THE NUTRITION SITUATION OF WOMEN AND CHILDREN IN MALAYSIA

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SITUATION ANALYSIS PAPER
PREPARED FOR UNICEF MALAYSIA

June 1992

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1 Introduction

Concern for the nutritional status of an individual or community stems from the fact that nutritional deficiencies can result in such deleterious effects as depressed physical and mental development, reduced resistance to infections, greater risk to premature delivery, increased maternal and foetal mortality and morbidity and reduced work performance. These consequences of malnutrition waste human resources and add to the social costs of the nation. Therefore, it is imperative for nutritionists to work closely with policy makers in identifying nutritional problems that may exist so that timely interventions can be implemented.

For many years, various Government departments and research institutions in the country have been studying and characterising the nutritional problems of Malaysians. Health indicators such as life expectancy at birth, birth weight data, and infant, toddler and maternal mortality rates have been constantly monitored as indirect indicators of the nutritional status of communities. At the same time, various communities in different parts of the country have been studied by direct assessment. In all these investigations, particular attention has been given to children and women, the recognised vulnerable groups of communities. These surveys have provided valuable informatiion on the nutritional status of various communities in different parts of the country, that may be utilised in intervention programmes.

This report provides an overview of the nutrition situation in Malaysia, with particular emphasis on undernutrition in women and children. The major nutritional deficiencies are highlighted to illustrate the extent of the problems.

Situation analysis paper prepared for the United Nations Children's Fund (UNICEF), June 1992

2 Mortality rates as indicators of health and nutritional status

Infant, toddler and maternal mortality rates in Peninsular Malaysia (Figure 1 and Table 1) have often been used as proxy indicators of the improving health and nutritional status of these vulnerable groups of the population. There has been a dramatic decline in these rates since the country gained Independence in 1957. Infant mortality rates declined from 76 in 1957 to around 13 in 1989. Over the same period, toddler (1-4 years) mortality rates dropped from 10.7 to 1.0, while maternal mortality recorded a decline from 3.20 to 0.20.

However, as can be expected, there were considerable variations in the health status of communities in different parts of the country. Figures 2, 3 and 4 show that there were marked decline in these mortality rates for all the states in the country over the years. These figures also illustrate the differences in the mortality rates prevailing in the different states. The highest mortality rates were found in the states of Terengganu, Kelantan, Kedah, Perak and Pahang. Those states with better health status, as reflected by low mortality rates, were the Federal Territory, Selangor and Penang. These differences between the various states appeared to have remained essentially the same since a decade ago, as seen from data in the figures.

Within each state, there were again wide variations in mortality rates in the different districts. For example, in Kelantan and Kedah, there were a few districts with infant mortality rates about twice that of the national average. At the same time, several districts in these states recorded death rates of infants at about the level of the national average.

A similar picture was seen with regards to birth-weight data, although statistics in this area was less comprehensive. As shown in Figure 5, prevalence of infants born with < 2.5 kg had declined in most of the states, and there was considerable variation in this prevalence rate in different parts of the country.

Selected statistics for recent years from Sabah and Sarawak (Table 2) also show a general decline in mortality rates, more clearly seen for infants and toddlers. It is to be noted, however, that statistics from Sabah and Sarawak are less comprehensive than those for Peninsular Malaysia, and that there is probably under-reporting of deaths in these two states.

It is clear that although these indices do give an indication of the overall nutritional status of the country or state, they do not show the problems existing at the micro level. Thus, while the overall nutrition situation in the country has improved over the years, pockets of malnutrition exist in various parts of the country.

3 Specific nutrient deficiencies

3.1 Protein-energy malnutrition

Some recent data (Chen, 1983; Chong *et al.*, 1984; Khor, 1985) on growth performance of pre-school children are shown in Figure 6. These weight-for-age data were plotted alongside some data collected in the 1970's (McKay *et al.*, 1971; Chong *et al.*, 1972), and the NCHS median (WHO, 1983). A general trend in growth performance of these children may be seen and some of the highlights include:

- upper income children had better weight-for-age achievement than those from rural areas;

- an apparent gain in weight-for-age among the preschoolers of poor rural communities over a decade period;
- there seemed to be less gain in weight-for-age for the upper income group (for which relatively less data are available) after more than a decade;
- the group of aborigine children studied in the mid-1980's appeared to be worse off than the rural poor Malay children.

The height-for-age data of these groups of children were similarly plotted and shown in Figure 7. It can be seen that :

- the mean height-for-age of the upper income children, for both the 1971 and 1983 data, was close to the NCHS median, and was clearly higher than that of the rural children;
- height-for-age of rural pre-school children has clearly improved over the 10-year period, and is similar among the aborigines and the village population;

In terms of weight-for-height (Figure 8).

- the rural preschoolers showed achievements of 92-98% of the NCHS reference, compared to 83-89% a decade ago;
- the upper income children had weight-for-height achievements ranging between 87 and 95% of the NCHS reference, without notable change over the years.

During 1982-86, a Nutrition Surveillance Programme was conducted by the Ministry of Health involving approximately 1.2 million children (Ministry of Health, 1989). Data from 7 states showed that the prevalence of severely undernourished children (wt/age below 60% of reference) was less than 1% for infants and children between 1-4 years in all the states (Table 3). Prevalence rate was slightly higher among children aged 5-6 years, ranging from 0.2 to 2.1%. The proportion of children found to be moderately undernourished (wt/age between 60-80%) showed the same trend of increasing prevalence for the older children. Mean prevalence rates for the 7 states ranged from 16.1% among infants to 38.1% in children 5-6 years of age. Besides differences between age groups, the prevalence of undernutrition can be seen to vary considerably for children in the different states studied.

Growth performance of primary school children has also been given considerable attention by investigators. Some recent data from rural children in Peninsular Malaysia (Chong *et al.*, 1984) are given in Figure 9. The prevalence of acute malnutrition (wasting) and severe chronic undernutrition (wasting and stunting) were minimal (1-2%), but chronic undernutrition (stunting) and underweight were more frequently seen (35-49% and 23-38% respectively). The median weight and height curves of these children were clearly inferior to those of their urban counterparts in Kuala Lumpur and Petaling Jaya (Figure 10). Such differences in growth achievement of rural and urban school children had also been reported earlier (Rampal, 1977).

3.2 Nutritional anaemia

3.2.1. Anaemia in Malaysian children

Anaemia amongst Malaysian children has been documented from around the 1950's. The study by Bourne (1949) of some 1,200 children from welfare centres, orphanages and a refugee camp reported a high prevalence of anaemia (Hb <70% of Talquist scale), ranging from 42 to 90%. The prevalence of anaemia among some 10,000 school children studied was lower, ranging from 40% to 63%. Although the socio-economic status of some of these children was better than that of the first group of children, their haemoglobin status was found to be poor.

Three studies in the 1960's highlighted the anaemia problem amongst children. The ICNND (1964) study of some 260 children of civilian and military dependents reported that 36% of children less than 5 years of age and 13% in the age group 5-14 years were anaemic (Hb <12 g/dl). The study of Chappel and Janowitz (1965) of 142 rural Malay children in a land development scheme reported that the percentage of anaemic children (Hb <10 g/dl) was higher amongst the children less than 6 years of age (ranging from 30 to 70%) and highest in the 1-2 years olds. In both studies, dietary iron deficiency was thought to be an important causative factor. In a hospital-based study by Lie-Injo and Virik (1966), anaemia was investigated in 2,025 children admitted to the children's ward of the General Hospital, Kuala Lumpur. The lowest haemoglobin levels occurred in children aged 6-36 months and 13% of the children had very low haemoglobin levels of 8 g/dl or less.

Anaemia amongst children continued to be given emphasis in the 1970's. Several studies by Chong and co-workers (Chong, 1970, 1974; Chong *et al.*, 1972) revealed that rural children in Ulu Terengganu had the highest prevalence of anaemia (based on haematocrit values of <32%), compared with children from the ANP pilot area of Telok Datok and a group of army children. A total of 425 pre-school children (aged between 6 months to 7 years) in Kampung Selisek, Ulu Selangor district were examined by Amir Abbas (1973). The percentage of anaemic pre-school children in all the villages studied ranged from about 50% to 70%, with a mean prevalence rate of 62.1% (Hb <11.5 g/dl).

The studies of Kandiah and co-workers (Kandiah, 1977; Kandiah and Lim, 1976, 1977) of some 1,000 children in two Malay rural communities and an Indian estate population provided further data on the anaemia situation (Table 4). Prevalence of anaemia (Hb <11 g/dl for pre-school children and <12 g/dl for school children) was higher amongst pre-school (range 23 to 51%) than school children (range 10 to 37%), and the problem was worst amongst Indian children in the rubber estate. Most of the anaemic cases were thought to be due to iron deficiency.

Several studies of A.J.U. Anderson on over 3,000 children of various communities in Sarawak are of significance (Anderson, 1976a, 1976b, 1977a, 1977b, 1978a, 1978b). The anaemia problem amongst the various ethnic groups was generally of the same order of magnitude (Table 5). The highest prevalence of anaemia (Hb <11.0 g/dl for children 6 months to 5 years and Hb <12 g/dl for children 6 to 8 years), ranging from 30 to 60%, was observed in the first two years of life in all the communities studied. This was thought to be due to indequate supplementary feeding and poor weaning practices, with lack of iron, protein and other nutrients. Intestinal helminths were said to be a contributory causal factor in the anaemias encountered.

The prevalence of anaemia (based on Hb <11 g/dl for children 6 months to 6 years and Hb <12 g/dl for children 6 to 14 years) was reported by Chen *et al.* (1981) for over 3,000 children below 13 years of age and belonging to various ethnic groups in the Interior, West Coast and Kudat Divisions of Sabah (Table 6). Prevalence rates ranged from 15 to 30%, with the children below 2 years the worst affected. There was no clear trend of sex difference in the prevalence rates of anaemia.

Several studies on various Malay rural poverty communities in different states of Peninsular Malaysia, carried out from 1979 to 1983, were reported by Chong *et al.* (1984). The series of studies covered close to 2,000 children below 12 years. The anaemias encountered were said to be primarily due to iron deficiency. Prevalence rates varied widely in the different areas and amongst children of different age groups (Table 7) (criteria for anaemia given below table). Children in Baling, Kedah appeared to be worst affected, with prevalence rates ranging from 37 to 83%.

In a study of children 0-6 years in three malaria endemic villages of Bengkoka Peninsula, Sabah (Kandiah *et al.*, 1984), 18-67% of the subjects were said to be anaemic (Hb < 11 g/dl), with the highest prevalence rates in children under two years of age (Table 8). The anaemia encountered was related to iron deficiency, whilst malaria, estimated to affect 24% of the children, was also believed to play a role.

These studies reviewed have shown that the anaemia problem among children has been highlighted for the past three decades, and there appears to be only a slight decrease in the magnitude of the problem. There was a mild to moderate prevalence of anaemia amongst children in the communities studied, ranging from 10 to 50%, with most areas having 20-30% prevalence rate. The situation in Peninsular Malaysia is no better than in Sarawak and Sabah. Anaemia was said by various investigators to be mostly of the iron deficiency type. Some research groups noted a higher prevalence amongst children below three years of age.

3.2.2. Anaemia in pregnancy

Early investigators in the country had recognised the importance of nutrient deficiencies in the causation of anaemia and that pregnancy aggravated the condition (Corke and Bush, 1930; Pallister, 1934; Reed, 1940). Tasker *et al.* (1956) pointed out that the incidence of anaemia amongst pregnant women was high and that they appeared to be the most susceptible group of the population.

Early detailed studies of the anaemia problem amongst ante-natal subjects in the General Hospital, Kuala Lumpur were reported by Tasker *et al.* (1956) and Tasker (1958). Tasker had emphasised that iron deficiency was almost invariably present in patients with nutritional anaemia. Besides this basic deficiency, additional types of anaemia were detected, of which that associated with a megaloblastic marrow were said to be the most important and common.

Lourdenadin (1964) summarised the prevalence of severe anaemia as seen in the Maternity Hospital, Kuala Lumpur in a retrospective study for the period 1957-1961. From close to 47,000 deliveries, the incidence of severe anaemia (Hb <6.5 g/dl) was reported to be 2.2%. It was observed that microcytic anaemia, said to be caused by "defective nutrition and iron deficiency", formed about 76% of the total number of anaemic patients. The remaining was mostly macrocytic anaemia, with folic acid and vitamin B_{12} deficiencies implicated. In the same report (Lourdenadin, 1964), the results of a prospective study of the haemoglobin levels of a thousand consecutive pregnant

mothers attending ante-natal clinic of the Hospital were also reported. A total of 76.9% of these women studied were found to be anaemic.

Similar figures were reported by Llewellyn-Jones (1965) for the same hospital, but for a longer time period, between 1953 and 1962. A total of 73,048 women were seen at the Maternity Hospital during the period; 3.1% were found to have severe anaemia (Hb <6.5 g/dl) and the majority of this was of the iron deficiency type.

Fewer studies into the nutritional anaemia problem during pregnancy were reported in the 1970's. Ong (1973) reported a mild degree of iron deficiency anaemia among 278 pregnant Orang Asli women at the Orang Asli Hospital, Gombak, Kuala Lumpur. Haematological status of the "deep" jungle women was found to be better than that of the "outside" jungle populations. It was thought that this difference could be due to migration of the latter group to settle down near villages or towns, which caused changes in their life style, having to earn money to buy food. Due to their low purchasing power, the little amount of money spent on food could result in poor nutrition and anaemia, especially in the pregnant women.

Several studies in the 1980's on anaemia amongst pregnant women at the Maternity Hospital, Kuala Lumpur were reported. The first is a study of 96 women who attended the antenatal clinic at the Hospital (George *et al.*, 1980). The results were analysed according to trimesters (Table 9). With the progression of pregnancy, there was a fall in serum haematological parameters. The prevalence of low haematological values increase markedly from the second trimester onwards.

A smaller series of 19 women in the same Hospital were studied by Jaffar Ali *et al.* (1981). Mean serum iron and transferrin saturation values were extracted and tabulated in Table 10. No prevalence rates of low values for these parameters were presented. Table 10 also gives the haemoglobin levels of 191 pregnant women at the same Hospital found by these authors in another study (Jaffar Ali *et al.*, 1982) - that of folate and vitamin B_{12} status discussed in the following paragraph. 18.7% of women in this series were found to have a haemoglobin level of <10.5 g/dl.

The third recent study at the Maternity Hospital, Kuala Lumpur was that of the status of folate and vitamin B_{12} of pregnant women admitted at term at the Hospital (Jaffar Ali *et al.*, 1982). Cord blood was also analysed for the same vitamins. This is one of the few studies on these vitamins in the country. Table 11 shows that 58.5 percent of these women could be considered to have low serum folate levels, and 32.4 percent had lowered RBC folate levels. In contrast, none of the women were found to have a low serum vitamin B_{12} value. It was however pointed out that the number of subjects studied for this last parameter was very small. Table 11 also shows that the cord blood levels of these vitamins were significantly higher than the corresponding levels in the maternal blood. The authors suggested the possible involvement of an active process in the transfer of folates and vitamin B_{12} to the fetus, to ensure adequate supply of these nutrients to the fetus even in case of maternal deficiency.

Yet another study conducted at the Maternity Hospital in the 1980's (Tee *et al.*, 1984) has shown that there was a moderately high prevalence of anaemia amongst the 309 pregnant women examined, all of whom were from the lower socio-economic strata. Based on Hb values, 30-60% of the women could be considered anaemic; approximately half of them presented with unsatisfactory serum iron, transferrin saturation and ferritin values; 45-77% had low serum folate levels; and about 30% may be considered to be of poor protein nutriture (Table 12; cut-off levels given in Table). Anaemia was said to be related mostly to iron and to a lesser extent, folate deficiency.

Statistically significant differences in the haematological, iron, folate and protein status of the women from the three racial groups of the study population were observed. These indices were observed to be poorest amongst the Indian women, better in the Malays, and generally best in the Chinese. Birth records of 160 of these women revealed that one of the infants had a birth weight of <2.0 kg; incidence of low-birth weight, <2.5 kg, was 8.3%. Although there was a trend of deteriorating haematological, iron and protein status of women from the 0, 1-3 and >4 parity groups, these differences were not statistically significant.

For obvious reason, the studies reviewed above were all hospital-based. Some were retrospective, making use of existing hospital records. Another point to note is that they were mostly concentrated in the Kuala Lumpur area. It is hoped that data from hospitals in other areas of the country would be made available. Haemoglobin is determined as a routine test in most ante-natal clinics. What is needed is of course satisfactory results obtained with proper quality control, and a collation of all these data. It is also to be noted that except for the three studies cited above, determination of folic acid and vitamin B_{12} has not been carried out. Since other haemopoietic nutrients besides iron, especially folic acid, could play an important role in the etiology of anaemia in the tropics, it is hoped that other studies would deal with this vitamin more thoroughly in the future.

3.2.3. Anaemia amongst Malaysian labourers and industrial workers

There have been several studies on anaemia amongst labourers, particularly of the estate labour force. Although these studies were mostly carried out some years ago, they were of importance and were surely much appreciated at that time. For example the study of Battray in 1918, in which 110 Indian and 221 Chinese "coolies" who had just arrived to work on a rubber estate in Johore were studied. Based on the results of the study, it was recommended that all newly recruited workers be examined for haemoglobin and helminthiasis, and treated if necessary.

In a study of the vital statistics of some estates in Perak before and immediately after the Japanese occupation, Reed (1947) noted that one of the greatest problems at that time was anaemia. Anaemia amongst these Indian labourers was said to be a great cause of prolonged sickness and loss of working power and a great contributory cause of mortality. The cause of the anaemia was said to be almost entirely nutritional, with both iron deficiency anaemia and "tropical macrocytic anaemia" occuring frequently.

A large scale survey by the British Military Administration (Bourne, 1949) reported that of 1,978 rubber estate labourers and dependents examined in Selangor, 47.3% of males, 61.7% of females and 71.8% of children had a haemoglobin value of less than 60% (Tallquist scale). In Penang and Province Wellesley, of the 851 workers examined, 60-70% of the adult males and females had haemoglobin values of less than 60%. All the workers were said to be suffering from a considerable amount of malnutrition. On the other hand, among the 405 industrial workers (including workers in an automobile repair shop, power station employees and employees of a tin mining company) studied, only 4.2% were found to have haemoglobin values below 60%.

England (1952) reported that in routine inspections of an estate labour force of about 2,700, about "4-7% showed clinically gross anaemia". The condition was said to be "due to a combination of ankylostoma infestation and undernutrition".

A more comprehensive study was reported by Lamprell and Cheek (1952) on a rubber and coconut plantation, consisting of a labour force of 1,375 Indians. The

plantations, on the coast of Selangor, were said to be virtually malaria-free. Haemoglobin levels of 268 labourers and their dependents were observed to be below the average for Southern Indian labourers in Malaya. Anaemia was said to be particularly common amongst women of child-bearing age and the group of women and men who were doing the heaviest work, and to be essentially dietary in origin. A second survey carried out on 100 of these subjects, after the implementation of some intervention measures, showed significant increase in haemoglobin levels.

Other studies of labourers around that time were those of Tasker (1951) and Tasker *et al.* (1952). These reports dealt with smaller series of labourers and were mainly concerned with detailed investigations into their anaemia conditions. Burgess and Laidin (1950) in the study of various occupational groups in Malacca also paid attention to a group of labourers.

In a later study, Kandiah and Lim (1976) reported on the nutritional status of labourers in a rubber estate community. Of the 78 adult males examined for haemoglobin concentration, 20 (25.6%) were said to be anaemic; 72 of the 105 adult women examined (68.6%) were anaemic.

Studies on nutritional biochemistry of industrial workers in Shah Alam, Selangor (Ng, 1978) were part of a larger study carried out by the Ministry of Health to obtain baseline information regarding the health and socio-economic status of the workers. While only 10% of the 135 male workers had low haemoglobin levels (<13 g/dl), a much larger prevalence of 26% was observed for the 85 female workers (<12 g/dl). Mean values of the serum iron and percent transferrin saturation of the females workers were also found to be lower than those of the male workers.

No studies on anaemia in Malaysian labourers and industrial workers have been published in the 1980's. A study of the major functional groups of the Malaysian population to be undertaken from 1992 to 1995 is expected to provide new data on these groups of workers in the country.

3.3. Vitamin A deficiency

Several reports of vitamin A deficiency in the country were documented prior to the 1950's. Viswalingam (1928) reported cases of keratomalacia among ill-nourished children up to 5 years of age, in families of Indian labourers. Field (1931) reported higher prevalence of xerophthalmia among Indian children (4.2%) compared with the other ethnic groups (0.5% in the Malays). The occurrence of the deficiency among infants and young children was highlighted by Williamson (1948, 1952). All these investigators had emphasised that faulty diet and a low socio-economic status were said the prime factors bringing about the condition. The use and abuse of sweetened condensed milk was considered by Williamson the most important single factor. Thompson (1953) described the use of red palm oil, skim milk, and vitamin oil for treating afflicted children.

Several reports in the 60's also highlighted the deficiency, especially among children. McPherson (1965), reporting his experiences on the problem in various clinics, hospitals, and schools in several districts in Kelantan, said keratomalacia was the most common single cause of blindness, with age of onset mostly at 2-3 years. The first reports of biochemical determinations of vitamin A deficiency in the country were made during this time (IMR, 1963). A close correlation between mild eye signs of the deficiency and a low serum vitamin A level in children was observed. On the other

hand, carotene levels were found to vary widely. Thompson *et al.* (1964) reported a study of serum and cord blood vitamin A levels of 517 women at delivery in the labour ward. Serum vitamin A levels below 20 µg/dl was found in 25% of the subjects studied. When the vitamin A level of the maternal blood was near normal, the cord blood level of the infants was about half that of the mothers. However, when the mothers' vitamin A levels were low, the infant blood levels were, on the average, not correspondingly reduced and in some instances were actually higher than those of the mothers. Mean vitamin A level in the breast milk collected from 317 women on the third day after delivery was about 60 µg/dl. About 60% of the subjects were said to have a low breast milk vitamin A level, taken to be below 68 µg/dl.

Another report from the 1960's was a large scale nutrition survey carried out in various states of Peninsular Malaysia by the Interdepartmental Committee on Nutrition for National Defense in late 1962 (ICNND, 1964). A total of 8,172 clinical examinations and 729 biochemical determinations were carried out on military personnel, their dependents and civilians. A higher prevalence of hypovitaminosis A among the female subjects was observed, as well as the younger age groups of both sexes. The prevalence of "deficient" serum vitamin A values was low, the highest being about 10% in the 5-9 age group (Table 13). The percentage of subjects, of both sexes, with "deficient" serum carotene level was generally lower, the highest being 4.5% (Table 14).

In the 70's, several rather comprehensive studies on the problem were reported. Chandrasekharan (1975) reported a study of 10 primary schools in Ulu Terengganu. All children were examined clinically and those with signs of vitamin A deficiency or generally malnourished, numbering 215 or about 10% of the children, were selected for biochemical determinations and dietary studies. Mean serum levels of vitamin A and carotene were reported (Table 15); however, the number of children with low levels was not reported. Dietary studies showed that the consumption of foods rich in pre-formed vitamin A was very low in quantity and infrequent. Over 95% of the vitamin A consumption was in the form of provitamin A from vegetables and fruits. Low intake of fat and protein was considered to contribute to poor absorption and utilisation of the provitamins.

Chong *et al.* (1972) reported findings from several studies. Serum vitamin A and carotene values of pre-school children in Ulu Terengganu were said to be "dangerously low", similar to those of children from the General Hospital (Table 16). Some 10% of these children were reported to have clinical signs of xerophthalmia.

Teoh (1973) reported a dietary study of 205 households in Rembau, Negri Sembilan. In general, it was found that vitamin A intake was low, the median value of the percentage of requirement met by households was about 47%. Seventy per cent of the households had intakes below the recommended daily intake. Analysis of the percentage of retinol and provitamin A intake showed that about 80% of the vitamin A was from the precursors of vitamin A, and mainly from fruits and vegetables.

The study of Ng and Chong (1977) emphasised biochemical determinations of serum vitamin A. Out of a total of 407 subjects (of all ages) from two villages in Selangor, Ulu Rening and Sungai Choh, some 32% of the pre-school children were said to be "at risk" (serum vitamin A <20 µg/dl) (Table 17). Among children of school-going age, about 20% were said to be "at risk". The adult population was found to be the least affected, and had satisfactory serum vitamin A level. Eye signs of vitamin A deficiency were not detected for the subjects in Ulu Rening. In Sungai Choh, some 11% of the primary school children were found to exhibit mild signs of xerophthalmia.

In the middle of the 1970's, several studies on the nutritional status of various communities, in Sarawak were documented by A.J.U. Anderson (1976a, 1976b, 1976c, 1977a, 1977b, 1978a, 1978b, 1978c). Various native groups were studied, including the Land Dayak, Melanau, Iban, Penan, Kayan, and Kenyah. All age groups were studied, using a combination of assessment procedures. Results from clinical examinations provided some useful data on the extent of vitamin A deficiency problem amongst the communities. The cases of xerophthalmia reported were, in most cases, conjunctival xerosis, followed by corneal xerosis. There was only one child with Bitot's spot and two with keratomalacia in the total of over 3,000 children under 7 years of age examined. The problem was thus of moderate severity. The prevalence rates of xerophthalmia varied from community to community, ranging from 2% among the Melanau to 38% in Malay children. The prevalence rates are therefore very high in several communities, considering the criteria established by WHO (1982) for determining the public health significance of xerophthalmia and vitamin A deficiency in relation to the preschool-age population, 6 months to 6 years old: nigh blindness in >1% of children; Bitot's spot in >0.5%; corneal xerosis/corneal ulceration/ keratomalacia in >0.01%; corneal scar in >0.05%; plasma vitamin A <10 µg/dl in >5% of children. A common pattern observed was an increasing prevalence with increasing age, with peaks at about 4 to 6 years. In these age groups, the prevalence rates were about double the mean values tabulated in Table 18.

The predominant ethnic groups in the study of Chen *et al.* (1981) in the Interior, West Coast and Kudat Divisions of Sabah were (in descending order) the Kadazans, Chinese, Bajaus, Malays, and the Muruts. Clinical examination (including eye signs of vitamin A deficiency) carried out on a total of 3,672 children upto 13 years of age did not reveal any clear or frank case of any form of nutritional deficiency. Food consumption studies of a sub-sample of the households revealed that a significant proportion of the households for some of the communities, particularly the Kadazans, were deficient in vitamin A intake (<50% of the recommended allowance) (Table 19).

In a series of studies in 14 rural villages in Peninsular Malaysia (Chong *et al.*, 1984), a total of 3,584 persons of all age groups were examined for clinical signs of nutrient deficiencies. Severe xerophthalmia 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. Serum vitamin A levels were not determined on all subjects due to insufficient availability of blood samples, especially from young children. Results for slightly under 700 subjects were presented, with most of them between 18 and 46 years (Table 20). It was concluded that vitamin A deficiency did not pose a serious problem in this age group since only about 10% of the subjects were found to have a serum vitamin A level of <20 µg/dl (ICNND "low" category). Results obtained for the younger children and adolescents also indicated that there was no serious vitamin A deficiency problem among these subjects. Dietary studies, however, showed that household consumption of animal foods rich in vitamin A was poor, much lower than reported in the food balance sheet. Even consumption of fruits and vegetables was much lower. It would appear, therefore, that even though the number of cases of frank xerophthalmia was small, marginal vitamin A deficiency probably existed in considerable numbers in the communities studied.

These studies reviewed have shown vitamin A deficiency to be an important sight-threatening disorder prior to the 1970's, affecting mainly young children on imbalanced diets. The disease was most prevalent among the lower socio-economic segments of the population. Vitamin A intake was generally low, with little or no

retinol, and most of it from the provitamins. Even then, the amount of vegetables and fruits consumed were generally low. The problem appears to have lessened over the years, judging from reports upto the late 1970's and the early 80's. No exact estimates of the magnitude of the problem are presently available. However, as seen from reports in the literature, the problem appeared to be confined to certain groups, mainly in the rural areas, and does not pose a major health hazard nationwide. There are probably very few cases of children with eye signs past the conjunctival xerosis (X1A), and with serum vitamin A <10 µg/ml. It is however recognised that there are many remote areas in the country where the vitamin A status is not known, including parts of Peninsular Malaysia. Furthermore, the problem among urban squatters has been little studied. Most of the surveys relied on clinical signs and dietary inquiries, due to the lack of laboratory facilities to carry out biochemical investigations. For the latter, investigators have been faced with the difficulty of obtaining sufficient blood from subjects. A reliable micro-method would have to be established for local use. It is recommended that the extent of the problem be investigated in communities considered at greater risk of vitamin A deficiency because of poverty, characteristics of the diet, or a higher prevalence of protein-energy malnutrition.

3.4. Iodine deficiency disorders

The problem of endemic goitre in Malaysia was documented from the 1930's. A large-scale health survey in Kedah by Vickers and Strahan (1936) reported the occurrence of goitre in the districts of Sok and Jeneri. Prevalence of goitre was said to be high in Kampong Banggol Berangan and Banggol Batu. An early large scale study of endemic goitre was that of Polunin (1951). Goitre gland enlargement was observed in about 40% of some 1500 subjects studied. The contribution of low iodine in water, the non-consumption of sea foods, and low iodine content of salt to the etiology of goitre was discussed.

Polunin (1971) subsequently reported data of extensive goitre surveys, carried out in various parts of the country, with a particular emphasis on women. Among 4,080 women examined, visible goitres were observed in 25.3% of Malay women and in 34.7% of Indian women aged 15 years and above. In general, the more remote interiors of the States of Perak, Kedah, Kelantan, Terengganu and Pahang were found to have very high prevalence rates of goitre. It was estimated that the population exposed to risks of complications from endemic goitre was probably of the order of 5% of all adult women in West Malaysia.

The highest prevalence rates were encountered in Sarawak, in which visible goitres were found in 39.0% of 1,750 women studied in the 1st, 2nd, 3rd and 5th Divisions. The ethnic groups most affected were the Ibans and Kejamans, and prevalence rates were distinctly higher in the remote areas. In Sabah, visible goitres were found in 26.11% of 963 women 15 years and above in the West Coast, Sandakan and Interior Residences. None of the several isolated inland communities studied had a very high prevalence of goitre, except for the hill people inland from Bandau. Endemic goitre in Sabah appeared to be patchily distributed, widely scattered in many isolated communities.

The consumption of salt and sea foods amongs the study populations were also described. The importance of providing iodised salt to the communities, particularly in Sarawak, was emphasised. Various detailed recommendations were made with regards to the iodisation of salt for West Malaysia, Sarawak and Sabah.

Subsequent reports of endemic goitre in Malaysia were mostly of studies carried out in Sarawak. In the study of Ogihara *et al.* (1972) of some 600 subjects in four districts of the 3rd Division, the overall prevalence of goitre was found to be 22.3%, and prevalence rates were four times greater in females (33.2%) than in males (8.1%). No cretinism was encountered. Urinary iodine excretion was low, but there was no significant difference between goitrous and non-goitrous subjects. Iodine content in drinking water was extremely low in all the districts studied. Thyroid parameters such as PBI, Ts resin sponge uptake and cholesterol were all within normal limits. Anti-thyroid antibodies were not demonstrated in sera from either goitrous and nongoitrous subjects. Experimental feeding of cassava on members of the research team for two weeks did not show any change in thyroid parameters including potassium cyanide discharge test. It was felt that iodine deficiency was probably a major causative factor for the endemic goitre observed.

In a study of some 300 Ibans in three regions of the 2nd Division of Sarawak, Maberly and Eastman (1976) reported a goitre prevalence of 99.5% and 74% respectively in the Ai River and Rubu regions, while only a few people with goitre were detected in the Bajong region. Neurological cretinism was estimated at 3.6% in the severely goitrous Ai River region but was not detected in the other regions. Dietary studies indicated that iodine deficiency was a significant contributory factor in the development of endemic goitre in the study populations. The investigators called for urgent attention to iodine supplementation to ameliorate the problem. In a subsequent report, Maberly *et al.* (1978) described findings from an iodised-oil injection programme covering 2,000 subjects in the severely goitrous region of Lubok Antu District. A sub-sample of the subjects was followed-up at yearly intervals. At the end of the first year of instituting the programme, the prevalence of goitre was reduced from 75% to 33%, and 80% of the goitrous subjects showed a reduction in goitre size. A concomitant rise in serum T3 level and the appearance of symptoms and signs of thyrotoxicosis in a number of subjects was however observed. The investigators pointed out the need for long-term prospective studies of the duration and effects of iodised-oil programme, in order to determine the benefits and possible detrimental effects of these programmes.

Alexander (1979) reviewed the prevalence of endemic goitre in Sarawak, based on studies carried out in the Upper Lemanak River area in the 2nd Division and the Kanowit Town and Kanowit District, as well as several published reports by other investigators. A high prevalence of goitre was reported, both in the coastal and the inland areas. On the average, visible goitres were found in 39% of all women aged 15 years and above. The report also reviewed the salt iodisation programme in the state, with iodisation plants established in Kuching in 1957 and in Sibu in 1959. The programme in Kuching was reported to be not performing well, and goitre prevalence remained high. In Sibu, the programme was said to be performing better. Nevertheless, the voluntary salt iodisation programme in Sarawak had failed to significantly reduce the prevalence and prevent the development of endemic goitre in the State. The author called for legislation for the compulsory iodisation of all salt in the state.

The prevalence of goitre in the riverine longhouse communities along the Tinjar River, Baram District, 4th Division of Sarawak was reported by Chen and Lim (1982). The subjects were mostly Kenyah, Kayan and Iban. The overall rate of palpable goitre amongst 555 subjects aged 5 to 14 years and 202 females aged 15 years and above was 74% for the former group and 78% for the latter. At all locations of the study, the prevalence of goitre was over 60%. On questioning 126 households, only 9 used iodised salt while 74 households used only uniodised coarse salt, and 7 used only

uniodised fine salt. The remaining 36 households used both fine and coarse uniodised salt. The need to provide iodised salt, including iodised coarse salt, to the communities was emphasised.

Tan (1982) reviewed the various studies of the endemic goitre problem carried out in Sarawak since the 1950's. Available data indicated that 12 of the State's 25 districts could be identified as goitrous, with varying rates of prevalence mainly in the inland areas (Table 21). It was estimated that there were at least 20,000 cases of endemic goitre in Sarawak, representing about 1.5% of its total population. The problem was said to be caused primarily by iodine deficiency in the diet, but the author suggested that the importance of goitrogens in cassava should also be investigated. The implementation of endemic goitre control programmes in Sarawak was also reviewed. To further improve the availability of iodised salt, legislation was passed in January 1982 making the import of iodised table salt compulsory. The use of iodised oil injections was felt to be unsuitable because of the high prevalence of thyrotoxicosis and the rapid depletion of iodine stores from the body. A third programme instituted was the fitting of an iodinator into the existing gravity-fed village water supply. The method was said to have produced encouraging results.

A survey conducted in 1988 on the availability of iodine enriched salt in Sarawak by the Department of Medicine and Health Services in the state has indicated the persistence of a number of problems in the production and distribution of iodised salt (Mohd. Taha Arif *et al.*, 1988). Of 345 samples analysed, only 39% were found to contain iodine. Low availability of iodine enriched salt was found in areas in the Divisions of Kuching, Samaharan, Sri Aman and Limbang (12.2%), compared to the Divisions of Sibu, Sarikei and Karpit (70.5%).

Few studies on the endemic goitre problem in Sabah have been reported. A recent study by Chen *et al.* (1988) examined 366 females aged 15 years and above in four areas of differing remoteness in the Keningau Division of Sabah. An overall endemicity of 76.5% was reported, and the incidence of goitre was found to correlate with the remoteness of the areas. The investigators pointed out the need for urgent implementation of a salt iodisation programme as it was found that only 3.0% of the people used iodised salt.

A recent study of the epidemiology of endemic goitre in selected villages in Kedah in Peninsular Malaysia was reported by Hanis *et al.* (1987). A total of 1,075 subjects aged 5 years and above in 7 villages in the district of Sik and Baling was studied. Two of the villages in the district of Sik were previously severely endemic. A regional pattern was noted, with the highest goitre prevalence in the innermost villages (over 50%), and very low prevalence rate in a coastal village (less than 10%). In all the regions studied, goitre prevalence was consistently higher in the females than the males. In the innermost villages, all or almost all households presented with at least a case of visible goitre. The investigators emphasised on the severity of the problem and called for large-scale programmes to arrest the disorder. The need for epidemiological studies to be carried out in other inland areas of the country was also emphasised.

Available data indicate that endemic goitre does not appear to be a major nutritional problem in Peninsular Malaysia, except for a few studies which have indicated high prevalence rates in isolated parts of the Peninsula. In the absence of public health interventions to prevent iodine deficiency, goitre has been recently found to be still highly endemic in villages of Kedah, where a very elevated prevalence was recognised 50 years ago. The suspect that there may be many other foci of endemic goitre in the state, and possibly in other inland areas of Peninsular Malaysia suggests

the need for a systematic assessment of the prevalence of iodine deficiency disorders in these parts of the country. The problem is much more extensive in Sarawak, particularly among women. There is continued interest in studying the endemic goitre problem in Sarawak and Sabah, including extensive characterisation of the problem as well as further studies into intervention programmes.

4 Breastfeeding and weaning practices in Peninsular Malaysia

The Malaysian Population and Family Survey, carried out in 1984-85 contained questions on breastfeeding (BF) practices of both urban and rural women. The survey was confined to Peninsular Malaysia, like the 1974 Malaysian Fertility and Family Survey. The National Household Sampling Frame maintained by the Department of Statistics was used as the basis of selection of primary sampling units for the study (Paranjothy, 1988). The results show some interesting socio-economic and ethnic differentials in the frequency and duration of BF (Subbiah and Looi, 1988).

The findings (which refer to the early 1980's) revealed a situation that seems rather encouraging in terms of BF practices: about 80% of mothers had initiated BF (Table 22), both in urban and in rural areas (Table 24) and the mean duration of BF was 6 months (Table 23). There was, however, considerable difference in the mean duration of BF in urban areas (4.0 months) compared to the rural ones (7.1 months). In another report of the results of this survey the mean duration of BF is 7.8 months in the Malays, 3.6 months in the Indians and 1.8 months in the Chinese (Hamid Arshat *et al.*, 1988).

The analysis on the factors related to BF practices was not presented separately for urban and rural women, so the following findings refer to the urban and rural population considered together (Subbiah and Looi, 1988). Of the 3 ethnic groups (Table 24), the Malays were most likely to initiate breast-feeding (96% of cases), followed by the Indians (74%), while the Chinese started only in 45% of cases.

The working situation of the mother did not appear to influence BF patterns. Approximately 1/3 of mothers sampled were working outside the home (Table 24); in both groups defined as "currently working" and "not working" the proportion of mothers who breastfed was about 80% and the duration of BF was about 6 months (Table 23). However, the lack of distinction between urban and rural mothers may hide important differentials in this respect. Furthermore, the term "currently working" (at the time of the survey) does not necessarily imply that the woman was working when she had her second-last child.

The mother's level of education, expressed in terms of years of schooling, was found to be inversely related to the duration of BF (Table 23): better educated mothers tend to breastfeed, on average, for about half the time that their less educated counterparts breastfeed. In a similar way, when the income of the husband increased, the frequency of BF was reduced (Table 24) and so was its duration (Table 23).

The duration of BF increased with the number of children the mother previously had (Table 23). The initiation of BF did not appear to be much influenced by the age of the mother (Table 22) also the younger women (less than 25 years old) had initiated BF in 84% of cases. With regard to the duration of BF, however, older women, especially above 40 years of age at the time of the study, breastfed for a longer time (Table 23).

An analysis of the trend of feeding patterns in Peninsular Malaysia over the period 1950-76 (Haaga, 1986) confirms the wide inter-ethnic variation previously mentioned (Figure 11). Almost no change in rate of BF occurred among the Malays during these 3 decades, at a time when the frequency of BF was dropping rapidly in the other 2 ethnic groups. Because the Chinese are the most urbanized of Malaysia's ethnic groups, this ethnic difference partly overlaps with differences in BF prevalence among rural areas, small towns and metropolitan areas, occurring over the same time period (Figure 12). However, these ethnic differences have been shown to persist even when potential confounding factors, such as family income, education and urban residence, were controlled (Haaga, 1986). It is therefore clear that cultural factors related to different ethnic groups have a strong influence on whether or not a newborn infant is put to the breast.

During the same time period, the duration of BF also declined in the Chinese and the Indian population but not in the Malay (Figure 13). For the Chinese infants who were breastfed, the median duration of BF dropped from 8.7 months in the early 1950's to less than 3 months in the early and mid-1970's.

Considerable variation in the duration of BF among individuals within each ethnic group is also apparent from Figure 13, particularly regarding the Malays: 25% of infants who began BF in the period 1970-76 continued for 22 months or more; while another 25% were entirely weaned before reaching 5 months of age (Haaga, 1986).

Part (but not all) of the decline in both the initiation and duration of BF in Malaysia was explained by an increase in women's participation in the non-agricultural labour force, since work outside the house was found to be associated, in multivariate analysis of these data, with less BF. Work in agriculture outside the house, instead, was not associated with a lower probability of BF, even controlling for rural residence (Haaga, 1986).

The study on the trend in feeding patterns in Peninsular Malaysia (Haaga, 1986) showed that a definite decline in the rate of children ever breastfed had taken place from just above 92% in the early 1950's (Figure 14) to below 78% in the 1970's. That study also suggested that there was evidence of a reversal of that trend during the 1970's, since the figures for the overall prevalence of BF for the first half of 1977 pointed towards rates well above 80%. However, the results of the Malaysia Population and Family Survey of 1984-85 indicate that the overall rate of children ever breastfed was 81% in the early 1980's, corresponding to the overall rate found in the late 60's in Peninsular Malaysia.

The main suggestion for action that emerges from the separate data for each ethnic group is the need to promote BF among the Chinese and Indian population in particular, in urban areas, among the women who work outside the home in non-agricultural jobs, among the more educated mothers and the better-off families.

Another important aspect which emerges from an analysis of feeding patterns and their determinants, conducted in the 1970's, is that lower BF rates were found in infants born in Government hospitals and private clinics, both in urban and rural areas (Pathmanathan, 1978).

A study conducted at the University Hospital of Kuala Lumpur in the 1970's showed that only 30% of the infants were exclusively breastfed at birth (Chen, 1978). It is therefore no wonder that in the same study, the main reason given for stopping BF was "inadequate lactation", in 67% of cases. The other main reasons given were "work" (15%) and the hospitalization of the infant (5%). One of the reasons babies were given

supplementary feeding right from birth is the fact that babies were put to the breast late after delivery. In a study of babies born in some hospitals in Kuala Lumpur and Petaling Jaya, it was found that most babies were put to the breast more than 24 hours after delivery and they were bottle-fed before the initiation of BF. This undermined the mother's confidence in her ability to breastfeed and also gave the impression that bottle feeding was perhaps best for the baby since hospitals encourage such practice. As a consequence of this, many mothers breastfed only partially, resulting in lactation failure in a short time (Chen, 1978).

Particular attention should be given to the promotion of BF in urban squatter communities, where surveys have found that only a small fraction of children are immunized, there is a high prevalence of worm infestation and the water supply, latrine and garbage disposal systems are inadequate. It has been shown that households with these characteristics have a higher risk of infant morbidity and mortality, arising primarily from problems related to contaminated bottle feeds (Butz *et al.*, 1984; Haaga, 1985).

Infant feeding practices among urban squatters, constituting about one fourth of the population in Kuala Lumpur, 1978, have been recently shown to be much less favourable than in other sectors of the population (Khor, 1989). Of 71 randomly selected Malay mothers from one of these communities, only 62% practised exclusive BF at the end of the first month and 33% at the end of the second; by this time 37% had stopped BF. When the child was two-months old 95% of the working mothers and 54% of the full-time housewives had introduced bottle-feeding, supplemented with pre-cooked cereal and porridge. A favourable findings is that, in 28% of supplemented babies, BF continued into the 20th month.

According to Serva *et al.* (1986) in a random sample of predominantly Malay squatter settlements of Kuala Lumpur, in the early 1980's, 62% of mothers adopted mixed-feeding, with a median duration of BF of 3.5 months. Ten percent of mothers never breastfed. Bottle feeding had been commenced within one week of birth by 44% of mothers, most of them using non-modified cow's milk formula.

In a study of the knowledge and attitudes of 74 women attending ante-natal government clinics at two semi-urban health centres around Kuala Lumpur, Kandiah and Ooi (1984) have shown that although, at the third trimester of pregnancy, 92% considered breastmilk as the best food for their babies, only 63% intended to breastfeed exclusively. The general preference was for mixed feeding, especially among Chinese women, women from higher income groups, working women and multiparous mothers. Seventy three percent did not agree that giving breastmilk alone is sufficient for a baby until he/she is 5 months old. Sixty four percent believed that the most suitable age to start supplementary feeding is before 5 months and 67% intended to do so. Only 38% of respondents had attended an educational talk at the clinic.

Three other factors which are generally considered important determinants of the duration of BF, are not specifically mentioned in the studies quoted. The first one is the duration of fully paid maternity leave after delivery; this is six weeks for government civil servants and eight weeks for workers of the private sector. A recent, although partial improvement for mothers working in government posts, is the possibility of taking one month of unpaid leave after the six weeks of paid leave.

The other factors which can be important to help working mothers continue BF are the existence of day care centres for newborns near the workplace, and the possibility of taking time off work to breastfeed. Both these facilitating factors are generally lacking.

The shift away from sweetened condensed milk (SCM) has continued and the use of infant formula has increased, particularly among urban mothers. Processed milks are used by a majority of urban mothers by one month. Urban mothers maintain a high usage of processed milk throughout the first year of life, whereas among rural mothers the usage is less and gradually declines after the sixth month (King and Ashworth, 1987).

Non-milk foods are also introduced very early, especially by rural mothers (King and Ashworth, 1987). Commercial cereals have become increasingly popular for early supplementation but are replaced among low-income groups by traditional cereals as the infants get older.

From the above analysis, the main determinants of contemporary infant feeding practices in Malaysia appear to be ethnicity, level of education and age of the mother, income of the father, female participation in the economy, urbanisation and modernisation, health sector activities including the education of pregnant women and hospital practices in the perinatal period, the duration of maternity leave and the lack of facilities to help mothers breastfed after returning to work, and the commercial promotion of processed milks.

5 Overnutrition and chronic diseases

As a result of the rapid pace in socio-economic development and increased affluence in Malaysia, there has been a definite change in the nutritional problems in the country. The population is now faced with the other facet of the malnutrition problem, namely chronic diseases associated with dietary excesses and imbalances, such as hypertension, coronary heart disease and certain types of cancers, as evident from mortality data and epidemiologic data.

Mortality data for Peninsular Malaysia have shown that deaths due to diseases of the circulatory system and neoplasms have been on the rise since the 1970's. Official statistics of medically certified and inspected mortality in Peninsular Malaysia for 1989 show that diseases of the circulatory system (ischaemic heart disease, cerebrovascular disease and diseases of of pulmonary circulation) tops the list of ten leading causes of death in the country. Ranking third in the list is deaths due to neoplasms, and the two major cancer sites are (a) the digestive organs and peritoneum, and (b) respiratory and intrathoracic organs. These two categories together constitute slightly over 40% of all medically certified deaths.

Studies into these diet-related chronic diseases are relatively recent undertakings in the country. Investigations into the relationship between diet and coronary heart disease (CHD) were carried out from the 1960's. Several studies on serum lipid levels of Malaysians and other risk factors have shown that the more affluent segments of the population are faced with greater risk to CHD (Chong, 1986; Teo *et al.*, 1988). More data on the prevalence of these risk factors among children and adolescents, including serum lipid levels and obesity are being collected to understand the level of risk of the younger population groups.

Over the last two decades, the incidence rate of mortality due to malignant neoplasms has increased from about 15 per 100,000 to almost 20. The fact that cancers of the digestive organs and the peritoneum are the most frequent causes of cancer deaths indicates the need to carry out more studies to identify dietary risk factors for cancer. For female cancers, the mortality rate for certified cases of breast cancer has been rising gradually from 1.8 per 100,000 in 1983 to 2.3 in 1988.

6 Nutrition intervention programmes

Some of the intervention programmes implemented by various ministries and agencies to overcome the nutritional problems discussed are summarised in this section. Details of the programmes are described in Tee and Cavalli-Sforza (1992).

An integrated programme initiated in 1969, with the Ministries of Health, Education, Agriculture and Information as the major participating ministries, was the Applied Nutrition Programme. Launched in a pilot project area of Mukim Tanjong Dua Belas in Kuala Langat district, the ANP received international assistance from WHO, UNICEF and FAO. This community development project was aimed at improving the nutritional status of the community through the community's own efforts. Following an evaluation in 1974, the Programme was renamed the Applied Food and Nutrition Programme (AFNP) and was expanded to states with high toddler mortality rates. The Programme involved integrated and coordinated efforts in the sectors of economy and food production, nutrition education and home economy, health, sanitation and supplementary feeding in order to improve the nutritional status of the rural population. By 1980 the Programme was expanded to 43 selected districts in Peninsular Malaysia. Under the Fifth Malaysia Plan (1985-1990), the AFNP was further extended to other districts in Peninsular Malaysia, and to Sabah and Sarawak.

The regular programmes of the Ministry of Health include (a) the provision of maternal and child health care (including domiciliary delivery and family planning) and outpatient services through a network of rural clinics, mobile teams, riverine and subsidiary clinics; in Sabah and Sarawak, also through the flying doctor services, and in some metropolitan areas, through Local Authority Clinics; (b) provision of health services to school and preschool children through visiting school health teams; and (c) nutrition surveillance through community and clinic-based activities. Supplementary feeding in the form of instant full cream milk powder is also being given free to selected children (aged 6 months to 7 years), pregnant women, lactating mothers and school children who are found to be underweight or at higher risk to undernutrition.

Two new intensive, multi-agency programmes were initiated in 1988 and 1989 to eradicate poverty and enable the very poor to join the main stream of development. The first programme focusses on health development of "the very poor" families throughout the country. Home visits are made by health staff to establish rapport with the identified families and to ensure that they have easy accessibility to the health facilities and use the existing health services. Nutrition education through cooking demonstrations is carried out, and food supplements are given to malnourished children in the poor families. The second programme is aimed at rehabilitating moderate to severely malnourished children by providing them with food aid and multivitamin supplements. It is considered an immediate intervention measure while other interventions are implemented, including immunisation, health and nutrition education and close growth monitoring.

The Ministry of Education has implemented several regular programmes to overcome the malnutrition problems amongst school children. The school health programme includes health and nutrition education activities, school health services, and collaborative programmes between schools and the community. Two feeding programmes are currently being implemented in schools, namely the school supplementary feeding programme and the school milk programme.

Besides participating in the AFNP, various other nutrition related activities were also carried out by the Ministry of Agriculture. The Farm Family Development (FFD) Programme was established in 1968, and aims at improving the quality of life among farm families. The strategies of the FFD include a great deal of emphasis on women, for example developing an active Women Extension Group, encouraging and training farm women in agro-based economic activities, and increasing knowledge and skills among farm women in agriculture, food and nutrition and home management.

The Ministry of Rural Development implemented various community development (KEMAS) activities from 1961, focussing on health improvement of rural communities. Activities directly related to nutritional interventions included the nationwide nutrition education programme for rural women through its Home Economics Programmes from 1963; the pre-school/Taman Bimbangan Kanak-kanak (TABIKA) programme starting from 1970, which included providing supplementary food to the children; the community kitchen project in 1990 and the nurseries in 1991.

With regards to promotion of breast-feeding, various actions have been taken by the Ministry of Health, non-governmental organisations (NGOs) and the food industry. The Ministry of Health actively promotes BF for as long as possible, but at least for 6 months, and advocates the introduction of solids between the ages of 5 and 6 months (Ministry of Health, 1985 and 1987). The Malaysian Code of Ethics for Infant Formula Products was first introduced in 1979, even before WHO developed the International Code of Marketing of Breast-milk Substitutes (WHO, 1981) and was revised in 1983, 1985 and in 1991-1992 (in progress). Recently, the Ministry of Health has decided to ban with immediate effect all free samples of infant formula distributed to hospitals and medical institutions (Kuttan, 1992).

More than 20 voluntary organizations are known to play a role in the promotion of BF (Ministry of Health, 1987) by counselling women individually, in groups, by letter and over the telephone, providing advice, encouragement and information, organising exhibitions, talks and radio programmes, producing and distributing leaflets and newsletters on advantages, techniques, and all aspects of BF, conducting surveys on feeding practices, acting as a liaison between the community they are involved with and the health personnel, and raising funds for their activities. One of these NGOs, the Malaysian Breastfeeding Mothers Association (PPPIM), has pointed out the need to change the attitude towards BF of hospital administrators, obstetricians, paediatricians and the nursing staff, because mothers are presently not adequately encouraged and supported to breastfeed (Tee and Cavalli-Sforza, 1992; pp 131-132).

The infant food manufacturers have also played a role in educating the public on topics pertaining to maternal and child health care, by publishing books, pamphlets and leaflets on ante-natal and post-natal diet, health and care, on feeding practices, breast-feeding, etc. All these materials are first examined by a vetting committee, members of which comprise relevant government bodies, and printed only after being approved (Tee and Cavalli-Sforza, 1992; pp 126-127).

In recent years, attention has also been given towards arresting the rise in diet-related chronic diseases. There has been serious efforts to improve the life-style of the population through various programmes and activities. Many government and private organisations in the country are promoting fitness amongst their staff members through fitness seminars. These seminars are aimed at improving life style, including changes to dietary patterns and increased physical activities. On a nation-wide scale, the Ministry of Health launched the Healthy Life Style Campaign in May 1991. The campaign has been scheduled to extend over a six-year period, and will cover six main health problems. Commencing with the problem of cardiovascular disease in 1991, other issues to be covered are AIDS, food safety, cancer, childhood diseases, and diabetes mellitus.

7 Conclusions

The overall nutrition situation in Malaysia has been shown to have improved steadily over the years. However, as can be expected, owing to the uneven distribution of facilities and resources, pockets of undernutrition exist in various parts of the country. Thus, although frank nutritional deficiencies are rarely encountered, mild to moderate undernutrition exists among various population groups, especially the vulnerable groups in socio-economically disadvantaged communities. Growth retardation and anaemia are the major problems encountered, while vitamin A deficiecy and iodine deficiency goitre are prevalent among selected population groups. In spite of overall nutrition improvement in the country, these nutrition issues persist amongst selected communities.

Rapid advancements in the socio-economic situation in Malaysia has resulted in significant changes in the life-styles of communities, including food habits, and food purchasing and consumption patterns. Increasing urbanisation puts further strain on the available health services and other facilities in the cities. These changes have resulted in a definite change in the food and nutrition issues facing the communities in Malaysia over the past two decades. These emerging issues in the nutrition situation pose great challenges to the nutritionists and other health workers in the country. Like many other societies in transition, Malaysia needs to re-define its policies and programmes to tackle the food and nutrition issues facing the communities.

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Table 1
Maternal Mortality Rates in Peninsular Malaysia, 1957-1982

Year	Maternal Mortality Rates (per 1,000 live births)
1957	3.20*
1967	1.68*
1972	1.07
1974	0.96
1976	0.78
1977	0.79*
1978	0.84
1979	0.69
1980	0.63
1981	0.59
1982	0.50
1985	0.37
1986	0.30
1987	0.28
1988	0.26
1989	0.20

(Source: *Hamid Arshat *et al.*, 1984; others from Department of Statistics)

Table 2
Selected Mortality Rates for Sabah and Sarawak, 1980, 1985-1989

	Neonatal	Infant	Toddler	Maternal
SABAH				
1980	11.3	22.8	2.6	0.1
1985	11.6	17.6	2.0	0.21
1986	14.6	21.2	2.1	0.1
1987	14.2	20.8	2.1	0.14
1988	13.5	19.8	1.6	0.19
1989	11.9	17.6	1.6	0.25
SARAWAK				
1980	12.0	23.8	2.39	0.5
1985	7.5	11.3	0.9	0.1
1986	6.9	10.2	0.9	0.02
1987	6.6	9.1	0.5	*
1988	6.2	9.8	0.6	0.15
1989	6.8	10.5	0.8	0.12

* Only 2 maternal deaths registered.

Source: Vital Statistics, Department of Statistics, Sabah dan Sarawak

Table 3

Prevalence of PEM* amongst Malaysian children: data from Nutrition Surveillance

Location	Sample size	Sex	Age (yrs)	% of subjects wt/age		
				<60%	60-79%	80%
National (7 states)						
Perlis	4827	M/F	<1	0.2	20.3	64.8
Kedah	35336	M/F	<1	0.3	17.2	61.2
Selangor	40349	M/F	<1	0.4	18.0	61.3
Pahang	21159	M/F	<1	0.6	22.2	59.7
Terengganu	25441	M/F	<1	0.7	12.9	64.8
Kelantan	35322	M/F	<1	0.5	22.2	59.7
Sarawak	56410	M/F	<1	0.2	8.9	68.9
Total	218844	M/F	<1	0.4	16.1	63.3
Perlis	4362	M/F	1-4	0.3	25.6	63.8
Kedah	44034	M/F	1-4	0.4	27.8	63.7
Selangor	49691	M/F	1-4	0.2	26.6	62.3
Pahang	33080	M/F	1-4	0.7	30.6	60.0
Terengganu	29776	M/F	1-4	0.7	33.4	60.0
Kelantan	35362	M/F	1-4	1.0	40.6	52.0
Sarawak	94713	M/F	1-4	0.3	25.8	64.2
Total	293018	M/F	1-4	0.5	29.3	61.4
Perlis	941	M/F	5-6	0.3	24.1	60.4
Kedah	11311	M/F	5-6	0.6	30.3	62.8
Selangor	10116	M/F	5-6	0.2	30.6	58.1
Pahang	5586	M/F	5-6	1.6	35.1	55.0
Terengganu	5114	M/F	5-6	2.1	42.5	50.3
Kelantan	6641	M/F	5-6	1.6	46.2	45.8
Sarawak	20602	M/F	5-6	1.4	43.6	48.2
Total	60311	M/F	5-6	1.1	38.1	53.3

* Harvard standard

(Source: Ministry of Health, 1989)

Table 4

Prevalence of Anaemia Amongst Children in Two Malay Communities and an Indian Estate Population

Population and reference	Pre-school children	School children	
Rural Malays, Ulu Jempol, N. Sembilan (Kandiah & Lim, 1976)			
n	72 (1-6 yrs)	486 (7-14 yrs)	70 (15-19 yrs)
% anaemic	51.0	18.6	10.0
Malays, SLDA* Scheme, Ulu Rening, Selangor (Kandiah, 1977)			
n	39 (1-6 yrs)	73 (7-17 yrs)	
% anaemic	23.1	11.0	
Indians, rubber estate, Selangor (Kandiah & Lim, 1977)			
n	57 (0-7 yrs)	247 (8-18 yrs)	
% anaemic	47.4	37.2	

*SLDA = State Land Development Authority

Criteria for anaemia: pre-school children, Hb < 11.0 g/dl

school children, Hb < 12.0 g/dl

Table 5
Prevalence of Anaemia Amongst Children of Various Communities in Sarawak

	Age groups									
	6-11 mth	1 yr	2 yrs	3 yrs	4 yrs	5 yrs	6 yrs	7 yrs	8 yrs	all ages
Land Dayak, Tebakang										
n	-	-	-	-	-	-	-	-	-	667
% anaemic	-	-	-	-	-	-	-	-	-	27.7
Iban, Middle Mukah River										
n	51.4	64	59	66	64	69	70	51	51	545
% anaemic	31.3	35.9	33.8	12.1	10.9	7.2	20.0	13.7	3.9	18.7
Iban, Lemanak River										
n	32	59	61	51	51	53	54	58	59	487
mean Hb, g/dl	10.6	10.3	11.2	11.4	11.5	11.8	12.0	12.0	12.0	11.5
% anaemic	59.4	57.6	23.0	21.6	27.5	11.3	51.9	39.7	32.2	35.1
Iban, Sut and Mujong River										
n	24	67	67	68	58	55	46	47	41	473
mean Hb, g/dl	10.2	10.4	11.6	11.9	12.0	12.2	12.3	12.0	12.2	11.7
% anaemic	50.0	58.2	26.9	14.7	15.5	7.3	28.3	44.7	36.6	29.8
Malays, Srk River Delta										
n	32	44	43	48	41	48	68	68	87	479
% anaemic	40.6	52.3	23.3	29.3	19.5	16.7	50.0	36.8	32.2	34.0
Penan, Gunong Mulu										
n	24	67	67	68	58	55	46	47	41	473
mean Hb, g/dl	10.2	10.4	11.6	11.9	12.0	12.2	12.3	12.0	12.2	11.7
% anaemic	50.0	58.2	26.9	14.7	15.5	7.3	28.3	44.7	36.6	29.8

* = 0-11 months
Criteria for anaemia:
6 mths - 5 yrs, Hb < 11.0 g/dl
6 yrs - 8 yrs, Hb < 12.0 g/dl

(Source: Anderson 1976a, 1976b, 1977a, 1977b, 1978a, 1978b)

Table 6
Prevalence of Anaemia Amongst Children of Various Ethnic Groups in the Interior, West Coast and Kudat Divisions, Sabah

	% anaemic		
age (years)	male	female	combined
0.5- 2	34.5	27.4	30.9
2- 4	14.8	26.4	20.2
4- 6	32.4	19.1	25.0
6- 8	28.1	31.7	29.8
8-10	29.6	27.4	28.5
10-12	22.8	23.3	23.0
12-13	17.6	13.5	15.8
0.5-13	26.4	25.6	26.0

Study population: 0- 4 yrs = 28
5-12 yrs = 2877
total n = 3672
Criteria for anaemia: 6 mths - 6 yrs, Hb < 11.0 g/dl
6 yrs - 14 yrs, Hb < 12.0 g/dl
(Source: Chen *et al.*, 1981)

Table 7
Selected Data on the Prevalence of Anaemia Amongst Rural Poor Malay Children

Communities studied	Infants	Pre-school child	Primary school child	
Kuala Terengganu,Terengganu (Chong, 1974)				
n	-	399	-	
% anaemic:				
Hb < 11.0 g/dl	-	23	-	
PCV < 33%	-	9	-	
Kota Bharu, Kelantan (Chong *et al.*, 1979)				
n	-	64	174	
% anaemic	-	33	73 (boys); 56 (girls)	
Mersing, Johore (Chong *et al.*, 1981)				
n	-	123	146	
Hb, mean ± SD, g/dl	-	12.3 ± 1.5	13.3 ± 1.4	
% anaemic	-	16	16	
Baling, Kedah (Chong *et al.*, 1982)				
n	30	243	122 (boys)	120 (girls)
Hb, mean ± SD, g/dl	10.3 ± 1.3	11.2 ± 1.4	11.9 ± 1.8	12.5 ± 1.6
% anaemic	83	41	45	37
MCHC, mean ± SD, %	32.9 ± 5.5	30.8 ± 3.2	31.5 ± 3.8	31.9 ± 3.1
% anaemic	36	53	40	38
Perak Tengah, Perak (Chong *et al.*, 1983)				
n	24	187	283	
Hb, mean ± SD, g/dl	10.9 ± 1.1	11.4 ± 1.7	12.6 + 1.5	
% anaemic	12	32	27	

Criteria for anaemia: < 6 yrs: Hb < 11 g/dl
6-14 yrs: Hb < 12 g/dl and MCHC < 31%

Table 8
Anaemia Amongst Pre-school Children in Three Malaria Endemic Villages of Bengkoka Peninsula, Sabah

Age groups (months)	Haemoglobin		MCHC		PCV
	mean ± SD (g/dl)	% children <11 g/dl	mean ± SD (%)	% children < 11%	mean ± SD (%)
< 12	10.7 ± 1.6	67	31 ± 2.7	50	36 ± 2.3
12-23	10.5 ± 1.9	53	30 ± 2.7	67	36 ± 2.3
24-35	11.1 ± 1.3	36	32 ± 2.1	55	36 ± 3.1
36-47	11.4 ± 0.8	53	31 ± 1.7	50	36 ± 1.2
48-59	11.4 ± 1.6	38	32 ± 2.5	31	36 ± 3.2
60-72	11.8 ± 0.9	18	33 ± 2.4	22	37 ± 1.9
all ages (n=90)	11.1 ± 1.5	44	31 ± 2.7	48	36 ± 2.9

(Source: Kandiah *et al.*, 1984)

Table 9
Haematological Data of 96 Women at Maternity Hospital, Kuala Lumpur

	Hb (g/dl)		MCV (fl)		MCH (pg/l)		MCHC (ng/l)		ferritin (µg/l)	
	mean	%<12	mean	%<77	mean	%<26	mean	%<32	mean	%<12
First trimester	12.9	0	90.2	0	30.8	0	34.0	0	86.6	0
Second trimester	11.4	52	87.4	0	29.6	8	33.0	10	12.6	24
Third trimester	10.9	59	83.0	15.2	28.0	30.9	33.0	11.9	11.3	26

(Source: George *et al.*, 1980)

Table 10
Serum Iron Parameters and Haemoglobin of Maternal Blood at Parturition

	Iron (μg/dl)*	TIBC (μg/dl)*	Transferrin* saturation (%)	Haemoglobin** (g/dl)
mean	74.0	310.6	26.4	11.4
SD	35.9	108.6	14.5	1.3
range	15.4-142.8	107.7-571.4	5.0-60.0	6.5-14.6
n	19	19	19	191

(Source: * Jaafar Ali *et al.*, 1981
** Jaafar Ali *et al.*, 1982)

Table 11
Folate and Vitamin B_{12} of Malaysian Maternal and Cord Blood at Parturition

	maternal blood	cord blood
Serum folate		
mean ± SD, ng/ml	5.0 ± 3.5	19.9 ± 17.4
range, ng/ml	1.0-18.5	5.9-68.0
% < 5 ng/ml	58.5	not given
n	104	35
RBC folate		
mean ± SD, ng/ml	338.4 ± 227.5	569.6 ± 444.2
range, ng/ml	70.0 - 845.2	91.0 - 1408.9
% < 160 ng/ml	32.4	not given
n	71	7
Serum vitamin B_{12}		
mean ± SD, pg/ml	370.4 ± 114.7	496.6 ± 188.7
range, pg/ml	195.0 - 691.0	351.8 - 975.0
% < 100 pg/ml	0	not given
n	14	9

(Source: Jaafar Ali *et al.*, 1982)

Table 12
Nutritional Anaemia Amongst Pregnant Women in the Maternal Hospital, Kuala Lumpur

Parameters	Ethnic groups			
	Chinese	Malays	Indians	Combined
Hemoglobin				
n	104	109	63	276
mean ± SD (g/dl)	11.48 ± 1.80	11.15 ± 1.51	10.51 ± 1.68	11.13 ± 1.70
% < 11 g/dl	30.8	47.7	58.7	43.8
Packed Cell Volume				
n	104	109	63	276
mean ± SD (%)	36.03 ± 4.58	34.75 ± 4.50	33.67 ± 4.42	34.99 ± 4.60
% < 33%	24.0	31.2	47.6	32.2
Serum Iron				
n	117	121	71	309
mean ± SD (%)	60.18 ± 35.07	48.45 ±33.53	47.38 ±38.88	52.65 ±35.89
% < 50 µg/dl	45.3	60.3	69.0	56.6
Transferrin Saturation				
n	117	121	71	309
mean ± SD (%)	19.45 ± 9.91	15.87 ± 8.44	15.23 ± 8.39	17.08 ± 9.21
% < 15%	38.5	51.2	54.9	47.2
Ferritin				
n	110	103	67	280
mean ± SD (%)	21.86 ± 25.34	11.09 ± 8.80	12.61± 15.32	15.69 ±19.02
% < 12 ng/ml	40.9	61.2	62.7	53.6
Serum Folate				
n	104	101	66	271
mean ± SD (%)	4.70 ± 5.06	3.30 ± 3.83	2.47 ± 2.44	3.64 ± 4.19
median	3.15	2.40	1.60	2.40
% < 3 ng/ml	45.2	66.3	77.3	60.9
Serum Protein				
n	117	121	71	309
mean ± SD (%)	6.03 ± 0.35	6.21 ± 0.43	6.13 ± 0.36	6.12 ± 0.39
% < 6 g/dl	36.5	23.1	25.4	28.8
Serum Albumin				
n	117	121	71	309
mean ± SD (%)	3.24 ± 0.24	3.11 ± 0.32	2.99 ± 0.30	3.13 ± 0.30
% < 3 g/dl	11.1	25.6	46.5	24.9

(Source: Tee *et al.*, 1984)

Table 13
Plasma Vitamin A Levels of Military Dependents and Civilians in Peninsular Malaysia

		Serum vitamin A			
				% of subjects	
Age groups	No. of subjects	Mean (µg/dl)	S.E.	"low"[1]	"deficient"[2]
Males					
5- 9 years	57	28.0	1.7	24.6	0
10-14	79	30.3	1.7	21.5	2.5
15-44	75	42.9	1.5	1.3	0
>45	22	40.2	3.4	4.5	0
Females					
Non-pregnant, non-lactating					
5- 9 years	59	27.6	2.0	22.0	8.5
10-14	70	27.6	1.5	17.1	5.7
15-44	111	36.6	1.4	6.3	2.7
>45	24	34.6	3.8	20.8	4.2
Pregnant	8	32.8	3.7	12.5	0
Lactating	25	29.0	2.1	12.0	4.0

[1] "low" = serum vitamin A level between 10-19 µg/dl
[2] "deficient" = serum vitamin level <10 µg/dl
(Source: ICNND, 1964)

Table 14
Plasma Carotene Levels of Military Dependents and Civilians in Peninsular Malaysia

		Serum carotene			
				% of subjects	
Age groups	No. of subjects	Mean (µg/dl)	S.E.	"low"[1]	"deficient"[2]
Males					
5- 9 years	57	67	4	17.5	0
10-14	79	83	5	5.1	1.3
15-44	75	88	4	5.3	0
>45	22	69	7	13.6	4.5
Females					
Non-pregnant, non-lactating					
5- 9 years	59	70	5	18.6	0
10-14	70	78	3	8.6	0
15-44	111	94	4	5.4	0.9
>45	24	98	7	8.3	0
Pregnant	8	115	14	0	0
Lactating	25	84	6	8.0	0

[1] "low" = serum carotene level between 20-39 µg/dl
[2] "deficient" = serum carotene level <20 µg/dl
(Source: ICNND, 1964)

Table 15
Serum Vitamin A and Carotene Levels of Primary School Children in Ulu Terengganu

Location	No. of children	Mean serum level (μg/dl)	
		Vitamin A	Carotene
Matang	20	21	42
Kua	20	25	37
Kuala Dura	20	19	39
Bukit Gemuroh	22	25	49
Bukit Diman	23	25	35
Tapah	8	18	42
Kuala Brang	50	26	48
Bukit Apit	20	26	45
Tengkawang	17	16	41
Tanggol	22	25	50
Pulau Perhentian	27	32	29

(Source: Chandrasekharan, 1975)

Table 16
Mean Serum Vitamin A and Carotene Levels of Malay Pre-school Children

Group	No. of subjects	Carotene (μg/dl)	Vitamin A (μg/dl)
Ulu Terengganu	44	29	11.2
Army children	62	62	28.9
Terengganu (coastal kampungs)	10	38	27.9
Children with eye signs of vitamin A deficiency, General Hospital, Kuala Lumpur, 1969	11	28	13.5

(Source: Chong *et al.*, 1972)

Table 17
Vitamin A Status of Two Rural Communities - Ulu Rening and Sungai Choh

Community	Age group	No. of subjects	Serum vitamin A (µg/dl)	% at risk[1]	% with clinical signs
Ulu Rening	Pre-school	38	25 ± 8	32	0
	School	69	32 ± 11	16	0
	Adult	89	42 ± 11	3	0
Sungai Choh	Pre-school	22	24 ± 6	32	1.6[a]
	School	80	26 ± 11	27	10.8[b]
	Adult	109	36 ± 13	7	5.5[c]

[1] serum vitamin A level <20 µg/dl
[a] no. of subjects = 65
[b] no. of subjects = 251
[c] no. of subjects = 202

(Source: Ng and Chong, 1977)

Table 18
Prevalence of Xerophthalmia among Children under 7 Years of Age of Various Communities in Sarawak

Community	Location	No. of children	% with xerophthalmia
Land Dayak	Tebakang area, 1st Division	552	6.9
Melanau	Tilian River, 3rd Division	352	2.0
Iban	Middle Mukah River, 3rd Division	460	3.9
Iban	Lemanak River	388	12.9
Malay	Sarawak River Delta, 1st Division	361	38.2
Iban	Sut and Mujong River, 7th Division	414	20.5
Penan	Mulu area, 4th, 5th Division	131	19.1
Kayan & Kenyah	Middle Baram River, 4th Division	556	11.5

(Source: Anderson, 1976a, 1976b, 1976c, 1977a, 1977b, 1978a, 1978b, 1978c)

Table 19
Adequacy of Household Vitamin A Intake among Various Communities in Sabah

Community	No. of Households	% of HH with requirements for vitamin A equal to	
		50-99%[a]	<50%[a]
Muruts	28	5	0
Rungus Dusun	7	30	0
Kadazan (coastal plains)	29	13	62
Kadazan (upland)	32	9	56
Chinese	10	30	10

[a]Percent of the recommended daily requirements for vitamin A intake; households meeting <50% of the requirements considered as "deficient".

(Source: Chen *et al.*, 1981)

Table 20
Serum Vitamin A Levels of Rural Communities, Peninsular Malaysia

Age group	No. of subjects	Mean ± SD (µg per dl)	% with "low"[1] vitamin A
Pre-school children	25	31 ± 9.5	12
Primary school children	40	33 ± 12.5	10
Boys, 12-17.9 years	32	44 ± 22.0	16
Girls, 12-17.9 years	61	55 ± 19.0	3
Males, 18-45.9 years	152	46 ± 19.0	7
Females, 18-45.9 years	353	47 ± 24.0	12
Males, => 46 years	14	54 ± 33.0	0
Females, => 46 years	14	42 ± 17.0	7

[1] "low" = serum vitamin A <20 µg/dl

(Source: Chong *et al.*, 1984)

Table 21
Summary of Goitre Studies in Sarawak

Location	Ethnic groups	Age (years)	Total number	Prevalence (%)
First division	Chinese, Malay	10-14 (female)	273	49.8
	Biduyah	> 15 (female)	157	52.2
Second division	Iban, Malay	10-14 (female)	147	38.8
	Chinese	> 15 (female)	161	80.7
Third, sixth and seventh	Iban, Chinese	10-14 (female)	252	34.5
divisions	Malay, Kejaman	> 15 (female)	589	55.2
Fifth division	Malay, Chinese	10-14 (female)	20	45.0
	Iban	> 15 (female)	151	45.0
	Total	> 10 (female)	1750	50.0
		> 15 (female)	1058	58.0
Third division	Iban	All ages	608	8 (male)
Rejang River (interior)		(both sexes)		33 (female)
Second division	Iban	> 11 (both sexes)	167	99.5
Lubuk Antu (interior)				
Ruba (coastal)	Iban	> 11 (both sexes)	38	74.1
Bajong (coastal)	Iban	> 11 (both sexes)	122	3.0
Second division	Iban	5 - 8 (both sexes)	388	76.5
Lemanak River (interior)		mothers only	166	90.5
Fourth division	Kayan/Kenyah	< 7 (both sexes)	556	30.4
Middle Bayam		4 - 8 (both sexes)	372	55.1
(intermediate)		mothers only	142	50.0
Muda area (interior)	Punan	All ages		
	(nomadic tribe)	(both sexes)	334	59.3
Seventh division	Iban	< 7 (both sexes)	414	7.0
Sut/Mujong River		mothers only	106	30.2
(interior)				
Second division	Iban	> 15 (female)	75	93.3
Upper Lemanak River		8 - 12 (both sexes)	152	21.7
(interior)				
Third division	Iban	> 15 (female)	137	38.7
Kanowit District				
(Rejang River interior)				
Kanowit Town	Iban, Chinese	7-12 (both sexes)	542	0.7
Fourth division	Kayan, Kenyah	10-14 (female)	110	78.0
Tinjar River	Iban	> 15 (female)	157	77.7
		10-14 (female)	114	78.6

Source: Tan (1982)

Table 22
Proportion of women who breastfed second youngest child by current age and parity

	Parity			
Current age	1-2	3-4	> 4	Total
< 25	0.83	0.87	0.80	0.84
25-34	0.74	0.82	0.88	0.80
> 34	0.60	0.71	0.89	0.80
Total	0.77	0.80	0.89	0.81

Source: Subbiah and Looi (1988)

Table 23
Mean duration (in months) of breastfeeding (second younger child) by selected characteristics

	N	Unadjusted	Adjusted
			by no. of live births
All	1439	6.0	6.0
Current age			
< 20	14	3.0	4.1
20-24	207	4.6	5.5
25-29	356	5.7	6.1
30-34	308	5.7	5.5
35-39	169	6.7	5.9
40-44	68	6.7	8.1
45-50	15	15.4	13.4
No. of live births			by current age
1	259	3.6	4.1
2	269	5.8	6.1
3	249	5.8	5.8
4	159	6.7	6.4
5	88	7.4	7.0
6	55	7.7	7.1
7	30	9.4	8.7
8+	64	9.7	8.6
Ethnic group			by current age and number of live births
Malays	768	7.8	7.7
Chinese	273	1.8	1.9
Indians	121	3.6	3.7
Others	11	7.7	8.0
Stratum			
Urban	442	3.9	4.0
Rural	731	7.2	7.1
Education (years)			
No schooling	117	8.8	7.8
1-6	520	6.7	6.6
7-12	451	4.8	5.3
>12	85	2.9	3.2
Husband's income			
< $400	228	8.6	8.5
$ 400-699	408	6.8	6.9
$ 700-999	220	5.1	5.1
$1000-1499	156	4.3	4.1
> $1499	145	2.4	2.5
Currently working ?			
Yes	498	5.8	5.7
No	675	6.1	6.2

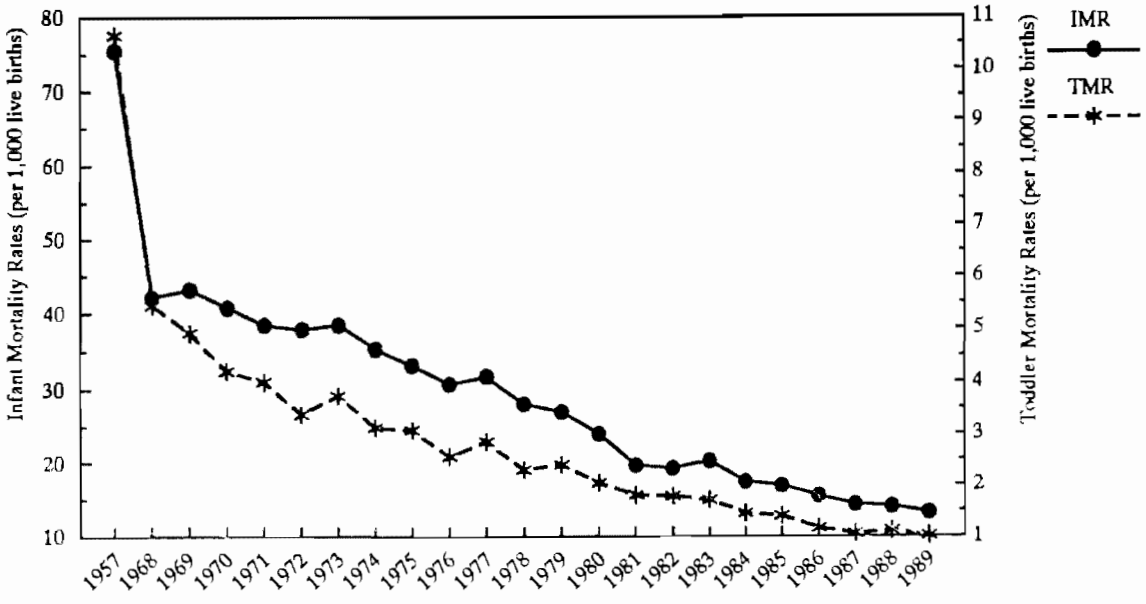
Source: Subbiah and Looi (1988)

Table 24
Proportion of women who breastfed their second last child by selected variables

	N	Unadjusted	Adjusted by current age and number of live births
All	1800	0.80	0.80
Ethnic group			
Malays	1127	0.96	0.96
Chinese	496	0.45	0.45
Indians	152	0.74	0.74
Others	26	0.92	0.92
Stratum			
Urban	635	0.70	0.80
Rural	1166	0.86	0.80
Education (years)			
No schooling	237	0.81	0.73
1-6	957	0.79	0.76
7-12	534	0.80	0.86
>12	37	0.88	0.99
Husband's income			
< $400	385	0.89	0.91
$ 400-699	628	0.85	0.86
$ 700-999	334	0.76	0.75
$1000-1499	240	0.70	0.69
> $1499	214	0.66	0.63
Currently working ?			
Yes	685	0.79	0.78
No	1116	0.81	0.81

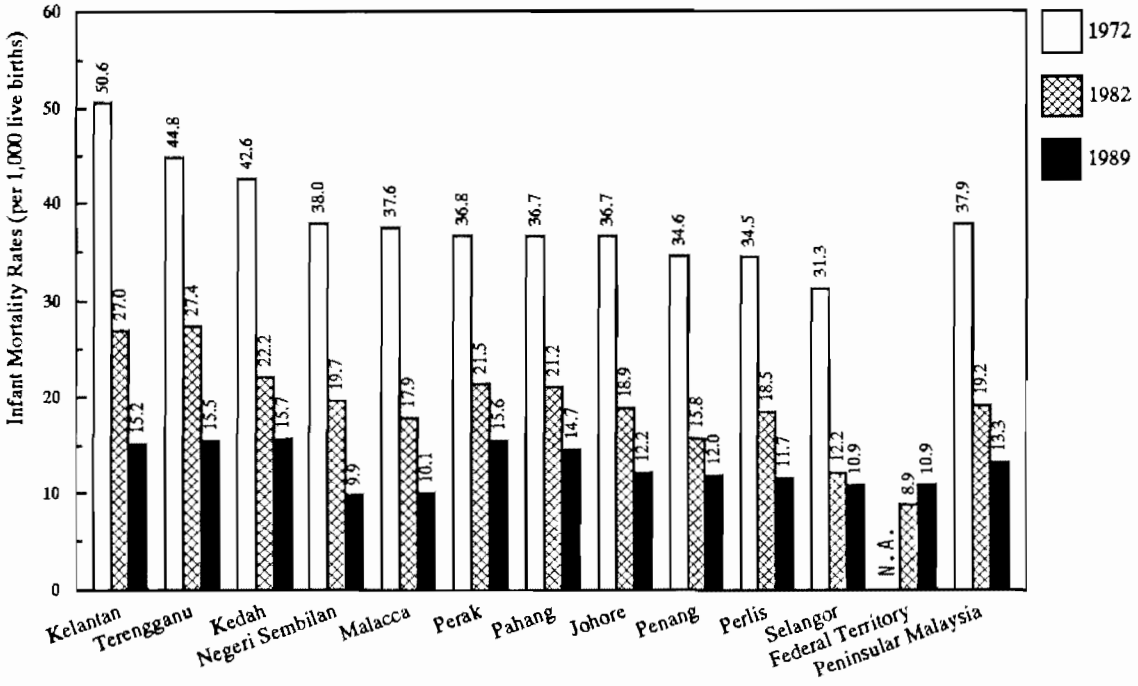
Source: Subbiah and Looi (1988)

Figure 1
Infant and Toddler Mortality Rates in Peninsular Malaysia, 1957 to 1989



Source: Plotted using data from reports by Department of Statistics

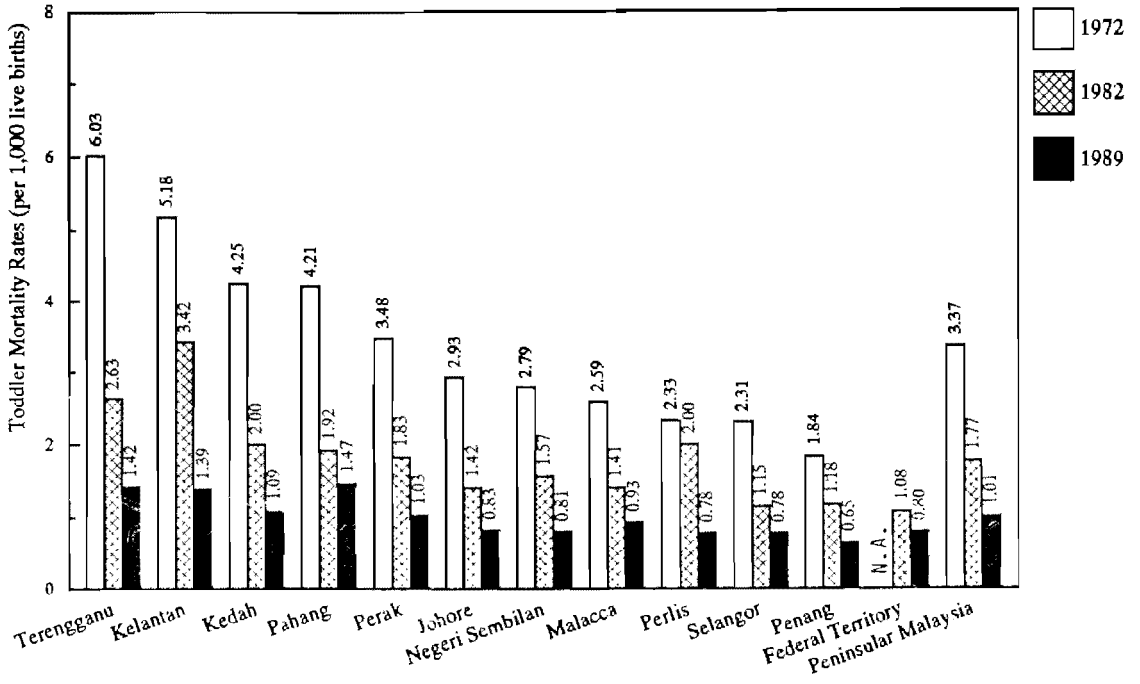
Figure 2
Infant Mortality Rates of Various States in Peninsular Malaysia, 1972, 1982 and 1989



Source: Plotted using data from reports by Department of Statistics

N.A. = data not available

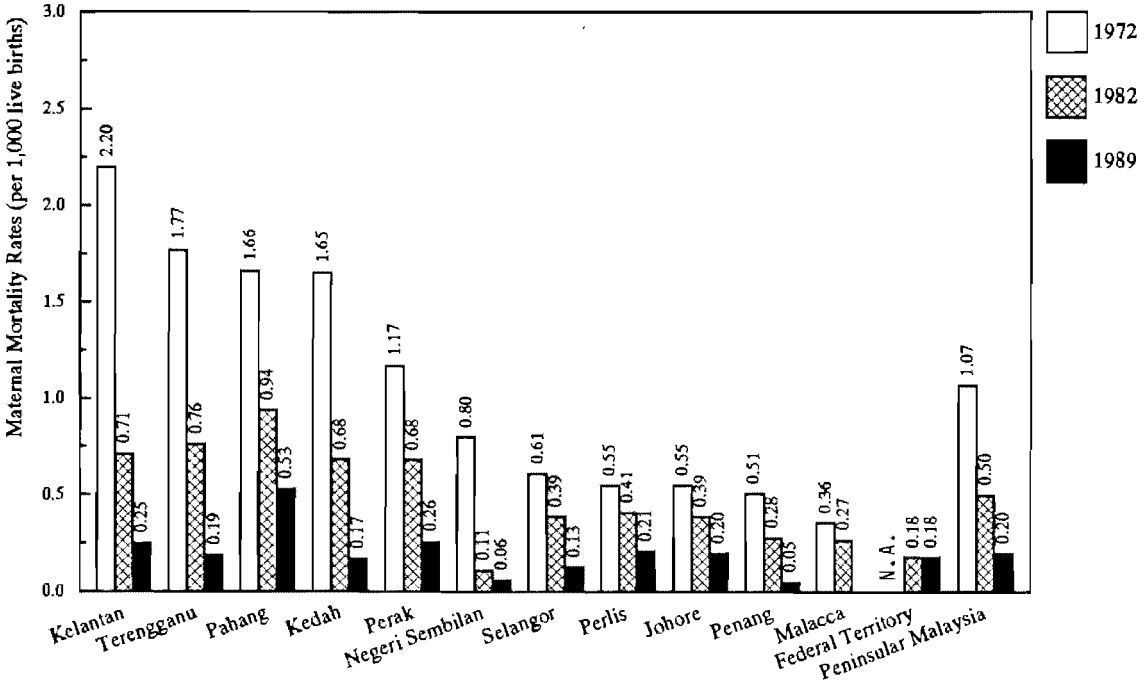
Figure 3
Toddler Mortality Rates of Various States in Peninsular Malaysia, 1972, 1982 and 1989



Source: Plotted using data from reports by Department of Statistics

N.A. = data not available

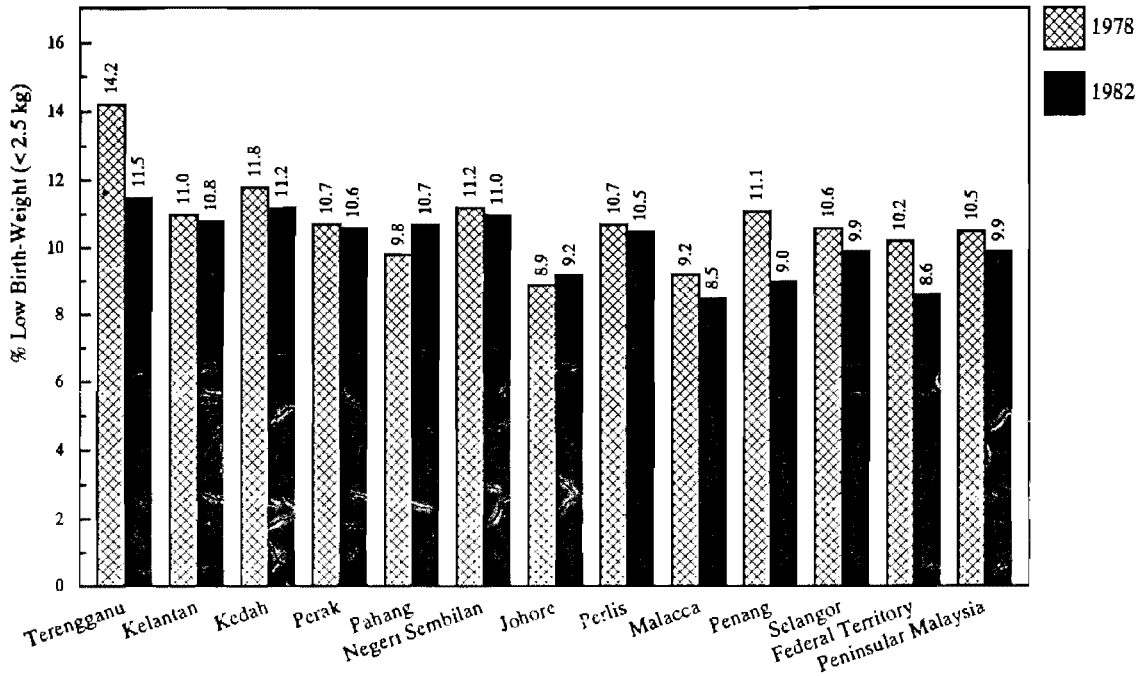
Figure 4
Maternal Mortality Rates of Various States in Peninsular Malaysia, 1972, 1982 and 1989



Source: Plotted using data from reports by Department of Statistics

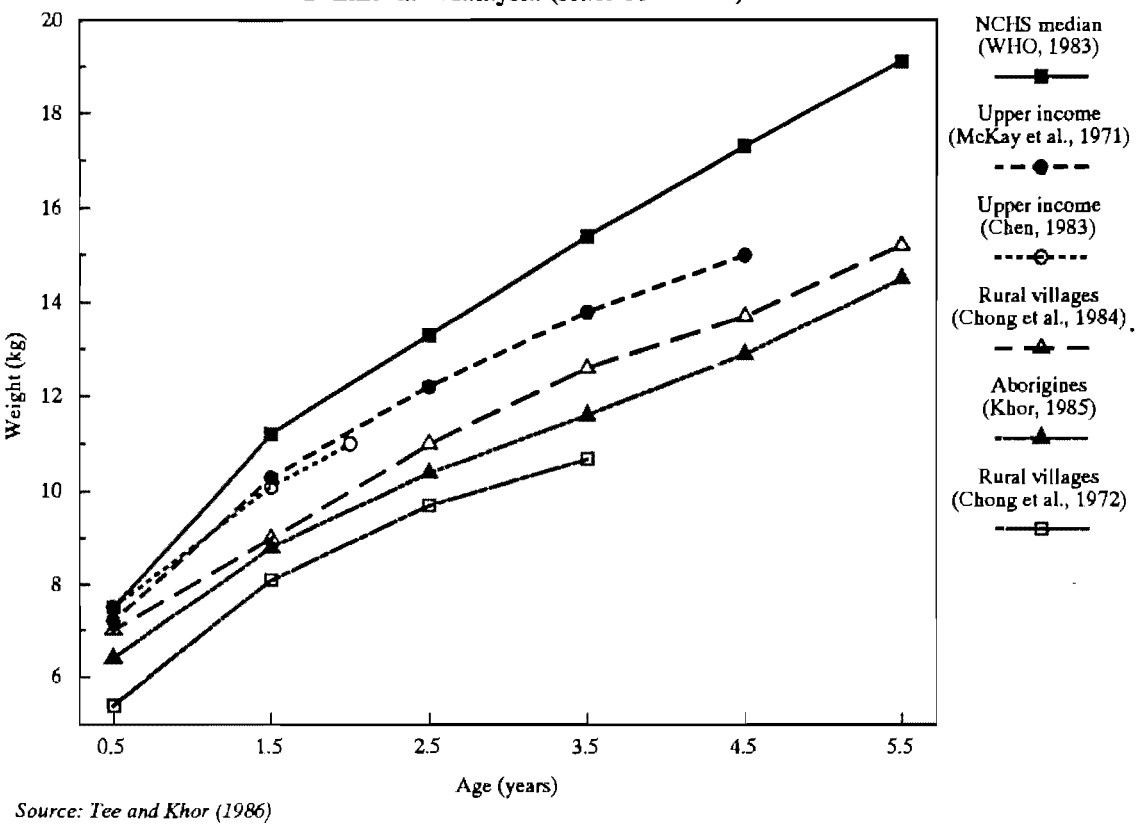
N.A. = data not available

Figure 5
Prevalence of Low Birth-Weight in Various States of Peninsular Malaysia, 1978 and 1982



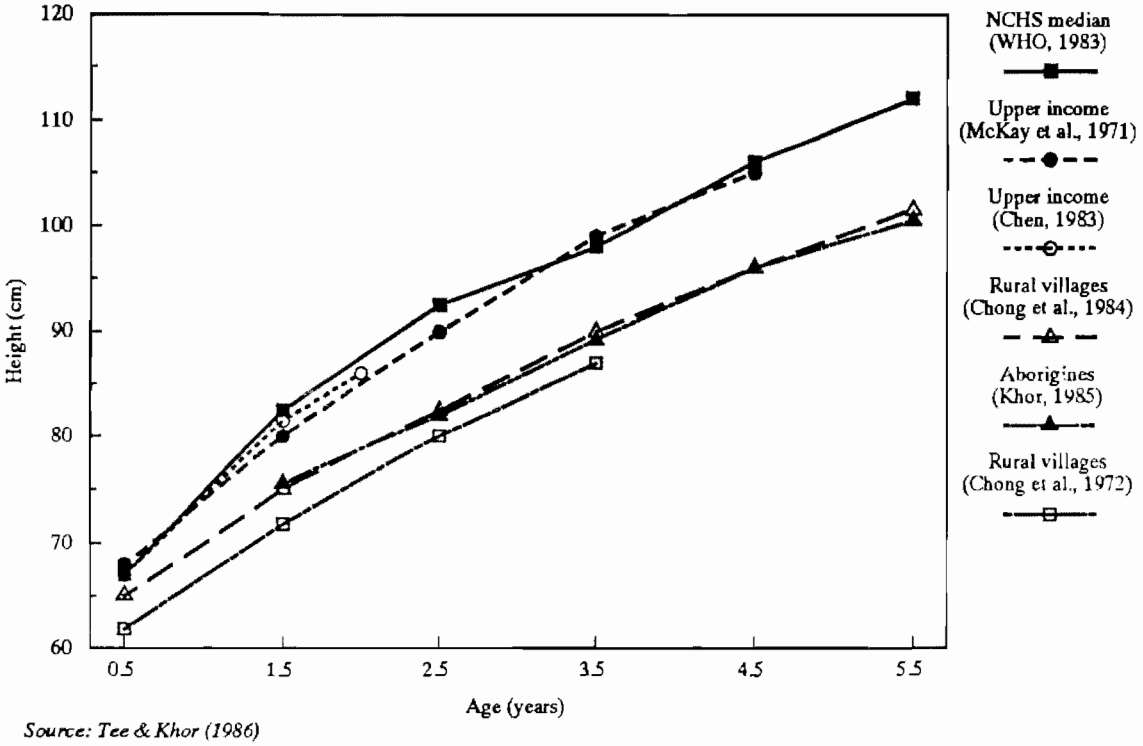
Source: Plotted using data from reports by Department of Statistics

Figure 6
Weight-for-Age of Malay Pre-School Children, Peninsular Malaysia (sexes combined)



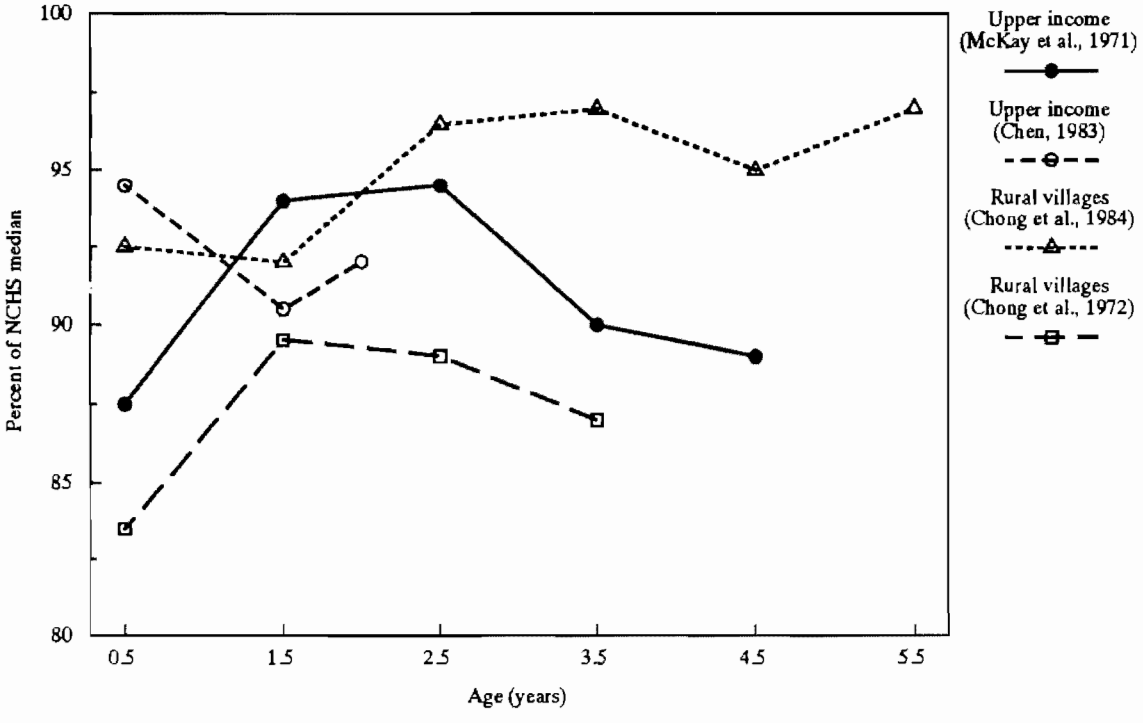
Source: Tee and Khor (1986)

Figure 7
Height-for-Age of Malay Pre-School Children, Peninsular Malaysia (sexes combined)



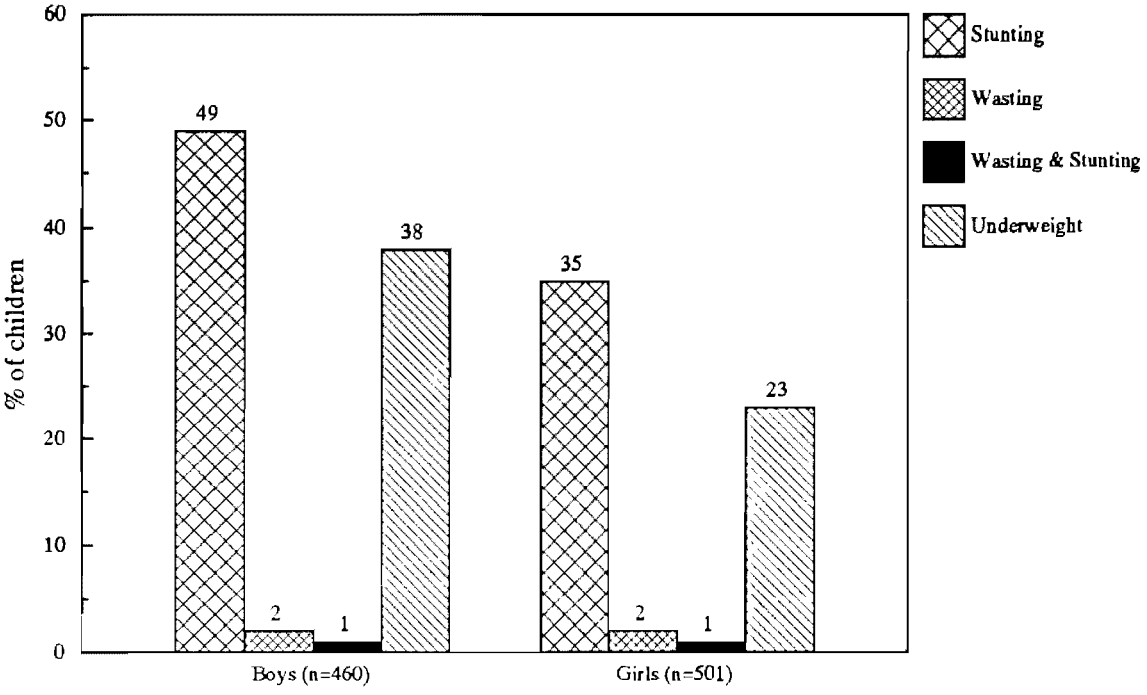
Source: Tee & Khor (1986)

Figure 8
Weight-for-Height of Malay Pre-School Children, Peninsular Malaysia (sexes combined)

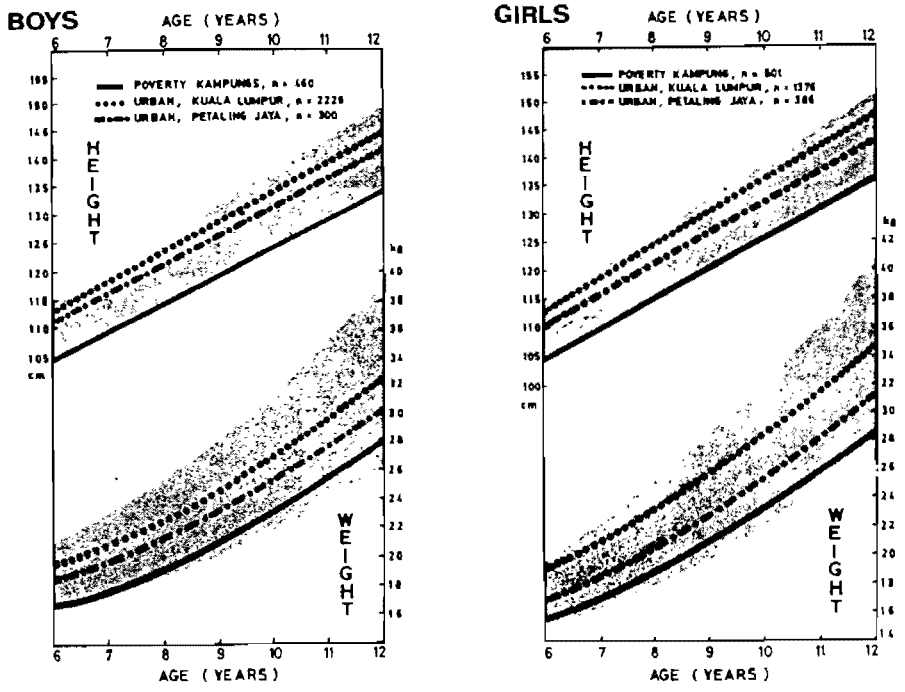


Source: Tee & Khor (1986)

Figure 9. Prevalence of Growth Retardation in Primary School Children of Rural Villages, Peninsular Malaysia



Source: Chong et al. (1984)

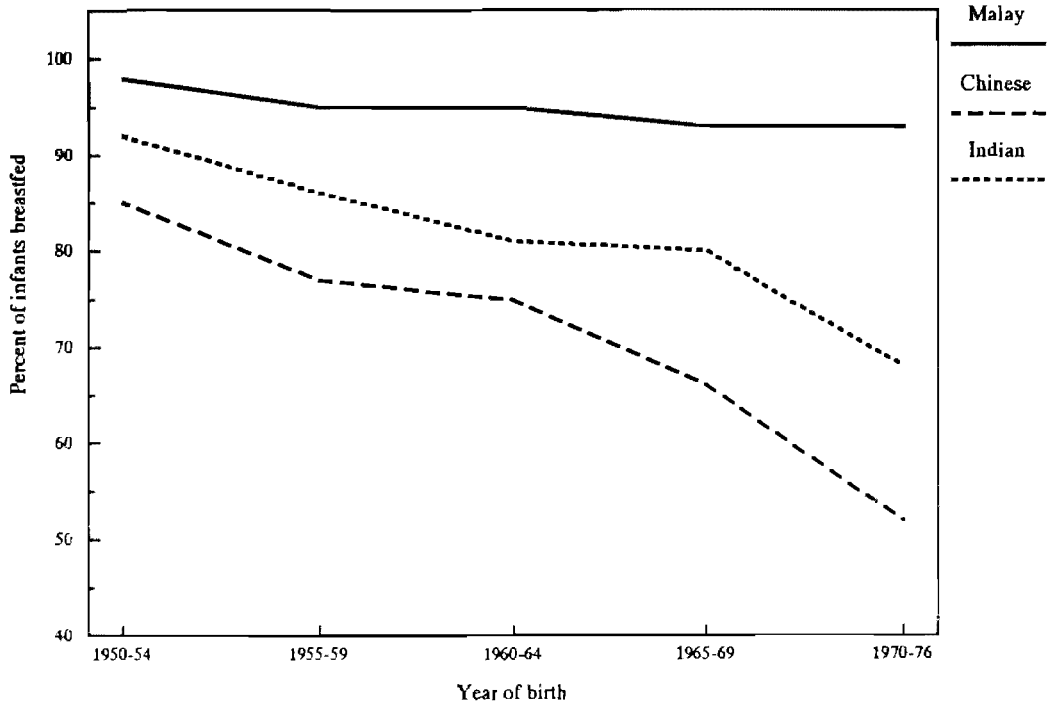


(a) (b)

Figure 10. Comparative Growth Achievement of (a) Primary School Boys, and (b) Primary School Girls in Selected Rural Villages and Urban Areas

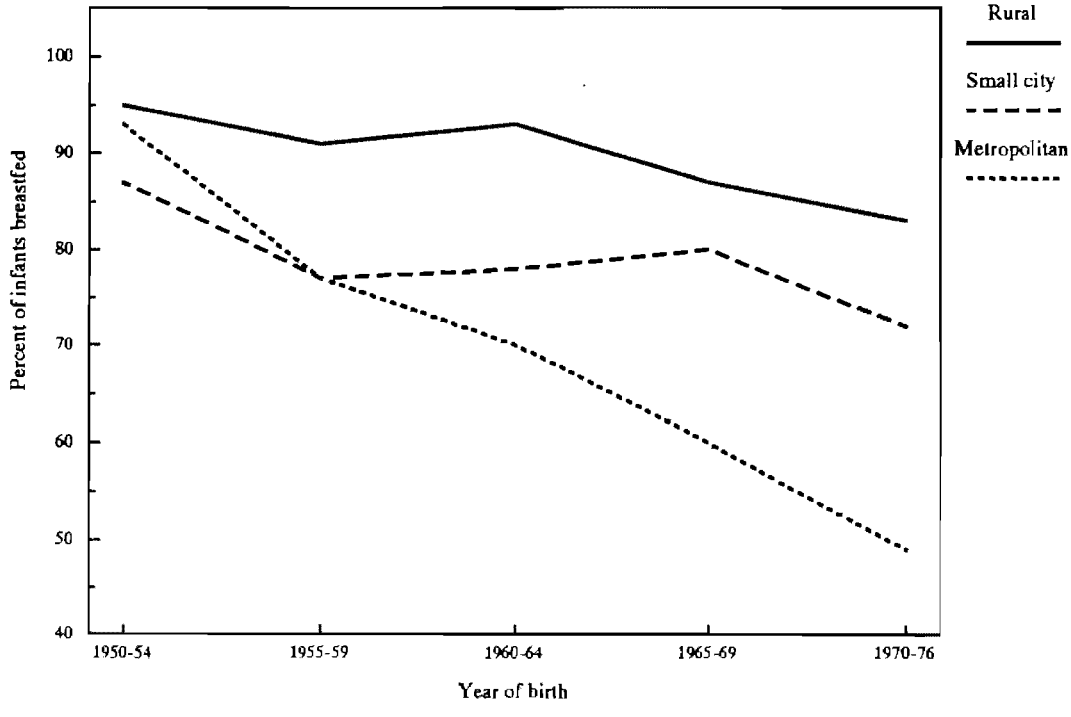
Source: Chong *et al.* (1984)

Figure 11. Percentage of infants breastfed, by ethnic group and year of infant's birth, Peninsular Malaysia, 1950-76



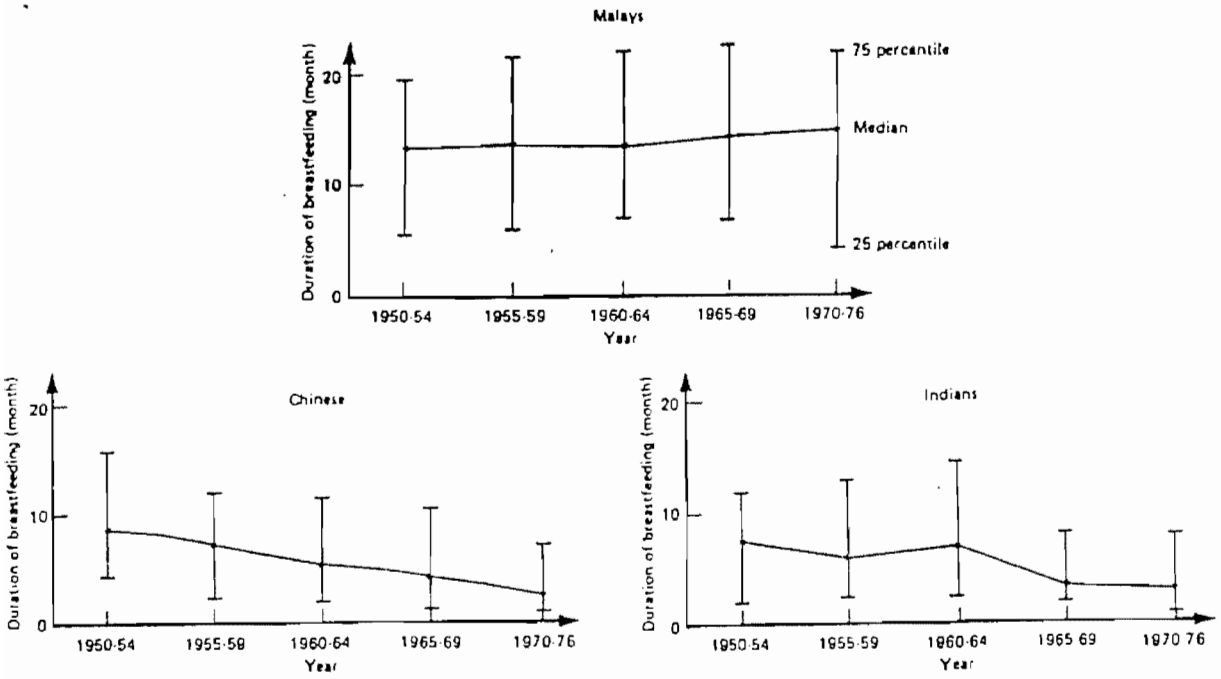
Source: Haaga (1986)

Figure 12. Percentage of infants breastfed, by urban/rural residence and year of infant's birth, Peninsular Malaysia, 1950-76



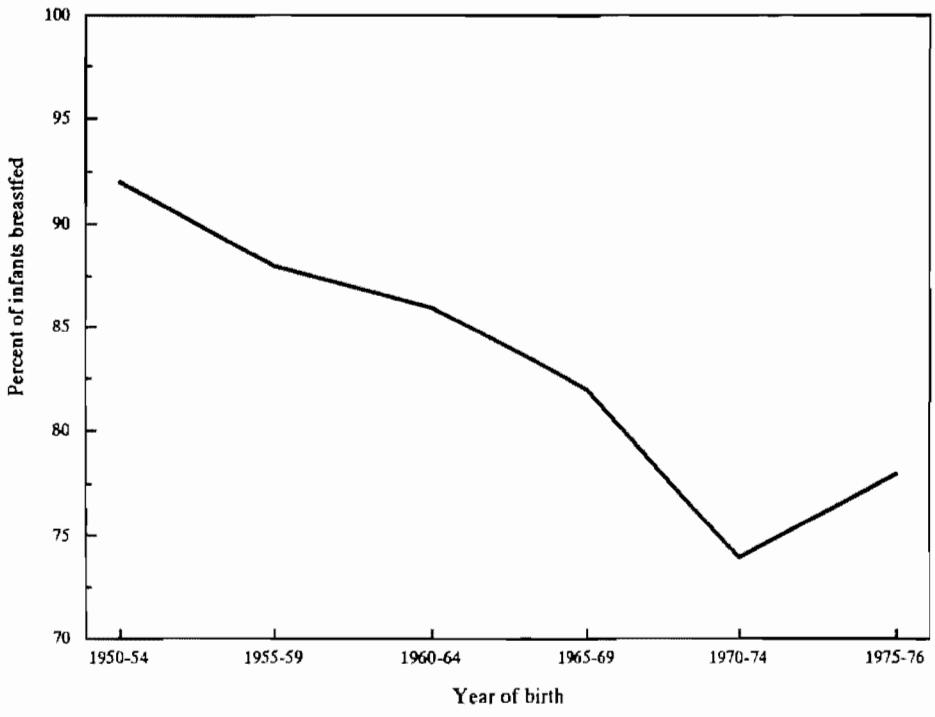
Source: Haaga (1986)

Figure 13. Duration of breastfeeding for breastfed infants, by ethnic group and year of infant's birth, Peninsular Malaysia, 1950-76



Source: Haaga (1986)

Figure 14. Percentage of infants breastfed, by year of infant's birth, Peninsular Malaysia, 1950-76



Source: Haaga (1986)