

The nutritional impact of the Pre-School Health Programme at three clinics in Central Province, Kenya

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Jan Hoorweg and Rudo Niemeijer

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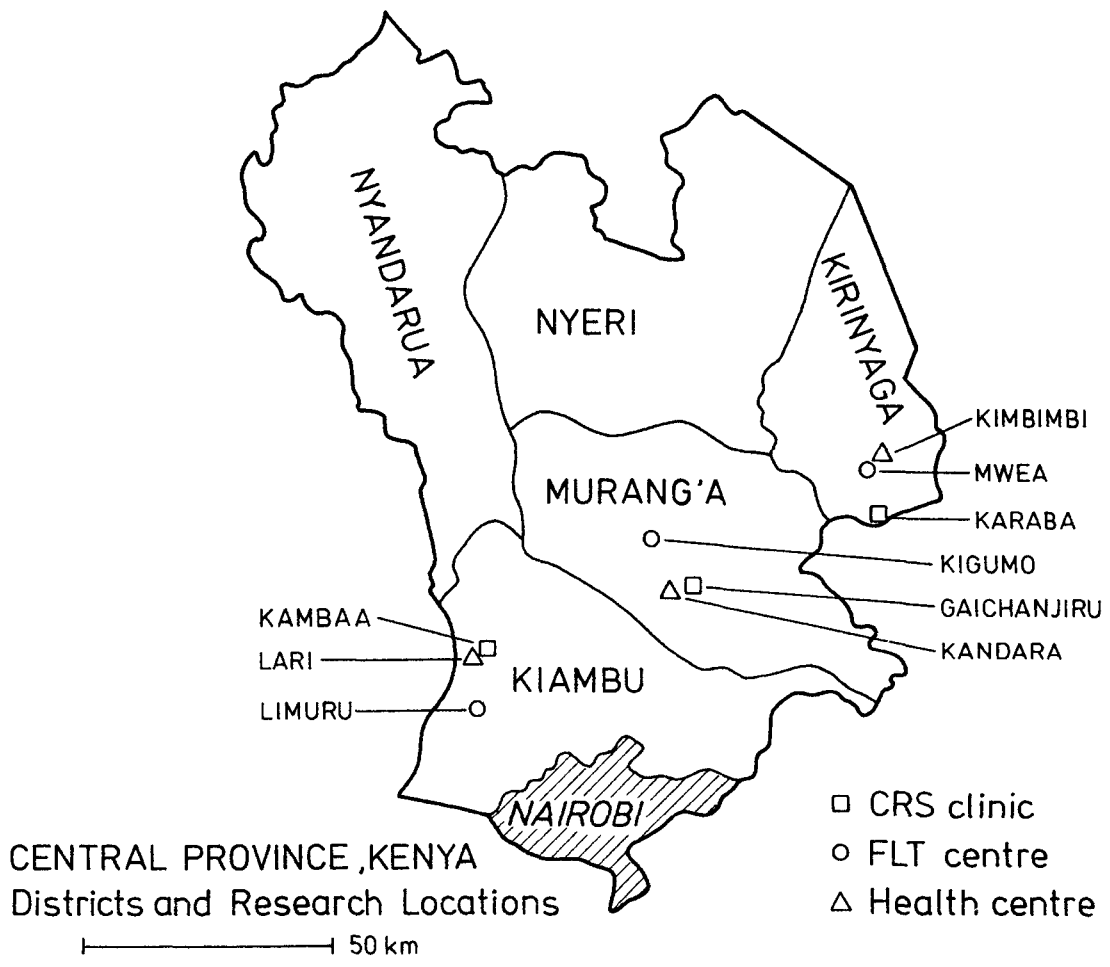
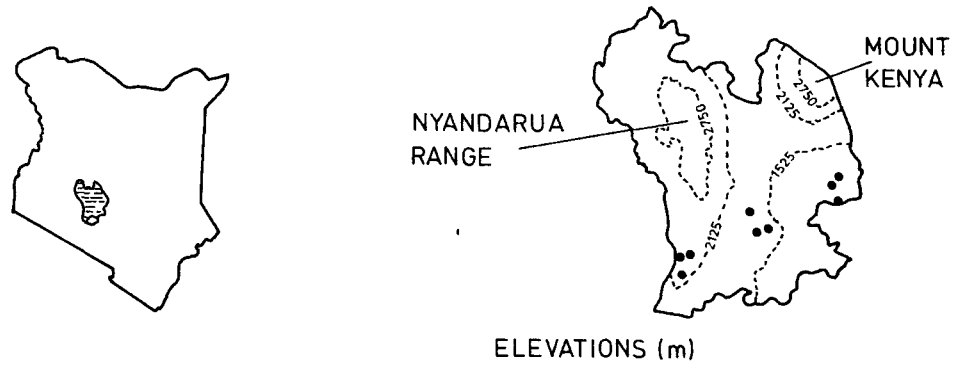
SUMMARY

This report contains an account of a study of the effects of the Pre-School Health Programme at three clinics in different ecological zones in Central Province, Kenya.* This nutrition programme, organized by Catholic Relief Services, aims at children between the ages of 6 months and 5 years. Mothers and children are required to pay monthly visits to the clinics, children are weighed, nutrition education is given and supplementary food rations are distributed.

Two groups of mothers were selected for interviewing: recent entrants and longtime participants. No major social or economic differences exist between the two groups although there are indications of a shift in admission criteria in recent years, particularly at the clinic in the higher-lying area. In general, the programme draws participants from the poorer sections of the population. The study concentrates on the following aspects: (a) nutritional knowledge; (b) maternal food preferences; (c) food consumption of the children during the previous day; (d) nutritional status of the children.

The two components of the programme, nutrition education and distribution of food rations, both have discernible effects. Knowledge and preferences of the mothers are somewhat improved while the nutritional status of the children who have participated for a long time also shows a beneficial effect: they keep on growing at the level at which they entered the programme. However, the education does not influence the diets prepared by the mothers. The strength of the programme, therefore, appears to lie in the food distribution rather than in the educational component.

* This study of child nutrition in Kenya is part of a larger research undertaking: The Nutrition Intervention Research Project (NIRP). A working version of the present report was previously circulated as NIRP Report No. 14.



1. INTRODUCTION

Protein-energy malnutrition among young children is one of the major nutritional problems in many developing countries. Compared to other African countries, the situation in Kenya is generally estimated to be relatively favourable in that there is probably enough food grown to provide for the population. There is, however, a considerable incidence of childhood malnutrition, and it has been reported that in certain areas up to 40% of the young children have very low weights (Blakhart, 1974; CBS, 1977). Malnutrition occurs frequently during the first years of life due to the special food requirements of the very young child and due to frequent infections. There is overwhelming evidence that, at this age, malnutrition results in the impairment of intellectual development (see Brozek, 1978). The chronic aspects of malnutrition in particular appear to be responsible for such impairment (Hoorweg and Stanfield, 1976).

For these reasons, nutrition intervention programmes aimed at improving diets in developing countries, are usually focussed on the small child and its mother. In Kenya, as in most African countries, different forms of intervention exist (PBFL, 1973). A primary distinction can be made between curative and preventive programmes. The former concentrate on children who already suffer from various degrees of malnutrition, while the latter tend to focus on mothers of young children in general, or even on the population as a whole.

A second distinction, depending on the type of approach adopted, can be made between feeding programmes, supplementation programmes, and educational programmes. Feeding programmes provide food which is eaten on the spot (e.g. at crèches, schools, in-patient clinics). Supplementation programmes supply food free of charge, or at reduced prices, whereby preparation and distribution is left to the family concerned. The aim of the educational programmes in general is to provide information, to influence food preferences and to foster certain food habits with a view to improving the diet. Although different approaches are often combined within a single programme, e.g. educational programmes comprising food distribution, the type of intervention that is most effective is still a point of discussion.

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Which particular form of intervention is most suitable probably depends on the specific ecological environment and on the individual family at which it is aimed. It is indeed likely that the best results with nutrition education are obtained in reasonably fertile areas and among families that are not too poor, while supplementation or feeding programmes are best suited to the conditions prevailing in the less fertile areas, and among poor families. For a proper assessment of nutrition intervention programmes it is necessary to view results against the background of the specific social environment in which the programmes operate.

The need to evaluate existing nutrition intervention programmes is generally recognized (W.H.O., 1974). Evaluation is important for several reasons. It is necessary to assess results to gain insight into effective means of intervention and hence to improve existing methods. The most ambitious aim of evaluative research is to create a basis for the development of strategies for selective nutrition intervention, i.e. to establish which types of nutrition intervention are most suited for specific sections of the population. However, to achieve this aim evaluation must comprise more than a simple and direct assessment of end-results and entail an assessment of 'process', i.e. an analysis of why and how the observed effects are achieved (Suchman, 1967). Consequently it is necessary to study not only the nutritional status of children, but also the knowledge, attitudes and behaviour of the mothers as well as other social factors which may influence the diet and nutritional status of the individual child. Such comprehensive evaluation has until recently rarely been undertaken, although of late progress is being made in this direction (see Klein et al, 1979).

The general aim of the Nutrition Intervention Research Project (NIRP) is to contribute to this field of knowledge by studying nutrition programmes for children under five among the Kikuyu living in rural areas in Central Province, Kenya (NIRP, 1976; 1978; 1980). The specific objectives of the project are to provide systematic knowledge concerning the effectiveness of these different nutrition programmes and to develop a model for the evaluation of such services. The effects of the different types of nutrition intervention are studied in relation to differences in the ecological, economic, and social environments of the participants.

Evaluation studies have been carried out concerning three programmes: Family Life Training Programme (Ministry of Social Services), Pre-School Health Programme (Catholic Relief Services) and the Nutrition Field Workers (Ministry of Health). The first programme covers a number of Family Life Training Centres (FLTC) in different districts throughout Kenya. At these centres women with malnourished children are admitted for a three week course consisting primarily of nutrition and health education. These FLTcentres have much in common with what are internationally known as Nutrition Rehabilitation Centres. The programme is aimed at malnourished children below five years of age but siblings are admitted as well. The Pre-School Health Programme (CRS) is a well-known, world-wide programme aimed at children between the ages of 6-60 months in needy families. Once the children are enrolled in the programme, their mothers are required to pay monthly visits to the clinic, where the children are weighed, nutrition education is given and where mothers receive supplementary foods for the young child against payment of a nominal sum. Nutrition Field Workers are employed by the Ministry of Health and many of them work as members of the MCH team at Health Centres, where they give nutrition education to mothers attending MCH clinics and monitor the under-fives.

From each of these three programmes one centre was selected in the three following ecological zones: a semi-arid area in the lower plains, a more fertile area in the coffee belt and an area of high agricultural potential at high altitude.

Since the present intervention programmes concentrate their activities largely on children between the ages of six months and five years, a series of nutrition surveys was conducted among children of this age group, independently from the evaluation studies but during the same period. These surveys were conducted in Kigumo division, Muranga, in two areas situated at different altitudes. The preliminary results of these surveys will be published in two parts, the first concentrating on the socio-economic results (NIRPa), the second on the diets and anthropometry of children under five (NIRPb). The studies at the Family Life Training Centres and at the Health Centres are published as companion reports to the present one.

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This report is exclusively concerned with the Pre-School Health Programme sponsored by Catholic Relief Services as it functions at what we call CRS clinics. Prior to a description of the programme, and the method of evaluation, brief descriptions will be given of the three research areas and of some relevant aspects of Kikuyu society, food habits and the general nutritional status of Kikuyu children.

2. THREE RESEARCH AREAS

The selection of Central Province as area of study was based on the fact that it offers a wide variety of ecological conditions while being inhabited mainly by the same ethnic group: the Kikuyu. Restricting the studies to one ethnic group facilitates the evaluation of the programmes since it avoids the complications that would result from differences in food habits between ethnic groups.

Central Province is a region of considerable variations in altitude, temperature and rainfall. Consequently there is a considerable diversity in agricultural and economic potential. The topography of the province is dominated by Mount Kenya and the Nyandarua range (the former Aberdares). There are two distinct rainy seasons: long rains in April and May and short rains during the month of November. The numerous ridges consist of rich red soils which allow the cultivation of a variety of crops. As far as arable land is concerned Central Province compares favourably with the rest of Kenya where over 70 per cent of all the land is of poor quality and suitable only for wild life and the poorest type of ranching. In Central Province, however, 70 per cent of the land surface is suitable for farming.

The population of the province was estimated to be over 2 million people in 1977, about 15 per cent of Kenya's total population (CBS, 1972). Since the province accounts for less than 3 per cent of Kenya's land surface, it has a relatively high population density. The majority of the population in the province (c. 80%), lives on the midslopes of Mount Kenya and the Nyandarua range, an area which accounts for about 35 per cent of the total provincial territory. Also the majority of the population (c. 80%), lives on smallholdings. Although smallholders in Central

Province are more orientated towards export crop production than farmers elsewhere in Kenya, smallholder agriculture in Central Province is still primarily orientated towards the production of food crops and livestock products. The standard of living of the majority of the rural population is low. (The above figures and all other information in this section are derived from a report by Meilink (1979) on smallholder farming in Central Province. This report was compiled specifically for the Nutrition Intervention Research Project with special reference to the research areas.)

The province is divided into five districts, Nyeri and Nyandarua to the north and Kiambu, Muranga and Kirinyaga (the three districts with which we are concerned) to the east and south (see map on page 4). The districts Kiambu, Muranga and Kirinyaga may be divided into several distinctly different ecological zones, on the basis of altitude, rainfall and vegetation ⁽¹⁾. From high to low altitude these are the following.

- (Zone I) Moorland, grassland and barren lands at high altitudes which are largely uninhabited and of no relevance to this research.
- (Zone II) Forests and derived grasslands and bushlands with a potential for forestry and intensive agriculture and suitable for food crops such as hybrid maize, beans, Irish potatoes and vegetables as well as cash crops such as pyrethrum and tea. This zone and zone III are both densely populated.
- (Zone III) Land without forest potential, with variable vegetation and good agricultural potential. Subsistence crops such as hybrid maize, beans or cow peas are grown along with sweet potatoes and bananas. Coffee is the main cash crop.
- (Zone IV) The semi-arid zone of grass and woodland which is of marginal potential, but offers possibilities for irrigation agriculture. In this drier zone drought-resistant grains and root crops are the main food crops. Pigeon peas, grams and sisal are grown as cash crops. ⁽²⁾

One research area, with a Health Centre, a CRS clinic and a FLT centre was selected in each of these three zones. The three research areas are situated in Limuru division of Kiambu district; in the Kandara and Kigumo divisions of Muranga district; and in the Mwea division of Kirinyaga

district⁽³⁾. The Limuru area is situated at the highest, the Mwea area at the lowest altitude, and the Kandara-Kigumo area in between. Population densities in the three areas in 1969 were 410, 390 and 107 per km² respectively.⁽⁴⁾

Not counting coffee and tea cultivation, there is little difference between smallholders in Kiambu and Muranga in terms of agricultural productivity and income. In Kirinyaga smallholders reap only half the value per acre under food crops. But, this is compensated by the fact that the average smallholder farm is larger than in the two other districts. The average holding in Kiambu is estimated at 1.8 acre, in Muranga at 2.3 acre and in Kirinyaga at 3.0 acre (Meilink, 1979: 27). The major differences between the research areas, however, are due to ecological factors, as evinced by the following brief descriptions of the areas.

The Limuru research area lies within Limuru division on the southern slopes of the Nyandarua range, at an altitude of over 2300 m. It extends from Limuru town to Lari and Kambaa⁽³⁾ at a distance of 10-15 km to the north respectively (see map, p. 4). The area lies in ecological zone II, soils are rich, rainfall is high (c. 1400 mm), and agricultural potential is high. Unlike in the lower parts of the division, the important cash crops, tea and coffee, are not grown in the Limuru research area. The main food crops are maize and potatoes, and because of the altitude most food crops can only be harvested once a year. Important cash crops in 1977 were wattle and pyrethrum. Pears are another important fruit crop grown exclusively in this division and, as elsewhere in the district, incomes were supplemented by a variety of horticultural products: tomatoes, cabbages, plums, carrots, cauliflowers and onions. Milk production was another important source of income, over 2.5 million litres fetched the farmers about 1/- sh per litre in 1977.

Unlike the Limuru and Mwea research areas, each of which falls in a separate administrative division, the Kandara-Kigumo research area lies in two divisions both situated on the Eastern slopes of the Nyandarua range. The Kandara-Kigumo research area comprises the villages of Kigumo, Gaichanjiru and Kandara, at distances of 10-20 km from each other⁽³⁾ and at middle altitude, between 1500 and 1700 metres. This area corresponds with ecological zone III with its rich fertile soils, c. 1150 mm of rainfall, and good agricultural land. The area is situated in the main coffee growing belt. Kandara alone grows 50 per cent of the district's

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coffee and counts no less than 33 coffee factories. According to conservative estimates for the top year 1977, some 85 per cent of the smallholders growing coffee earned about 4,000 sh from this crop. A lesser cash crop is wattle. Major food crops are maize, beans and Irish potatoes, with bananas grown widely as an interplanted crop. At this altitude maize and other food crops are harvested twice a year; onions, cabbages and sweet potatoes are also widely grown. In both districts dairy co-operatives are absent or inadequately organized; milk production is consequently of little cash importance and is mostly used for home consumption.

The Mwea research area lies at the lower end of Mwea division in Kirinyaga district and is situated on the plains south of Mount Kenya and east of the Nyandarua range. This research area comprises the villages of Karaba, Wamumu and Kimbimbi⁽³⁾, all three near the Mwea-Tebere Irrigation Scheme at 10 to 15 km from each other. The area lies at the lowest altitude of 1100-1200 m. with sparse rainfall, c. 900 mm on average. This is grass woodland (ecological zone IV), semi-arid, and far less fertile than the other two research areas. It is of low agricultural potential except for the irrigation area where rice is grown.

At present the Irrigation Scheme involves about 3,000 tenants and their families; a population of c. 20,000. The Scheme started in 1961, the tenants were given four acre plots and were settled in villages of about 80 households. Since then both cultivated area and yields have grown steadily. Presently there are 35 villages. By 1977 gross rice earnings were just over 1 million K£ and the average net income after deduction of loans, and water and ploughing fees was 7,200 sh. per tenant. In some of the villages tenants are given additional land to grow food crops for home consumption, but in most cases tenants have little or no opportunity to grow food crops and must therefore spend much of their income on food. The other smallholders in this low-potential area grow the usual food crops such as maize, beans and bananas, and try to derive an additional income from the cultivation of cotton and grams.

The major cash crop in the Kandara-Kigumo area is coffee; and in the Limuru area horticultural crops and dairying constitute the main source of cash income. As a consequence of the high coffee price of the last ten years, the middle area offered the best opportunities in terms of cash crop production; the upper Limuru area follows next, while the Mwea area offered the least opportunities in this respect. This is also evinced by the agricultural value per acre of the leading cash crops in the areas.

In 1977, in Kiambu, horticultural crops fetched about 2,025 shillings per acre; in Mwea, rice fetched 1,560 sh/acre and in Muranga, coffee 15,700 sh/acre⁽⁵⁾ (Meilink, 1979: 28).

To sum up, the three research areas differ in two important aspects: first, the overall agricultural potential and, second, the proceeds from cash crop cultivation. The Limuru and Kandara-Kigumo area differ little in general potential although the Limuru area is probably slightly better off in this respect. In recent years the Kandara-Kigumo area has been favoured most as regards the income from cash crops. In both respects, the lower research area, Mwea, offers the least favourable environment.

3. KIKUYU SOCIETY, KIKUYU FOOD HABITS AND THE NUTRITIONAL STATUS OF YOUNG CHILDREN.

The Kikuyu belong to the North-east Bantu-speaking peoples, and in 1969 they numbered about 2,200,000. In Kiambu, Muranga and Kirinyaga districts 96 per cent of the population was Kikuyu in that year (MoFEP, 1970). The history of the Kikuyu has been traced back several centuries by Muriuki (1974), and it is fairly well established that they migrated south along Mount Kenya in the 15th and 16th century, subsequently dispersing through Muranga and later towards Nyeri to the North and Kiambu to the south. The first contacts with Europeans and European rule date from the end of the 19th century. At that time the Kikuyu numbered perhaps 500,000 people organised in a system of age groups and lineages. Age groups and membership of the extended family constituted an important source of identity for the individual. Political decision-making and land ownership was vested in the lineages. There were no chiefs in this largely egalitarian society, and only limited social stratification.

Kikuyu society has undergone a dramatic change since the beginning of this century. The age-group system was soon discontinued and the nuclear family became increasingly important. There has also been a shift towards individual landownership culminating in the land consolidation of 1955-65. Commercial farming on smallholdings has assumed great proportions. Social stratification has become much more prominent and is now an important factor in Kikuyu society. The reasons and mechanisms behind this transformation have been admirably described by Tignor (1976); land

reform has been studied by Sorrenson (1966). Contemporary daily life of the Kikuyu must be viewed against the background of these sweeping and profound social changes.

Today the residential pattern of Kikuyu in the rural areas is patri- or neolocal, sons marry and settle on the land of their fathers or acquire land elsewhere to strike out on their own. The most common residential situation is that land is occupied by one nuclear family, or divided between a father and his sons. Most people live in houses built with mud on a wooden frame, with a corrugated iron roof. In small houses the kitchen is often combined with a living room, but in the larger houses, it is usually a separate room or even a separate building. The clearing around the house is where guests are received and other activities take place. In cases where the land is shared by several households the houses are usually built close together in one large compound, although the households remain otherwise independent.

The vast majority of households consists of the nuclear family: man, wife and children.⁽⁶⁾ In the Muranga survey which covered 300 households with children between the ages of 6 and 60 months, and from which most of the data in this section are derived, it was found that no less than 80% of the households were nuclear families. The average family size varied between 6 and 7 people. Nearly all the children lived with their parents.⁽⁷⁾ The incidence of polygamy was low (NIRPa).

The Kikuyu in the rural areas earn their living in a variety of ways. The NIRP survey found that 45% of the husbands had regular employment or were self-employed, 45% did casual labour of some kind, while only 10% reported no gainful activity at all outside their farm. More than half the husbands worked as migrant labourers elsewhere and visited their homes with varying regularity. The vast majority of the population in Central Province lives on smallholdings, the average holding being 2 to 3 acres. The percentage of landless people and people with very small farms varies throughout the province but is highest in Kiambu district near to the Nairobi agglomeration. Whenever they have land available, people grow foodcrops for their own consumption; type and extent of commercial farming varies considerably. In the NIRP survey a distinction was drawn between 'cash farmers' and 'subsistence farmers', on the basis of the area planted with coffee, sale of food

crops, number of cattle, number of chickens and whether farm labourers are employed by the household. This distinction is, of course, not absolute, but one of degree.

Starting out from these two important factors, commercial farming and employment, it is possible to distinguish three socio-economic strata among the households in the NIRP survey: 'affluent', 'intermediate' and 'poor' households. In the 'poor' households there is no question of regular employment or serious commercial farming; these households depend on subsistence farming and an irregular and meagre income from the day labour of the husband, the wife or both. Households in the intermediate group derive a cash income from either commercial farming or regular employment (this includes the self-employed). The 'affluent' households, enjoy a double income: they have both resources at their disposal. This stratification, which reflects the share of the family in the money economy, shows a striking correlation with the proportion of households which report that they are able to grow enough food for home consumption.

Most differences between rural Kikuyu families can, in effect, be attributed to differences in social class or in family organisation. Family organisation is determined primarily by the domestic stage that a family has reached. In the NIRP survey three stages were distinguished: "young" families with children under six, "middle-age" families with children under seventeen and "elder" families where the eldest child has reached the age of seventeen or more. Naturally, every additional child that is born in the family means another mouth to feed and more domestic work, but older children, on the other hand, offer domestic help. Although the size of the family is largely determined by its domestic stage, the number of children can still vary considerably. An important distinction must be drawn in this respect between pre-school children (0-5yrs), school age children (6-16 yrs) and grown-up children (17 yrs and over). Under the age of five, children require most attention. Six is about the age at which they start doing small jobs such as looking after the younger children. As they grow older and stronger they have to carry water and help on the farm after school hours. Gradually they relieve the mother of some of her tasks. After the age of seventeen, when most of them are no longer at school, they are no longer regarded as children and are expected to contribute their labour to the household, particularly with respect to the farming that has to be done.

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3.1. Food habits

Most Kikuyu housewives in the rural areas still prepare meals over a wood fire, as their grandmothers used to do, wedging pots and pans between a few large stones. Usually a family eats three meals a day: a meagre breakfast, a second meal early in the afternoon between 1 and 3 o'clock and the last meal in the evening between 7 and 9. After these meals people often drink tea prepared with plenty of milk and sugar, tea may also be taken in the morning or the afternoon.

The staple food of the Kikuyu is maize, which can be roasted or boiled on the cob when fresh, although the grains are usually removed from the cob. The favourite staple dish is whole maize with kidney beans boiled together (githeri). This is usually prepared every day or two. Individual meals usually consist of a portion of this basic dish to which vegetables, green bananas, potatoes, or seasonings may be added to give some variety to the two main meals of the day. Other kinds of beans or peas may be added, or they may replace the kidney beans. Occasionally some meat may also be added. In some areas the githeri meals are often mashed, in other areas this is hardly ever done. Githeri is highly favoured as the basic dish but stiff maize flour porridge (ngima) serves as an alternative either when whole maize is not available or as a quick dish that requires less preparation and time. Another alternative is gitoero, a stew of starchy roots or tubers. Some roots are also eaten separately, boiled with a little salt. A common lunch consists of boiled sweet potatoes. On rare occasions, a rice dish may be served.

Although the Kikuyu used to plant a variety of grains they now grow mostly maize, which was introduced early in the last century (Bertin et. al., 1971). Millet and sorghum flour are commonly given to children (as a light porridge). Green bananas and Irish potatoes are the most frequently consumed roots and tubers and are often given as a combined stew to small children. Irish potatoes, which were introduced at the turn of the century have rapidly become popular. The most common legumes are the kidney bean, the ordinary pea, and the cowpea. The bonavist bean, njahi, and the pigeon pea, njugu, are regarded as delicacies and served in festive dishes at marriage and child birth ceremonies.

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The vegetables most often prepared are cabbage, cowpea leaves, pumpkin leaves and kale. This last vegetable, although introduced only recently, has become very popular. It has replaced many other plant leaves, particularly the wild varieties, whose consumption appears to have greatly declined. Onions, peppers, tomatoes and carrots are used frequently as seasonings. Fruits are usually eaten by children between meals, sweet banana, mango and passion fruit being especially common. (8)

Children are usually breastfed until the age of one year but receive additional foods as from the age of five or six months. They are weaned to a diet which has a high milk content, and further comprises large quantities of roots and tubers, particularly the aforementioned mash of bananas and potatoes. After the second year milk and root consumption gradually declines and a shift occurs towards maize and beans. Young children are not given whole maize, but maize flour porridge is already introduced at an early age. They are also given beans without maize. Gradually there is a further shift towards the adult diet. (Detailed data will be presented in NIRPb).

3.2. The nutritional status of Kikuyu children

In recent years two nutrition surveys have been held in Central Province, the first as part of a national survey by the Central Bureau of Statistics in 1977, the second in Muranga in 1978 as part of the Nutrition Intervention Research Project. A summary of the results of these two surveys is presented in table 1. The average weight-for-age

Table 1. Summary of anthropometry of children in Central Province from CBS (1977) and NIRP(b) surveys.									
	Average			Standard Deviation			Children (%) falling below critical value of		
	W-A	H-A	W-H	W-A	H-A	W-H	W-A (80)	H-A (90)	W-H (90)
CBS*	84	93	94	-	-	-	39	31	33
NIRP**	85.6	93.3	95.6	10.2	4.5	8.0	28	21	22

* N=225; age range 12-48 months
 ** N=508; age range 6-59 months.

(W-A), height-for-age (H-A), and weight-for-height (W-H) are almost identical, but the percentage of children falling below critical values of W-A(80), H-A(90) and W-H(90) is higher in the CBS survey. This is probably due to the wider range of ecological conditions from which the

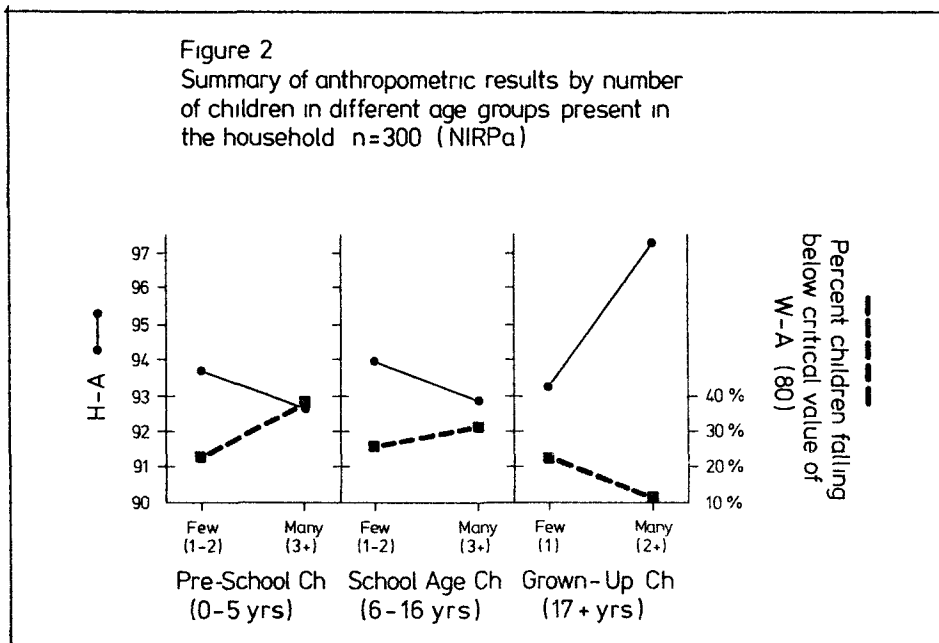
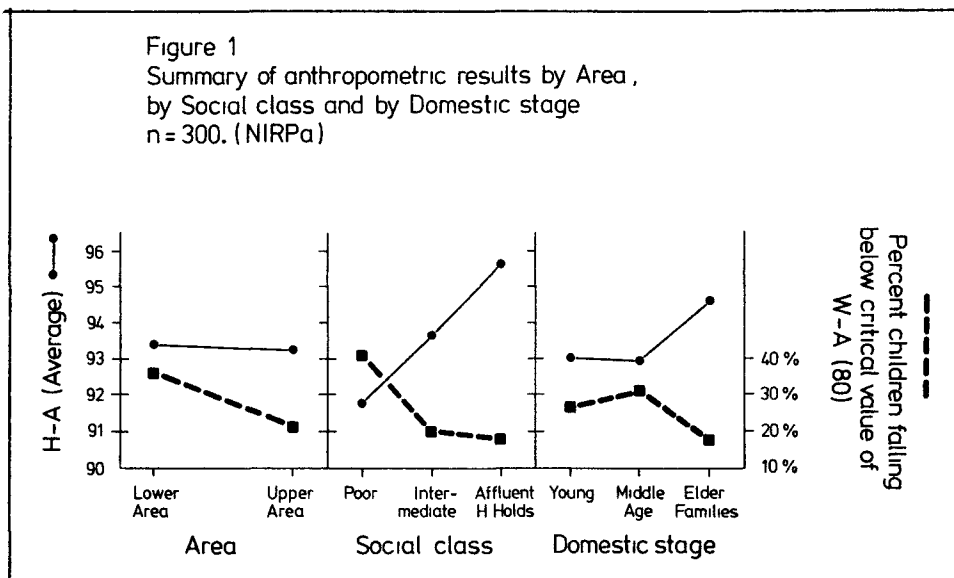
latter survey sampled, while the NIRP survey was restricted to two locations about 25 km from each other with an altitude difference of 200-250 m. The results of the CBS survey also showed that the nutritional status of children in Central Province was not much different from that of children in other parts of Kenya and, if anything, fell slightly below the national results. Compared with other developing countries these results are neither strikingly positive nor negative. A significant finding, however, is that in Central Province some 30-40 per cent of the young children fall below W-A(80) at a given moment in time and, by that standard, suffer from mild malnutrition.

Both the CBS survey and the NIRP survey explored the relationship between the nutritional status of young children and social and economic variables at household level. The first survey found that of the three variables - farmsize, employment of the head of the household and degree of commercial farming - the latter two showed a positive relationship with the nutritional status of young children (CBS, 1979). This finding, that households which cultivate agricultural products for sale had a lower incidence of malnutrition, was confirmed by our own survey. More attention will be paid here to the results of the latter survey, not because they are intrinsically more important, but because they determine the framework for the analysis of the present evaluative studies. The major findings follow below, and are graphically presented in figures 1 & 2. (9)

(-) There were no differences in average H-A between the children in the two ecological areas covered by the survey. There were, however, differences in W-A. In the less fertile area 36 per cent of the children fell below W-A(80), while in the more fertile area at higher altitude only 21 per cent of the children fell below this weight level.

(-) Significant differences in nutritional status were found between children from different social classes. This is reflected in the average H-A, which increases from 91.8 among children from 'poor' households, and 93.7 among children from 'intermediate' households to 95.7 among children from 'affluent' households. The percentage of children falling below the 80% critical value of W-A, naturally, follows the inverse trend, decreasing from 40 per cent, to 20 per cent, and is only 17 per cent among 'affluent' households.

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(-) There are also differences in nutritional status between children from families at different domestic stages, although these differences are less pronounced than those relating to social class. Both H-A and the percentage of children falling below the critical W-A value are more positive among 'elder' families, while there is little or no difference in this respect between children from 'middle-age' and 'young' families.

(-) The nutritional status of young children is also related to the number of other children present in the household (figure 2). There is a negative correlation between on the one hand the number of pre-school and school age children, and on the other hand the average H-A and the percentage of children falling below W-A(80). Put more simply, the greater the number of pre-school children and the number of school age children in the family, the poorer the nutritional status of the younger child. This is probably the combined effect of a greater drain on food resources and a larger amount of domestic work for the mother who can pay less attention to the younger children. The number of grown-up children, on the other hand, is positively related to the nutritional status of the young child. This indicates that it is the presence of several grown-up children in 'elder' families that positively influences the status of the young child.

4. CRS CLINICS

Catholic Relief Services sponsors child nutrition programmes in a number of developing countries. The programme in Kenya started more than a decade ago. The objective of the programme is to maintain adequate growth of the pre-school children in the community concerned by means of (a) education of the mother in child care; (b) periodical assessment of the child's nutritional progress; (c) provision of supplementary foods (CRS-USCC, no date).

In practice this means that Catholic Relief Services receives foods through USAID, which are imported in Kenya. This food is delivered free of charge at the port of arrival, Mombasa. CRS Kenya distributes these foods to the participating agencies, half of them Catholic mission hospitals, the rest government health facilities, other missions and a small number of private organizations. These institutions have

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committed themselves to organizing special clinics (here called CRS clinics) for mothers and children enrolled in the programme. These clinics are limited in size, not more than 60 children per session is the rule, and each session takes a full morning or afternoon. (10) The clinics are run by two, three or four assistants, depending on local circumstances.

Enrollment in the CRS clinics is possible for children between six months and five years (60 months) of age. In Kenya the programme policy is to give mothers from poor, needy families priority. The actual selection of mothers and children is left to the participating agency. Mother and child are required to attend once a month on a fixed day. If they do not attend for three consecutive months, without good reason, they are dropped from the programme. Once a child reaches the age of five it may no longer partake in the programme but its place is often taken by a younger sibling so that the mother (i.e. the family) may participate many more years than one particular child. New mothers seeking entrance to the programme often remain on the waiting list for a long time. (11)

The clinics are usually held during the morning; upon arrival the child is first weighed. Its monthly weight is recorded in the clinic records as well as on the weight chart which the mother keeps in her possession. The mother may also be given some individual advice while the child's weight is recorded. Next, she joins the other mothers to wait until all are present after which a lecture cum demonstration is given. The teaching assistants usually have a fixed repertory of lectures on child care. Child nutrition is given relatively much attention, particularly concerning the preparation of the foods that are distributed at the clinics. After the lecture the food rations are distributed which usually consist of several pounds of corn-soya mixture or dried skimmed milk, bulgar wheat and oil. (12) For this a mother contributes about 5 shillings per child each month to cover local overhead costs and transport costs within Kenya.

On average a mother has to wait 25 minutes for her child to be weighed. The weighing itself including individual advice takes, on average, no more than 2 minutes. After that she has to wait about 50 minutes for the beginning of the lecture, which usually takes 20 minutes.

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After that she generally has to wait another 20 minutes before it is her turn to receive foods. The average mother spends about 2 hours at the clinic, threequarters of this time being spent waiting. ⁽¹³⁾

The national CRS headquarters keeps a close check on the way the clinics function demanding not only a strict accounting of the food distributed but also inspecting whether education is indeed given and whether the children are weighed every month. It is our definite impression that the CRS clinics, by and large, function as expected. Children are weighed, lectures given, foods distributed, and most mothers attend every month. Few mothers drop out while absence rates among the regular participants are low. ⁽¹⁴⁾ One reservation, however, must be made. Very little individual advice appears to be given, and the average time of less than 2 minutes during which the child is also weighed, speaks for itself.

The distributed foods are intended for the child enrolled in the programme but there is little to stop the mother from using it for her other children or even for herself or other adults. This is one of the reasons why admission policy has recently been modified, so that participation is no longer restricted to one child per family. Mothers are now allowed to enroll more than one child and may now even themselves become recipients of the programme ⁽¹⁵⁾. These policy changes were mostly introduced during the time of our studies and after.

In 1979 there were some 135 CRS clinics in Kenya, with about 45,000 children enrolled. In Central Province there were about 30 clinics, each with between 200 and 1000 children attending ⁽¹⁶⁾. In all, more than 17,500 children were enrolled in the Central Province programme. Three CRS clinics, situated in rural areas, were selected for the present study. As stated, they were selected on the basis of ecological conditions and the presence in the vicinity of a FLT centre and a Health Centre with a Nutrition Field Worker. The CRS clinics at Kereita Catholic Mission Maternity, Gaichanjiru Catholic Mission Hospital and at Karaba Catholic Mission were thus selected as research locations.

Kereita Maternity, situated in Kambaa village, had an enrollment of about 250 children at the start but had doubled its intake by the end of our studies. Gaichanjiru Hospital had an enrollment of about 500 children and this remained more or less constant. The CRS clinic at Karaba mission

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had been operating with ups and downs for several years but at the start of our studies, in 1977, an assistant was employed full-time and enrollment did rise to more than 500. By the end of 1978, however, some months after our interviewing had ended, this clinic was closed down because of personnel problems and differences of opinion between the Kenya headquarters and the local agency.

The staff at CRS regional headquarters take a serious interest in evaluation of the programme results; collecting the weight charts of the children which are taken in when they reach age five. Studies have been conducted on CRS programmes in different African countries (CRS, 1974; 1975a; 1975b). The most recent report on the Kenyan programme, available to us, dates from 1972 and concerned 238 children attending at Nazareth Hospital (CRS, 1972). Five different methods of analysis were employed and only one of them showed a statistically significant effect, in so far as children who had attended the clinic had better weights than children of the same age entering the programme. These data, however, also revealed that more than 40 per cent of the children still fell below W-A(80) after shorter and longer periods of participation. This study was limited to the weights of the participating children which obviously restricts the possibilities for analysis considerably.

5. METHOD

In the introduction to this report we argued that evaluation should consist of more than a simple and direct assessment of end-results. In our opinion, the evaluation of nutrition intervention should not only focus on the nutritional status of groups of children⁽¹⁷⁾. (For a more elaborate argumentation see Hoorweg & McDowell, 1979.) In addition to the nutritional status of children, the present study also deals with knowledge, attitudes and behaviour of the mothers. The respective indicators are described below. Two groups of participants were selected: newcomers and long-term attenders. The reasons for and the manner of this selection are given below. Comparison between these two groups of participants constitutes the evaluation as such. Any nutritional impact of the Pre-School Health Programme should lead to better results among the long-timers.

CRS

5.1. Indicators

The indicators employed in the present study consist of a number of knowledge questions; a list of comparisons to measure food preferences; a recall of food intake during the previous day; and the nutritional status of the children concerned. It should be mentioned that these indicators were only drawn up after thorough preliminary studies which covered general aspects of Kikuyu food habits, such as the foods presently in use, classification of foods and food preferences for children (Hoorweg & Niemeyer, 1980). This entailed the compilation of a list of food names in the vernacular. It was established that Kikuyu food classification does not differ substantially from the customary nutritional division of the Western world. It was also demonstrated that the method of paired comparisons is suitable for measuring maternal food preferences. Food preferences are remarkably similar throughout Kikuyu country: there is a high preference for legumes and some starchy foods while certain cereals are held in conspicuously low regard.

(a) The knowledge questions were identical to those employed in the NIRP surveys (the exact phrasings are listed in appendix A). The questions on the recognition and the causes of kwashiorkor and marasmus, the best age to stop breastfeeding and the treatment of diarrhoea are straightforward and need no further explanation. Nutrition teaching in Kenya generally pays much attention to weaning and the introduction of weaning foods. Hence the question about the age at which children can start eating five specific foods (Q.4). Four of these foods are weaning foods, and one -whole maize with beans- signals later introduction to the adult diet. The answers concerning the four weaning foods can be combined in one score: the number of times the respondent mentions an early introduction age of 0-4 months. Another important aspect is how many times a day a child is fed since in the case of small children it is better not to give only three meals a day but also to give some extras between the main meals (Q.5). Finally, nutrition teaching in Kenya (as in other developing countries) puts much emphasis on the distinction between and the functions of three food groups: energy foods, body-building foods and protective foods (Q.8). This latter question was only put to long-term attenders.

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(b) The second indicator by which effects are ascertained comprises maternal food preferences as measured by the preference scale. This scale consists of a number of comparisons between two foods; the mother is asked 'which food would you prefer to give to a 2 year old child'. Kikuyu mothers generally have no difficulty in choosing between foods, whether or not these foods are drawn from the same of or from different food groups, as was shown in the preliminary studies (Hoorweg & Niemeyer, 1980). It was also demonstrated in these studies that the answers exhibit consistent patterns and that these paired-comparison scales in general have a satisfactory reliability. The preference scale used in the subsequent project studies consisted of 24 comparisons between foods that differ to greater or lesser extent in nutritional value. Because the analysis of the full scale is rather complex and as yet uncompleted, a reduced scale has been utilized for the present report. This scale comprises 16 comparisons between four high protein-high calorie foods on the one hand, and on the other eight foods that are either low in proteins or low in proteins as well as calories. Beans and eggs were compared successively with rice, finger millet, green bananas and cabbage; peas and meat were compared with maize flour, kale, Irish potato and oranges (the list of items is found in appendix B). The sixteen items are combined in a single preference score in which one point is given each time a high protein-high calorie food is chosen. Since there are 16 comparisons, scores can theoretically vary between 0 and 16, although the actual range was from 5 to 16. The reliability coefficient of this scale as computed for the group of 300 mothers in the survey was .71 (Spearman-Brown).

(c) The dietary recall concerning the previous day provides the third indicator. A detailed description and discussion of the method is given elsewhere (NIRPb). The mother was asked about the food and drink consumed by the child in the course of the previous day, starting with the first dish of the day and further in chronological sequence. She was requested to demonstrate the amounts consumed using standard household equipment. In the case of liquid dishes, consumed volumes were measured with water. Volumes of solid dishes were measured with dry maize. From these volumes the weight of the cooked dish and the subsequent raw ingredients were calculated either by means of the average recipe or

from the actual proportions indicated by the respondent. The food table by Platt (1962) was used to calculate energy and nutrient content.

Results will be presented in two ways, first the amounts of individual food groups consumed (raw matter) and second the total intake of proteins and calories⁽¹⁸⁾.

(d) The final indicator comprises anthropometry and entailed recording weight, height and birthdate of the children. Unlike the interviews, which were conducted by the assistants, all anthropometric measurements were taken by either one of the present authors. Weights were measured in tenths of kilograms with Salter scales, model 235. The children were placed in a plastic harness which was hooked to the scale. Next, the scale with the child hanging from it was lifted in the air. Children were weighed naked except for a shirt or light jersey; all weights were therefore corrected by subtraction of 150 grs. Weighing scales were gauged every week. Heights were measured with a collapsible length board which featured a fixed head-rest, a detachable foot-rest and a fixed tape measure⁽¹⁹⁾. Each child was placed on the board lying down with an assistant holding its head against the head-rest. The child's knees were pressed down and the foot-rest (which slid at a right angle to the tape measure) was pushed up against the child's heels. Birthdates were recorded to the day when possible. With some patience and probing it was possible to arrive at the exact date for the vast majority of the children. If the day of birth was not recollected, at least the month of birth was recorded.

The results for each child were compared against the Harvard standards as listed in Jelliffe(1966) and three indices were computed. Height-for-age (H-A) expresses the height of the child as a percentage of the standard height expected for the age of the child. If a child is small its weight may be expected to be correspondingly lower. To allow for this, the second index, weight-for-height (W-H), converts the weight of the child into a percentage of the standard weight expected for its height. Finally, weight-for-age (W-A), does not allow for height and simply expresses the weight of the child as a percentage of the standard weight for the age of the child. These three indices reflect different, but not altogether unrelated aspects of nutritional status.

Height-for-age indicates degree of stunting and, since this can only occur over time, this index reflects the nutritional history of

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the child. Weight-for-height is subject to greater fluctuations and is generally regarded as reflecting the momentary status of the child. Weight-for-age, which combines the two previous indices, is a useful, overall index of nutritional status. Since height-for-age reflects the outcome of the growth process it is the most significant of the three indices for the study of relations between social variables and nutritional status. The same obviously applies in respect of the measurement of the long-term effects of nutrition intervention.

Apart from the anthropometry recorded at the time of the study we also avail of the weights for these children noted in the clinic records, in particular their admission weights and all weights recorded during 1976 and 1978.

5.2 Design

Evaluation of intervention programmes requires that criteria be measured before and after intervention in such a way that differences between the two conditions can be ascribed to the intervention. The nutritional effects of attendance at the Pre-School Health Programme can only be expected and assessed after a long period of attendance. The limited time-span of the present studies did not permit coverage of long periods and it was not possible to see mother and child as they started visiting the CRS clinic and after they had attended for a long period. In other words, the so-called 'pretest-posttest' design was not practicable, so that other designs had to be considered, including some quasi-experimental ones. The suitability of different designs for the evaluation of nutrition intervention programmes has been discussed elsewhere (Hoorweg & McDowell, 1979). Virtually all these designs are based on the comparison of different groups of subjects.

The most obvious comparison is that between mothers with and without contact with the programme. However, it is doubtful whether such a comparison would be sound because the mothers participating in the programme do not form a random sample of the population. Any comparison of participants with the general population would not only reflect the effect of the programme but also the differences with the general population (for the nature of these differences see section 9).

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Another, more suitable, alternative is to compare new attenders with long-standing participants. This design is, in effect, a 'posttest-only' control group design. A prerequisite for this particular design is that there may be no differences of a social or other nature between the mothers in the two groups. Such differences could arise if selective reattendance or self selection occurs, i.e. if a certain number of women drop out of the programme and if these drop-outs have certain characteristics which distinguish them from the other women. These may be the women who live farthest away from the clinic, those who are poorest, or those who are least interested in the programme. In the latter two cases, results for the long-time participants may differ from those for the newcomers simply because of this kind of self-selection. Often, however, it is possible to select the two groups to be compared in such a way that the effects of selective re-attendance are neutralized, for instance by omitting from the newcomers those women who are likely not to re-attend on the basis of the factors causing the selection. In the present study a much more simple solution was possible.

Mothers who had joined the programme within the last 6 months were interviewed, in March and April, 1978: 30 in Kambaa, 27 in Gaichanjiru and 22 in Karaba. A group of long-term participants was interviewed in the same period: 25 in Kambaa and 32 in Gaichanjiru (who had been attending over 2½ years), and 25 mothers in Karaba (attending over 1½ year). In the course of the following year the clinic records were checked to see

Table 2.
Personal and attendance characteristics of recent and longtime participants

		RECENT PARTICIP. N=70	LONGTIME PARTICIPANTS N=82
Age	19yrs and younger	3%	-
	20 - 29 yrs	53%	44%
	30 - 49 yrs	41%	56%
	50yrs and older	3%	-
Education	none	40%	49%
	primary 1-4	17%	26%
	primary 5-7(8)	37%	24%
	secondary sch.	6%	1%
Distance between home village and CRSclinic	0.0 - 1.9 km*	52%	49%
	2.0 - 4.9 km	42%	43%
	5.0+ km	6%	8%
Period of attendance at CRSclinic	0 - 3 months	85%	-
	4 - 6 m.	15%	-
	18 - 29 m.	-	33%
	30 - 41 m.	-	49%
	42 - 54 m.	-	18%

* This distance was calculated from maps (1:50,000) of the areas as the straight line between the CRSclinic and the centre of the home village.

		RECENT PARTICIP. N=70	LONGTIME PARTICIPANTS N=82
Marital status	single	4%	4%
	married	90%	89%
	sep/divorced	4%	5%
	widowed	1%	2%
Domestic stage	young families	30%	23%
	middle-age families	61%	63%
	elder families	9%	13%
Average number of children:			
	pre-school children (0-5yrs)	2.3	2.3
	school age children (6-16yrs)	1.8	2.2
	grown-up children (17yrs & older)	0.1	0.2

which of the newcomers had dropped out. The nine cases that had stopped attending were subsequently excluded from the study: a simple way of counteracting selective re-attendance. (This correction, however, was no possible at Karaba because the programme at this location was discontinued before the end of the year). The social, economic and family characteristics of the two remaining groups are listed in tables 2, 3 and 4. There are no differences between the two groups in respect of distance travelled, age, education, or marital status. Neither are there important or systematic differences in respect of type of residence, domestic stage and number of children. In respect of social class, however, there is a difference between the two groups, that will be dealt with later (section 9). The mothers were interviewed during their visit to the clinic. If they were enrolled with more than one child, which was the case for c.45% of the mothers, anthropometry was measured for all children. In those cases, food intake was recorded for the child nearest to 2 years of age.

The presentation of results is organized as follows. In section 6, the knowledge and preferences of the two groups of mothers are compared. This comparison between mothers is straightforward and differences between the two groups are assumed to arise from contact with the programme. The data on food intake and nutritional status of the children are presented in sections 7 and 8. Since the children of newcomers are usually younger than those of long-time participants, these comparisons pose certain problems that will be discussed in the sections concerned. Data are presented in full, either in tables in the text, or else in the appendices A-D. Finally, in section 9 we discuss the

Table 4. Socio-economic characteristics of recent and longtime participants			
		RECENT PARTICIP. N=70	LONGTIME PARTICIPANTS N=82
Type of residence	smallholding, shared	57%	46%
	smallholding, independent	40%	48%
	not on smallholding	3%	6%
Size, smallholding	no land	3%	7%
	0.1 - 0.9 acres	31%	33%
	1.0 - 2.9 acres	26%	28%
	3.0 acres and more	40%	31%
Social class	poor households	39%	55%
	intermediate h.holds	50%	39%
	affluent h.holds	11%	6%

social and economic background of the participants in relation to ecological zone.

6. KNOWLEDGE AND PREFERENCES

Nutrition education in Africa may generally be expected to pay attention to the following: malnutrition and its causes, introduction of supplementary foods, weaning, quantitative and qualitative food requirements of the child and the foods that meet these requirements. These aspects are covered by the different knowledge questions and, judging from the comparison between recent and long-time participants, the effects of the teaching at the CRS clinics are meagre (table 5, appendix A).

On several questions there are indications of differences in knowledge between the two groups of mothers, primarily with respect to the recognition and causes of malnutrition. None of these differences are statistically significant, but it is remarkable that on all three questions a greater percentage of long-time participants mentions either quantity or quality of foods⁽²⁰⁾. Also, more long-time participants mention water - plain or with sugar or salt - as treatment in cases of diarrhoea. Contrary to what one might expect the long-time participants find it significantly more often advisable to wean before 14 months of age. The percentage of women who express the opinion that children should be weaned early - before 9 months - remains low, however. Early weaning is certainly not advised in the teaching and the fact that there is no increase in the percentage of women mention-

Table 5. Summary of knowledge results for recent and longtime participants*

	RECENT PARTICIP. N=70	LONGTIME PARTICIP. N=82
1. Percentage of women who recognize kwashiorkor from verbal description	71%	74%
2. Percentage of women who mention poor quality or insufficient quantity of food as cause of kwash.	53%	61%
3. Percentage of women who mention poor quality or insufficient quantity of food as cause of marasmus	48%	56%
4. Percentage of women mentioning an early age of introduction (0-4 m.) for two or more of the following dishes: ucuru; gitoero; mboco; ngima na mboga	33%	32%
7. Percentage of women mentioning weaning age of 14 months or younger	37%	52%
8. Average percentage of mothers correctly classifying (7) foods into different food groups	-	63%

* Detailed results are listed in appendix A

ing an early introduction age of weaning foods accords with this. The trend therefore is to discontinue the practice of prolonged breast feeding, which would be an understandable side effect of the programme with its inevitable emphasis on other foods than breastmilk.

An alternative way of looking at these results is to concentrate on the absolute levels of knowledge among the long-time participants. From that viewpoint, too, the findings are not impressive. Although 60 per cent of the women mention quantity or quality of food as causes of kwashiorkor and marasmus, only 30 per cent give the really correct answer, according to the teaching: quality in the one case, quantity in the other. Only 50 per cent of the long-time participants consider that young children need extras apart from the three main meals of the day, and only 12 per cent mention an egg in this connection. Finally, the average percentage of mothers who are able to classify foods correctly into the much emphasized food groups is rather low (63%) when compared with the percentage expected by pure chance (50%).

The results in regard of maternal preferences are encouraging (table 6). The overall score on this scale is significantly higher⁽²¹⁾ among the long-time participants; they are more inclined to choose high protein-high calorie foods. The higher score is for the most part attributable to choices for peas and eggs (see also appendix B). However, the preference score should be interpreted with caution. Using this type of scale requires that results should be interpreted in comparative terms, not in absolute terms (as was possible with the knowledge

Table 6. Preferences for recent and longtime participants: Average number of choices for beans, peas, eggs and meat when compared with the four foods mentioned in parentheses*

	RECENT PARTICIP. N=70	LONGTIME PARTICIPANTS N=82
Average number of choices, out of 16 comparisons, for high-protein, high-calorie foods (standard deviation in parentheses)	11.4 (2.6)	12.3 (2.4)
BEANS - (rice/f.millet/banana/cabbage)	3.3	3.3
PEAS - (maize fl./kale/I.potato/orange)	2.0	2.5
EGGS - (rice/f.millet/banana/cabbage)	3.3	3.5
MEAT - (maize fl./kale/I.potato/orange)	2.8	3.0

* Detailed results are listed in appendix B

questions).

In sum, there are sufficient indications that the teaching at the clinics does indeed have an effect on knowledge and attitudes of mothers. The facts remains, however, that this influence is small and that much is left to be desired as regards the nutritional knowledge of the mothers.

7. FOOD CONSUMPTION

A 24 hr dietary recall was recorded for one of the children of each participant. Since the mothers were interviewed during their visit to the clinic it may be assumed that the food rations distributed during the previous months had, by and large, been exhausted. The recall at this moment reflects what mothers give their children when thrown back on their own resources and ascertains what kind of changes occur in maternal behaviour independent of the food rations.

It has already been mentioned that children in the group of long-time participants are generally older than the children of newcomers. This is an inevitable complication of the present design, although we were able to counter these age differences to some extent in the following way. About 45% of the mothers had more than one child enrolled in the programme, be it that children of one mother had usually participated for different lengths of time in the programme. These mothers were asked to give a recall for the child nearest to 2 years of age, irrespective of the period of participation in the programme of that child. Since the child's diet reflects, first off all, the behaviour of the mother it does not matter exactly how long the particular child had been attending the clinic. Nevertheless, the ages of children for

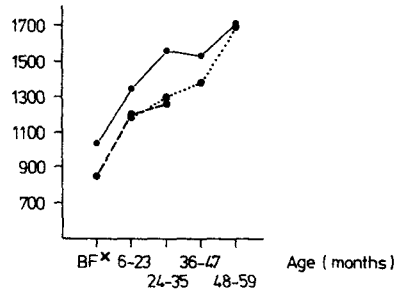
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Figure 3.

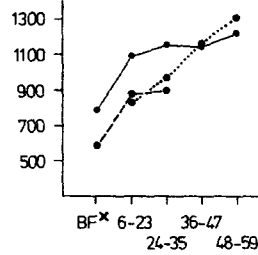
Average food consumption by age groups**

- Recent participants
-• Longtime participants
- Survey (NIRPb)

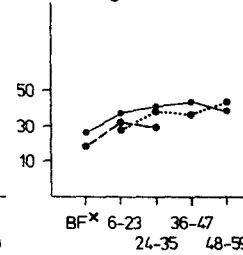
A. Total food consumption (grs.)



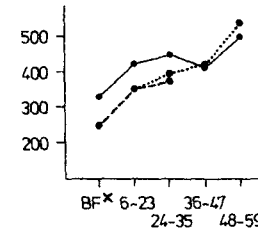
B. Energy intake (Kcal.)



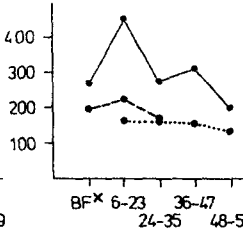
C. Protein intake (grs.)



D. Solid foods (grs raw matter)



E. Milk (grs)



× BF = Children, breastfed (see note 22)

** Detailed information is listed in appendix C. crs

whom a dietary recall was recorded differ in the two groups: 19 months on average in the group of newcomers, 36 months in the group of long-time participants. Since the diets of children show important changes during their early years, this seriously hampers the comparison of food consumption of the two groups.

The average food consumption for the children of the recent and long-time participants, subdivided by age groups, is given in appendix C. The results for subgroups comprising more than 10 children are given in figure 3, together with the corresponding figures for the general child population. Figure 3 shows two important findings. First, that there is no difference in food consumption between recent and long-time participants in corresponding age groups. In the age ranges of 6-23 and 24-35 months the average food consumption is virtually identical, as are energy and protein intake (figures 3B & 3C). The composition of the daily food consumption at these ages is also virtually the same among both recent and long-time participants, with the possible exception of milk consumption which is slightly lower among the long-time participants (table 7). What is also evident from figure 3A-C is that there are important differences in food intake between the children attending the CRS clinics and the general child population. The difference is particularly manifest among the children between 6-23 months and 24-35 months, i.e. the period of weaning and introduction to the adult diet. These children consume less food than the general child population, a difference that translates into related reductions in energy and protein intake. Whereas the 4 year old children more or less meet their energy requirements, this is not the case in the three younger groups of children, aged 6-23, 24-35 and 36-47 months. As calculated on the basis of their weights, these children on average, meet only 90%, 85% and 90% of their calorie requirements respectively. It must be pointed out, though, that protein consumption is relatively high and remains consistently above requirements in the different age groups.

Figures 3D and 3F show where the cause of these deficiencies lies. The children attending the CRS clinics are given considerably less milk than the general child population. This difference is far greater than the difference in consumption of solid foods. Apparently, the mothers participating in the programme, wean mainly towards a diet of solid foods, and give far less milk than mothers in general. Since this occurs among

Table 7. Dietary Recall: Percentage that individual food groups contribute to the daily intake (raw matter) of recent and longtime participants. (Comparison restricted to children aged 6-36 months, with breastfed children excluded)

	RECENT PARTICIPANTS N=37	LONGTIME PARTICIPANTS N=27
Total consumption (grams raw matter)	563	536
Cereals	18%	20%
Roots & tubers	20%	17%
Legumes	5%	7%
Vegetables	12%	18%
Eggs & meats	1%	1%
Miscellaneous	7%	6%
Milk	36%	30%

both recent and long-time participants it is probably a characteristic of this particular population, and cannot therefore be blamed on the intervention of the programme. (Although this intervention does not seem to do much good either, given the fact that the long-time participants give even less milk, but the difference is too small to allow any definite conclusions to be drawn.) It is only at the later ages when milk consumption among children in general diminishes that the children in the programme reach the general level of food intake.

The reasons for the consumption deficits at younger ages (milk in particular), must first be sought in the socio-economic circumstances of the families. ⁽²³⁾ The CRS clinics are dealing with a group that is considerably poorer than the general population and also has less commodities available, for example they report less often that they have milk available and more often that they are not able to grow enough food to feed their families. (A discussion of the general characteristics of the families attending at the CRS clinics follows in section 9).

The first conclusion of the present findings must be that there is no discernible influence of the programme on the dietary behaviour of the mothers (food rations not taken into account). Second, that the food rations reach families with children that are in need.

8. NUTRITIONAL STATUS

Comparison of the nutritional status of the children in the two groups is hampered by the same difficulties as the comparison of food consump-

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Table 8. Anthropometric results for children belonging to the groups of recent and longtime participants: Averages, standard deviations(), and percentages of children falling below critical values

	RECENT PARTICIPANTS (93 children)	LONGTIME PARTICIPANTS (88 children)
<u>Characteristics at the time of admission to the programme:</u>		
Age (months)	20.5	13.7
Weight-for-age	87.2 (11.5)	80.2 (13.9)
Percent children below W-A(80)	17%	44%
<u>Characteristics at the time of study:</u>		
Age (months)	22.7	46.2
Period of part. in progr.(months)	2.2	32.8
Weight-for-age	86.3 (10.3)	83.4 (9.2)
Height-for-age	93.2 (4.6)	91.5 (4.2)
Weight-for-height	97.2 (7.9)	96.3 (6.7)
Percent children below W-A(80)*	22%	41%
Percent children below H-A(90)	25%	34%
Percent children below W-H(90)	17%	17%

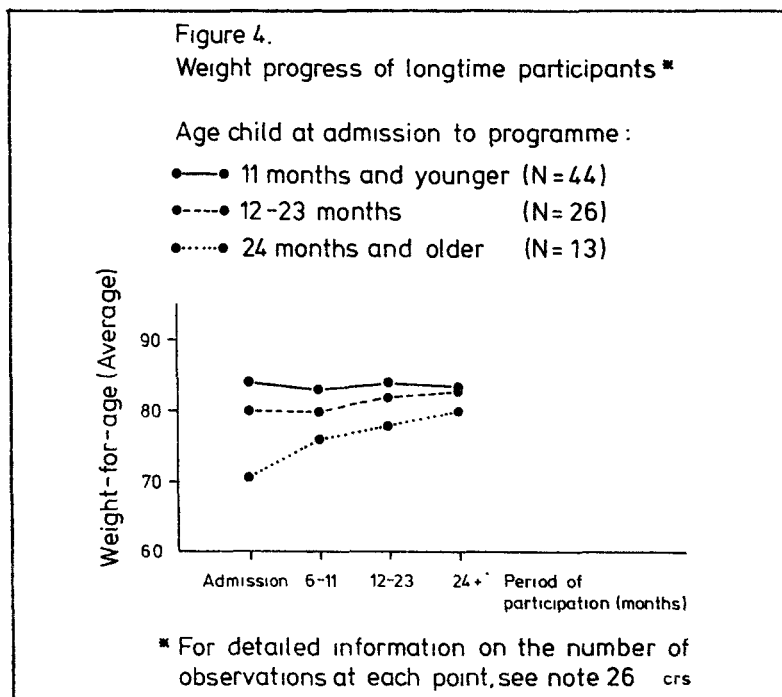
* Detailed distributions are presented in appendix D.

tion: the children in the two groups differ in age. Whereas in the case of food intake this problem could be partly overcome by concentrating on the younger children, it was not possible to do the same with respect to nutritional status. Food intake can be considered as a characteristic of the mother but nutritional status is the final outcome of the intervention, a characteristic of the children. For that reason a comparison must be drawn between children who meet the same selection requirements as their mothers. The 70 mothers who had recently joined the programme had enrolled 93 children altogether. The 82 long-timers had 88 children who had participated for the same period, and 35 children who had enrolled later. The results for the latter group are not presented in this report. Table 8 gives information regarding the two main groups. Listed are characteristics at admission, period of participation preceding the time of our interview, present age of the children and various anthropometric results. The long-time participants have attended an average of 32 months, the recent participants only 2 months.

It is difficult to draw any conclusions from a comparison between these two groups about the effect that the programme has on the nutritional status of the children. Firstly, because of the difference in age between the children in the two groups at the time of the study (23 vs 46 months), and secondly because of the poor condition of the long-time participants when admitted to the programme. The average W-A

of these children at that time was 80.2, while for the recent participants W-A was 87.2 at admission. Since the heights of these children had not been recorded at the time of admission to the programme, it is not well possible to interpret the difference in nutritional status that exists between these two groups at the time of the study. It is therefore preferable to concentrate on the group of long-time participants only, to see what conclusions can be drawn from the successive data for this group.

First of all it can be argued that the long-time participants show some improvement through the years, since the average W-A increases from 80.2 to 83.4. However, the percentage of children falling below W-A(80) does not decrease and remains virtually the same (44% vs 41%). One can also point at the present average H-A of 91.7 which falls significantly below the population average of 93.3. One would guess, however, that average H-A at the time of admission was already below the population mean. Whatever the case, the weight data suggest that the nutritional status of the long-time participants has at least remained constant



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during the period of attendance at the CRS clinics. In a sense this may be considered a positive result, since the children did not fall further behind once they had joined the programme. On the other hand there are no indications of any catch-up growth occurring.

A detailed analysis of the weight progress of the long-time participants over the preceding years tends to confirm this. Since we did have the weights of the children, recorded in the clinic records⁽²⁴⁾, at our disposal we were able to chart the development of these children from their admission, through their average weight-for-age during the period of 6-11 months, 12-23 months and over 24 months after their entrance⁽²⁵⁾. In figure 4 these weight data are presented according to the age of the children when they entered the programme. The first that strikes the eye is that the older the children are when admitted to the programme, the poorer their overall condition. Second, that the children entering before 1 year of age, stay at the level at which they entered. Children who enter after that age are in poorer condition; however, there is some compensation to be seen in their weights if they enter between 1 and 2 years, and a considerable compensation in the case of the children entering when they are older than 2 years. The height-for-age of these three groups at the time of our study was 92.0, 91.0 and 90.4 respectively. It could easily be argued that if not for their participation in the programme the young entrants would at least have dropped to a H-A of 90.4 since they all come from the same population. One could further point out that among the young entrants at least the aim of the CRS programme is realized: they maintain growth at their level. The group who enters after age two shows catch-up in weight but these children were probably acutely malnourished when admitted to the programme, and one can only speculate about the extent to which weight gains can be attributed to the intervention of the programme and the extent to which they are the result of spontaneous recovery.

The general conclusion, however, is that there is every indication that children, once they start to participate in the programme, keep on growing at the level at which they entered the programme. This is a modest but nevertheless important result.

9. THE SOCIAL AND ECONOMIC BACKGROUND OF CRS PARTICIPANTS, IN RELATION TO ECOLOGICAL ZONE

As stated, the Pre-School Health Programme in Kenya aims to concentrate

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aid on needy families. In Central Province this means, first of all, that CRS clinics are mostly established in the lower-lying areas because that is where the needs of the population are assumed to be greatest. The clinics are furthermore expected to select the most needy families from the local population; the manner of selection is left to the staff at the clinics concerned. What are the characteristics of the people that are actually enrolled in the programme? To answer that question the combined groups of CRS participants can be compared with the respondents in the NIRP survey in Muranga. The latter sample was defined in the same way as the CRS participants, i.e. all households studied had one or more children aged 6-59 months.

The main characteristics of CRS participants and survey population are listed in appendix E. CRS participants are apparently not selected according to the age of the mother, her marital status, or the number of pre-school and school age children in the family, although mothers tend to be slightly less educated and there were fewer elder families among them. Selection occurs primarily in terms of social class i.e. in terms of economic resources. While among the NIRP survey sample 24 per cent of the households had two sources of income (regular employment and cash farming) this was only the case among 9 per cent of the CRS participants. Since there are considerable differences in social class between the participants at the three different clinics where the study was conducted (higher, middle and lower area) closer examination is required.

The ecological conditions of the middle area are most similar to those of the survey areas and the participants at this clinic differ even more strikingly from the survey population (table 9). In the middle area, more than 70 per cent of the CRS participants are from poor house-

Table 9. Resources of CRS participants by area

		CRS PARTICIPANTS			NIRP SURVEY
		UPPER AREA N=48	MIDDLE AREA N=57	LOWER AREA N=47	N=300
Social class:	poor households	54%	72%	11%	41%
	intermediate h.holds	40%	23%	75%	38%
	affluent h.holds	6%	5%	15%	21%
Percent women who report that they are able to grow enough food to feed their families		58%	13%	24%	43%
Percent women who report that they have milk at their disposal(home production)		46%	9%	19%	51%
Percent women who report that they have eggs at their disposal(home production)		50%	54%	47%	59%

holds, so the selection at this clinic must be quite strict. Selection at the two other clinics appears to be less stringent, which fact requires some explanation. In the lower-lying area, 70 per cent of the CRS participants belong to intermediate households, but this is due to their living at the rice irrigation scheme, so that they have one source of income: cashfarming. The economic circumstances of these households are often precarious because they have to spend a large proportion of their income on food. Indeed, as regards food resources, the CRS participants seem no better off in the lower area than in the middle area. Less than a quarter of the women at both clinics report that they are able to grow enough food to feed their families, while even fewer report that they have milk at their disposal. Among the survey sample these figures were both about 50 per cent. The clinic in the lower area apparently caters to a population with much the same food needs as the participants in the middle area.

The situation is, however, different at the clinic in the higher area. Not only are there fewer participants from poor households, but some 50 per cent of the women report that they can grow enough food and that milk is directly available (note that the availability of eggs appears quite unrelated to all this). Table 10 further shows that it is the group of recent participants at this clinic that is somewhat better off. It should be borne in mind, however, that during the time of our research the capacity of this clinic was doubled from 250 to 500 and that many new mothers and children joined the programme over a relatively short period of time. It also appears that during this influx, selection standards were less stringent than in previous years. As mentioned in section 5.2, there was a slight flaw in the design in that fewer recent participants came from poor households in comparison with long-time participants. It is now evident that this is due to variations in selection criteria, particularly at the clinic in the

Table 10. Social class distribution for recent(Rc) and longtime(Lt) participants by area

	UPPER AREA		MIDDLE AREA		LOWER AREA	
	(Rc)	(Lt)	(Rc)	(Lt)	(Rc)	(Lt)
	N=23	N=25	N=25	N=32	N=22	N=25
Poor households	39%	68%	68%	75%	5%	16%
Intermediate h.holds	52%	28%	24%	22%	77%	72%
Affluent h.holds	9%	4%	8%	3%	18%	12%

higher area. (This shift in social class, however, is not responsible for the better nutritional condition of the children that were admitted at the time of the study⁽²⁶⁾.)

Figures on food consumption of the participants at the three clinics are presented in appendix F (The results of recent and long-time participants have been combined because there were no systematic differences between these two groups, as shown previously). Milk consumption decreases from 234 grs. in the upper area, to 167 grs. in the middle, and 120 grs. in the lower area. (It should be remembered that the consumption of milk in particular of CRS participants lagged behind that of the survey population). The lower milk consumption in the middle area compared with the upper area, is more than compensated by a higher consumption of solid foods: roots and tubers, cereals and legumes. The children at the clinic in the lower area are behind in consumption of milk as well as solid foods. A rough estimate indicates that the children at the latter clinic meet only 80 per cent of their energy requirements. Since the recall was recorded a month after the last visit to the clinic it reflects not only what mothers wish to feed their children, but also what they are able to feed them from their own resources. In this respect, the needs of the participants in the lower-lying area indeed appear to be greatest.

Some anthropometric data concerning the children who had been attending for extended periods are listed in appendix G. It is evident that some years ago the middle and lower clinics had more entrants with W-A under 80 than the clinic in the higher area. This finding is open to various interpretations, and further study of the records of larger groups of children is therefore required (and already in progress). There is, however, a surprising similarity in height-for-age figures at the three clinics at the time of study. Average H-A varies between 91.4 and 91.6 and the percentage of stunted children (below H-A(90)), varies from 33% to 35%. This finding, of course, reflects the status of the children after a long period of participation in the programme and therefore says little about differences or similarities of the needs among the participants in the three areas. The finding is nevertheless intriguing and at least indicates that the ultimate growth process, as reflected in height, remains at the same level at the three clinics,

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despite the differences in ecological circumstances.

10. CONCLUSION

Any evaluation has two major components: design and indicators. With respect to the indicators employed in the present study and the confidence that can be placed in them, the following remarks may suffice. Although the knowledge questions require some further internal analysis they are, on the whole, straightforward. The preliminary research into maternal food preferences has already been mentioned (Hoorweg and Niemeyer, 1980). The one-day dietary recall as a method of measuring food intake has certain limitations but is nevertheless an useful instrument for assessing the mean food intake of groups of children (Garn, Larkin and Cole, 1978; NIRPb). The anthropometric measurements need no further arguments here: they are commonly used to assess the nutritional status of children.

The design of the present study consists of comparison between recent and long-time participants and it is assumed that the mothers admitted at the time of the study were no different from the mothers admitted some years ago. There is no reason to expect the mothers in the two groups to exhibit differences in maternal knowledge, preferences or dietary behaviour at the time of their entry to the programme. A comparison between recent and long-time participants therefore demonstrates the effect of the programme in these respects⁽²⁷⁾. Comparison of the nutritional status of the children in the two groups is, however, not very meaningful. Firstly, because children who have participated for an extended period of time, are generally older, and secondly because the children admitted some years ago were in a much poorer condition at the time of entry than those admitted at the time of our study. This part of the analysis has therefore concentrated on the development of the long-time participants over the years without the benefit of a comparison group. If anything, such complications show how necessary it is to adhere strictly to methodological principles when studying nutrition intervention.

The findings, first of all, prove that the clinics actually do reach the poorer sections of the population. This contradicts the crit-

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icism that the small fees charged by the CRS clinics exclude participation by the poorer households, although the possibility remains that the very poorest households cannot afford to join the programme (see also p. 23 and note 15). Besides the fact that with drastic increases in number of participants, such as occurred in the upper area, selection standards tend to be less strictly enforced, it can furthermore be pointed out that selection occurs mostly in terms of economic resources, and that other family circumstances seem to count little.

The Pre-School Health Programme combines two different types of nutrition intervention: distribution of supplementary food rations on the one hand, and nutrition education with monthly weight checks, on the other. Knowledge and preferences of the mothers are seen to be affected by participation in the programme; this is attributable to the teaching. The level of nutritional knowledge of the long-time participants nevertheless leaves much room for improvement. No differences in food consumption were found to exist (apart from those connected with age) between children in the two groups, and the education does not appear to influence the diets prepared by the mothers. (No influence, that is, as regards the utilization of her own resources, because the one-day recall was recorded a month after the last visit to the clinic, by which time the food rations must have been exhausted.)

The weight progress of the children who had participated for extended periods indicates not only an overall beneficial effect, but also that the younger the children when they are enrolled in the programme the better their progress. Results are far from spectacular because 40 per cent of the children still had a W-A under 80. This last finding, however, must be seen in proper perspective, since many of these children come from poor families, among whom a high percentage of children falls below this critical value (NIRPa). Many of the children had already sustained growth deficits by the time they entered the programme, and it appears that such stunting in growth is not compensated, but that children remain at the same relative growth level at which they entered. In terms of the aims which the programme has set itself, this may be considered a positive finding.

This result is achieved, despite the fact that no changes in maternal, dietary behaviour were observed. This indicates that the strength of

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the programme lies in the food distribution, rather than in the educational component (excluding any instruction that may be given on the preparation of the foods that are distributed). There are in fact some minor indications of negative side effects: the long-time participants prefer to stop breastfeeding earlier, while milk consumption in general of the children in this group is slightly lower than among the recent participants.

The following remarks can be made concerning the fact that the educational effects of the programme are only small. The main reason why mothers are willing to attend every month is, of course, the food rations that are distributed. (This was confirmed in 1977 when no supplies arrived and attendance dropped drastically). The long hours that mothers have to wait at the clinics do not help create an optimal educational atmosphere. Alternative types of education might therefore be considered, for instance concentrating more on individual advice or on small groups of, say 4 or 5, mothers. The educational approach and the nutritional knowledge of the clinic staff members themselves could also be improved. The tone of the teaching is often brusque and authoritarian. The qualifications of these assistants are usually quite modest: many of them have not had any nutrition training, with the possible exception of one of the seminars, occasionally organized by CRS Kenya. Since our findings show that the food consumption of the participating children falls short in regard of energy intake, but that the levels of protein consumption seem sufficient, we feel that the current emphasis, in the teaching, on provision of proteins, particularly animal proteins, should definitely be reconsidered.

The present report is intended as a straightforward overview of findings. More detailed suggestions and comments will have to await further comparison with the results of the surveys among the population at large and the results of the studies at the other programmes, as well as analysis of additional material collected at the CRS clinics.

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NOTES

1. There are various ways of classifying ecological zones (Atlas of Kenya, 1970; Ojany and Ogendo, 1973; Ominde, 1968). This report uses the division of zones in the Atlas of Kenya, a division based on different values of a moisture index. The moisture index used in the present report was suggested by Braun (1977, 1979) and is computed as follows:
moisture = (mean annual rainfall (mm)/potential evaporation (mm)) x 100%
potential evaporation = 2422 - 0.358 x altitude (meters)
Ecological zone V has a moisture index of 37% or less
Ecological zone IV " " " " " 37-52%
Ecological zone III " " " " " 52-67%
Ecological zone II " " " " " 67% and more
As regards the three research areas the following averages have been used in the calculations:
Limuru research area: rainfall 1400 mm; altitude 2350 m.
Kandara-Kigumo area: rainfall 1150 mm; altitude 1600 m.
Mwea research area: rainfall 900 mm; altitude 1150 m.
This results in the following:
Limuru research area: relative moisture 89%; ecological zone II.
Kandara-Kigumo area: relative moisture 62%; ecological zone III.
Mwea research area: relative moisture 45%; ecological zone IV.
2. Other ecological zones such as zone V (arid) and VI (very arid) do not exist in Central Province.
3. The nine clinics c.q. centres studied are located in the following towns and villages:
 - Kiambu district: Limuru (Family Life Training Centre), Kambaa (Catholic Relief Services), Lari (Health Centre), all three in Limuru division.
 - Muranga district: Kigumo (FLTC), Gaichanjiru (CRS), Kandara (HC), situated in the middle and lower parts of Kigumo and Kandara divisions.
 - Kirinyaga district: Mwea (FLTC), Karaba (CRS), Kimbimbi (HC), all in Mwea division. The FLT centre in this district is usually referred to as situated in Mwea, without reference to the village Wamumu, a practice to which we conform.
4. These densities were calculated from the 1969 Census (MoFEP, 1970) and combine the results for the administrative locations in which the respective programmes are situated. For the Limuru research area this means the Lari and Limuru locations; for the Kandara-Kigumo area the Kandara, Gaichanjiru and Kigumo locations; and for the Mwea area the locations of Tebere, Murunduku and Mutithi.
5. The last figure, 15,700 sh/acre, should be seen in perspective. Most smallholders growing coffee have only a small plot with this crop, which requires considerable investment and a long fruition time. Few grow more than half an acre of coffee and because cultivation methods are often less than optimal their harvests are usually modest. Meilink estimated that in the top year, 1977, some 85% of the coffee-growing smallholders in Muranga earned an average of only 4,000 Sh from this crop (1979:23).
6. The term "household" or "family" as used in this report, refers to the domestic unit living under one roof. Since this domestic unit nearly always consists of a nuclear family, no distinction is made between "household" and "family", unless otherwise indicated. For the sake of convenience, however, the term "household" is used mostly in connection

with the economic position of the domestic unit, as in 'poor households'. The term "family" is mostly used in connection with the domestic cycle and the composition of the domestic unit, as in 'young families'. When reference is made to several, related (nuclear) families sharing a compound, the term 'extended family' is used.

7. Very few children do not live with their parents, and less than 5% of the children are brought to the health centre by someone other than their mother, as will be seen later in the report. All female guardians of children and all women bringing children to the health centres are therefore referred to as 'mothers'.
8. A complete list of foods in use among the Kikuyu, with their names in Kikuyu, has been presented elsewhere (Hoorweg & Niemeyer, 1980a).
9. These results are based on the findings regarding one child per household, namely the index child for which purpose the child nearest to 2 years of age was selected.
10. To give an example of how attendance is organized: at Gaichanjiru Mission Hospital a CRS clinic was held 3 mornings a week, that is 12 clinics a month which, with an average attendance of about 40 children, amounts to a total enrollment of 500 children.
11. Sometimes mothers, in really desperate circumstances, may try to force admission to the programme by repeatedly attending all morning, although they do not receive any foods. If she persists, she is usually given a place, eventually. There comes a point, however, when all places have been given out and the only remaining alternative is to organize one more session a month.
12. For instance, in 1979, in Kambaa, the rations consisted of 2 pounds of oil, 5 pounds of corn-soya mixture and 3 pounds of bulgar wheat.
13. These time figures are based on observations made on five occasions at the three centres where our studies were conducted; time records were made for all mothers attending (229 in all).
14. Except when no food is available for distribution as was the case for several months in 1977, when the monthly clinics were kept going but attendance rates dropped sharply, only to pick up again after food had arrived.
15. The mothers are, however, also charged double or three times the fee if they enroll not only with one child. It is one thing for a mother to pay 5 sh. a month but it is quite a different proposition if they have to furnish 10 or 15 sh every month. It is to be feared that the really poor cannot afford this.
16. With one exception, Nazareth Hospital, north of Nairobi, where 1800 children were enrolled in the programme.
17. In cases when one child is regularly examined we prefer the term 'case-monitoring'.

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18. The recall method is discussed in more detail in the forthcoming report on the survey results (NIRPb) which will also contain a comprehensive discussion on the reliability of this method when compared with nutritional observations.
19. Design copied by courtesy of the Central Bureau of Statistics.
20. At this point no distinction is made between answers emphasizing the quantity or the quality of the diet.
21. $T = 2.24$; $p < .05$
22. All children still being breastfed are included in the group BF, irrespective of age. The average age of the children in this group is still much lower than that of the next group, which comprises the children between 6-23 months.
23. But possibly not the only one. The children aged 6-35 months also lag behind the general child population in consumption of solids, and it is doubtful whether that can be blamed on a lack of resources, because the older children in these families do not suffer deficits in this respect. There are, however, also shifts in composition of food intake at different ages, which make further analysis of these results at a later stage necessary.
24. The weights recorded by the staff at the clinics proved accurate. Weights recorded by ourselves at the time of study corresponded closely with those recorded by the clinic staff on the same occasion ($r = .91$).
25. The following table shows the actual number of cases represented at each point. For every case the mean W-A during that period was calculated and the average number of observations per case used for this calculation is shown in parentheses.

		Period of participation:			
		Admission	6-11 m.	12-23 m.	24+ m.
Age child at	-11 m.	N=36 (1)	N=30 (4.3)	N=43 (8.2)	N=38 (12.1)
admission to	12-23 m.	N=26 (1)	N=21 (4.9)	N=26 (7.8)	N=23 (8.6)
the programme:	24+ m.	N=13 (1)	N=13 (5.7)	N=12 (6.1)	N=10 (6.0)

26. This is because the condition of recent entrants is better at all three clinics, not only at the clinic in the upper area. The percentage of children under W-A(80) admitted in the high, middle and low areas some years ago was 29%, 55%, and 46% respectively (appendix G), and among the children admitted at the time of the study 9%, 23% and 21% respectively.
27. Although there remains a slight difference in social class between recent and long-time participants with fewer poor households among the former. In view of this difference, knowledge, preferences and food consumption of the recent participants could, theoretically, be higher than among the long-time participants at the time of entry. This would mean that the effects of the programme have

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been underestimated. The difference in class distribution is, however, slight and it is unlikely that it would alter the results significantly. But even if underestimation has occurred this can only strengthen our conclusion that the teaching does have an effect on the knowlegde and preferences of the mothers.

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Appendix A.

KNOWLEDGE QUESTIONNAIRE: RESULTS FOR RECENT AND LONGTIME PARTICIPANTS

		RECENT PARTICIP. N=70	LONGTIME PARTICIP. N=82
1. When a child has a swollen body, red or grey hair and is miserable; what disease does it suffer from?	kwashiorkor/higo*	71%	74%
	other answers	24%	24%
	don't know	4%	1%
2. What causes higo?	food: poor quality	26%	30%
	food: insufficient quantity	27%	31%
	other answers	31%	33%
	don't know	16%	6%
3. What causes kuhoma? **	food: poor quality	14%	17%
	food: insufficient quantity	34%	39%
	other answers	40%	28%
	don't know	11%	16%
4. At what age can a child start to eat the following dishes? (a) ucuru ***	0 - 4 months	59%	46%
	5 - 9 months	30%	49%
	10+ months	11%	5%
	(b) gitoero		
	0 - 4 months	33%	32%
	5 - 9 months	56%	51%
	10+ months	11%	17%
	(c) mboco		
	0 - 4 months	10%	12%
	5 - 9 months	59%	49%
	10+ months	32%	39%
	(d) ngima na mboga		
	0 - 4 months	16%	13%
5 - 9 months	50%	55%	
10+ months	34%	32%	
(e) githeri			
0 -20 months	14%	20%	
21 -29 months	39%	35%	
30+ months	46%	45%	
5a. When a child of 2 years eats three meals a day (breakfast, lunch, dinner); is that enough or does it need anything else?	enough	51%	57%
	needs extra's	49%	43%

* The Kikuyu word higo literally means kidneys but also stands for kwashiorkor.

** kuhoma = the Kikuyu concept closest to marasmus: a condition in which a child does not grow well and has thin arms and legs.

*** ucuru = maize gruel; gitoero = mashed bananas and Irish potatoes; mboco = beans; ngima na mboga = maize porridge with vegetables; githeri = whole maize and beans.

Appendix A, KNOWLEDGE QUESTIONNAIRE; CONTINUED

		RECENT PARTICIP. N=70	LONGTIME PARTICIP. N=82
5b. If answer: needs extra's. What is needed?	mention milk/ucuru	37%	29%
	mention eggs	4%	12%
	mention other foods	17%	18%
6. When a child suffers from kuharuo (=diarrhoea) what foods or drinks should you give?	water, plain	43%	62%
	water, with sugar and/or salt	14%	9%
	other answers	43%	29%
7. What is the best age at which to stop breastfeeding a child?	0 - 9 months	4%	7%
	10 -14 months	33%	45%
	15 -20 months	37%	28%
	21+ months	26%	20%
8. Have you ever heard of the three food groups: body-building foods (gwaka miri) protective foods (kugitira mwiri) and energy foods (kuhe hinya)?	yes	-	87%
	no	-	13%
8b. Is maize flour a body-building or <u>energy</u> fd? cabbage, body-building or <u>protective</u> fd? milk, protective or <u>body-building</u> fd? fruits, body-building or <u>protective</u> fd? Irish potatoes, <u>energy</u> or protective fd? beans, energy or <u>body-building</u> fd? green leaves, <u>protective</u> or body-building fd?		-	65%
		-	62%
		-	63%
		-	57%
		-	70%
		-	67%
	-	60%	

(The answer percentages given are the percentage of women choosing the correct, underlined alternative)

LONGTIME
P. PARTICIP
N=82

Appendix B.
PREFERENCE SCALE: RESULTS OF PAIRED COMPARISONS FOR RECENT AND LONGTIME PARTICIPANTS (Following below are the proportions of respondents choosing the first of the two foods mentioned; for example, 91% of the recent participants preferred beans over rice)

		RECENT PARTICIP. N=70	LONGTIME PARTICIPANTS N=82
29%			
12%			
18%			
62%			
9%			
29%			
7%	Beans-Rice	.91	.91
45%	Beans-Finger millet	.79	.76
28%	Beans-Green banana	.82	.83
20%	Beans-Cabbage	.76	.83
	Peas-Maize flour	.66	.73
87%	Peas-Kale	.35	.48
13%	Peas-Irish potato	.65	.75
	Peas-Orange	.35	.49
65%	Eggs-Rice	.87	.96
62%	Eggs-Finger millet	.91	.79
63%	Eggs-Green banana	.75	.89
57%	Eggs-Cabbage	.75	.85
70%	Meat-Maize flour	.78	.81
67%	Meat-Kale	.66	.61
60%	Meat-Irish potato	.74	.86
	Meat-Orange	.66	.70

Appendix C.

DIETARY RECALL: AVERAGE FOOD CONSUMPTION IN GRAMS FOR RECENT AND LONGTIME PARTICIPANTS BY AGE GROUPS
(STANDARD DEVIATIONS IN PARENTHESES)

	RECENT PARTICIPANTS					LONGTIME PARTICIPANTS				
	BF*	06-23	24-35	36-47	48-59	BF*	06-23	24-35	36-47	48-59
	N=28	N=25	N=12	N=3	N=0	N=8	N=12	N=15	N=17	N=24
Cereals	52	96	111	69	x	47	113	103	164	176
Roots & tubers	146	127	89	82	x	90	95	92	109	191
Grain legumes	8	31	20	65	x	11	12	60	46	64
Vegetables	24	54	91	83	x	8	107	90	44	58
Fruits	0	4	0	0	x	0	0	7	0	0
Eggs & meats	4	8	6	0	x	6	4	3	0	5
Fat	3	4	6	7	x	1	6	4	4	5
Sugar	7	14	34	49	x	1	17	21	25	23
Miscell. solid foods	0	12	19	0	x	0	5	7	24	2
Subtotal: Solid foods	247	355	375	355	x	163	358	393	416	537
()	(122)	(154)	(171)	(65)	x	(114)	(140)	(180)	(200)	(297)
Milk	194	222	170	160	x	163	163	162	156	134
()	(188)	(160)	(187)	(84)	x	(236)	(118)	(154)	(127)	(131)
Subtotal: Raw matter	442	570	545	514	x	326	522	555	572	681
()	(202)	(243)	(202)	(140)	x	(219)	(181)	(248)	(203)	(356)
Cooking water	407	644	718	1058		382	673	741	811	1013
Total consumed (grs.)	849	1214	1263	1572	x	708	1195	1296	1383	1694
()	(284)	(344)	(250)	(363)	x	(374)	(339)	(354)	(509)	(535)
Energy intake (Kcal.)	580	881	898	945	x	434	833	968	1148	1305
()	(209)	(339)	(435)	(292)	x	(247)	(253)	(390)	(508)	(417)
Protein consumption (grs.)	18	32	29	30	x	17	27	38	36	43
()	(10)	(18)	(12)	(21)	x	(10)	(11)	(27)	(18)	(18)

* BF=children, breastfed (see note 22)

APPENDIX D.
ANTHROPOMETRY: DISTRIBUTIONS FOR RECENT AND LONGTIME PARTICIPANTS

		RECENT PARTICIPANTS (93 children)	LONGTIME PARTICIPANTS (88 children)
Weight-for-age	-59	-	-
	60-69	8%	7%
	70-79	14%	33%
	80-89	47%	36%
	90-99	22%	19%
	100-109	9%	5%
	110+	1%	-
Height-for-age	-79	-	-
	80-84	4%	6%
	85-89	21%	28%
	90-94	43%	46%
	95-99	24%	19%
	100-104	6%	1%
	105+	2%	-
Weight-for-height	-69	-	-
	70-79	1%	-
	80-84	7%	5%
	85-89	10%	13%
	90-99	50%	56%
	100-109	27%	23%
	110+	5%	3%

APPENDIX E. CHARACTERISTICS OF PARTICIPANTS IN CRS PROGRAMME

			CRS PARTICIP. N=152	NIRP SURVEY N=300
Characteristics mother	Age:	19yrs and younger	1%	2%
		20-29yrs	48%	46%
		30-49yrs	49%	50%
		50yrs and older	2%	2%
	Education:	none	45%	36%
		primary 1-4	22%	28%
		primary 5-7(8)	30%	29%
		secondary	3%	7%
	Marital status:	single	4%	3%
		married, monog.	86%	84%
		married, polyg.	4%	8%
		sep/divorced	5%	2%
		widowed	2%	3%
Characteristics family/household	Domestic stage:	young fam.	26%	25%
		middle age fam.	63%	57%
		elder fam.	11%	18%
	Average number of children:			
		pre-school children (0- 5yrs)	2.3	2.2
	school age children (6-16yrs)	2.0	2.1	
	grown-up children (17yrs & over)	0.1	0.3	
Social class:	poor households	47%	41%	
	intermediate h.holds	44%	38%	
	affluent h.holds	9%	21%	

APPENDIX F. DIETARY RECALL: AVERAGE FOOD CONSUMPTION IN GRAMS
FOR CRS PARTICIPANTS BY AREA

		UPPER AREA N=47	MIDDLE AREA N=56	LOWER AREA N=45
Number of children for whom 1-day recall was recorded	BF [*]	12	8	16
	6-23 months	15	14	8
	24-35 months	13	4	12
	36-47 months	4	12	6
	48-59 months	3	18	3
Cereals		89	127	106
Roots & tubers		119	170	70
Grain legumes		16	59	20
Vegetables		101	35	37
Fruits		0	2	9
Eggs & meats		4	4	5
Fat		5	4	4
Sugar		27	21	6
Miscell. solid foods		9	1	15
Subtotal:	Solid foods	384	427	271
Milk		234	167	120
Subtotal:	Raw matter	613	597	398
Cooking water		594	800	627
Total consumed		1207	1397	1025

* BF=Children, breastfed (see note 22)

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APPENDIX G. ANTHROPOMETRIC RESULTS OF LONGTIME PARTICIPANTS BY AREA:
AVERAGES AND PERCENTAGES OF CHILDREN FALLING BELOW CRITICAL VALUES

		UPPER AREA N=24	MIDDLE AREA N=29	LOWER AREA N=22
Characteristics at the time of admission to the programme	Age (months)	13.2	11.3	17.1
	Weight-for-age	85.6	79.1	75.9
	Percent children below W-A(80)	29%	55%	46%
Characteristics at the time of study	Age (months)	48.7	49.5	40.0
	Period of part. in progr(m.)	35.5	38.1	23.7
	Weight-for-age	81.9	82.1	86.3
	Height-for-age	91.4	91.4	91.7
	Weight-for-height	95.3	95.1	98.4
	Percent children below W-A(80)	42%	45%	33%
	Percent children below H-A(90)	33%	33%	35%
	Percent children below W-H(90)	16%	24%	10%

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