BULLETIN NO. 22
from the
Institute for Medical Research
Malaysia

STATUS OF COMMUNITY NUTRITION IN POVERTY KAMPUNGS

Division of Human Nutrition,
Institute for Medical Research,
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FOREWORD

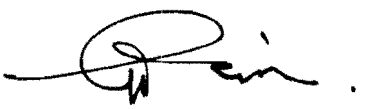
The Instiute for Medical Research is continually aware of the need to direct its research efforts towards solving some of the Nation's major health problems that could lead to improvement in the health status of the population. The need for this is perhaps greatest in the rural areas where the majority of our people live and where many are poor.

To contribute towards this aim, the Division of Human Nutrition embarked on a four-year programme to study the status of community nutrition in a group of kampongs that have been lagging behind the main stream of socio-economic development. This bulletin records the findings of this study, makes relevant conclusions and proposes appropriate recommendations.

The choice of a multi-pronged approach to study a subject so complex and interrelated with so many other factors is indeed challenging. As such, the effort is very commendable and should certainly strengthen the value, credibility and usefulness of the findings.

The study revealed a high incidence of chronic undernutrition among pre-school and primary school children, lack of calorie reserve in adults and the presence of moderate anaemia in the community due to nutritional iron deficiency. Factors that affect nutritional status such as income, food consumption, food habits and intestinal parasitism were also studied, quantified and discussed in relation to the main findings.

The recommendations for improvement impinge upon income, environment and education and can only be successfully implemented through sustained and co-ordinated efforts of a number of Government Ministries, in particular, Health, Agriculture, Education and Rural Development. This bulletin therefore should provide interesting reading and valuable information to concerned officials of these Ministries. The recommendations proposed are wide-ranging and call for the strengthening and re-examination of existing programmes and institution of new ones. Implementation of some of these should certainly be regarded as a means of fulfilling the goals of the Government's New Economic Policy and the realisation of this goal should make the efforts that went into this work and this bulletin worthwhile.



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5th March 1984

PREFACE

This monograph presents the findings of four separate nutrition surveys conducted at approximately yearly intervals between September 1979 and September, 1983.

The impetus for these studies was provided initially by the nationwide survey on the incidence of poverty in rural disadvantaged kampungs conducted by the Prime Minister's Department during 1978. This highlighted the need to assess the status of nutrition of such communities of whom we have limited and inadequate knowledge.

The series of studies were conceived and planned during early 1979 as part of the Division's overall research strategy for the Fourth Malaysia Plan. They involved the examination of about 3600 persons drawn from 14 kampungs in the states of Kelantan, Johore, Kedah and Perak. About 550 households were visited and blood specimens were obtained from about 3000 individuals, while 1,500 persons provided stool and urine samples. It is certainly the first time that nutritional studies of such a size and scope have ever been attempted by local researchers.

A lot of hard work, time and sacrifice have gone into these studies. I estimate that if it had been possible for these surveys to be conducted one after another in a single breath so as to speak, it would have taken at least 1¼ years of the full time and undivided attention of the Division. That each of these studies have been completed instead on an annual basis over a 4 year interval was primarily due to the constraints of funds and our other concurrent commitments.

It is my sincere hope that this monograph will be read not only by nutritional scientists but also by public health and medical doctors, administrators, social scientists and economists.

I realise that there will be the inevitable flaws and deficiencies in a study of this scale, but I can truthfully say that we have tried out best.

Y.H. CHONG
20th February, 1984

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KOTA BARU, KELANTAN, 1 – 11 September, 1979.

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BALING, KEDAH, 12 – 24 February, 1982.

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PERAK TENGAH, PERAK, 4 – 14 September, 1983.

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Others:

Zainal Abidin, Latifah Hamdan and Andak Halijah *(Sub-Health Centre, Kampung Gajah).*

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STATUS OF COMMUNITY NUTRITON IN POVERTY KAMPUNGS FROM FOUR STATES OF PENINSULAR MALAYSIA

BACKGROUND AND OBJECTIVES

Between 1979 and 1983, the Institute for Medical Research conducted a series of community nutritional assessment surveys on rural disadvantaged kampungs in the states of Kelantan, Johore, Kedah and Perak. These kampungs were known to have a high percentage of their population below the "poverty line" as defined by the Economic Planning Unit of the Prime Minister's Department and were thus regarded as poverty kampungs.

The primary objectives of these assessments were to determine the type and magnitude of nutritional problems in these villages that appeared to have been bypassed by socio-economic development, seek understanding to their contributory causes, obtain baseline data for future surveillance and to suggest appropriate recommendations for remedial and preventive actions.

Owing to the multi-faceted nature and multi-factorial causes of malnutrition, the approach and the scope of these surveys were comprehensive and designed to provide information concerning the following:-

- child growth and development
- protein-energy malnutrition
- iron deficiency anaemia
- vitamin A and thiamin status
- parasitic infestations
- socio-economic and demographic characteristics of households.
- households food pattern and food intake
- food habits and practices

This report highlights and discusses the main findings together with some suggestions for reduction of the malnutrition seen.

MATERIALS AND METHODS

Selection of Kampungs

The selection of poverty kampungs was done in consultation with the respective State Development Officer and the State Chief Medical and Health Officer on the basis of the following criteria:-

- a high incidence of poverty according to data provided by the Prime Minister's Department from a nationwide socio-economic survey of traditional kampungs of Peninsular Malaysia, conducted in 1978.
- lack of basic amenities such as proper roads, piped water, electricity and sanitation.
- ecological setting and economic activity: no two study locations were selected with identical ecological setting and economic activities.

By the above criteria, the following four groups of kampungs were selected for study:

- two coastal fishing kampungs, Kota Bharu, Kelantan.
- two rice-growing kampungs, Mersing, Johore.

- four inland kampungs of mixed economic activities of mainly rubber-tapping and rice-growing in Baling, Kedah.

- six riverine kampungs of mixed economic activities including rice-growing, rubber-tapping, fishing and prawning in Perak Tengah.

The location of these kampungs is shown in Fig. 1.

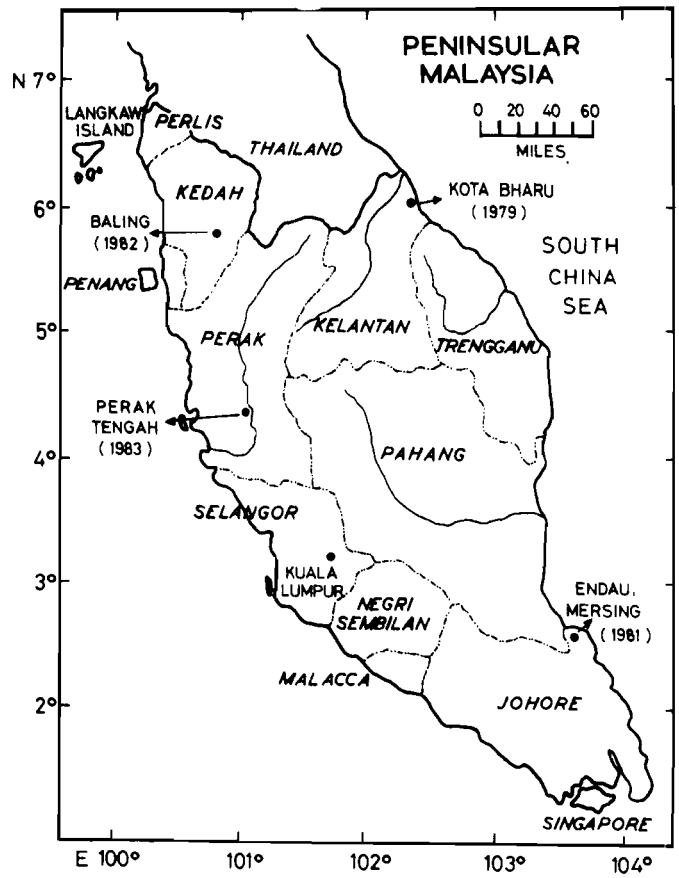

Figure 1. Map of Peninsular Malaysia showing Study Locations.

Topography and Background Data of Study Kampungs

Kota Baru, Kelantan

Two coastal fishing kampungs, viz., Pantai Kundor and Mek Mas in the district of Kota Baru, about 10 km north-east of the town of Kota Baru were the first in the series to be selected for study during September, 1979.

These two kampungs located on the coast of the South China Sea were inhabited by about 1,200 Malays. Most of the houses were built on flat sandy terrain lined mostly with coconut palms. Houses were also found further inland along a branch of the Kelantan river which meandered through the kampung houses and flowed into the sea. There was much more greenery in the inland kampungs where the vegetation consisted of mangroves, nipah, and secondary jungle often dotted with coconut palms.

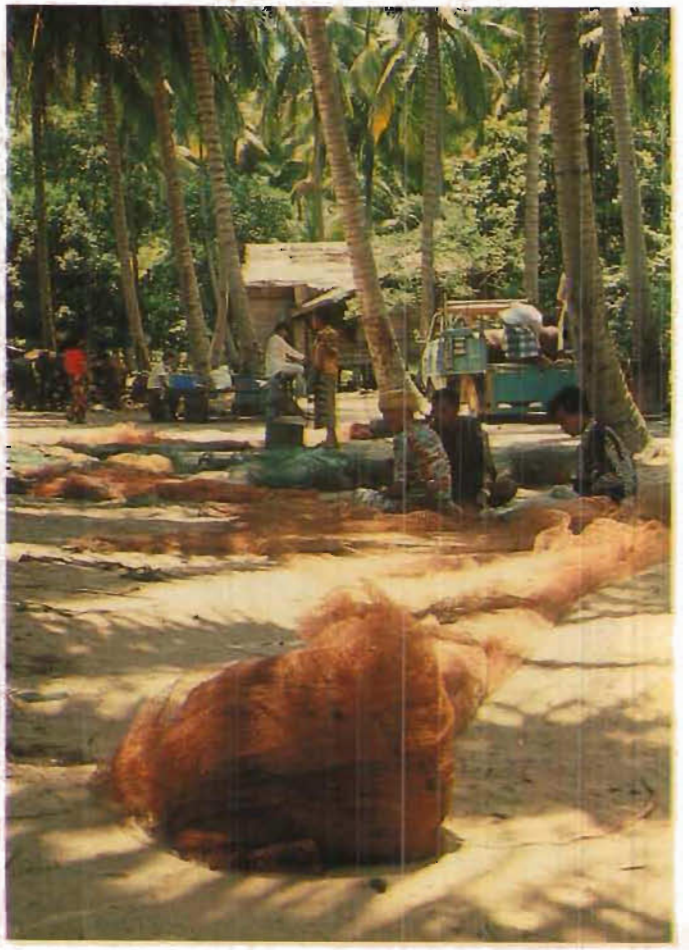

Plate 1. Fishermen repairing fishing nets in Kota Baru, Kelantan.

The main economic activities of the two kampungs were fishing, fish processing (*kerupok* and *budu*) batik printing, kite-making and the processing of copra.

Mersing, Johore

Two rice-growing kampungs, Semaloi and Bukit Pasir in the district of Mersing, Johore were studied next during March 1981. These two kampungs were situated on rather flat terrain, 2–3 km from the main road. The rice fields were well irrigated by canals while the Endau river which borders the area also provided opportunities for prawning and fishing.

The kampungs had a population of 1,119 and were all Malays many of whom had migrated from Kedah about five years ago to take part in a Government supported land development scheme for the growing of rice.

Baling, Kedah

Four remote inland kampungs, viz., Kuala Kuang, Padang Lengkuas, Kemanggi and Seneyek in the district of Baling, Kedah about 25 km from the Malaysian-Thai border were selected for study during February, 1982.

Plate 2. A kampung house in Baling, Kedah against a backdrop of primary forest.

Plate 3. Rice-growing in Padang Endau, Mersing, Johore.

These kampungs were situated on undulating terrain grown with rubber trees, while padi was grown in flat patches of land irrigated by a stream which was dry at the time of the survey due to drought. The houses in these kampungs were poorly constructed and built far apart from one another with some even appearing dilapidated.

Secondary growth and the hilly primary jungle provided the backdrop of these villages where the main occupational activities were rubber-tapping, rice-growing and the gathering of jungle-produce such as rattan and bamboo. The two kampungs were inhabited wholly by Malays and their population size was 1,832.

Perak Tengah, Perak

The last survey in this series was conducted during September, 1983 on six riverine kampungs, namely Bandar, Air Mati, Kuala Parit, Pasir Jenderis, Bandar Tua and Bukit Chawi in the district of Perak Tengah, Perak. These kampungs were situated along the west bank of the Perak river. Depending on downstream tidal conditions, the river often overflowed its banks to reach the doorsteps of some of the houses built along side it.

Houses were built with considerable amount of land between them allowing fruit trees, coconut palms, rubber trees and the occassional cocoa to be grown. Rice was grown on flat patches inland against a backdrop of secondary forests. Rice-growing, rubber-tapping and prawning were the main activities. These kampungs can be readily reached from Teluk Intan (Teluk Anson), about 15–20 km south-east by road and motorised sampan. The population of the kampungs studied was entirely Malay and numbered 1,974.

Organisation and Logistics

Normally two preliminary field visits were necessary before an actual field survey began. The purpose of such visits were:

to consult with the office of the State Development Officer and that of the State Chief Medical and Health Officer on the selection of the study kampungs.

Plate 4. Outline of riverine kampungs in Perak Tengah viewing from the Perak River.

BLACK

- to meet with the district, mukim and kampung level personnel and to explain the purpose and nature of the survey.
- to enlist the support and co-operation of kampung administration personnel in order to ensure community participation.
- to inspect the terrain and accessibility of the kampungs and to determine the choice of suitable locations such as community halls, ***surau***, schools or ***bidan*** clinics for the purpose of serving as centres for examination during the survey.
- to arrange for pre-survey household population census of the selected kampungs and the preparation of site maps.
- to make early arrangements for the accomodation and meals of the survey team.

The field survey team usually consisted between 20 to 22 persons whose responsibilities were as follows :-

● Chief nutritionist	–	team leader/coordinator
● Assistant nurse	–	registration of subjects
● Medical officer	–	clinical assessment
● Nutritionist assisted by a medical laboratory technician	–	anthropometry
● Medical laboratory technicians (4)	–	biochemistry and taking of blood samples
● Medical laboratory technician	–	stool and urine samples
● Nutritionists (4) assisted by 4 local personnel	–	household visits for socio-economic and food intake studies.
● Dispenser	–	dispensing of medication
● Attendant	–	miscellaneous duties
● Drivers (2)	–	transport of equipment, etc.

The time spent on each survey varied between 10 to 12 days (inclusive of Saturdays and Sundays) and often there was a need to change locations several times during each survey.

Generally, the survey team would leave for the kampungs early in the morning from its field base which was either the Rest House or a Hotel in the nearest town and return by late afternoon. For the field laboratory team however, the day's work was by no means over; after a quick wash-up and dinner, the team would proceed promptly to the nearest district hospital laboratory to complete the day's work of taking haemoglobin readings, determining haematocrit values, separation of plasma and sera, preparation of stool and urine samples and their storage.

To encourage community participation and to promote goodwill, the medical team also attended to minor complaints and illnesses and provided appropriate medication. In addition, two 500 gram packets of full-cream milk powder were distributed to every household interviewed.

Clinical Examination

An abbreviated clinical examination for signs of nutritional deficiencies was conducted by the medical doctor on every person who came to the centre. The list of common clinical signs of malnutrition that were looked for is shown in Table 1. The presence of skin ulcers, scabies, head-lice and other skin infections was noted and a history of recent illness was also recorded. All subjects were examined under good lighting conditions with the aid of a torch, wooden tongue depressor and a stethoscope.

Plate 5. Medical Examination.

Plate 6. Mothers and Children waiting to be examined.

Table 1. Clinical Signs Of Common Nutrient Deficiences

	Signs	Suggestive or indicative of
Hair	lack of lustre, sparesness, dyspigmentation, easily plucked	protein deficiency
Face	swelling, moon-face	protein deficiency
Eyes	paleness of conjunctiva, poor dark adaptation	anaemia
	dryness of conjunctiva	vitamin A
	Bitot's spots; keratomalacia	
Lips	angular stomatitis or scars	riboflavin deficiency
Tongue	smooth, swollen or purplish-looking	anaemia
Gums	swollen and bleeding	vitamin C
Neck	thyroid enlargement	iodine deficiency
	parotid enlargement	protein deficiency
Skin	lack of fat reserve	calorie deficiency
	oedema	protein deficiency
	pallor	anaemia
	follicular hyperkeratosis	vitamin A
Nails	pale, spoon-shaped	anaemia
Muscles	wasted appearance	protein deficiency

Collection of Specimens

Blood specimens:

With few exceptions, every person who came to a centre was bled. Blood was obtained by finger prick from infants, children up to 12 years old and the elderly. For adolescents and adults, blood was obtained by the venous route. Finger prick blood was drawn into five heparinised micro-capillary tubes of which one was a 'breakoff' tube calibrated to contain 0.02 ml of blood (Harshaw Chemicals, England) required for haemoglobin estimation. Venous blood was collected into 10 ml plastic disposable syringes.

Plasma and serum samples were separated in the laboratory at the end of the day and thereafter stored at -15°C.

Urine and Stool:

Urine was collected into 30ml capacity screw-capped bottles containing a few drops of hydrochloric acid as preservative and stored at -15°C.

Stool was collected into screw-capped Bijou bottles containing thiomersal-iodine-formaldehyde or 10% formalin for examination of helminthic ova.

Laboratory Procedures

Haemoglobin was determined by the cyanmethaemoglobin method using 0.02ml "breakoff" tubes (Division of Human Nutrition, IMR). Readings were taken at the end of each day either on a Spectrophotometer or direct digital readout haemoglobinometer.

Plate 7 **Bleeding a child for haemoglobin estimation.**

Plate 8 **Household visit.**

Plate 9 **The unpopular task of transferring faecal and urine samples into bottle containers.**

Plate 10 **A "floating" latrine in Perak Tengah.**

Microhaematocrit was determined after centrifuging on the micro-haematocrit centrifuge.

Albumin from capillary blood was determined on 0.025ml plasma by the dye-binding method using bromo-cresol-purple (Pinnell and Northam 1978) while albumin of venous

samples was determined after electrophoretic separation (Spinco Beckman R system or Helena Cliniscan). Serum protein was determined either by the microkjeldahl procedure or the biuret procedure (Wootton and King 1964).

Serum iron, total iron-binding capacity, and transferrin saturation were determined using bathophenanthroline as the chromogen (Jung and Parekh, 1970).

Serum vitamin A was done by the Carr-Price procedure (ICNND, 1963)

Serum cholesterol and triglycerides were done on the Technicon Autoanalysor (Technicon Instrument Corporation, 1972).

Urinary urea was determined by the diacetyl monoxime method and creatinine by the picrate method (Wootton, 1964).

Urine thiamin was done by the modified thiochrome procedure (Leveille, 1972).

Except for haemoglobin and haematocrit which were done at the field laboratory, all other biochemical determinations were performed at the base laboratory in Kuala Lumpur.

The guide to biochemical interpretation is shown in Table 2.

Anthropometric Measurements

Weights were recorded to the nearest 0.1kg on a SECA beam balance. Subjects were weighed barefeet and in a minimum amount of clothing. When possible, the weights of children under 2 years were recorded on an infant scale but when not possible, their weights were obtained by subtracting the weight of the mother from the combined weights of the mother and child.

Heights were recorded in cm and for those below 2 years old, the supine length was recorded on a portable infantometer.

Mid-arm circumference was taken to the nearest millimetre using a non-stretchable fibre glass tape.

Ages of children were taken from birth certificates or school registers while those of adolescents and adults were obtained from identity cards.

Classification of Anthropometric Measurements

The anthropometric measurements of pre-school and primary school children were classified by the following growth criteria:-

"underweight"	– children whose weight-for-age fell below -2 S.D. of the reference median.
"stunting"	– children whose height-for-age fell below -2 S.D. of the reference median.
"wasting"	– children whose weight-for-height fell below -2 S.D. of the reference median.
"malnourished" with "poor" mid-arm circumference.	– children with mid-arm circumference of less than 85% of reference.

The reference medians for weight and height are those of the National Centre for Health Statisfics (NCHS) recommended for International use by WHO (WHO, WPRO, 1979).

The reference mid-arm circumference values are those of Wolanski, smoothened by Burgess and Burgess (1969).

"Underweight" and obesity in adults were determined by their body mass index of wt/ht^2 where weight was in kg and height in metres. An index exceeding 25 for men and exceeding 24 for women denotes obesity, while an index below 20 for men and below 19 for women is indicative of "underweight" (Thomas, McKay and Cutlip, 1976).

Table 2. Guide To Biochemical Interpretation.

Parameter	Cut-off Value	Interpretation	Source
Haemoglobin	< 11 g per dl (6 months – 6 years)	likely to be anaemic	
	< 12 g per dl (6 – 14 years)	" "	WHO, 1972
	< 13 g per dl (male)	" "	
	< 12 g per dl (female)	" "	
	< 11 g per dl (pregnancy)	" "	
Serum/Plasma albumin	< 3.5 g per dl	low to medium protein deficiency	ICNND, 1963
Serum iron	< 50 µg per dl	iron deficiency	WHO, 1972
Serum % transferrin saturation	< 15%	"	
Urinary urea nitrogen creatinine ratio	< 5.0 (up to 6 years)	probable protein deficiency	Chong, 1974
Urinary hydroxyproline index	< 1.5 (up to 6 years)	growth retardation probably due to protein deficiency.	Chong, 1974
Urinary thiamin excretion	< 176 µg/g creatinine (1 – 3 years)	low to medium risk of thiamin deficiency	Sauberlich and Skala, 1974
	< 121 µg/g creatinine (4 – 6 years)		
	< 181 µg/g creatinine (7 – 12 years)		
	< 151 µg/g creatinine (12 – 15 years)		
	< 66 µg/g creatinine (adults)		
Serum vitamin A	< 20 µg per dl	probable vitamin A deficiency	ICNND, 1963

Household Surveys

Household surveys were conducted by interviews on selected households with the aid of pre-designed questionnaires (Appendix) that sought information on:-

- household socio-economic and demographic characteristics
- food pattern and consumption
- infant and young child feeding practices
- food habits and beliefs

The questionnaire was designed after consideration of various factors such as duration of interviews, objectivity of the questions asked, and suitability of data for computerisation. The questionnaire had two sections. The first section made enquires on household socio-economic and demographic characteristics, while the second section dealt with dietary pattern, food consumption, food beliefs and feeding practices. The dietary section of the questionnaire sought information on both the qualitative and quantitative aspects of household diets using a modified "food frequency of consumption and food purchase" technique. It had a pre-coded format with columns for recording frequency of food consumption, food purchase and the amount consumed or purchased for a series of food items listed under three basic food groups, namely, energy-foods, protein and protective-foods.

The selection of households was aided by a site map giving the location and numbering of the kampung houses in relation to the main georgraphical features such as streams, rivers, roads, rice-fields, midwife clinics, schools, community halls, *surau*s etc. Such maps were constructed and provided by the *Penghulu* on prior request.

Household interviews were conducted by four separate teams each consisting of a nutritionist, assisted by a local community development worker (KEMAS) or a local health staff or youth who was familiar to the community. Since fatigue on the part of both interviewer and respondent is known to decrease the quality of data, the household surveys were conducted with this in mind.

Interviews were conducted on a alternate houses as indicated on the map enabling 40–50% of total households in every study area to be covered.

All socio-economic and dietary data including the nutrient composition of food items listed in the questionnaire were keyed into a Data General MICRONOVA MP 200 computer which had been pre-programmed to provide the required information. The preliminary Malaysian Food Composition Table compiled by Tee (1982) was used as a basis for calculation of nutrient values. The Recommended Dietary Allowances by Teoh (1973), were used for calculating per capita calorie and protein requirements.

Number of Persons, Specimens and Households Studied

The number of persons examined, specimens collected and households interviewed are shown in Table 3.

The age breakdown of the subjects and specimens are shown in Table 4. It may be seen here that there was a greater representation of children and women of childbearing age in the anthropometric and biochemical evaluation and the survey findings therefore can be regarded as more representative of such age groups from poverty kampungs within the country.

RESULTS AND DISCUSSION

Household Socio-Economic Characteristics

A total of 548 houses, representing 45% of all houses in the study area were visited and interviews conducted. Over 80% of the respondents were heads of households, their wives or both.

Table 3. Number Of Subjects, Specimens And Households Examined By Location.

	Year of study	No. of Kampungs	Clinical & Anthropometry	Blood (capillary or venous)	Stool & urine	Households studied
Kota Baru, Kelantan	1979	2	473	433	236	102
Mersing, Johore	1981	2	697	526	341	111
Baling, Kedah	1982	4	1,162	808	378	146
Perak Tengah, Perak	1983	6	1,252	1,158	501	189
Total:		14	3,584	2,925	1,456	548

Table 4. Number Of Subjects And Specimens Examined By Age Groups.

Subjects	Sex	Clinical and Anthropometry		Blood	Urine	Stool
INFANTS (0 - 0.99 year)	Both	105	*(3%)	62	34	43
PRE-SCHOOL (1.0 - 5.99 years)	Both	635	(18%)	518	326	304
PRIMARY-SCHOOL (6.0 - 11.99 years)	Both	954	(27%)	933	366	406
ADOLESCENTS (12.0 - 17.99 years)	Both	365	(10%)	337	139	133
ADULTS (18.0 - 45.99 years)	Males	246	(7%)	217	107	112
	Females	631	(18%)	515	241	280
ADULTS (46 years and above)	Males	282	(8%)	155	48	94
	Females	366	(10%)	188	42	84
Total:		3,584		2,925	1,303	1,456

* Figures in parentheses refer to percentage of total

When both were not available, the respondents were drawn from other older children or their grandaprents. Interviews were conducted in Bahasa Malaysia and the response and co-operation given were generally most satisfactory.

Demography

When all kampungs were considered, the percentage of the population under 5 years was found to be 15.3% and those under 12 years was 43%, resembling very closely the demographic characteristics for these age groups as reported previously for Peninsular Malaysia for 1975 (Chong, 1976). The male to female ratios for the age groups below 18 years were close to unity and the proportion of persons under 18 years also did not differ significantly in the study areas (Fig. 2).

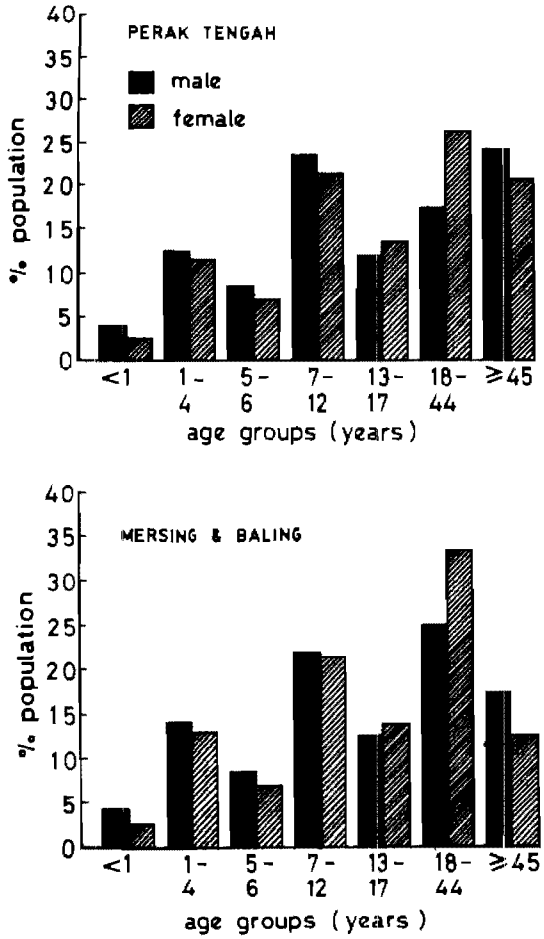

Figure 2. Population Structure.

However, the percentage of the population in the age groups 18–44 and those over 45 years in Perak Tengah differed significantly from that of Baling and Mersing combined ($p < 0.001$ for both age groups). Furthermore, the male to female ratio in the age group 18–44 years in all three areas were reduced to about 0.7. This observation may be attributed to the rural-urban migration of able-bodied young men, or young couples as in the case of Perak Tengah, a fact that has often been voiced by village elders.

Educational Level

Of 526 heads of households and 465 of their spouses interviewed, 72% of the heads of households and 60% of their wives were found to have attended primary school or other schools (Table 5).

On the basis of kampungs, Kota Baru was found to have the lowest attainment for education, while Perak Tengah may be regarded to have the highest literacy rate.

Table 5. Education Level Of Heads Of Households And Their Spouses (expressed as a percentage of total number of households)

	Kota Baru		Mersing		Baling		Perak Tengah		Combined	
	head	wife	head	wife	head	wife	head	wife	head	wife
n	80	74	111	92	146	134	189	165	526	465
Primary school	34	39	59	41	55	52	80	58	62	51
Secondary school	0	5	4	1	2	2	2	1	2	2
Vocational school	0	0	0	11	0	0	0	0	0	0
College/university	0	0	0	1	1	0	0	1	0	0
Religious school	3	1	5	6	4	1	6	1	5	2
Adult education classes	2	2	1	4	9	10	1	3	3	5
No formal education	61	53	31	46	29	35	11	36	28	40
Percent with education	39	47	68	54	71	65	89	64	72	60

Household Income and Poverty Prevalence

The mean monthly household income was highest at $237 in Perak Tengah and the lowest at $185 for Mersing ($p < 0.05$). The per capita monthly income was highest in Perak Tengah at $47 and least for Mersing and Baling at $38 ($p < 0.05$) – Fig. 3.

Using a household monthly income of $290 and below as a cut-off to denote rural poverty, it may be seen from the same figure that 78% of all households may be regarded as below poverty line with the highest prevalence for poverty of 83% in Baling and Mersing and the lowest of 72% in Perak Tengah.

Household Size and Income

The average household consisted of 5.7 persons and there was no statistically significant difference in the household size between locations.

Table 6 shows that large households with more than seven members have significantly higher incomes than smaller households ($p < 0.001$). A low but significant level of correlation ($r = 0.27; p < 0.001$) was also found between household income and household size.

Despite this, the per capita income of larger households was in actual fact significantly less than smaller households and an inverse correlation can be demonstrated between per capita income and household size ($r = -0.39; p < 0.001$). This suggests that per capita income is a better indicator of poverty than household income which is dependent on household size.

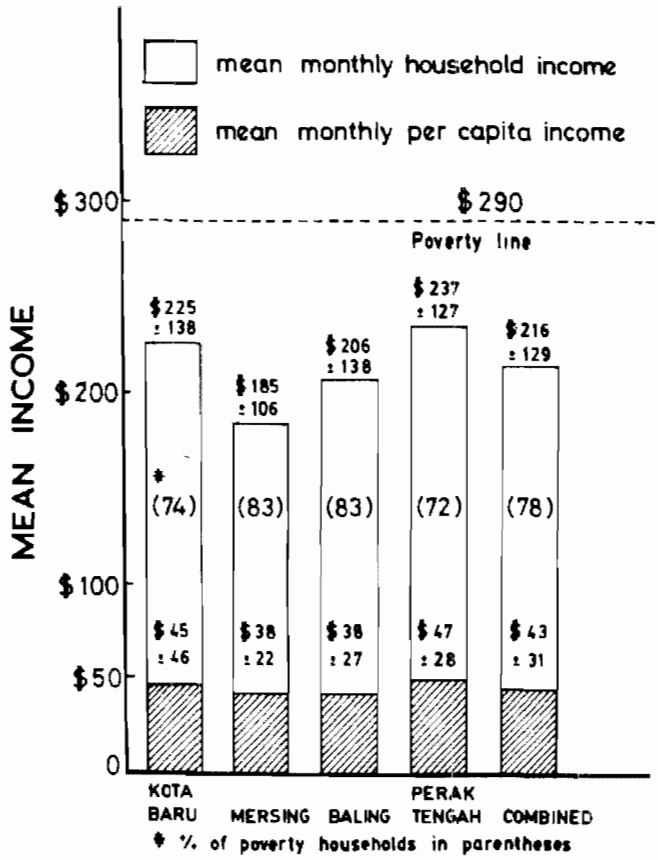

Figure 3. Household Per Capita Income and Poverty Prevalence.

Table 6. Household And Per Capita Income (In Ringgit – Mean & S.D.).

	Kota Baru	Mersing	Baling	Perak Tengah	Combined
Household Income:					
< 7 persons/household	207 ± 133	176 ± 103	197 ± 121	213 ± 118	200 ± 119
n	63	77	91	124	355
> 7 persons/household	257 ± 142	207 ± 113	222 ± 163	284 ± 132	247 ± 143
n	37	33	54	65	189
Per Capita Income:					
< 7 persons/household	55 ± 55	44 ± 24	45 ± 29	55 ± 32	50 ± 35
n	63	77	91	124	355
> 7 persons/household	30 ± 15	26 ± 14	28 ± 20	33 ± 15	30 ± 17
n	37	33	54	65	189

Household Income and Literacy

Table 7 shows that households whose heads were literate earned a higher income than those who were illiterate, $p < 0.001$ for the combined data.

Table 7. Household Income And Educational Attainment (In Ringgit, Mean & S.D.).

	Kota Baru	Mersing	Baling	Perak Tengah	Combined
Household Income:					
(a) heads with education	257 ± 160	202 ± 109	215 ± 142	245 ± 129	229 ± 132
n	31	74	103	169	377
(b) heads with no education	214 ± 121	151 ± 94	186 ± 128	169 ± 99	184 ± 116
n	48	36	42	20	146

Expenditure on Food

The proportion of income spent on food was 60% for all kampungs. However poverty households spent a significantly greater proportion of their income (64%) on food than those above the poverty line (48%) – $p < 0.01\%$, Table 8. A negative correlation was also demonstrated between monthly household income and percentage food expenditure ($r = -0.36$; $p < 0.001$).

Table 8. Household Income And Food Expenditure (as % of income).

	Kota Baru	Mersing	Baling	Perak Tengah	Combined
Percent income spent on food:	53 ± 22	not available	54 ± 22	69 ± 17	60 ± 21
n	85	–	139	189	413
Percent income spent on food for households with:					
(a) monthly income of < $290	56 ± 22	–	58 ± 20	73 ± 16	64 ± 21
n	66		116	137	319
(b) monthly incomes of > $290	43 ± 20	–	33 ± 16	56 ± 14	48 ± 18
n	19		23	52	94

Economic Activities

The main occupational activities of the heads of households studied in the four areas are depicted in Fig. 4. It is evident that the major economic activities of the kampungs in Kota Baru, Mersing, Baling and Perak Tengah were respectively fishing, rice-growing, rubber-tapping and a combination of rice-growing and rubber tapping. Other minor economic activities that were noted in Kota Baru included *batik* printing, kite-making, making *kerupuk*, dried fish and *budu*, processing of copra, preparation of *gula melaka* and *daun rokok*. *Mengkuang* mat-weaving was an important subsidiary activity in Mersing while in Perak Tengah making *gula kabung*, *menekad* (embroidery) and prawn-catching were other forms of extra income-generating activities.

Property and Material Possessions

Data on property ownership and material possessions are summarised in Table 9.

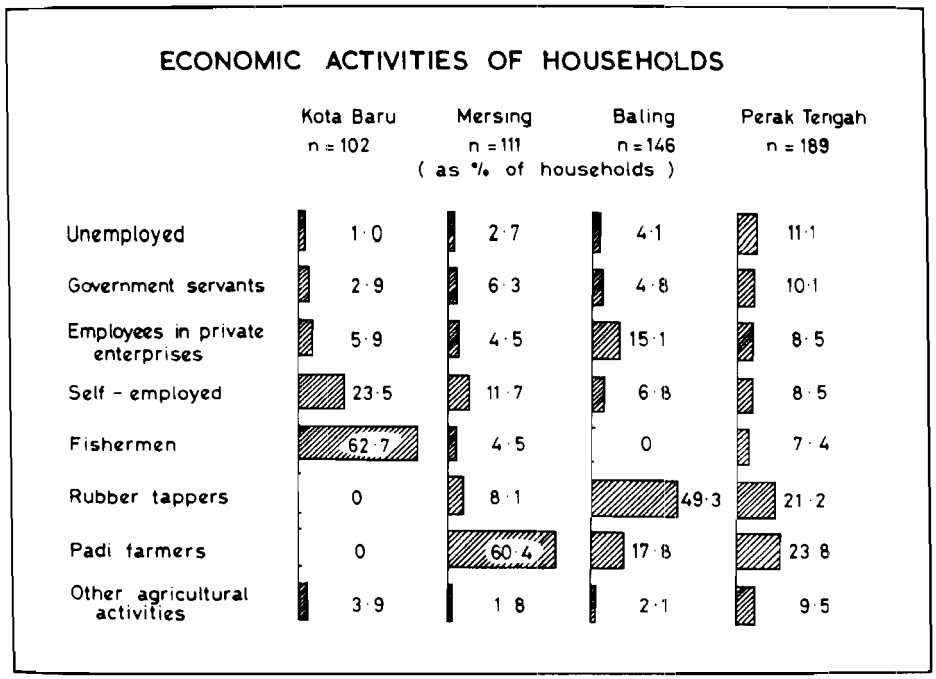

Figure 4. Occupational Activities of Heads of Households.

Table 9. Property Ownership And Material Possessions (as % of households)

	Kota Baru	Mersing	Baling	Perak Tengah
n	102	111	146	189
Land	32	68	58	57
House	98	96	94	94
Radio	26	62	62	76
Television	–	32	20	42
Refrigerator	3	0	0	0
Motor-car	1	5	3	3
Motor-cycle	7	32	23	50
Bicycle	27	78	35	83
Motor-boat	7	0	0	2
Sampan	8	12	0	24

In all study locations, house ownership was common with about 95% of those interviewed staying in their own houses. 55% of the population also owned some land that was suitable for padi plots, orchards or vegetable gardens.

Possession of radios and bicycles was common with the highest rate of 76% and 83% respectively in Perak Tengah. The latter district also appeared to be more affluent than the others judging from the high proportion of households in possession of battery-operated TV sets (42%) and motor bicycles, (50%). Where fishing was an important activity such as in Kota Baru and Perak Tengah, some house owners also possessed sampans and motor boats. The motorised boats were purchased with the aid of Government subsidies which were aimed at helping the ailing fishing industry.

Livestock

In all kampungs, poultry rearing was by far the most common form of animal husbandry and about 90% of households reared chickens. The birds were free-range and the number of birds were limited to between 10 to 20 per house and they were reared mostly for self consumption. Ducks were the next most common animals bred. In Baling it was found that in addition, 36% of households had cows and 22% kept goats. The cows and goats reared in Baling are a reflection of recent efforts by the Agriculture Department to encourage more widespread animal husbandry and increase food production at the local level (Table 10).

Table 10. Livestock (as % of households)

	Mersing	Baling	Perak Tengah
n	111	146	189
Houses that reared livestock:	92	99	83
chickens	89	95	83
ducks	34	41	11
cows	3	36	0
buffaloes	9	1	0
goats	4	22	3
geese	1	1	1
turkeys	0	1	0

House Types, Fuel and Water Supply

The typical rural kampung house is simple and sparesly furnished. Meals and drinks are consumed on the floor overlaid with a mat. Likewise, beds are rare and the villagers and the families generally sleep on mats. Shoes and slippers are never worn indoors and the interior of all kampung houses as observed were always kept scrupulously clean.

The kampung houses in Kota Baru, Mersing, Baling and Perak Tengah were rather similar in construction. They were simple wooden or bamboo structures raised on stilts, thatched with either attap or zinc sheets. Houses thatched with zinc sheets were most common in Perak Tengah while attap roofs were more abundant in Kota Baru.

Most houses have a separate cooking area away from the living area. Wood fire was the most common fuel used for cooking, while coconut oil lamps or kerosene lamps were the common means of lighting as there was no electricity supply in the study areas.

Piped water was not available except for a kampung (Bukit Chawi) in Perak Tengah. The main source of drinking water was from improperly constructed and unraised well. In riverine kampungs such as in Perak Tengah, the river provided the main source of water for drinking, laundry and bathing. Drinking water irrespective of its source however was usually pre-boiled (Table 11).

Table 11. House Types, Fuel And Water Supply (% of total households).

	Kota Baru	Mersing	Baling	Perak Tengah
n	102	111	146	189
House Types.				
wood and zinc	39	64	71	91
wood and attap	60	23	10	7
bamboo and attap	1	12	19	2
Fuel for Cooking:				
wood	–	73	93	91
charcoal	–	16	2	0
kerosene	–	10	5	8
gas	–	1	0	1
Water Supply				
pipe	0	0	1	26
raised well	19	38	32	23
unraised well	81	47	41	13
river	0	1	26	36
rain	0	14	0	2

Home Gardens

In all areas studied, vegetable gardens were uncommon. But fruit trees such as papaya, banana, rambutan, jackfruit, sapodila were commonly found around the kampung house.

Certain trees and crops were specific to the locality studied. For instance, the coastal kampungs of Kota Baru had an abundance of coconut palms. Coffee was commonly grown for home consumption in Baling while cocoa was also seen in kampungs of Perak Tengah.

Other crops of economic importance in the rural Malay kampungs were the nipah palms that provided *attap, daun rokok* and *gula kabung* as well as the *daun mengkuang* for making bags, hats and mats.

Waste Disposal

In all kampungs, human waste disposal was generally unsatisfactory. Pour-flush latrines were found from 9% of homes in Baling to 51% of homes in Mersing. Those homes without this amenity resorted to the surrounding bushes, streams or rivers. 66% of the homes in Kota Baru, 68% of homes in Baling, 47% of households in Perak Tengah and 4% in Mersing used the river or streams for excreta disposal (Table 12).

Table 12. Waste Disposal (as % total households).

	Kota Baru	Mersing	Baling	Perak Tengah
n	102	111	146	189
Latrine Types.				
pour flush	26	51	9	32
hole-in-ground	1	34	11	14
river	66	4	69	47
house surroundings	7	11	12	7
Garbage Disposal:				
bury	0	2	2	1
burn	87	84	93	67
hole-in-ground	6	4	1	5
river	0	1	–	21
house surroundings	7	9	4	6

The river was also often used for garbage disposal as in Perak Tengah but the majority of households elsewhere would burn their refuse and garbage.

Clinical Findings

A total of 3,584 persons were examined clinically in the study kampungs.

The main clinical findings in relation to the major deficiency diseases and some health problems are as follows.

- protein-energy malnutrition – not a single case of clinically manifest protein-energy malnutrition, such as kwashiorkor, marasmic kwashiorkor or marasmus was encountered. However features suggestive of muscle wasting and stunting were occasionally observed in pre-school and primary school children. Hair colour change which is not specific for protein-energy malnutrition was found in 6% of children in Baling and Mersing and 17% in Perak Tengah.
- anaemia – pallor of the conjunctiva was found in 17% of women of child-bearing age and in 25% and 36% of senior adult males and females of over 45 years respectively.
- vitamin A deficiency – xeropthalmia was rare. The most common eye sign was dryness and wrinkling of the conjunctiva with 13% of primary school boys and 8% of girls affected. Xerosis was also most commonly found in this age group.
- goitre did not appear to be a public health problem in the poverty kampungs studied.
- dental health – poor dental health was rampant. Tooth decay was common in all age groups. Large numbers of persons examined had missing teeth and poor gums. Dental fillings were uncommon.
- head lice - this parasitic infestation was common to all areas and those most affected appeared to be primary school children in whom 38% boys and 55% girls were found to be infested.

- scabies – this was found mostly amongst infants and children under 12 years.
- elephantiasis – 2% of male adults over 45 years were found to have this condition in Perak Tengah where filariasis is known to be endemic.

Growth Retardation (Protein-Energy Malnutrition) in Pre-School and Primary School Children

The anthropometric measurements of children whose ages were 0–5.99 years (pre-school) and 6.0–11.99 years (primary school) were examined in the following manner for:-

- "stunting", to denote chronic undernutrition due to recurrent episodes or prolonged protein-energy malnutrition.
- "wasting", to denote a recent period of acute protein-energy malnutrition.
- combination of "stunting" and "wasting", to denote severe cases of chronic undernutrition.
- "underweight" to denote undernutrition of unknown duration. Generally the prevalence of "underweight" may be quite close to "stunting" particularly when "wasting" is low.
- "Poor" mid-arm circumference which is a quick method for assessing nutritional status especially in communities known to have a high prevalence of current acute malnutrition.

Their growth achievements were also compared with urban Malay Children in Kuala Lumpur and Petaling Jaya.

Protein-Energy Malnutrition in Pre-School Children

The prevalence of malnutrition in pre-school children by the various anthropometric criteria are presented in Table 13.

It is clear from this Table that the magnitude of malnutrition as defined by weight and height indices did not seem to differ markedly from one locality to another.

Overall for all kampungs, the prevalence for chronic undernutrition or "stunting" was 43%, current acute malnutrition or "wasting" was 5%, severe chronic malnutrition or a combination of "stunting" and "wasting, 3%, while the prevalence for "underweight" was 37%

Table 13. Prevalence Of Growth Retardation In Pre-school Children (Both Sexes)

	Kota Baru	Mersing	Baling	Perak Tengah	All Kampungs
% "Stunted"	42	47	44	41	43
% "Wasted"	5	6	4	6	5
% "Stunted" & "wasted"	2	4	2	3	3
% "Underweight"	30	38	35	41	37
% "Poor" mid-arm circumference	--	12	30	25	22
n	77	128	283	238	726

The prevalence for "poor" mid-arm circumference was more variable compared to the indices of weight and height. This may be explained by the finding that mid-arm circumference lacks sensitivity when used to detect borderline or moderate malnutrition by the criteria of weight-for-age and weight-for-height and that the value of the measure is limited to the detection of the more severe forms of protein-energy malnutrition (Ng, 1984). The overall pre-school population with a "poor" mid-arm circumference index was 22%.

When the growth achievements of the pre-school children relative to the NCHS references were plotted at yearly intervals such as shown in Fig.5 it may be seen that growth achievements were generally satisfactory during infancy but began to falter thereafter:

- weight-for-age – there was a sharp decline in achievement from 92% of reference at infancy to 79% at 5–6 years.
- height-for-age – there was a steady decline in achievement from 96% at infancy to 91% at 5–6 years.
- weight-for-height – there was an initial decline from 100% during infancy to 91%, thereafter rising to 93%.

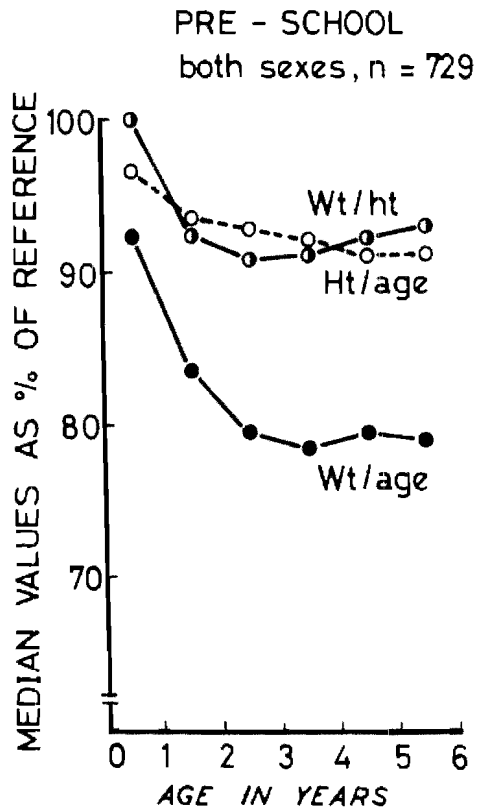

Figure 5. Growth Achievements of Pre-Schoolers by Wt/Age, Ht/Age and Wt/Ht.

Fig. 6 illustrates the poor growth achievements of poverty kampung children relative to the NCHS growth references and the growth of local urban counterparts. It may be seen here that the median growth curves of the pre-schoolers from poverty kampungs not only approxi-

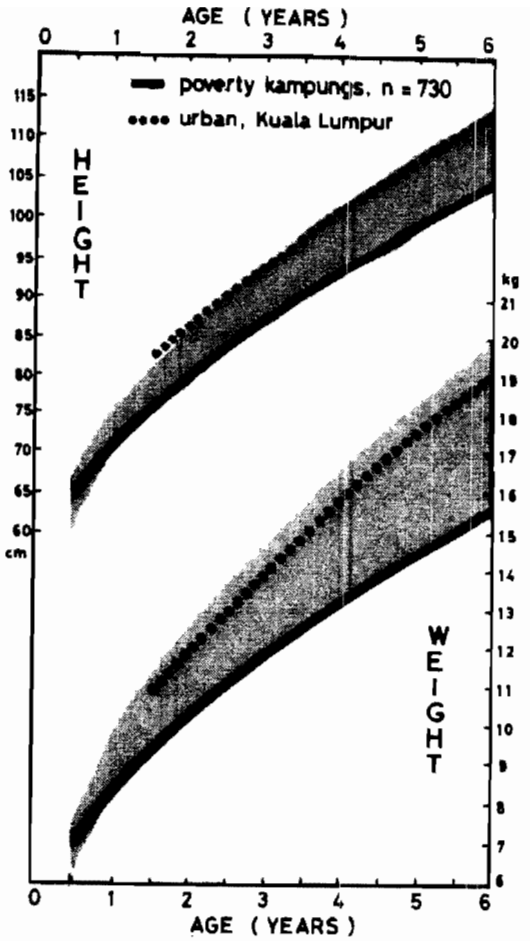

Figure 6. Comparative Growth Achievement of Pre-Schoolers (Poverty Kampungs vs. Urban). Urban, Kuala Lumpur – Source: (1) Chong, McKay and Lim (1972), Foo, unpublished data. Shaded area represents weight and height achievements between median and median -- 2SD of the NCHS reference.

mate the -2 S.D. line of the reference, but they were also inferior to the growth of urban children in Kuala Lumpur.

Protein-Energy Malnutrition in Primary School Children

The prevalence of growth retardation in primary school boys and girls is shown in Table 14. The prevalence for chronic undernutrition in boys varied from 41% in Mersing and Perak Tengah to 54% in Kota Baru. For girls, the prevalence of chronic undernutrition varied from 28% in Perak Tengah to 42% in Baling.

The overall prevalence for chronic undernutrition in all kampungs was 49% for boys and 25% for girls. However the prevalence rates for acute malnutrition and severe chronic undernutrition were minimal.

Figs. 7a and 7b show the growth achievements of boys and girls over the period 6 to 11.99 years. At all age groups, their wt/age, ht/age and wt/ht achievements were below the reference of 100%.

Table 14. Prevalence Of Growth Retardation In Primary School Children (6.0 – 11.99 Years).

		Kota Baru	Mersing	Baling	Perak Tengah	All Kampungs
BOYS:	% "Stunted"	54	41	57	41	49
	% "Wasted"	0	3	4	1	2
	% "Wasted" & "Stunted"	0	1	3	0	1
	% "Underweight"	42	33	46	28	38
	n	81	76	158	145	460
GIRLS:	% "Stunted"	34	33	42	28	35
	% "Wasted"	1	3	1	3	2
	% "Wasted" & "Stunted"	1	0	1	3	1
	% "Underweight"	18	34	25	18	23
	n	100	90	159	152	501

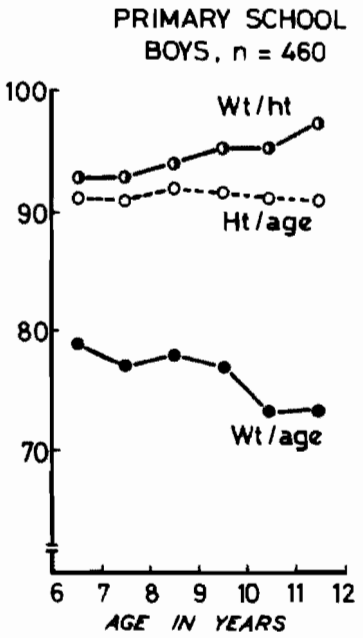

Figure 7a. Growth Achievements of Primary School Children – Boys (Wt/Age, Ht/Age & Wt/Ht)

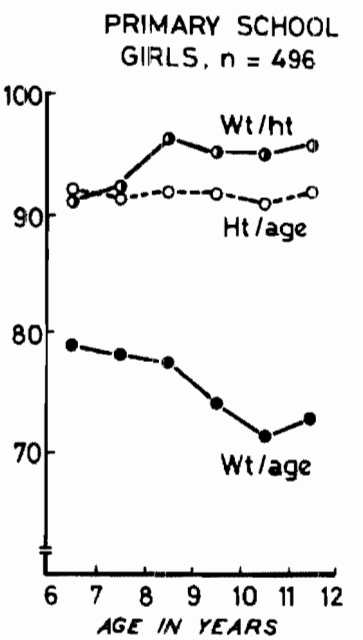

Figure 7b. Growth Achievements of Primary School Children – Girls (Wt/Age Ht/Age & Wt/Ht)

Fig. 8 & 9 illustrate the comparative growth achievements of the present series of primary school children, boys & girls respectively. It may be seen that the median weight and height curves of poverty kampung children of primary school age were all inferior to those of their

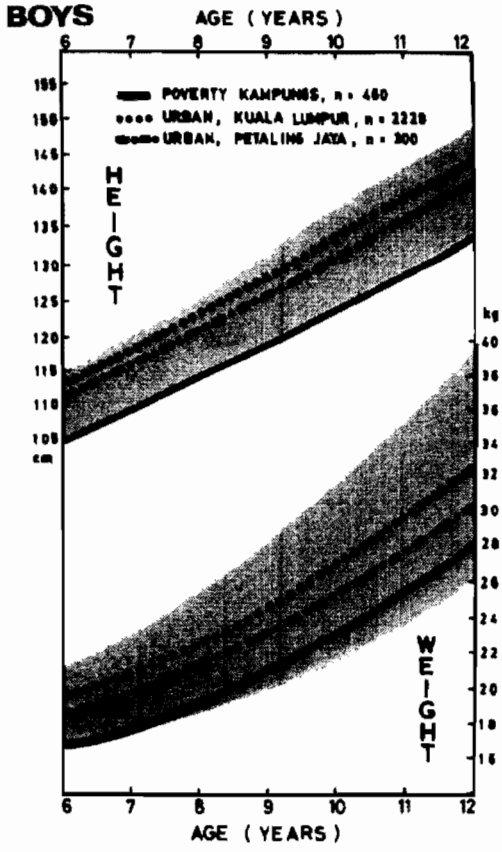

Figure 8. Comparative Growth Achievements of Primary School Children – Boys (Poverty Kampungs vs Urban).
Urban, Kuala Lumpur – Source: Foo, unpublished data.
Urban, Petaling Jaya – Source: Chen (1977)
Shaded area represents weight and height achievements between median and median – 2SD of the NCHS reference.

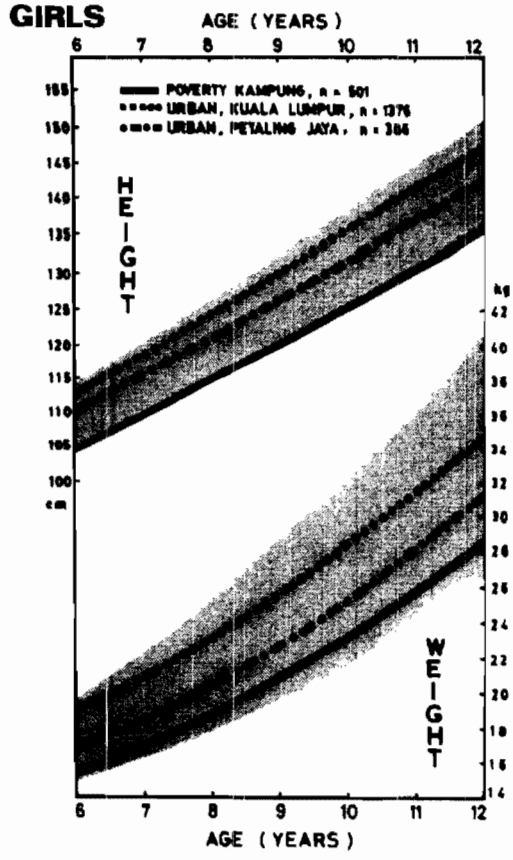

Figure 9. Comparative Growth Achievements of Primary School Children – Girls (Poverty Kampungs vs Urban).
Urban, Kuala Lumpur – Source: Foo, unpublished data.
Urban, Petaling Jaya – Source: Chen (1977)
Shaded area represents weight and height achievements between median and median – 2SD of the NCHS reference.

urban counterparts in Kuala Lumpur and Petaling Jaya, and that they only approximate the -2 S.D. lines of the NCHS reference.

Anthropometric Measurements and the Prevalence of Leanness and Obesity Amongst Adults. The mean height, weight and body mass index of male and female adults and their prevalence for leanness and obesity are shown in Table 15.

Men have a mean height of 160 cm (5' 3") and women 149 cm (4' 11"), while the mean weight for men was 52 kg and women 46 kg.

On the basis of their body mass index, there was a preponderance of lean people, (45% in males and 31% in females) compared to overweight people, (5% in males and 15% in females) in the kampung communities. The community in Baling however had the highest proportion of underweight adults, 53% for males and 42% for females. The above observation is consistent

with the existence of the problem of chronic protein-energy malnutrition that was described earlier.

In view of the fact that the anthropometric measurements of many able-bodied males were not available for reasons that they were out at work in the field or gone to the city in search for jobs, the measurements for male adults reported here cannot be taken to represent the stature of the average kampung adult male. However this cannot be said for the female adults; the anthropometric measurements reported are probably valid reflections of their average stature.

Table 15. Anthropometric Measurements And Prevalence Of Leanness And Obesity Amongst Adults.

Subjects	Kota Baru	Mersing	Baling	Perak Tengah	All Kampungs
MALES: (18 years and above)					
n	55	98	153	216	522
Height, cm	160.8	160.9	159.4	159.5	159.8
Weight, kg	52.4	52.9	50.8	53.3	52.4
Body mass index, wt/ht^2	20.2	20.3	20.0	20.9	20.4
% "Underweight"	40	47	53	40	45
% "Overweight"	7	6	2	7	5
FEMALES: (18 years and above)					
n	103	214	302	346	965
Height, cm	150.4	149.0	148.8	148.0	148.7
Weight, kg	47.4	47.4	44.8	46.5	46.3
Body mass index, wt/ht^2	21.0	21.3	20.2	21.2	20.9
% "Underweight"	29	22	42	30	31
% "Overweight"	19	20	7	18	15

Anaemia in the Community

The haemoglobin values and the prevalence of anaemia in the various age groups from the four poverty communities are seen in Table 16. Anaemia was common in all age groups and prevalent in all the districts. When considered for all kampungs, it may be seen that about one-third of pre-school children, 39% of primary school children, one-quarter of the women above 18 years and roughly one-third of the men (with exception of those men 18 – 45 years in whom anaemia was minimal) were anaemic.

Figs. 10, 11 and 12 show the frequency distribution of haemoglobin levels in pre-school children, primary school children and women of child-bearing age.

Serum iron and serum transferrin saturation studies (available only for subjects above 12

Table 16. Haemoglobin Levels (Means & S.D.) And Prevalence Of Anaemia.

Age Groups	Kota Baru	Mersing	Baling	Perak Tengah	All Poverty Kampungs
COMBINED SEXES:					
Pre-school, 1.0 – 5.9 years	11.2 ± 1.2	12.3 ± 1.5	11.1 ± 1.3	11.4 ± 1.7	11.6 ± 1.7
	*(31%)	(18%)	(43%)	(32%)	(33%)
n	52	87	186	187	512
Primary school, 6.0 – 11.9 years	11.7 ± 1.0	13.1 ± 1.4	12.1 ± 1.7	12.6 ± 1.5	12.3 ± 1.5
	(64%)	(22%)	(43%)	(27%)	(39%)
	177	154	296	283	910
MALES:					
Boys, 12 – 17.9 years	12.4 ± 1.2	14.8 ± 1.6	13.6 ± 1.3	13.5 ± 1.4	13.6 ± 1.5
	(67%)	(14%)	(31%)	(29%)	(32%)
n	28	25	29	66	148
Men, 18 – 45.9 years	14.4 ± 1.2	16.6 ± 1.6	15.0 ± 1.9	15.2 ± 1.8	15.3 ± 1.8
	(4%)	(0%)	(9%)	(7%)	(7%)
n	24	38	67	81	210
Men, 46 years & above	13.9 ± 1.3	14.5 ± 2.0	–	13.5 ± 2.0	13.7 ± 1.9
	(26%)	(19%)		(36%)	(32%)
n	20	16		118	154
FEMALES:					
Girls, 12 – 17.9 years	12.5 ± 1.0	13.7 ± 1.4	13.2 ± 1.3	13.3 ± 1.3	13.2 ± 1.3
	(30%)	(12%)	(19%)	(10%)	(15%)
n	34	30	52	67	183
Women, 18 – 45.9 years	12.0 ± 1.1	14.2 ± 2.1	12.8 ± 1.8	13.0 ± 2.1	13.1 ± 2.0
	(56%)	(9%)	(25%)	(23%)	(25%)
n	65	114	140	174	493
Women, 46 years & above	12.1 ± 1.1	13.2 ± 1.6	–	12.8 ± 1.8	12.7 ± 1.7
	(52%)	(19%)		(20%)	(24%)
n	26	16	–	142	184

* figures in parentheses refer to prevalence for anaemia.

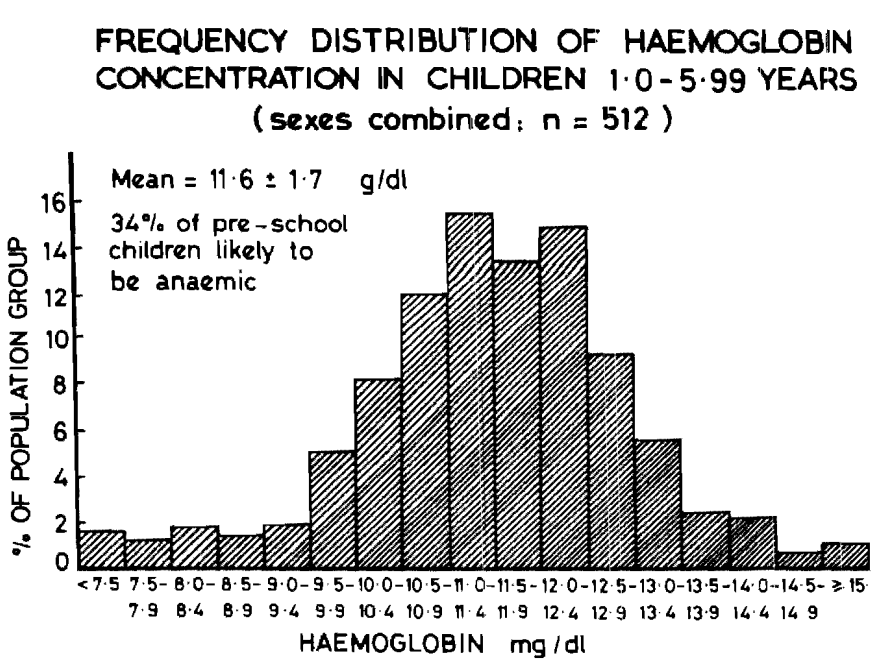

Figure 10. Frequency Distribution of Haemoglobin Levels (Pre-School Children).

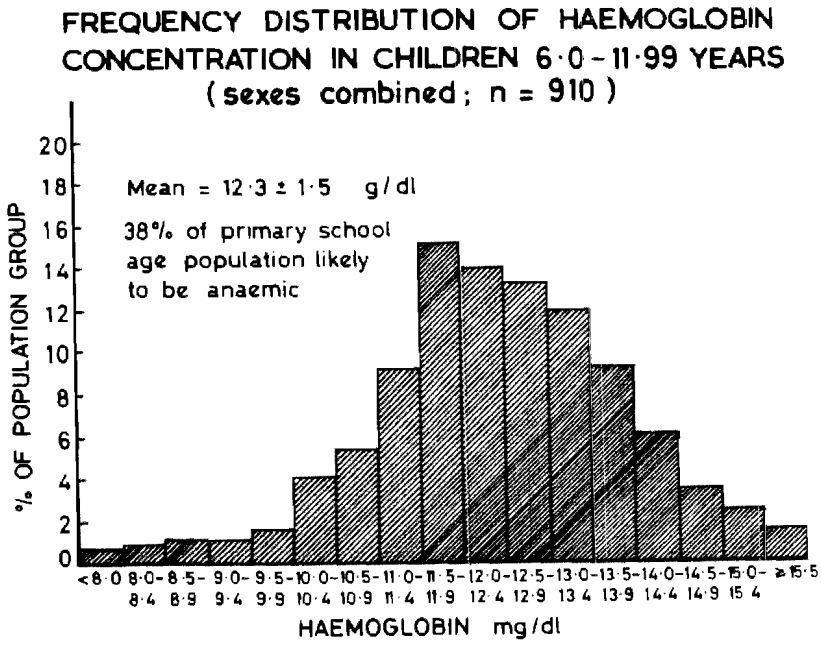

Figure 11. Frequency Distribution of Haemoglobin Levels (Primary School Children).

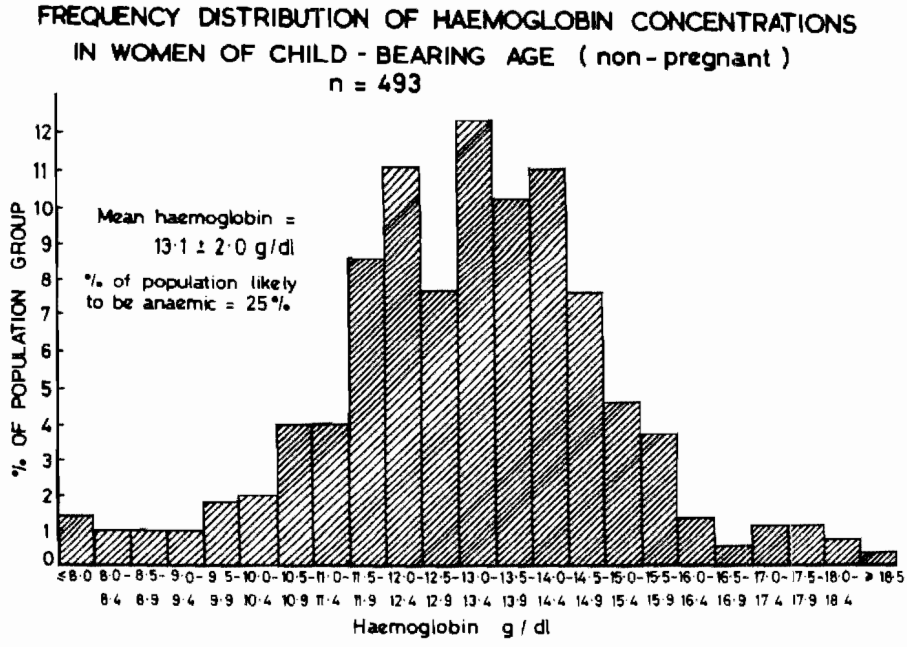

Figure 12. Frequency Distribution of Haemoglobin Levels (Women of Childbearing Age).

Table 17. Serum Iron and Transferrin Saturation (mean & S.D., all poverty kampungs).

		n	Serum iron µg/dl	% transferrin saturation
Males:	12 – 17.9 years	33	69 ± 36	23 ± 11
	18 – 45.9 years	138	76 ± 31	29 ± 11
	⩾ 46 years	29	63 ± 22	24 ± 9
Females:	12 – 17.9 years	72	56 ± 28	20 ± 8
	18 – 45.9 years (non-pregnant)	339	59 ± 32	23 ± 10
	⩾ 46 years	39	55 ± 24	21 ± 9

years old) as in Table 17 show that both serum iron and transferrin saturation values were comparatively lower in female subjects compared to males.

The prevalence for iron deficiency anaemia as defined by a serum transferrin saturation of less than 15% was as follows:-

Females

adolescent girls:	35% of 72 girls
women, 18 – 45 years:	25% of 339 women
women, ⩾ 46 years:	26% of 38 women

Males

adolescent boys:	27% of 33 boys
men, 18 – 45.9 years:	9% of 138 men
men, ⩾ 46 years:	17% of 29 men

When serum iron values were correlated with their corresponding haemoglobin values, a statistically significant correlation ($r = 0.37$; $p < 0.001$, $n = 640$) was found, suggesting a relationship between anaemia and iron deficiency.

The evidence presented indicates that the anaemia prevalent in the poverty kampungs may be attributed to iron deficiency and that iron deficiency anaemia affected more females than males.

Biochemical Assessment of Protein Status

The plasma/serum protein levels of pre-school children, primary school children, males and females of 12 to 45 years are shown in Table 18.

Table 18. Plasma/Serum Albumin Levels (Means & S.D.).

	Kota Baru	Mersing	Baling	Perak Tengah	All Kampungs
Pre-school: (both sexes)					
Mean & S.D. g/dl	3.7 ± 0.26	4.2 ± 0.29	3.6 ± 0.33	4.1 ± 0.44	3.9 ± 0.34
% Protein deficient	15	0	40	7	20
n	52	65	146	112	375
Primary school: (both sexes)					
Mean & S.D. g/dl	3.9 ± 0.29	4.2 ± 0.30	3.8 ± 0.38	4.3 ± 0.4	4.1 ± 0.35
% Protein deficient	4	0	14	3	6
n	144	105	188	235	672
Females (12 – 45.9 years):					
Mean & S.D. g/dl	4.1 ± 0.41	4.2 ± 0.32	4.3 ± 0.47	4.1 ± 0.42	4.2 ± 0.41
% Protein deficient	6	2	7	6	5
n	96	133	182	183	594
Males (12 – 45.9 years):					
Mean & S.D. g/dl	4.2 ± 0.39	4.3 ± 0.33	4.4 ± 0.44	4.2 ± 0.41	43. ± 0.40
% Protein deficient	2	2	4	4	3
n	44	56	93	101	294

With the exception of the community in Mersing, where the protein problem seemed minimal, all kampungs demonstrated the existence of some marginal protein deficiency as indicated by their albumin levels. This problem appeared to be particularly acute in Baling where an alarmingly high proportion (40%) of pre-school children and 14% of primary school children were found to have "low" plasma albumin values.

The impression gained was that where marginal protein deficiency occurred, those from the pre-school group was more vulnerable than older age groups.

This marginal protein problem amongst pre-school children is reinforced by the demonstration of a significant proportion of children from this age group having unsatisfactory urinary excretion of urea and hydroxyproline. (Table 19).

Table 19. Urine Urea N/Creatinine Ratio and Hydroxyproline Index (Means & S.D. – Pre-School Children Only).

	Kota Baru	Mersing	Baling	Perak Tengah	All Kampungs
Urea N/Creatinine ratio	6.4 ± 1.5	93. ± 3.6	7.4 ± 2.9	9.1 ± 5.2	8.3 ± 3.7
	*(27)	(9)	(22)	(21)	(19)
n	15	78	139	101	333
Hydroxyproline index	1.0 ± 0.7	2.0 ± 0.9	2.1 ± 0.8	1.8 ± 0.7	1.9 ± 0.8
	*(81)	(24)	(22)	(32)	(28)
n	16	75	138	99	328

* figures in parentheses refer to % of children with unsatisfactory indices.

Vitamin A Status

Owing to insufficient availability of plasma and serum samples, it was not possible to determine the vitamin A levels of all subjects, in particular the young children.

The serum/Plasma vitamin A results are those for the combined kampungs as shown in Table 20.

Table 20. Serum Vitamin A Levels (Combined Data From All Kampungs).

	Mean & S.D. ug per dl	% with "low" vitamin A
Pre-school n = 25	31 ± 9.5	12
Primary school n = 40	33 ± 12.5	10
Boys, 12 – 17.9 years n = 32	44 ± 22	16
Girls, 12 – 17.9 yeras n = 61	55 ± 19	3
Males, 18 – 45.9 years n = 152	46 ± 19	7
Females, 18 – 45.9 years n = 353	47 ± 24	12
Males, 46 years and above n = 14	54 ± 33	0
Females, 46 years and above n = 14	42 ± 17	7

With adults between 18 and 45.9 years of age, it was possible to get larger samples and the results certainly indicated that vitamin A deficiency did not pose a problem.

The results for the younger children and adolescents, albeit from a relatively smaller sample size, also do not suggest the existence of a vitamin A problem. The present biochemical evidence and the lack of supporting clinical evidence of vitamin A deficiency mentioned earlier are certainly indicative that there was little vitamin A deficiency of concern in these poverty kampung communities.

Thiamin Status

Thiamin status was evaluated biochemically by determining the urinary excretion of the vitamin. The data have been combined and are shown in Table 21.

Urinary excretion of thiamin seemed to decrease with age with younger subjects (pre-school and primary school) excreting more thiamin than older subjects.

The prevalence of "low" excretors varied with different age groups with no distinctive pattern being evident. On the whole, the data would seem to suggest that there is much room for improvement of vitamin B_1 intake in the kampungs.

Table 21. Thiamin Status (Urinary excretion) – Combined Data of All Kampungs.

	Median µg/g creatinine	% with "low" urinary excretion
Pre-school n = 251	438	7
Primary school n = 349	276	25
Boys, 12 – 17.9 years n = 65	174	26
Girls, 12 – 17.9 years n = 69	174	49
Women, 18 – 45.9 years n = 242	140	23
Men, 18 – 45.9 years n = 107	142	22
Women, over 46 years n = 40	134	25
Men, over 46 years n = 47	124	9

Serum cholesterol and Triglyceride Levels

The serum cholesterol and triglyceride levels of the kampung communities are shown in Table 22 according to decades of age.

In the males, both serum cholesterol and triglycerides clearly rose with each decade of

Table 22. Serum Cholesterol And Triglyceride Levels In Poverty Kampungs.

Age group	n	Total cholesterol mg/dl Mean & S.D.	Triglycerides mg/dl Mean & S.D.
Below 20 years:			
Males	51	158 ± 33	119 ± 65
Females	100	181 ± 32	117 ± 67
20 – 29 years:			
Males	44	163 ± 33	120 ± 53
Females	152	186 ± 40	106 ± 57
30 – 39 years:			
Males	76	181 ± 35	153 ± 66
Females	171	188 ± 41	113 ± 69
40 – 49 years:			
Males	44	190 ± 40	172 ± 91
Females	75	181 ± 30	102 ± 42
50 years & above:			
Males	31	188 ± 41	136 ± 64
Females	32	206 ± 42	148 ± 86
All Males:	246	175 ± 38	141 ± 71
All Females:	530	186 ± 38	112 ± 64

age until 50 years after which serum lipids began to decline. In the females a similar age effect on serum cholesterol and triglycerides was less apparent, although these values seem to rise after 50 years of age in marked contrast to that found for the males.

Strangely, the serum cholesterol values of the rural females (mean 186 ± 38 mg/dl) were higher than that found for the rural males (mean 175 ± 38 mg). But this observation did not apply to serum triglycerides which were higher in the males (mean 141 ± 71 mg%) than females (mean 112 ± 64 mg%).

We have no explanation to offer for the above anomaly except to emphasise that pregnant women had been excluded in the above series and that the sera were random, non-fasting samples.

At all age intervals, the serum cholesterol levels of the rural males, as expected were lower than that of their urban counterparts as shown in Fig. 13.

Helminthic Infestations

Infestation with helminths was highly prevalent in all kampungs. Of 1454 faecal specimens examined, 77% were found to harbour one or more parasite (Table 23).

Trichuris trichiura and ascaris vied with each other as the most common parasite but

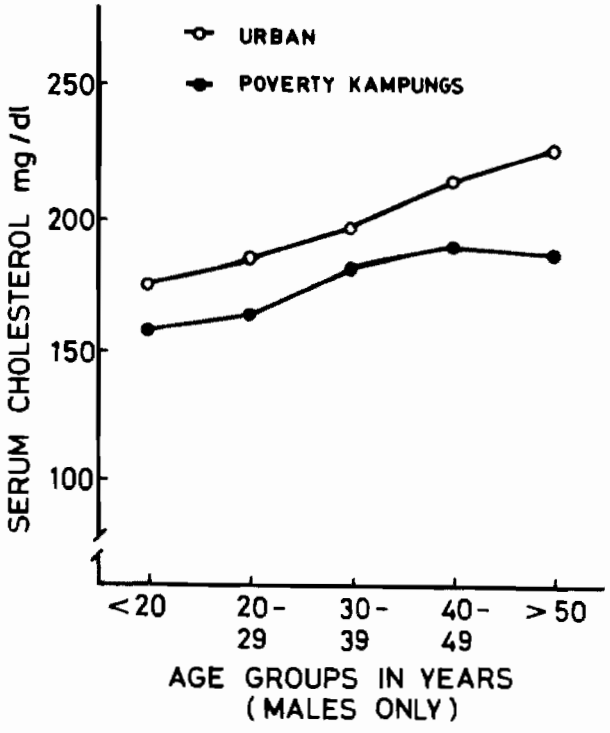

Figure 13. Serum Cholesterol and Triglycerides Levels (Poverty Kampungs vs. Urban). Urban – Source: Chong and Khoo (1975).

Table 23. Prevalence Of Helminthic Infestations By Locality (Means).

	Kota Baru	Mersing	Baling	Perak Tengah	All
n	233	348	370	503	1,454
% infested with helminths	80	81	75	75	77
% infested with ascaris	60	60	49	39	50
% infested with trichuris	59	43	35	63	52
% infested with hookworm	18	17	43	7	20

when all kampungs were considered, *trichuris trichiura* appeared to be the most common parasite being found in 52% of all samples, followed by ascaris, 50%, and hookworm 20%. An exception was however noted in Baling where hookworm prevalence was found to be higher than the prevalence for *trichuris*.

Table 24 shows that intestinal parasitism affected all age groups and even infants did not seem to be spared; the most affected group was that of primary school children.

Table 24. Helminthic Infestations By Age Groups And Infection Types (Means – Combined Data)

Age group	n	% free of worm Infestation	% with single infection			% with double infections			% with triple infections		
			ALO	TTO	HWO	ALO TTO	ALO HWO	TTO HWO	ALO	TTO	HWO
Infants	43	81	9	0	0	5	0	0		5	
Preschool children (both sexes)	298	29	22	15	4	19	4	1		6	
Primary school children (both sexes)	403	10	14	25	3	33	3	2		10	
Adolescent (both sexes)	133	13	18	18	1	28	5	5		12	
Adults (18 – 45 years)											
Males	112	31	16	16	11	13	2	4		7	
Females	287	22	17	13	9	17	7	4		9	
Senior Adults (≥ 46 years, both sexes)	178	34	10	25	3	14	1	6		7	
All	1,454	23	16	19	5	22	4	3		8	

*ALO - *Ascaris lumbricoides ova*, TTO = *Trichuris trichuira* ova, HWO = Hookworm ova

Jointly considered, 40% of the kampung communities were found to have a single infection, 29% had double infections and 8% were found to have triple infections.

Household Food Pattern and Consumption

The food consumption pattern per head daily for the poverty kampungs in the various locations are listed in Table 25 and compared with the food availability for Peninsular Malaysia derived from the food balance sheet for 1971 – 77.

Table 25. Food Consumption Pattern In Poverty Kampungs (Means – In Grams Edible Portions Per Capita)

Food items	Kota Baru 1979 *(87)	Mersing 1981 (110)	Baling 1982 (146)	Perak Tengah 1983 (160)	Combined kampungs 1979 – 1983 (503)	Food Balance** sheet, Pen. Malaysia 71/77
Rice	260	261	259	260	260	306
Wheat flour	25	74	57	58	54	68
Wheat products, e.g. biscuits, bread, etc	–	36	12	19	22	–
Roots and tubers	22	29	12	25	22	16
Sugar	43	90	52	86	68	93
Fats and oils (separated)	20	31	20	29	25	21
Pulses and nuts	7	13	18	9	12	18
Fish (including dried fish & other sea foods)	115	99	67	97	95	54
Meat and poultry	7	13	16	21	14	57
Eggs	8	10	8	14	10	21
Milk	6	25	12	16	15	29
Vegetables and fruits	73	70	88	225	114	256

* Figures in parentheses denote the number of households
** Source: Y.H. Chong (1982)

The staple food, rice, was eaten in essentially the same amounts in all the kampungs, but the mean amount eaten 260 g, was considerably less than the 306 g that was available on a countrywide basis.

A substantial amount of wheat flour and its products was eaten in the kampungs, although the amounts eaten varied with location. The consumption of sugar was variable; the kampungs in Mersing and Perak Tengah consumed nearly as much as that was available for the country, but sugar consumption in Kota Baru and Baling was considerably lower.

Slightly larger amounts of roots and tubers were eaten in the kampungs compared with the availability figure for the country; presumably this excess in roots and tubers was an adjustment to make up for the lesser amounts of rice eaten.

An outstanding feature of the kampung diet was the relatively high consumption of fish which ranged from 67 g per capita daily in Baling to 115 g per capita daily in Kota Baru where the main occupational activity was fishing. When all kampungs were taken into consideration, fish consumption at 95 g per capita daily was nearly twice the amount of fish availability of 54 g per head daily for Peninsular Malaysia during the period 1971 – 77.

In contrast, meat and poultry consumption of 14 g per head per day in the poverty kampungs was low compared to fish consumption.

Likewise the consumption of milk, eggs, vegetables and fruits at the poverty kampung level appeared considerably less than what were available according to the food balance sheet.

Calorie

When all kampungs were considered jointly, it may be seen in Fig. 14 that rice was the main supplier of energy, providing 51% of the dietary calorie. Next came sugar which supplied 14% of total calorie, while wheat products and separated oils contributed another 11% each.

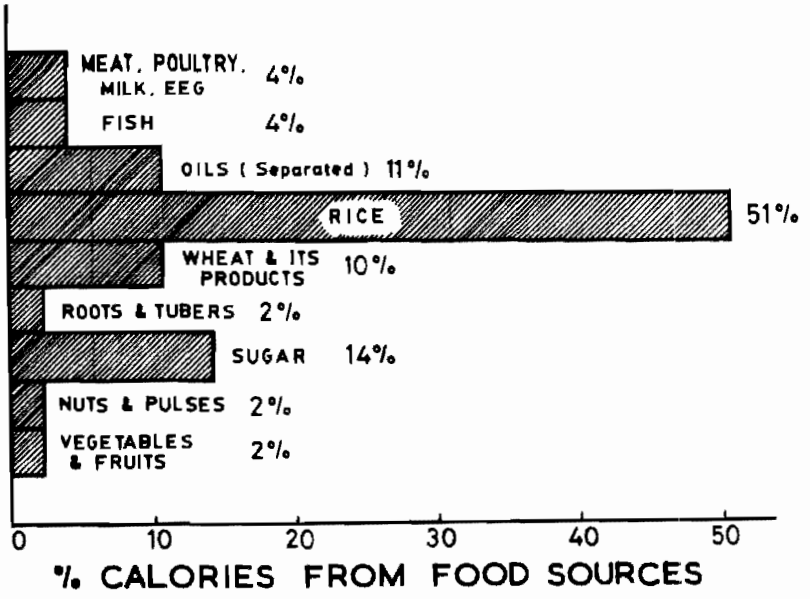

Figure 14. Calories from Food Sources.

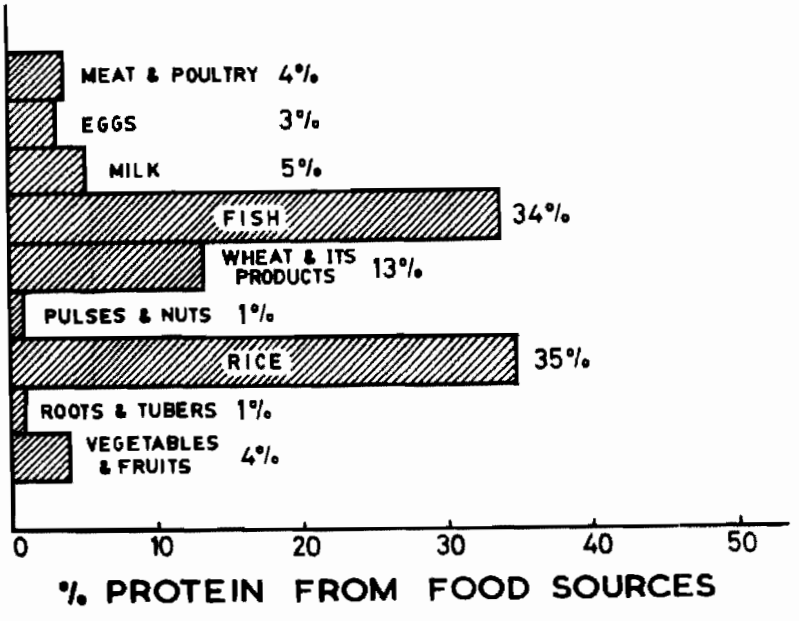

Figure 15. Protein from Food Sources.

Protein

Rice supplied 35% of the dietary protein followed closely by fish at 34%. Owing to the relatively high intake for fish, the contribution of protein from animal sources remained high at 46% in spite of the relatively low consumption of meat, poultry and eggs. (Fig. 15).

Fat

The diet of the poverty kampungs was generally low in fat. Separated fats contributed 11% of total calories. The total dietary fat intake after taking into account the "invisible" fats in the diet was 18% of total calorie.

Adequacy of Calorie and Protein Consumption

Table 26 shows that the daily per capita calorie consumption varied from 1,648 in Kota Baru to 2,106 in Mersing with an overall mean of 1,874. Protein consumption varied from 49 g per capita daily in Baling to 59 g in Perak Tengah.

Table 26. Calorie, Protein And Fat Intake In Poverty Kampungs (Per Capita Daily).

Nutrients	Kota Baru *(87)	Mersing (110)	Baling (144)	Perak Tengah (160)	Combined kampungs (503)
Calorie, k cals.	1,648	2,106	1,729	2,016	1,874
**Recommended calorie intake	2,080	2,156	2,062	2,004	2,075
Calorie as % of recommended intake	79	98	84	101	90
Protein, g	52	55	49	59	53
**Recommended protein intake	48	42	45	42	44
Protein as % of recommended intake	110	131	109	140	120
Fat, g	28	46	32	40	37

* figures in parentheses refer to the number of households.
** based on the age and sex composition of the households studied.

When the calorie and protein consumed were expressed as a percentage of nutritional requirements, it may be noted that there was a shortfall in mean energy consumption in nearly all the kampungs, such that there was an overall 10% deficit in energy intake.

Further analysis on the distribution of calorie consumption in households as shown in Fig. 16 revealed that 66% of households were not able to satisfy their daily energy requirements.

In contrast to calorie consumption, protein consumption appeared satisfactory for when taken as a whole there was an excess of 20% of protein over requirements (Table 26). However owing to uneven distribution, not all the households enjoyed the excess of protein. Fig. 17 shows that 34% of households actually sufferred a deficit of protein.

Infant Feeding Practice

One hundred mothers who had infants at the time of interview were asked how they were feeding their infants.

Fifty two (52%) mothers said they breastfed; another thirty seven (37%) breastfed but supplemented with cow's milk, while eleven mothers (11%) bottle-fed with commercial milk preparations alone. (Table 27).

The eleven infants who were solely on the bottle had been breastfed previously and it was found that for the majority, the change from breast to bottle look place after the infants had reached one month old (Table 27). It was found that 92% of mothers who bottle-fed gave

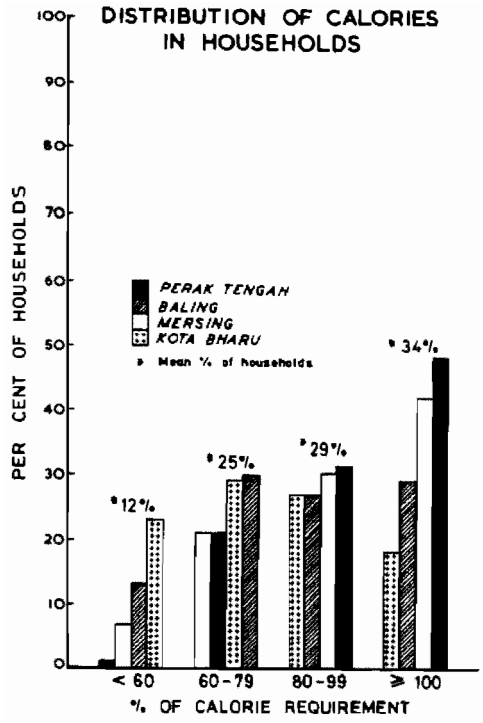

Figure 16. Distribution of Calories in Households.

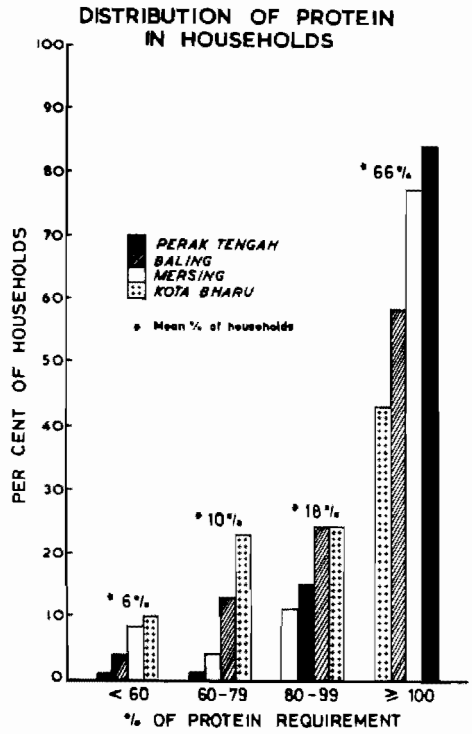

Figure 17. Distribution of Protein in Households.

Table 27. Infant Feeding Practice (% of mothers interviewed).

	Kota Baru	Mersing	Baling	Perak Tengah	Combined
n	31	19	27	23	100
Breast milk	48	63	63	35	52
Bottle feeding	13	11	11	9	11
Mixed	19	26	26	56	37

their infants powdered milk or infant formula and only 8% used sweetened condensed milk. "Insufficient breast milk" or "inconvenience" were the two most commonly cited reasons for the discontinuation of breast feeding.

Table 28 lists the time of introduction of solids or semi-solids. In all kampungs, the most common time for introduction of solids was at three months. The most common supplementary food used was "Nestum", a wheat based proprietary food, followed by biscuits and rice porridge (Table 29).

Table 28. Age Of Introduction Of Supplementary Foods (as % of respondents).

Age in months	Kota Baru n = 20	Mersing n = 15	Baling n = 24	Perak n = 14	Combined Kampungs n = 73
1	30	13	8	43	22
1 – 3	35	60	50	36	45
4 – 6	15	13	42	21	25
7 – 12	20	13	0	0	8

Table 29. Types Of Supplementary Foods (as % of respondents).

Type of food	Kota Baru n = 20	Mersing n = 15	Baling n = 24	Perak Tengah n = 14	Combined kampungs n = 73
Nestum	80	40	25	57	49
Biscuits	20	100	46	14	44
Rice porridge	40	53	21	36	38
Fruits	40	23	29	14	30
Rice-flour porridge	10	20	8	0	9
Egg	0	20	8	7	8
Sweets	0	7	0	7	5
Milo	5	7	4	0	4
Bovril	5	0	4	0	3

It is disturbing to note that "Nestum" has established itself even in the poverty kampungs as a status food. While not trying to decry the nutritive value of this convenience food, kampung mothers must be made to realise that rice cooked with small amounts of fresh or dried fish and some greens until pureed is nutritionally superior and costs less.

Toddler Feeding

315 mothers who had toddlers were interviewed with regard to toddler feeding. The majority i.e. 93% of toddlers were not given specially prepared meals and ate with the rest of the family and only 7% of toddlers were fed separately. Snacking appeared to be a common food habit amongst toddlers in the kampungs. The snacks included biscuits, "crispies", cakes, sweets, ice-cream, fruits, peanuts and sweetened iced-drinks.

Food Beliefs and Prohibitions

Food beliefs and prohibitions are known to exert a strong influence on the dietary pattern of rural Malays. Some are beginning to fade but some practices are so well ingrained that they have been practised from generation to generation. Food prohibitions are practised with the firm belief that they prevent diseases, although with little scientific justification. Some food beliefs are actually harmful in that they restrict variety of food consumption and consequently nutrients supply in an already monotonous rural diet.

The household interviews of the present series provided an opportunity to gather more recent information on food attitudes and beliefs amongst the rural Malay community.

From interviews conducted on 446 households, the food habits and prohibitions that were prevalent in the poverty kampungs as applied to the various physiological periods are as follows:-

During Confinement

The first 44 days after childbirth is known as *tempoh berpantang.* The majority of the women (95%) believed that this was a time when their bodies were most vulnerable to foods particularly those cited as "cooling" or *bisa* (poisonous).

Table 30 lists the items of food avoided during this period. It may be noted that vegetables, local fruits and some varieties of local fish were on the top of the list of prohibited foods.

The diet of the post-partum kampung women was found to be monotonous and restricted mainly to rice with smoked or salted fish. Ginger, pepper and spices were allowed as these were regarded as "heaty", giving "warmth" to the body and thus helping to "heal" the womb. In this connection, the above dietary practices were often supplemented by other practices such as *"berdiang* and *bertungku"*, ("roasting") and *"urut-mengurut"* (body-massage).

In addition, a high proportion of women considered that traditional preparations like *air akar kayu* (herbal preparations), *air rempah* (extracts of spices), *air halia* (ginger water) and a proprietary brand of tonic, *tonik Cap Gajah* were beneficial to their well-being and increased milk production.

Lactation

The primary reason for the restriction of certain category of foods during lactation according to 36% of mothers stems from the belief that breastmilk could carry harmful sub-stances from such foods which can be passed on to the infant. These foods included cockles, prawns and certain fishes that were labelled as causing "itching". For the same reason, lactating mothers would restrict the intake of "cooling" foods such as local fruits for fear of causing colic pains to their babies (Table 31).

Table 30. Food Prohibitions During Confinement (n = 446 Households).

Classification	Food items	Reasons for Avoidance	%
Cooling foods	vegetables, ice-water, coconut, bananas, papaya, cold rice, watermelon.	poor blood circulation	67
Poison foods	certain fishes eg. kembong, keli, lawang.	stomach upset, vomitting	38
Sharp ("tajam") foods (sour or acidic fruits)	mangoes, limes, pineapples, assam jawa.	heavy bleeding	7
Heaty foods	chillies, pepper, eggs, herbs, spices.	headaches, heavy bleeding	6
Foods which have high water content.	most foods (eg. vegetables, fruits, gravy, drinks) except rice and salted/smoked fish.	prevent rapid healing of womb.	4

Table 31. Food Prohibitions During Lactation (n = 446 Households).

Classification	Food items	Reasons for Avoidance	%
Itchy foods	certain sea-foods eg. *puyu, keli, sepat,* prawns, cockles.	cause rashes in baby	19
Cooling foods	bananas, papayas, cucumber, cabbage.	give stomach ache to baby.	16
Windy foods	jackfruit, tapioca, pumpkin	baby gets colic pains	13
Sharp foods	oranges, tapai, pineapples, mangoes.	cause diarrhoea in baby	13
Heaty foods	ginger, chillies, herbs, spices, pepper.	cause diarrhoea in baby.	4

There was an awareness that cow's milk, animal protein and vitamin pills were beneficial for milk production while some believed that the local herbal preparation mentioned earlier stimulated milk flow.

Pregnancy

Table 32 lists the food items that were avoided during pregnancy. Most of the foods cited were related to seafoods, "windy" and "heaty" foods. The fact that only 9% of the mothers followed such food taboos is suggestive that any harmful food restrictions practised

Table 32. Food Prohibitions During Pregnancy (n = 446 Households).

Classification	Food items	Reasons for Avoidance	%
Poison foods	certain fishes eg. *sembilang, keli.*	stomach upsets, vomiting,	35
Windy foods	bananas, jackfruit, pumpkin, tapioca, peanuts, groundnuts.	causes indigestion	29
Heaty foods	chillies, tonics, medicines, beef, chicken.	causes headaches	26
Cooling foods	cucumber, cabbage, watermelon.	body feels generally unwell.	11
Sharp foods	pineapples, *tapai* (fermented rice), mangoes, limes.	to prevent miscarriages.	9

during this period are likely to be less deleterious than those practised at the time of confinement and lactation as was also reported by Chen (1970) and Manderson (1981).

Infancy and Early Childhood

From the 29% of mothers who practised food restrictions during this period, a large proportion cited a variety of local sour fruits as capable of giving rise to diarrhoea and stomach ache. Many still believed that certain fishes, guava and groundnuts cause worms (Table 33).

Table 33. Food Prohibitions In Early Childhood (n = 446 Households).

Symptoms	Food Items	%
Stomach-ache	mangoes, limes, guavas, chillies, spices	51
Worms	certain fishes eg. *kembong, kayu, keli,* guavas, peanuts, groundnuts, coconuts.	38
Diarrhoea	chocolates, sweets, rambutans, langsat, papayas, unboiled water.	23
Cough	unboiled water, ice-cream, chocolates, sweets.	20

However certain fruits like bananas, oranges and papayas, vegetables like *kangkong, sawi* and cabbages and animal protein foods were now regarded as beneficial foods for toddlers implying that the well known prohibitions of vegetables and fruits in general to toddlers have now relaxed presumably as a result of nutrition education over the years.

It is noteworthy that the proprietary cereal foods like "Nestum" has gained such a firm foothold as a supplementary food of status in the infants and toddlers' diet. This product was mentioned more frequently (51%) as beneficial to infants than for instance, rice porridge (31%) and breastmilk (21%).

CORRELATIVE STUDIES

Relationship Between Household Size and Food Intake

Statistically significant inverse correlations were found for the following:-

Household size vs. per capita calorie intake

$r = -0.30; \quad p < 0.01,$
$n = 435$

Household size vs. per capita protein intake

$r = -0.29; \quad p < 0.01,$
$n = 426.$

Since per capita income was earlier shown to vary inversely with household size, the above relationships are suggestive of an association between income and food intake.

Per Capita Income and Food Intake

Households were divided into two groups on the basis of per capita monthly "cut-off" income of $50 (poverty line) and their mean per capita calorie and protein intakes were compared as shown in Table 34.

It can be seen from the above Table that the per capita calorie and protein consumption of poverty households was significantly less compared to households above the poverty line ($p < 0.01$), thus confirming the association between income and food intake.

Table 34. Relationship Between Income And Food Intake (Means and S.D.)

	Per Capita Income (monthly)		Level of significance of difference
	⩽ $50/-	> $50/-	
Per Capita Calorie intake	1,840 ± 735	2,104 ± 553	$p < 0.01$
Per Capita Protein intake, g	55 ± 17.8	65 ± 17.2	$p < 0.01$
n	335	100	

Income and Nutritional Status

There were however no significant differences in the growth achievements and haemoglobin values of children between poverty households and those above the poverty line (Tables 35 and 36).

Relationship Between Maternal Stature and Children's Height

In view of the high percentage of "stunting" found for pre-school and primary school children, it seemed worthwhile to correlate maternal height with the % ht/age achievement of children. The correlation coefficient found for the above relationship was however $r = 0.20$ ($p < 0.01$; $n = 303$). The low level of correlation compared to the significant amounts of "stunting" is suggestive that the lack of height in kampung children may be better explained by environmental factors such as a poor diet rather than by maternal stature.

Table 35. Relationship Between Income And Undernutrition (Means and S.D. – Pre-School Children).

	Per Capita Income (monthly) ⩽ $50/-	> $50/-	Level of significance of difference
Wt/age as % of reference	80.5 ± 12.1	80.8 ± 11.0	n.s.
Ht/age as % of reference	92.2 ± 6.3	91.2 ± 5.6	n.s.
n	273	63	–

Table 36. Relationship Between Income And Anaemia (Means and S.D.)

	Per Capita Income (monthly) ⩽ $50/-	> $50/-	Level of significance of difference
Haemoglobin g/dl	11.3 ± 1.5	11.6 ± 1.2	n.s.
n	144	40	n.s.

Relationship Between Growth Retardation and Biochemical Indices

When preschool and primary school children were divided into two groups, viz. malnourished and normal on the basis of either a wt/age cut-off or ht/age cut-off of -2 S.D. from the reference values, it may be seen from Tables 37 and 38 that malnourished children classified either by wt/age or ht/age achievements had significantly lower levels of haemoglobin, plasma albumin and hydroxyproline index than those of better nourished children from the same community ($p < 0.001$).

Table 37. Malnutrition (Wt/Age Achievement) & Biochemistry. (Mean & S.D. of Pre-School & Primary School Children).

	Malnourished Wt/age below -2S.D. of reference	Normal Wt/age above -2S.D. of reference	Level of significance of Difference.
Haemoglobin g/dl	11.7 ± 1.6	12.1 ± 1.7	$p < 0.001$
n	487	935	
Plasma albumin g/dl	3.9 ± 0.43	4.0 ± 0.39	$p < 0.001$
n	332	656	
Hydroxyproline index	1.7 ± 0.7	2.1 ± 0.9	$p < 0.001$
n	118	198	

Table 38. Malnutrition (Ht/Age Achievement) & Biochemistry (Means & S.D. – Pre-School & Primary School Children).

	Malnourished Wt/age below -2S.D. of reference	Normal Wt/age above -2S.D. of reference	Level of significance of Difference.
Haemoglobin g/dl	11.8 ± 1.5	12.1 ± 1.5	$p < 0.001$
n	608	812	
Plasma Albumin g/dl	3.9 ± 0.4	4.0 ± 0.3	$p < 0.001$
n	419	569	
Hydroxyproline index	1.7 ± 0.7	2.1 ± 0.8	$p < 0.001$
n	142	173	

Worm Infestations and Growth Achievements

Table 39 shows the anthropometric achievements of children (pre-school and primary school) who had worm infestations and those found to be worm free.

It is worthy of note that worm-free children invariably had more satisfactory growth achievements than those found infested. However a statistically significant difference was only found for wt/age ($p < 0.001$) and ht/age ($p < 0.01$) achievements.

Table 39. Worm-infestation And Growth Retardation (Pre-School And Primary School Children All Kampungs).

Nutritional Index	Worm-Infested	Worm-free	Level of significance of difference
Wt/age as % of reference	78.1 ± 10.2	82.3 ± 11.3	$p < 0.001$
n	527	117	
Ht/age as % of reference	91.8 ± 4.3	93.1 ± 4.3	$p < 0.01$
n	522	115	
Wt/Ht as % of reference	93.9 ± 6.9	94.5 ± 9.0	n.s.
n	520	115	
Mid-arm circumference as % of reference	89.4 ± 5.9	90.7 ± 6.2	n.s.
n	172	74	

Hookworm Infestation and Haemoglobin Levels

No difference was found between the haemoglobin values of subjects who had hookworm or those found worm-free.

The mean haemoglobin of 252 hookworm-infected persons was 12.6 ± 2.0 g/dl and 268 worm-free individuals was 12.7 ± 2.1 g/dl.

Correlation of Haemoglobin Levels with Serum Iron and % Transferrin Saturation.

The following correlations were found:

Haemoglobin vs. Serum iron	r =	0.36;	$p < 0.001$
	n =	640	
Haemoglobin vs. % transferrin saturation	r =	0.33;	$p < 0.001$
	n =	640	

The above relationships and the lack of association between hookworm infestations and haemoglobin levels are strongly indicative that the anaemia observed in poverty communities can be largely attributed to dietary iron deficiency.

Correlation Between Serum Lipids and Obesity

The body mass index was found to be correlated with both serum cholesterol and serum triglycerides (Table 40).

Such a relationship implies that obesity is associated with raised serum cholesterol and triglycerides while the opposite probably holds true for leanness.

Table 40. Correlation Coefficients Between Serum Lipids And Body Mass Index.

	Age	Body Mass Index	
		Uncorrected for age	Age held constant
Males n = 246:			
Age	–	0.21^b	–
Cholesterol	0.29^a	0.27^a	0.22^a
Triglycerides	0.15^c	0.34^a	0.32^a
Females n = 514:			
Age	–	0.10^c	–
Cholesterol	0.12^b	0.24^a	0.23^a
Triglycerides	0.06	0.20^a	0.20^a

a : $p < 0.001$; b : $p < 0.01$; c : $p < 0.05$

SUMMARY AND CONCLUSIONS

There is now increasing acceptance of the concept that the objectives of national development should not merely raise income levels but also improve nutrition. In other words, economic prosperity should not be used as the sole yardstick for determining the level of development but the status of community or population nutrition should also be taken into account.

The studies described have been conducted in view of the lack of adequate knowledge on the status of nutrition in our rural disadvantaged communities. Such a knowledge is not only basic to applied nutrition research but is also useful in the health and developmental planning for remedial actions, in line with the objectives of poverty eradication.

Owing to the multiple and complex factors that cause malnutrition, the studies presented have sought to assess and understand the nutritional problems and their contributory causes, not by means of a single test, but by application of a battery of techniques that included clinical examination, anthropometric measurements, biochemical evaluation, parasites study and assessment of food intake. Such a multi-pronged approach has enabled us to obtain the sort of information that is not possible by other means.

The incidence of poverty was high; of the 548 households studied, 78% were found living below the poverty line. There was a lack of proper sanitation and clean water in the majority of households contributing towards a contaminated environment that gave rise to a high incidence of intestinal parasitism, skin infections and head lice.

Chronic undernutrition i.e. "stunting" was found in major proportions of pre-school children (43%) and primary school children (49% for boys and 25% in girls). Genetics probably played an insignificant role in such nutritional "dwarfing" owing to the poor correlation found between maternal height and the height of offsprings.

It has been argued that the high prevalence of "stunting" in rural kampung children may be an artifact arising from the improper use of foreign growth references for the classification of malnutrition locally. However this can be discounted by the evidence that the growth of urban Malay and non-Malay children in Kuala Lumpur and Petaling Jaya followed closely the pattern of growth of the reference children. This is sufficient to indicate that the children of poverty kampungs have not had the chance to reach their full growth potential, but when given adequate food and an improved environment, they will most certainly grow the way their urban peers do.

From the health and economic viewpoint, the question that is often raised is whether the moderate type of malnutrition as described in the children of poverty kampungs is important. Suffice it to say that there is now increasing evidence to show that even moderate malnutrition may affect the finer aspects of cerebral function such as cognitive skills, memory and intelligence (Chavez and Martinez, 1979, Alan Berg, 1981, McKay, 1983). In addition the moderately malnourished child reacts slower, is more timid and passive to environmental stimuli (Chavez and Martinez, 1979).

In consistence with chronic undernutrition in children, was the preponderance of underweight people compared to overweight persons amongst the adult population. In the more affluent urban society, this observation may be regarded as desirable from the viewpoint of a lessening of risks to the early development of cardiovascular disorders. However, in the rural setting, where livelihood is heavily dependent on physical work, the presence of moderately large proportion of lean men and women suggests a lack of calorie reserve and may in fact seriously impede economic productivity or act as a source of poor health.

Anaemia was found in practically all sections of the community with moderately high prevalence rates in pre-school and primary school children, adolescent boys and girls, women of childbearing age, senior male and female adults over 46 years old. The anaemia was not related to hookworm infections but was associated with low levels of serum iron and transferrin saturation indicating that the anaemia was largely due to nutritional iron deficiency.

Anaemia besides posing a risk to the mother and foetus during pregnancy also saps up the strength and energy of the community affecting the economic productivity of its labour force (Basta *et al.*, 1977).

Household food consumption and distribution studies revealed a shortfall of calorie con-

sumption in 66% of households and a deficit of dietary protein in 34% of households. This was consistent with the problem of chronic undernutrition in children and the presence of moderate proportions of "underweight" adults. The shortage of dietary protein also found testimony in the protein deficiency detected by biochemical means.

That the nutritional problems identified were basically related to income, family size, educational attainment, culture and the environment are shown by the fact that:

- income was related to per capita calorie and protein consumption.
- large families had a relatively lower per capita income than smaller families.
- household income was related directly to the educational attainment of the heads of households or their spouses.
- parasitism in children was associated with growth retardation.
- the practice of undesirable food prohibitions particularly at the time of confinement and lactation might restrict the intake of nutrients resulting adversely on the quality and quantity of milk production.

The graphic presentation as shown in Fig. 18 serves to highlight the relative importance of the socio-economic and nutritional problems identified in the poverty kampungs drawn from the four districts.

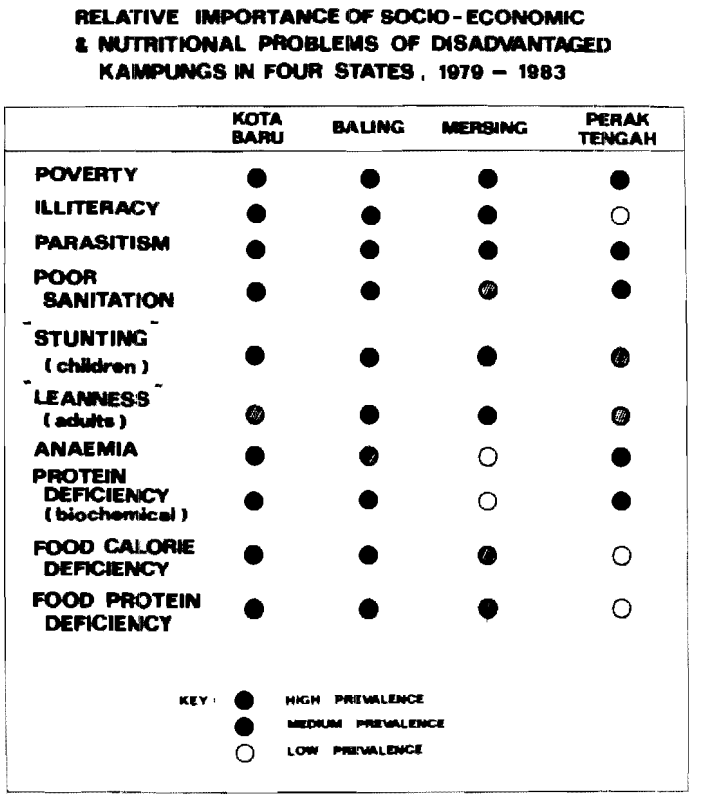

Figure 18. Relative Importance of Socio-Economic and Nutritional Problems in the Poverty Kampungs of Four Study Locations.

The impression gained is that these problems appeared to be more pronounced in the fishing community of Kota Baru and the inland kampungs of Baling, compared to the rice-growing kampungs in Mersing or the riverine kampungs of Perak Tengah. It would of course be superflous to conclude as a result that the types of economic activity and ecological setting were responsible for the relative importance of these nutritional and social problems in what were essentially economically identical kampungs.

The high prevalence of economic poverty was probably relative and unrelated to the abject type of absolute poverty defined as "a condition of life so limited by malnutrition, disease, illiteracy, low life expectancy and high infant mortality as to be beneath any rational definition of human decency" (McNamara *in* Berg, 1981).

The majority of subjects dwelled in their own houses, owned the land on which their houses were built and had a moderately wide range of household possessions and luxury goods. However, these should not be used as excuses for complacency, as the finding of widespread parasitism, poor sanitation, chronic undernutrition and anaemia are surely hallmarks of under-development and social deprivation at the local level.

Clearly if we are to increase the levels of nutrition, productivity and the quality of life of kampung communities, we must increase their family food supply through increased food production and land utilisation. At the same time, nutrition education of school children and mothers and vigilance of nutritionally related health problems should be intensified so as to ensure the proper utilisation of nutrients.

This calls for the support of the Government and the co-ordinated efforts of various Government Ministries such as Health, Agriculture, Education and Rural Development and participation of the community.

RECOMMENDATIONS

The solution to malnutrition problems is complex but there is little doubt that in the long run, national economic growth, increased per capita income, access to primary health care and increased agricultural output will improve nutritional status.

Since calorie, protein and dietary iron deficiencies were the main nutritional problems identified, it stands to reason that any measures aimed at increasing the family food supply and improving their nutrition must take these factors into consideration.

The resolution of the policy dilemma of maintaining low food prices for the poor and guaranteeing a high economic return for increased food production e.g. rice, is clearly of great importance in the long run, but during the interim period much can be done to improve family nutrition which calls for the following:-

Food Production on Underutilised Land

Idle and unutilised land around the kampung house should be tilled for the growing of energy-yielding crops such as tapioca and sweet potatoes, as well as other nutritious food crops such as green-leafy vegetables and legumes, like longbeans and groundnuts. Measures should be taken to prevent the destruction of such crops by pests and wild animals. Greater emphasis should be placed on the egg-laying role of poultry and the consumption of home-laid eggs should be promoted and encouraged.

Nutrition Education

Nutrition education should be regarded as a vital force for nutritional improvement. It should be directed at two main target groups, namely the homemakers and school children. In rural communities, the role of women as a provider of health and nutritional care has been under-

emphasized and undervalued. The saying that "teach a mother to be healthy and she will teach the rest of mankind" should be put into greater practice.

The importance of nutrition education in schools must not be overlooked. The subject should be made compulsory in schools and teachers-training colleges; the erroneous image that such a subject is only meant for girls in domestic science classes should be dispelled.

Traditionally, the rural main health centre and its sub-centres have been the bases for nutrition education. The mobile clinic should be considered as another centre for field nutritional and health educational activities. The wide availability of radios and television sets in the kampungs should be taken advantage of as another effective channel for nutrition education, while reaching the women through face-to-face household visits by the local community development workers is another practical and sure way of spreading nutritional knowledge.

The contents and the types of audio-visual aids for nutritional education should be carefully considered and drawn up by experienced nutritionists and should include instructions on the choice and preparation of locally available foods, nutritious foods for infants, young children, the pregnant, and the lactating, personal hygiene and sanitation.

Promotion of Income Generating Activities

Avenues for increasing income earnings at the kampung level should be further encouraged and promoted. The activities that were observed included, prawn catching and fishing in the nearby stream or river, gathering of jungle produce like rattan and bamboo, handicrafts like weaving of mengkuang mats, embroidery and village level food processing.

The introduction of improved technology with reference to such activities certainly should be examined in relation to optimum economic returns. Aquaculture should be considered in preference to the trapping or netting of prawns and fish in the rivers as the latter methods depended considerably on the vagaries of the weather. Where soil conditions are favourable for crops like coffee and cocoa, such as found for Baling and Perak Tengah respectively, their cultivation on a wider scale other than for home consumption, should be encouraged.

Supplementary Feeding

Owing to the problem of chronic undernutrition, the present supplementary feeding scheme for primary school children should be continued. However, there is a need for greater vigilance to ensure that the quality, quantity and the hygienic aspects of the food provided followed guidelines laid down by the Ministry of Education.

It must be remembered that supplementary feeding is expensive and never intended to be prolonged, since this can encourage a sense of dependency. Already, the supplementary meals were regarded as substitute meals by some kampung mothers. The practice defeats the very purpose of supplementary feeding and if widespread is totally wasteful.

Teachers and ketua kampungs should impress upon mothers the need to continue to provide breakfast for their children even though knowing full well the fact that their children will receive another meal later on in school. The supplementary meal can only be effective as intended for the betterment of the child's growth and health when given supplementary to the home meal. Either alone will not achieve the desired nutritional effects particularly in communities where a dietary energy deficit exists.

While encouraging breastfeeding, the distribution of full cream powdered milk to needy mothers and toddlers at Rural Health Centres should continue, since there is an obvious need for additional sources of dietary energy and protein in these nutritionally vulnerable groups.

Control of Infections

To the high prevalence of helminthic infestation in the kampong communities, may be added the threat of malaria, filariasis and diarrhoeal diseases, although these were not studied.

All infections affect the utilisation of nutrients. The control of malaria and worm infestations in particular must be given greater attention to ensure better utilisation of nutrients in the face of inadequate food resources.

School Health Services

Head lice, skin infections and tooth decay were common health problems found to afflict a large proportion of the community, particularly primary school children. These suggest that the school health and dental services were not able to reach pupils of these rural kampungs. There is thus an obvious need to step-up such activities and visits in order to control and reduce these health problems in rural schools. At the same time, health education conducted in schools and relevant to the problems seen, will go a long way towards the improvement of child health in these kampungs.

APPENDIX

HOUSEHOLD SURVEY FORM
NUTRITION OF THE HOUSEHOLD INCLUDING SOCIO-ECONOMIC ASPECTS

Interviewer: .....
Head of household: .....
Respondent: .....
State of origin: .....
Duration of stay in this village: ..... years.

State: .....
District: .....
Sub-district: .....
Village: .....
House no.: .....

Refereene number: ☐☐☐☐☐

Reference number: ☐☐☐☐

SECTION I

A: **PARTICULARS OF HOUSEHOLD MEMBERS**

no. of occupants: ☐☐

Name	Relationship with head of household	Age	Sex	Marital status	Educational status	Occupation		Income (per month)
						main	subsidiary	

Code for age:
1. < 1 year
2. 1 – 4
3. 5 – 6
4. 7 – 12
5. 13 – 17
6. 18 – 44
7. > 45

Code for sex:
1. male
2. female

Code for marital status:
1. single
2. married
3. widow
4. widower (add P if pregnant and BF if breast-feeding)

Code for educational status:
1. kindergarten
2. primary school
3. secondary school
4. vocational school
5. college/university
6. religious school
7. adult education classes
8. nil

Code for type of occupation:
1. not working
2. government employee
3. employee in private firms, incl. mines, factories, house construction sites, plantations, etc.
4. petty trader/businessman
5. fisherman
6. rubber tapper
7. padi planter
8. vegetable (and other agricultural produce) gardener

B (a): **Household monthly income and expenditure**

1. income : $ _____ ☐
2. expenditure : $ _____ ☐
3. expenditure on food : $ _____ ☐
4. home produce which are kept for own consumption:

type of food	quantity per month
_____	_____
_____	_____

Code:
1. < $50 per month
2. $ 50 – $ 99
3. $100 – $199
4. $200 – $299
5. $300 – $399
6. $400 – $499
7. > $500

B (b) **Housing and environmental conditions**

1. type of house ☐

1. brick and tile
2. wood and tile
3. wood and zinc
4. wood and attap
5. bamboo and attap
6. others (specify)

.....

2. water supply

(a) type ☐

1. pipe
2. satisfactory well
3. unsatisfactory well
4. river
5. rain water

.....

(b) shared ☐

1. yes
2. no
3. not applicable (if answer to part is a 4 or 5)

.....

3. latrine

(a) type ☐

1. flush latrine
2. pour latrine
3. hole-in-ground
4. river
5. surrounding the house

.....

(b) shared ☐

1. yes
2. no
3. not applicable (if answer to part (a) is 4 or 5)

.....

4. Garbage disposal

1. buried
2. burnt
3. hole-in-ground
4. river
5. surrounding the house

5. Type of cooking fuel

1. wood
2. charcoal
3. kerosene
4. gas
5. electricity

B (c) **Possessions**

land		motorcycle	
house		bicycle	
fridge		tractor	
radio		motorboat	
TV		canoe	
motor-car		others (specify)	

1. yes
2. no

B (d) **Domesticated animals**

	number		
cow			
buffalo			
goat			
chicken			
duck			
goose			

others (specify) _____

SECTION II

A: **Family food consumption pattern**

type of food	frequency of consumption	frequency of purchase	quantity of each purchase	unit
1. Energy foods				
rice				
wheat flour				
biscuit				
bread				
tapioca				
sweet potato				
potato				
sugar				
cooking oil				
mee/mee-hoon				
2. Protein foods				
fresh fish				
dried fish (salted)				
anchovies				

Codes:

Frequency of consumption:

1. daily
2. once a week
3. 2 – 4 times a week
4. 1 – 2 times a month
5. rarely
6. not eaten

Frequency of purchase:

1. daily
2. once a week
3. once in two weeks
4. once in three weeks
5. once a month
6. rarely/not eaten

Unit:

1. kati
2. tahil
3. pound
4. ounces
5. kilogram
6. gram

		frequency of consumption	frequency of purchase	quantity of each purchase			unit
sardine (canned)							
fresh prawn							
fresh cuttle-fish							
cockles							
eggs							
meats -	cow/buffalo						
	chicken						
	goat						
	duck						
beans (green/red)							
groundnuts							
milk -	fresh						
	powdered						
	sweetened condensed						

Codes:

Frequency of consumption:

1. daily
2. once a week
3. 2 – 4 times a week
4. 1 – 2 times a month
5. rarely
6. not eaten

Frequency of purchase:

1. daily
2. once a week
3. once in two weeks
4. once in three weeks
5. once a month
6. rarely/not eaten

Unit:

1. kati
2. tahil
3. pound
4. ounces
5. kilogram
6. gram

	frequency of consumption	frequency of purchase	quantity of each purchase	unit
3. Vegetables				
(a) How often does your family eat vegetables?				
(b) Name three types of vegetables that are frequently eaten:				
1. _____				
2. _____				
3; _____				
4. Fruits				
(a) How often does your family eat fruits?				
(b) Name three types of fruits that are frequently eaten:				
1. _____				
2. _____				
3. _____				

B. Infant feeding practices

1. section relevant	
2. what type of milk is being given to your baby?	

Codes:

Frequency of consumption:

1. daily
2. once a week
3. 2 – 4 times a week
4. 1 – 2 times a month
5. rarely
6. not eaten

Frequency of purchase:

1. daily
2. once a week
3. once in two weeks
4. once in three weeks
5. once a month
6. rarely/not eaten

Unit:

1. kati
2. tahil
3. pound
4. ounces
5. kilogram
6. gram

1. yes 2. no

1. breast milk
2. "artificial" milk
3. mixture of breast and "artificial" milk

3. If breast milk not given, at what age was breast feeding stopped? [ ]

Codes:
O. not applicable (if answer to Q. 2 is code 1)
1. 1 month
2. 1 – 3 months
3. 4 – 6 months
4. 7 – 9 months
5. 10 – 12 months

4. If bottle-fed, name the type of "artificial" milk used: [ ]

O. not applicable (if answer to Q. 2 is code 1)
1. sweetened condensed milk
2. powdered milk
3. evaporated milk

5. (a) Is your baby given supplementary foods besides milk? [ ]
   (b) If "yes", when was supplementary feeding started? [ ]

1. yes
2. no

O. not applicable (if answer to part (a) is 2)
1. 1 month
2. 1 – 3 months
3. 4 – 6 months
4. 7 – 9 months
5. 10 – 12 months

6. What are the types of supplementary foods you give your baby?

_____

_____

C. **Pre-school child (1 – 6 years) feeding practices**

1. Section relevant [ ]

1. yes
2. no

2. Is your child usually breast-fed for more than one year? [ ]

1. yes
2. no

3. (a) Is the daily food given to your child separately cooked or the same as family food? [ ]

1. separately cooked
2. same as family food

   (b) If separately cooked, up to what age is this food given? [ ]

O. not applicable (if answer to part (a) is 2)
1. 1 – 2 years
2. 3 – 4 years
3. 5 – 6 years

4. Aside from this daily food, is milk given to your child? [ ]

1. yes
2. no

5. Name the snack foods that are usually eaten by your child:

_____

D. Food Beliefs

1. Food avoidances

group	type of food	reasons
Pre-school children (1 – 6 years)		
Pregnant women		
Mothers after delivery		
Nursing mothers		

2. Foods believed to be beneficial

Infants (0 – 12 months)		
Pre-school children (1 – 6 years)		
Pregnant women		
Mothers after delivery		
Nursing mothers		

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Encik Mohammad b. Harun, Deputy State Development Officer, Johore.

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