working outside the homes and have to leave her children with child minders (paid or unpaid), who may not provide the optimal nutritional care to the children. Children of this age group tend to have a preference for snacks, sweet foods, soft drinks and foods that are attractively promoted in the television and other mass media. These children in general tend to dislike rice and vegetables, which are served to them as part of the family meal.

Given the host of socio-cultural and economic factors that can impinge deleteriously on the dietary habits of toddlers and preschoolers, it is not surprising to find that this age group in the

different communities showed a high prevalence of malnutrition. The overall mean prevalence of underweight was 32.6% among the boys and 35.9% for the girls (Table 8). Thus, approximately one in three among the toddlers and preschoolers was underweight. The fishing, padi and rubber villages had higher proportions of underweight children of this age group than the coconut villages for both gender. The prevalence of underweight toddlers and preschoolers in the estates was between the levels for the coconut villages and the other villages.

Table 8. Prevalence of malnutrition among children aged above 1-6 years in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys						
Weight-for-age	N = 141	N = 209	N = 167	N = 99	N = 84	N = 700
Underweight	56 (39.7%)	71(34.0%)	54 (32.3%)	23 (23.2%)	24 (28.6%)	228 (32.6%)
Height-for-age	N = 127	N = 202	N = 162	N - 98	N = 83	N = 672
Stunted	44 (34.6%)	64 (3 1.7%)	56 (34.6%)	14 (14.3%)	10 (12.0%)	188 (28.0%)
Weight-for-height	N = 126	N = 200	N = 161	N = -97	N = 83	N = 667
Wasted	18(14.3%)	20(10.0%)	12(7.5%)	9(9.3%)	11(13.3%)	70(10.5%)
Girls						
Weight-for-age	N = 155	N = 222	N = 153	N = 96	N = 101	N = 727
Underweight	57 (36.8%)	87 (39.2%)	57 (37.3%)	26 (27.1%)	34 (33.7%)	261 (35.9%)
Height-for-age	N = 134	N = 210	N = 150	N = 95	N = 102	N = 691
Stunted	36 (26.9%)	78 (37.1%)	48 (32.0%)	19 (20.0%)	18 (17.6%)	199 (28.8%)
Weight-for-height	N = 134	N = 209	N = 148	N = 94	N = 99	N = 684
Wasted	17 (12.7%)	15 (7.2%)	11(7.4%)	10 (10.6%)	16 (16.2%)	69 (10.1%)

The overall average prevalence of stunted toddlers/preschoolers was about 28% for both sexes. The prevalence of stunted children of this age category in the estates and the coconut villages was lower than the mean for all the communities combined. In comparison, the fishing, padi and rubber villages in general showed levels of stunted toddlers / preschoolers which exceeded the overall average.

The average percentage of "wasted" toddlers and preschoolers in all the communities combined was approximately 10%. The fishing villages and the estates showed higher levels of wasting than the overall group mean. In the case of the fishing villages, which also showed a high proportion of underweight and "stunted" children, this finding indicated that the toddlers and preschoolers in the fishing villages were too thin for their "stunted" height. These young children showed growth failure that is reflective of both current and chronic undernutrition.

In the case of the estates, the proportion of underweight in this age group was also relatively high, but its proportion of stunted children was the lowest among the various communities. The "wasted" young children in the estates may be described as being too thin for their normal or above normal height. This finding indicates that current undernutrition appears more serious than chronic undernutrition among the toddlers and preschoolers in the estates.

Above 6 years to 12 years old

Compared to the younger age group, children aged above 6 to 12 years old showed a lower prevalence of underweight with an average of 29.1% and 26.1% underweight boys and girls respectively in all the communities (Table 9). The overall mean prevalence of "stunted" children in this age group was 34.4% for the boys and 24.9% for the girls. The lower prevalence of stunted girls may be due to girls attaining puberty and showing a growth spurt at about 11 - 12 years. The prevalence of stunting was noticeably higher in boys from the fishing (41%) and padi (39%) communities, followed by the rubber (33.8%) and coconut (30.6%) communities. Boys from the estates showed the lowest prevalence of stunting (21.8%), indicative of a relatively lower experience of chronic malnutrition in this community.

Wasting prevailed at 8.2% among the boys and 6.2% among the girls in all the communities combined. As this age category had a relatively high prevalence of stunting accompanied by a relatively lower prevalence of underweight, this may have given rise to children with body weight which appeared appropriate for their "stunted" height. As a result, the proportion of wasting seems relatively low, but the serious nature of the problem should be recognized, in that these children were actually both stunted and underweight.

Table 9. Prevalence of malnutrition among children aged above 6-12 years in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys						
Weight-for-age	N = 251	N = 255	N = 226	N = 158	N = 167	N = 1057
Underweight	79 (31.5%)	70 (27.5%)	69 (30.5%)	39 (24.7%)	50 (29.9%)	307 (29.1%)
Height-for-age	N = 251	N = 254	N = 222	N = 157	N = 165	N = 1049
Stunted	103 (41.0%)	99 (39.0%)	75 (33.8%)	48 (30.6%)	36 (21.8%)	361 (34.4%)
Weight-for-height	N = 228	N = 234	N = 196	N = 145	N = 147	N = 950
Wasted	23 (10.1%)	19 (8.1%)	8 (4.1%)	6 (4.1%)	22 (15.0%)	78 (8.2%)
Girls						
Weight-for-age	N = 264	N = 277	N = 222	N = 167	N = 139	N = 1069
Underweight	59 (22.3%)	71(25.6%)	52 (23.4%)	30 (18.0%)	37 (26.6%)	265 (26.1%)
Height-for-age	N = 263	N = 276	N = 222	N = 167	N = 138	N = 1066
Stunted	65 (24.7%)	65 (23.6%)	60 (27.0%)	39 (23.4%)	36 (26.1%)	265 (24.9%)
Weight-for-height	N = 184	N = 183	N = 165	N = 106	N = 93	N = 731
Wasted	12 (6.5%)	8 (4.4%)	10 (6.1%)	4 (3.8%)	11(11.8%)	45 (6.2%)

This age group corresponds with the first six years of primary school age, and in general, the hours spent in school and going to and back from school amounted to 7-8 hours a day. Not all children may eat breakfast before leaving for school. They may also not have enough money to buy food in school, or they may spend their money on non-nutritious snacks and soft drinks.

It should be pointed out, however, that the higher prevalence of stunting in this age category (compared with the toddlers and preschoolers) does not necessarily mean that more of the older children are currently malnourished. The prevalence of stunting is a reflection of a previous history of malnutrition and has been going on for a longer lime (WHO, 1986).

Above 12 to 18 years

The overall mean prevalence of underweight in this age group was higher among the boys (29.9%) than the girls (17.7%) (Table 10). In general, boys in this age category tend to be more physically active than their female age counterparts, and when coupled with inadequate or improper dietary intake, more boys than girls would appear to be too thin for their age. The prevalence of underweight boys was higher in the rubber (34.3%) and the estate (34.1%) communities, followed by the padi (30.9%) and the fishing (29.1%) communities. It is noted that the estates, which had the lowest prevalence of underweight among the younger boys (aged above 1-12 years), as described previously, showed as high a prevalence of underweight for the older boys as in the other communities. The same phenomenon does not seem to prevail among their female counterpart. The prevalence of underweight among the estate girls in all age categories generally ranked lower than that for the other communities.

Table 10. Prevalence of malnutrition among adolescents aged above 12-18 years in different types of communities

	Fishing	Padi	Rubber	Coconut	Estates	All communities
Boys						
Weight-for-age	N = 103	N = 123	N = 108	N = 87	N = 91	N = 152
Underweight	30 (29.1%)	38 (30.9%)	37 (34.3%)	17 (19.5%)	31(34.1%)	153 (29.9%)
Height-for-age	N = 103	N = 123	N = 108	N = 88	N = 91	N = 513
Stunted	38 (36.9%)	36 (29.3%)	44 (40.7%)	17 (19.3%)	26 (28.6%)	161 (3 1.4%)
Girls						
Weight-for-age	N = 116	N = 136	N = 103	N = 84	N = 82	N = 521
Underweight	18 (15.5%)	28 (20.6%)	24 (23.3%)	10 (11.9%)	12 (14.6%)	92 (17.7%)
Height-for-age	N = 116	N = 135	N = 103	N = 83	N = 82	N = 519
Stunted	27 (23.3%)	50 (37.0%)	44 (42.7%)	23 (27.7%)	20 (24.4%)	164 (31.6%)

The average level of stunting among the adolescent boys and girls ranged from 19.3% in the coconut villages to 40.7% in the rubber smallholding community. The estates showed the lowest proportion of stunted adolescent girls (24.4%) while the rubber villages had the highest (42.7%) followed by the padi villages (37%).

Figures 9-12 illustrate the prevalence of underweight and stunting in boys and girls according to age in the five communities. In general, it is noted that children in all age categories in the coconut villages had the lowest prevalence of underweight, while children in the estates showed the lowest prevalence of stunting. The fishing, rubber and padi villages generally ranked higher in the prevalence of underweight and stunted children.

Comparison of prevalence of malnutrition

The present study is compared with Chong *et al* (1984), as the latter study on rural communities made use of the NCHS reference values for classifying nutritional status whereas, other previous nutritional studies which involved a reasonable sample size, such as the ICNND (1964) and Chen *et al* (1981), made use of the Harvard reference and therefore do not lend themselves to comparisons with the present report.
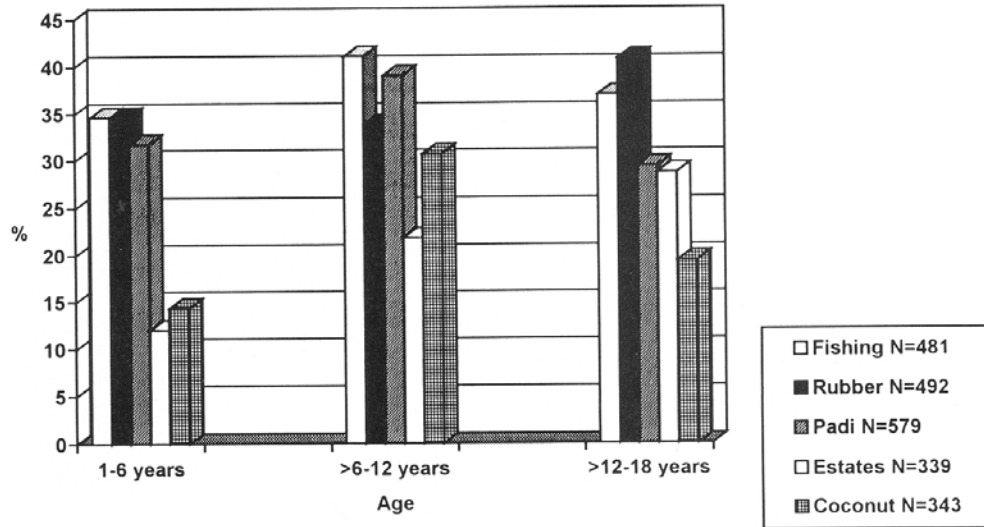
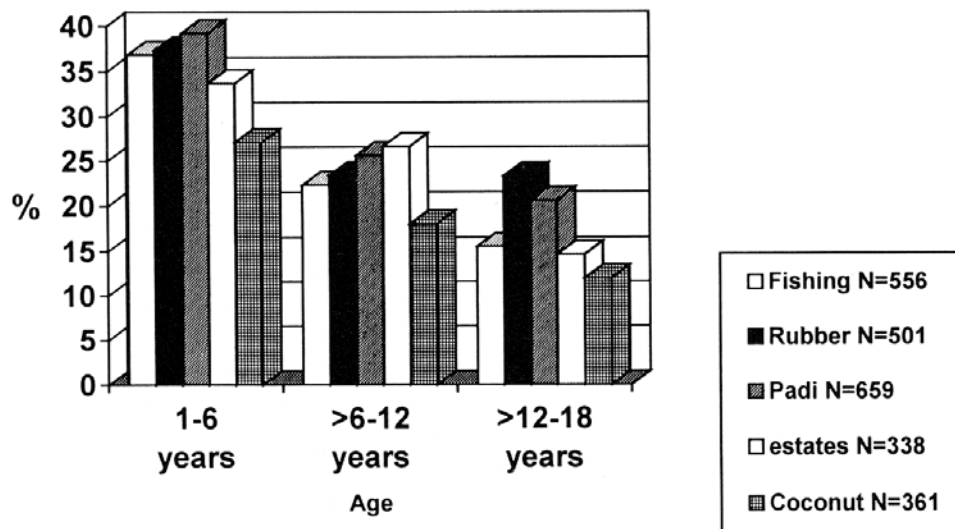**Figure 9**. Prevalence of underweight by age in different types of communities – boys

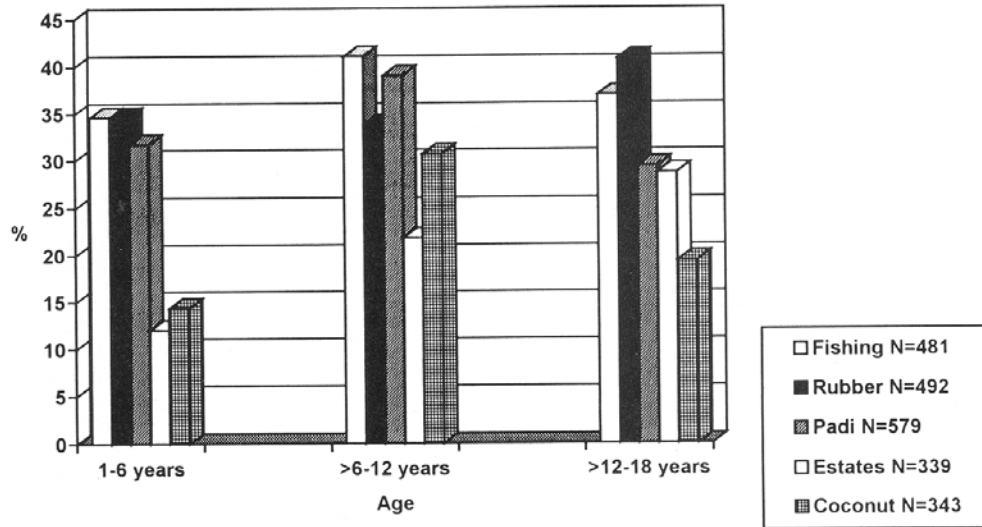**Figure 10**. Prevalence of underweight by age in different types of communities – girls

Figure 11. Prevalence of stunting by age in different types of communities – boys
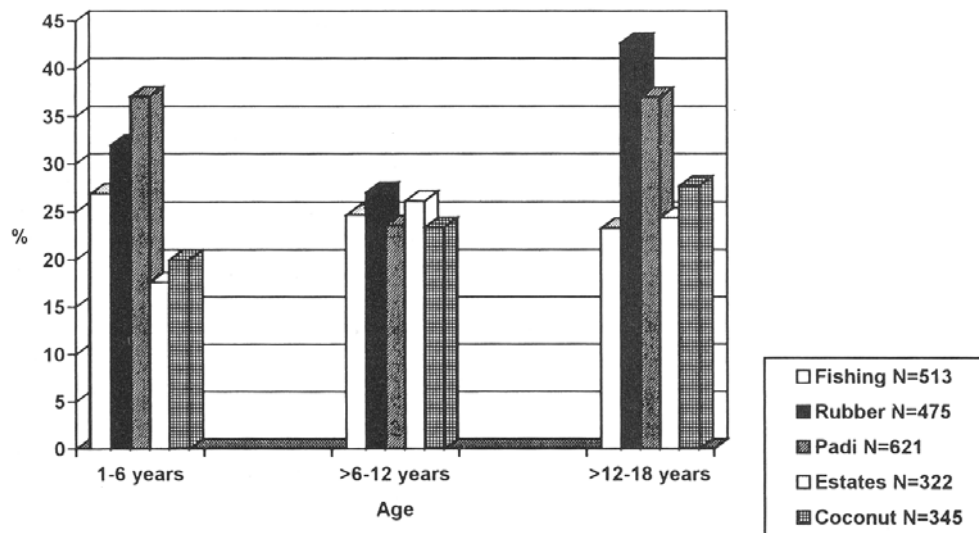

Figure 12. Prevalence of stunting by age in different types of communities - girls

In Chong *et al* (1984), the prevalence of underweight among young children aged 1 to below 6 years (sexes combined) in poor villages was high at 37% (Table 11). In the present study which included poor to middle income villages, the prevalence of underweight for the same age category was 30.7% for boys and 33.2% for girls. It appears that the overall level of underweight among young children below 6 years from poor rural communities persists at a level of about one in three.

Table 11. Comparison of the prevalence of malnutrition in children from rural villages in Peninsular Malaysia

	Gender	Number	Age (years)	Underweight* %	Stunted** %	Wasted** %
Poverty villages (Chong *et al.,* 1984)	Boys & girls	726	1 to <6	37	43	5
	Boys	460	6 to <12	38	49	2
	Girls	501	6 to <12	23	35	2
Present study 1992 - 1994	Boys		0 to 6	30.7 (N=795)	26.4 (N=795)	10.6 (N=756)
	Girls		0 to 6	33.2 (N=825)	26.7 (N=784)	10.7 (N=778)
	Boys		>6 to 12	29.0 (N=1057)	34.4 (N=1049)	8.2 (N=950)
	Girls		>6 to 12	23.3 (N=1069)	24.9 (N=1066)	6.2 (N=731)

*	Underweight
**	Stunted
***	wasted

(WHO, 1983)

As for the older age category of above 6 to 12 years, compared with the situation in the early 1980s, the prevalence of underweight of this age group from the rural areas seemed to have decreased somewhat for the boys but hardly for the girls (Table 12). The levels in the 1980s were 38% and 23% for boys and girls respectively compared to the corresponding figures of 29% and 23% in the 1990s.

The prevalence of stunting in young children in rural villages appeared to have decreased substantially in the past decade, e.g. from 43% in ages 1 to about 6 (Chong *et al.,* 1984) to about 26% (present study). Likewise, for ages 6 to 12 years, the prevalence of stunting was 49% for boys and 35% for girls in 1980s compared to 34.4% and 24.9% respectively in the 1990s.

In contrast, the prevalence of wasting appeared to have increased during the period being compared. The level of wasting for ages 1 to about 6 was 5% in Chong *et al.* (1984), but the present study reported a level of almost 11%. Meanwhile, the "wasting" level was 2% for both boys and girls aged 6 to 12 years in the former study compared to 8.2% for boys and 6.2% for girls in the present study. Wasting is supposed to be a reflection of a severe recent episode of malnutrition. However, the relatively high prevalence of wasting in the present study children may be due to the manifestation of a reduced prevalence of stunting coupled with a fairly high prevalence of underweight, thereby giving rise to a high proportion of the children who were too thin for their "non-stunted" height. Hence, the malnutrition problem in the study communities could be described as being more current than acute.

In Figures 13-16, the mean weight-for-age and height-for-age of children from the present study and Chong *et al* (1984) are compared with the NCHS reference values. It is seen that the mean weight and height of children from the present study are higher than the corresponding values for children in the study by Chong *et al.* The growth attainment of the children in the present study emerged closer to the graph of minus 1SD from the NCHS median, compared to the result from Chong et al which appeared worse, being closer to the graph of minus 2 SD from the NCHS median.

Another observation is that the mean height-for-age of Malaysian children tends to falter with age when compared with the NCHS reference values. Figures 15 and 16 showed that the mean height of the children from Chong *et al* (1984) faltered and fell below the graph of minus 2 SD from the NCHS median after the age of about 3 years in the case of boys, and after the age of approximately 6 years for girls. Likewise, among the children in the present study, their mean

height also faltered with age, but it did not fall below the graph of minus 2 SD from the NCHS median at any age.
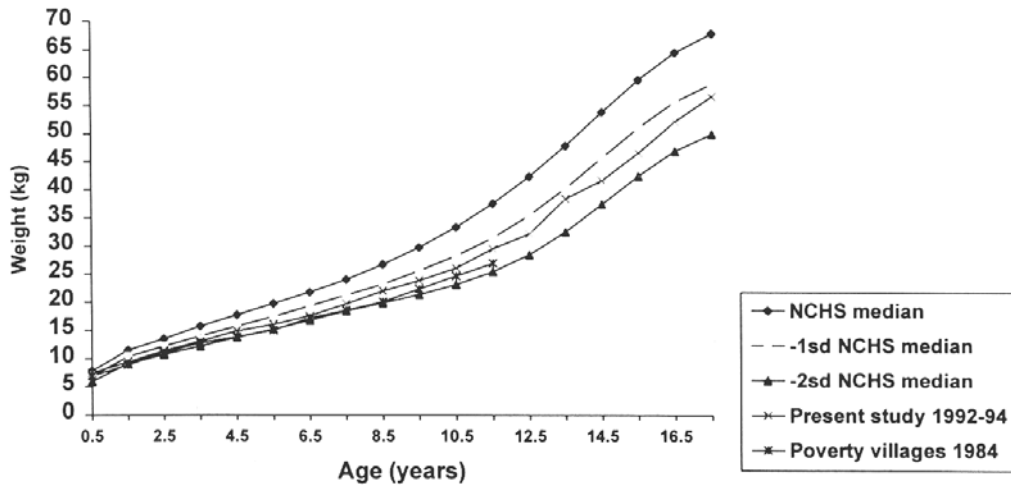

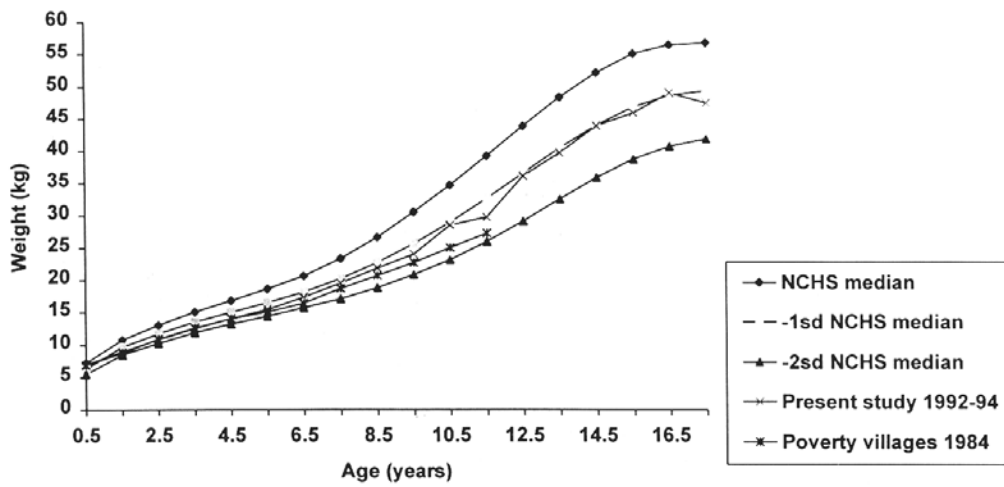**Figure 13.** Weight for age of boys from rural Peninsular Malaysia

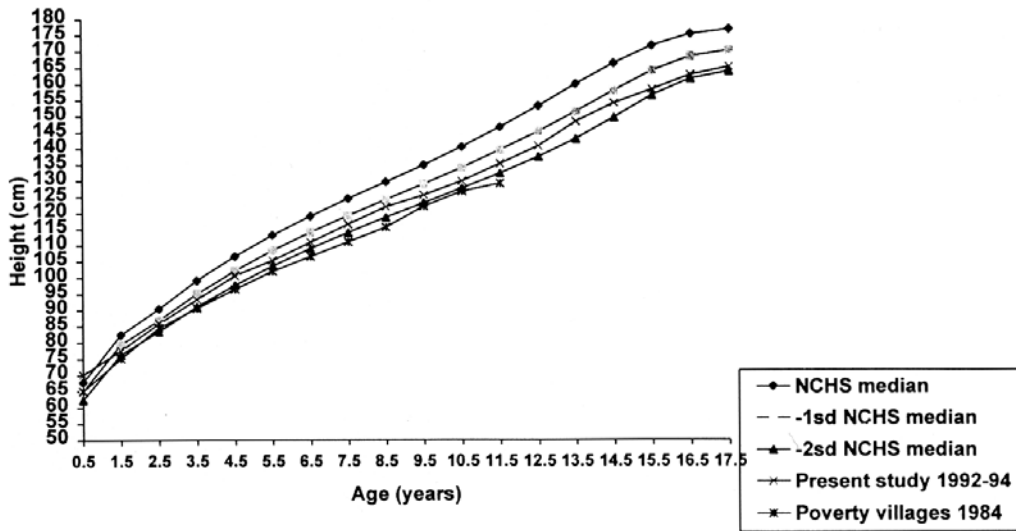**Figure 14.** Weight for age of girls from rural Peninsular Malaysia

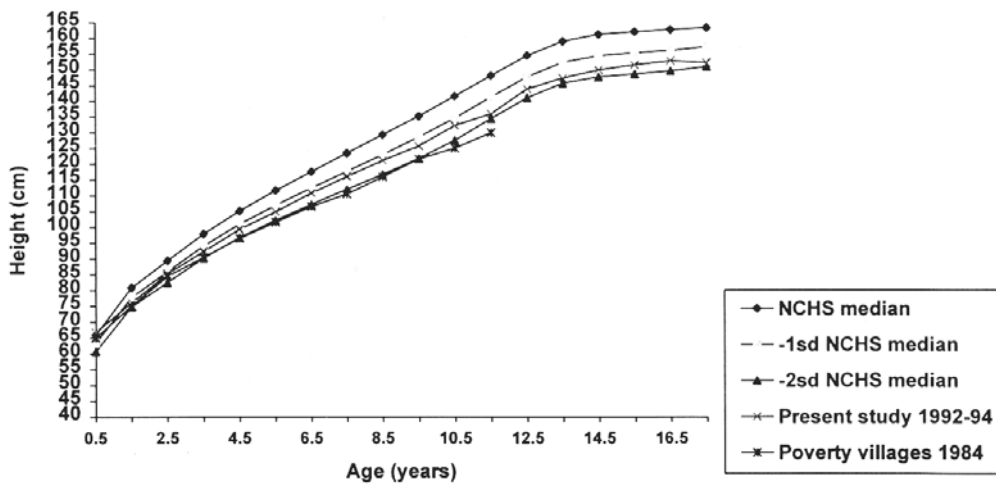**Figure 15.** Height for age of boys in rural Peninsular Malaysia

Figure 16. Height for age of girls in rural Peninsular Malaysia

CONCLUSION

The present study on the nutritional status of five rural communities in Peninsular Malaysia conducted in 1992-94, showed that the proportions of boys of 18 years and below who have normal weight-for-age, height-for-age and weight-for-height were respectively 69.4%, 68.3% and 88.8%. Among the girls of the same age group, the proportions with normal weight-for-age, height-for-age and weight-for-height were 73.8%, 72.6% and 89.5% respectively.

Despite the aforesaid, this study also showed the persistence of underweight, stunting and wasting amongst children aged 18 years and below in the rural areas. The average prevalence of underweight among the boys was 29.8% and 25.5% for the girls. The level of stunting was 31.3% for the boys and 26.9% for the girls, while wasting was present in 9.3% and 8.5% for the boys and girls respectively.

When compared with a previous peninsula-wide nutritional study in poor villages undertaken in 1979-1983 (Chong *et al,* 1984), it is found, over the past decade, that the prevalence of underweight in children under 12 years has decreased somewhat, while the prevalence of stunting has decreased more substantially. While the present findings denote a decline of chronic undernutrition, the persistence of current undernutrition has led to the manifestation of children who were too thin for their "non-stunted" height, thus giving rise to an apparently higher prevalence of wasting found in this study.

On a community basis, it is observed that the coconut smallholding community consistently showed the lowest prevalence of underweight for all ages among the boys and girls. The coconut villages also showed lower levels of stunting and wasting among the children. It is pertinent to reiterate that the anthropometric results reported here were derived from all children in the selected villages and estates who came to the community-based centres set up in this study. Thus, in the so-called coconut villages, the children measured came from coconut smallholding households as well as from households which were not involved in the coconut industry. As the economic importance of the coconut industry in Malaysia has diminished substantially, the number of households involved in the coconut industry has also declined in tandem. In fact, this study found that the number of non-coconut households out-numbered the number of coconut households (59% of the total households in the coconut villages in 1992 were non-coconut) (Chee, Khor and Tee., 1997). The latter had the highest proportion in this study with monthly household income exceeding RM1,500, while at the same time, a majority of them owned economically active land and livestock. Thus, the relatively better nutritional status of children in the coconut villages may be attributed to the higher economic status of the non-coconut households.

In the case of the estates, the growth patterns of the children reflected on the prevalence of acute and current undernutrition (underweight and wasting) rather than on chronic undernutrition (stunting). The estate households had the lowest prevalence of poverty (17%) among the communities. The estate community also had the highest mean monthly income and the highest mean monthly per capita household income among all the groups. Nonetheless, most of the estate households did not own land and only one-third owned livestock. It appears that the estate households were dependent mainly on salaries for income, and while this income was higher than for the other groups, it may not necessarily be spent on adequate nutritious food and health care for the children. Studies should be undertaken to identify the determinants, including socio cultural factors, which may have contributed to the prevalence of current undernutrition in the estates.

Children from the fishing, rubber and padi villages appeared worse off than children from the coconut and the estate communities in relation to current and chronic undernutrition. The

prevalence of poverty was found to be high in these three communities, including the non-fishing, non-rubber and non-padi households in these communities. The fishing group was least satisfactory as land ownership was lowest compared to the rubber and padi villages.

In conclusion, the anthropometric results reported here indicate the persistence of chronic, current and acute forms of undernutrition in children from the agricultural villages and the estates. The varying levels of prevalence of each type of malnutrition in these communities underscored the need to investigate further the underlying factors that influence malnutrition in these communities. These factors may not only be socio-economic in nature, but could be cultural and psychological influences that impinge on family or household activities, such as parent-child interactions and time management of house work.

ACKNOWLEDGEMENTS

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