Nutrition survey in Murang'a District, Kenya : Part 2 : Nutritional cognition and the food consumption of pre-school children

Hoorweg, J.C.; Niemeijer, R.; Steenbergen, W.van

Nutrition Survey in Murang'a District, Kenya

Jan Hoorweg, Rudo Niemeijer and Wil van Steenbergen

Part 2: Nutritional Cognition and the Food Consumption of Pre-School Children

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NUTRITION SURVEY IN MURANG'A DISTRICT, KENYA

Part 2: Nutritional Cognition and the Food Consumption of Pre-School Children.

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* With the Assistance of MARIAN GEUNS

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GLOSSARY

Githeri	Whole maize kernel with beans
Gitoero	Dish of roots & tubers, usually green bananas and Irish potatoes
Ngima	Stiff maize porridge of maize flour
Ucuru	Light porridge (gruel), usually prepared with maize flour

SUMMARY

As part of the Nutrition Intervention Research Project, a nutrition survey was held during the first months of 1978 in two locations in Kigumo Division of Murang'a District. The two locations differ in ecological conditions and agricultural potential. The population belongs to the Kikuyu ethnic group. In each location 150 households with children in the age range of 6-59 months were visited. This report presents the findings on the nutritional cognition of mothers and the food consumption of children under five years as measured by means of the 24-hour recall method. An assessment of this method of estimating individual food consumption is included as an appendix.

In general, Kikuyu mothers are aware of the important principles of child nutrition such as the recognition and causation of malnutrition, the introduction of weaning foods, the duration of breastfeeding, and the treatment of diarrhoea. They also express a strong preference for highly nutritious foods, such as legumes and animal products, for their young children.

Children are usually breastfed till the age of one year but receive additional foods from the age of three to five months. From early on they are introduced to mashed gitoero, a dish of bananas and potatoes, and ucuru, a thin porridge consisting of maize flour. Children are also given remarkably large amounts of milk to drink, single, served with tea or used in the

preparation of gitoero and ucuru. Children are also introduced quite early to ngima, the stiff maize porridge. Young children are not given githeri, the standard dish of maize and beans, because it is prepared with whole maize kernels. Instead, mothers start to introduce this dish by serving children beans, and no maize or only some token quantities. With age the consumption of milk and roots & tubers decreases while the consumption of cereals increases. Gradually, during the third and fourth year, a shift occurs towards the adult diet, although children may still be given occasional extras between meals.

Protein consumption is high in all age groups. Among one- and two-years-olds energy intake is above international recommended standards. Among the three to four-year-olds energy intake falls to 85 KCal per kilogram-bodyweight. Most energy intake comes from four food groups: roots & tubers, cereals, milk and legumes. The latter three also account for most of protein intake.

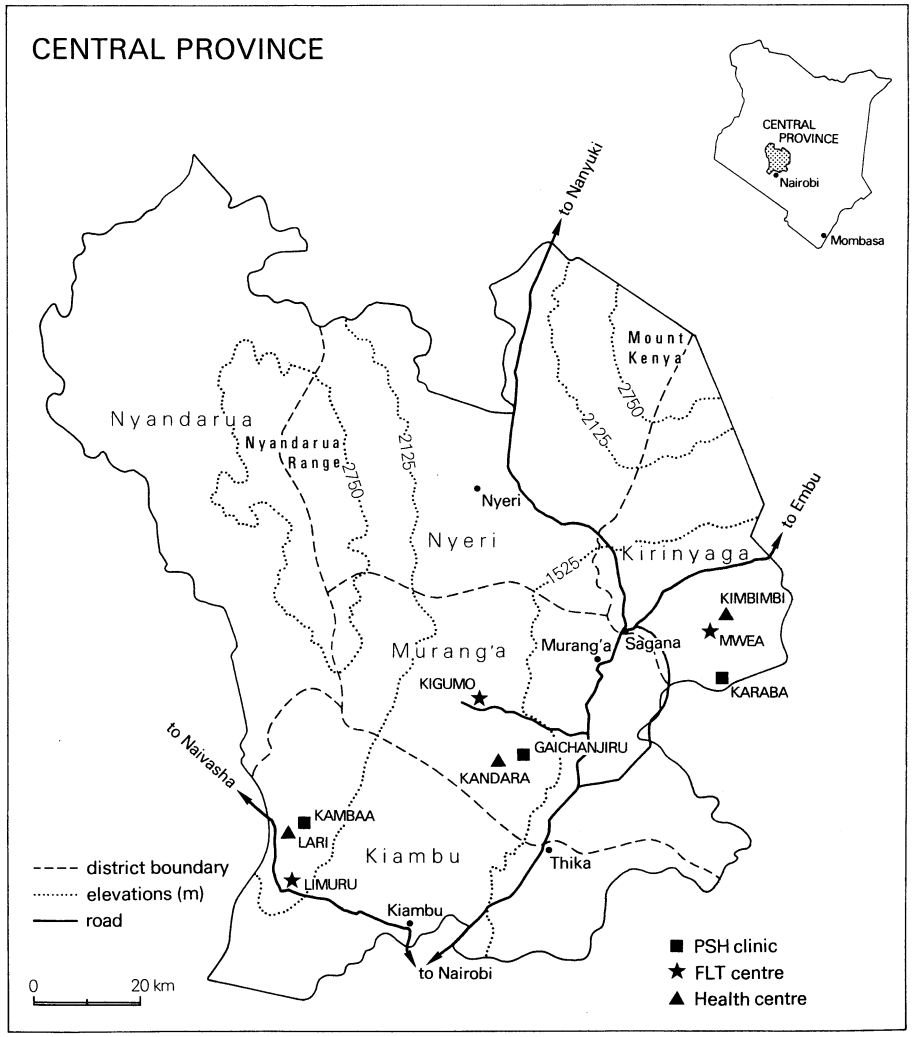
Formal education generally shows a small, but positive relation with nutritional cognition, but the actual food consumption of children was not related to the educational level of their mothers.

There are no indications of differences in energy and protein intake between children in the two ecological areas. This accords with earlier findings that the general standard of living in the two areas differs little and that there are no important differences in the nutritional status of children.

Food consumption is, however, related to household characteristics, notably social class. In particular, the energy consumption of one-year old children shows differences with social class, ranging between 200 and 450 KCal. These differences are

mostly the result of a lower consumption of milk and cereals. Mothers with less resources manage to compensate for this in part by giving their children more legumes to eat, but this compensation occurs mostly among the 2-yr old children. No differences in energy and protein intake were found to accompany other household characteristics such as the domestic stage of the family and family size, i.e. the number of young children in the household.

In an earlier, companion report it was already concluded that the aetiology of childhood malnutrition in Central Province is mainly connected with pressure on economic resources and peer pressure within families. The findings in the present report allow a further definition of these earlier, conclusions. There is no evidence of a serious lack of nutritional knowledge, detrimental weaning practices or adverse nutritional preferences. Rather, the energy intake of children is related to the available economic resources, and deficits among children from poor households occur mainly during the period when children have been taken off the breast and are still under two years of age. The finding that peer pressure is not connected with a lower energy or protein intake, while negatively related with nutritional status, points at the importance of maternal attention.


CENTRAL PROVINCE
CENTRAL PROVINCE
Nairobi
Mombasa
to Nanyuki
Mount Kenya
2750
2125
Nyandarua
Nyandarua Range
2750
2125
Nyeri
Nyeri
1525
Kirinyaga
to Embu
KIMBIMBI
MWEA
KARABA
Murang'a
Murang'a
Sagana
KIGUMO
GAICHANJIRU
KANDARA
to Naivasha
KAMBAA
LARI
Kiambu
LIMURU
Thika
Kiambu
to Nairobi
district boundary
elevations (m)
road
0
20 km
PSH clinic
FLT centre
Health centre

INTRODUCTION

The Nutrition Intervention Research Project reviews nutrition programmes for children under five among the Kikuyu in Central Province, Kenya (NIRP,1976;1978). The objectives of the project are to provide systematic knowledge concerning the impact of nutrition programmes and to develop a model for the evaluation of such services. The effects of nutrition intervention are examined and related to ecological conditions and to economic and social differences among the participants.

Impact studies were carried out for three programmes: the Nutrition Field Worker Programme of the Ministry of Health, the Pre-School Health Programme of the Catholic Relief Services, and the Family Life Training Programme of the Ministry of Housing and Social Services (Hoorweg & Niemeyer,1980a;1980b; 1982). From each programme one clinic or centre was selected in each of the three following locations: a semi-arid area in the lower plains, a more humid and more fertile area in the coffee belt and an area of high agricultural potential at high altitude (Meilink,1979). The studies cover not only the nutritional

status of the children in the programmes but also the knowledge levels, preferences and dietary practices of the mothers.

Concurrently, between March 1978 and May 1979 surveys were conducted in Central Province among children aged 6 to 59 months. The previously mentioned programmes largely concentrate on children under five years. Children under six months were excluded from the surveys because generally it is after the age of 5-6 months that persistent nutritional problems start to manifest themselves among African children. The surveys were conducted in Kigumo Division in Murang'a District, situated in the heart of Central Province on the Eastern slopes of the Nyandarua mountain range. Two survey areas were selected with different ecological characteristics.

The first, major, survey covered 150 households in each area; subsequently two smaller surveys were conducted consisting of two follow-up visits to 50 households in each area in the course of the next year. The primary aim of the first survey was to examine the dietary patterns and the nutritional status of children in relation to their living environment. A more specific aim was to furnish a set of social and nutritional data against which the participants at the nutrition programmes could be compared. For this reason the type of information collected in the first survey was largely identical to that collected during the impact studies of the nutrition programmes.

The follow-up surveys among a smaller group of respondents served a different purpose. These respondents function as a control group for the mothers interviewed at the nutrition programmes. The follow-up visits also made it possible to examine the food consumption and anthropometry of the children in these households more than once, thereby providing a useful longitudinal perspective.

This report is concerned with the first survey, in particular with the food consumption of young children and maternal knowledge and preferences in respect of child nutrition. In an earlier companion report the ecological and social conditions in the survey areas were already reviewed together with the nutritional state of the child population (Hoorweg, Niemeyer and Van Steenbergen, 1983). Rainfall in Central Province in 1977 and 1978 was of an average level and above, while maize harvests were of an average level or somewhat below according to available data of the Central Bureau of Statistics[1,2].

The present report starts with a general introduction on Kikuyu food culture. Next follows a description of the survey methodology. Subsequently, nutritional knowledge and preferences are reviewed, followed by a section on the food consumption of young children as assessed by means of the 24-hour recall method. A brief recapitulation of the variations in ecological, economic and social conditions in the survey areas precedes a discussion of the relations between child nutrition and these

variables. A series of appendices with detailed data concludes the report.

2. KIKUYU FOOD CULTURE

2.1 Foods and Dishes

Food habits have changed considerably over the past century. The Kikuyu used to grow a variety of grains and early in the century finger millet was still an important staple food together with sorghum. Nowadays the areas under cultivation with millet, sorghum and wheat are insignificant; when needed these grains are usually purchased. They have largely been replaced by white maize which was already introduced early in the last century, and which nowadays is highly preferred.

Different roots, tubers and starchy fruits are grown. Irish potatoes which were introduced only at the end of the last century have become very popular; green banana and sweet potato are also grown widely. Cassava, yam and taro (locally called arrow root) are far less common.

The kidney bean is the most common legume, together with the ordinary pea and the cowpea. The Bonavist bean and the pigeon pea are regarded as delicacies and served in ceremonial dishes at marriage and child birth occasions. The lima bean

which is locally called soya bean, the mung bean and the groundnut are available but less frequently used.

The vegetables most often prepared are kale, cabbage, pumpkin leaves and (young) cowpea leaves. The leaves of other legumes are also eaten but less often. Kale (sukuma wiki) has become very popular although introduced only recently. It has probably replaced many other plant leaves, particularly many of the wild varieties whose consumption seems to have greatly declined. Onions, peppers, tomatoes and carrots are the most frequent seasonings.

Children may eat fruits between meals. Sweet banana, mango and passion fruit, in particular, are popular. Most fruits are not difficult to obtain when in season but some foods such as gooseberries, pears, plums and tangerines are only grown in certain areas.

A list of the foods consumed by the Kikuyu in rural areas is reproduced in table 1. The list contains about 80 entries but certain of these foods are rarely eaten and perhaps never used in certain households. Truly exceptional items such as antelope meat, grasshoppers or stinging nettle are not included in the list.

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 during the morning or the afternoon. Children are usually breastfed till the age of one year, but receive supplementary foods from the age of three to

TABLE 1
FOODS CURRENTLY USED AMONG KIKUYU IN RURAL AREAS OF CENTRAL PROVINCE[1]

ENGLISH	SCIENTIFIC NAME	KIKUYU[2]
CEREALS		
maize	Zea mays	mbembe
maize flour	Zea mays	mutu wa mbembe
millet, bullrush, flour	Pennisetum americanum	mutu wa mwere
millet, finger, flour	Eleusine coracane	mutu wa mugimbi
rice	Oryza sativa	mucere
sorghum, flour	Sorghum spp.	mutu wa muhia
wheat, flour	Triticum vulgare	mutu wa ngano
ROOTS, TUBERS AND STARCHY FRUITS		
cassava	Manihot esculenta	mwanga(s); mianga(p)
green banana	Musa paradisiaca	irigu(s); marigu(p)
potato, Irish	Solanum tuberosum	waru
potato, sweet	Ipomoea batatas	ngwaci
taro	Colocasia esculenta	nduma
yam	Dioscorea spp.	gikwa(s); ikwa(p)
GRAIN LEGUMES		
bean, bonavist	Lablab niger	njahi
bean, kidney	Phaseolus vulgaris	mboco
bean, lima	Phaseolus lunatus	noe
bean, mung, green	Phaseolus aureus	ndengu; ngina; thuu
groundnut	Arachis hypogaea	njugu karanga
pea	Pisum, sativum	minji
pea, cow	Vigna spp.	thoroko
pea, pigeon	Cajanus cajan	njugu
VEGETABLES		
amaranth	Amaranthus spp.	terere
cabbage; cabbage leaves	Brassica oleracea	kabici
carrots	Daucus carota	karati
cauliflower	Brassica oleracea	kariburawa
kale	Brassica oleracea	thukuma
leaves, bonavist bean		nyeni cia macahi
leaves, cassava		nyeni cia mianga
leaves, cowpea		nyeni cia mathoroko
leaves, Irish potato		nyeni cia waru
leaves, kidney bean		maboco
leaves, pumpkin		nyeni cia marenge
leaves, taro		marutu
lettuce	Lactuca sativa	rethithi
onion	Allium cepa	gitunguru(s); itunguru(p)
peppers, red and sweet	Capsicum annuum	biribiri
pumpkin	Cucurbita spp.	irenge(s); marenge(p)
spinach	Spinacia oleracea	mathibinaci
tomato	Lycopersicum esculentum	nyanya
FRUITS		
apple, custard	Annona spp.	itomoko(s); matomoko(p)
avocado pear	Persea americana	ikorobia(s); makorobia(p)
banana, sweet	Musa sapientum	riru(s); meru(p)
berries	Rubus spp.	ndare
cape gooseberry	Physalis peruviana	nathi
grapefruit	Citrus grandis	irimau(s); marimau(p)
guava	Psidium guajava	ibera(s); mbera(p)
lemon	Citrus aurantifolia	ndimu
mango	Mangifera indica	iembe(s); maembe(p)
mulberry	Morus alba	ituya(s); matuya(p)
orange	Citrus sinensis	icungwa(s); macungwa(p)
passion fruit	Passiflora edulis	ndunda(s); matunda(p)
paw-paw	Carica papaya	ibabai(s); mababai(p)
pear	Pyrus communis	ngario
		mugumo(s); migumo(p)
pineapple	Ananas cosmosus	inanathi(s); mananathi(p)
		riinabu(s); mainabu(p)
plum, red; yellow	Prunus domestica	nduramuthi; ndarathini
tangerine	Citrus reticulata	thandara

TABLE 1 (continued)

ENGLISH	SCIENTIFIC NAME	KIKUYU
CONDIMENTS AND SPICES		
coriander, leaves	Coriandrum sativum	ndania
curry powder		mbithari
ginger powder	Zingiber officinale	tangauthi
sodium bicarbonate		igata
salt		cumbi
MEATS AND ANIMAL PRODUCTS		
beef		nyama cia ng'ombe
chicken		nyama cia nguku
egg		itumbi(s); matumbi(p)
fish		nyama cia thamaki
goat		nyama cia mburi
milk		iria
milk powder		iria ria mutu
mutton		nyama cia ng'ondu
pork		nyama cia ngurwe
rabbit		nyama cia mbuku
MISCELLANEOUS		
butter; margarine		thiagi
fat, cooking		maguta ma kuruga
ghee		thamuri
honey		uuki
sugar		cukari
sugar cane		kigwa(s); igwa(p)

1. Originally published in Ecology of Food and Nutrition, 1980, 142-143.
2. Food names in Kikuyu are listed in singular(s) and plural(p). Names that are known in only one form are given without further indication.

five months. By the age of four years most children eat with the adults although they may still be given occasional extras.

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 dish is maize and kidney beans boiled together (githeri). Sometimes other types of beans or peas may be added or may replace the kidney beans. Occasionally some meat may also be added. The ratio of maize and beans [3] shows wide variation depending on such factors as taste and availability. At young ages children are not given

githeri because it is prepared with whole maize kernels, and they may be given beans instead. Githeri is usually prepared in large quantities sufficient for several days. Individual meals usually consist of a portion of this basic dish to which vegetables, bananas[3], potatoes[3] or seasonings may be added to give some variety to the two main meals of the day. When roots & tubers are added to the githeri the dish may be mashed but in some areas this is hardly ever done.

Another basic dish is stiff porridge of maize flour (ngima) served either when whole maize is not available or as a quick dish that requires less time to prepare. Ngima is usually eaten with a vegetable stew consisting of onions, leafy vegetables and fat to which tomatoes and fresh beans or peas may be added when in season. It can also be taken with tea or milk. Ucuru is a thin porridge of maize, millet or sorghum flour and is an important weaning food. Another basic dish is gitoero, a stew of roots and tubers, such as Irish potatoes and green bananas [4]. It also serves as an important weaning food in which case milk is often added to soften the texture. More elaborate gitoero dishes may also be prepared with vegetables, meat or seasonings. Some roots like sweet potato are also eaten single, boiled in the skin. Occasionally a rice dish with gitoero or a stew may be served. Chapatis, unleavened bread, and pancakes are sometimes prepared. Occasional snacks include bread, biscuit, cakes and soft drinks which are on sale at many of the local shops.

Meat consumption is still very limited. Sometimes meat is added to the family dish at a special occasion, adult men also buy roasted meat in bars and at other selling points. The meats consumed are mostly beef, mutton, goat and chicken. Children are given fairly large amounts of milk to drink, either single, diluted with water, or served with tea as drunk by the adults.

Spices are largely absent from Kikuyu cooking, and limited to salt and, sometimes, curry powder. Ginger powder is sometimes added to tea, while sodium bicarbonate may occasionally be used in cooking vegetables not so much to add taste as to make the leaves more tender.

2.2. Food Classification

The Kikuyu word for food in general is irio, although in the Nairobi-Kiambu area the same word is used for a mash of githeri with potatoes, bananas and greens which is particularly popular in this area. Fruits are known as matunda, green leaves as nyeni. Mboga means cabbage but also denotes vegetables in general, including green leaves. Meat is called nyama; different kinds of meat are identified by reference to the particular animal.

Similarly, mutu is flour and individual flours are named after the grains. Finally, hindi stands for all kinds of seeds

and grains. There are no words in Kikuyu for food groups such as legumes, roots & tubers, cereals or spices.

A study of the Kikuyu classsificatory system nevertheless showed that Kikuyu women distinguish six major food groups: cereals; roots & tubers; legumes; vegetables; fruits; meats & animal products. They seem to make no further divisions within these groups and there is also no indication that some groups are less clearly identified than others.

Onions, peppers, carrots and tomatoes form an exception in that they are not associated with vegetables and do not belong to any other foodgroup either. There are furthermore indications that maize and green bananas, two important staple foods, take somewhat marginal positions in their groups, cereals and roots & tubers respectively. With the exception of these small deviations, however, it is fair to say that Kikuyu food classification does not differ from the nutritional assignation generally used (Hoorweg & Niemeyer,1978a,1980c).

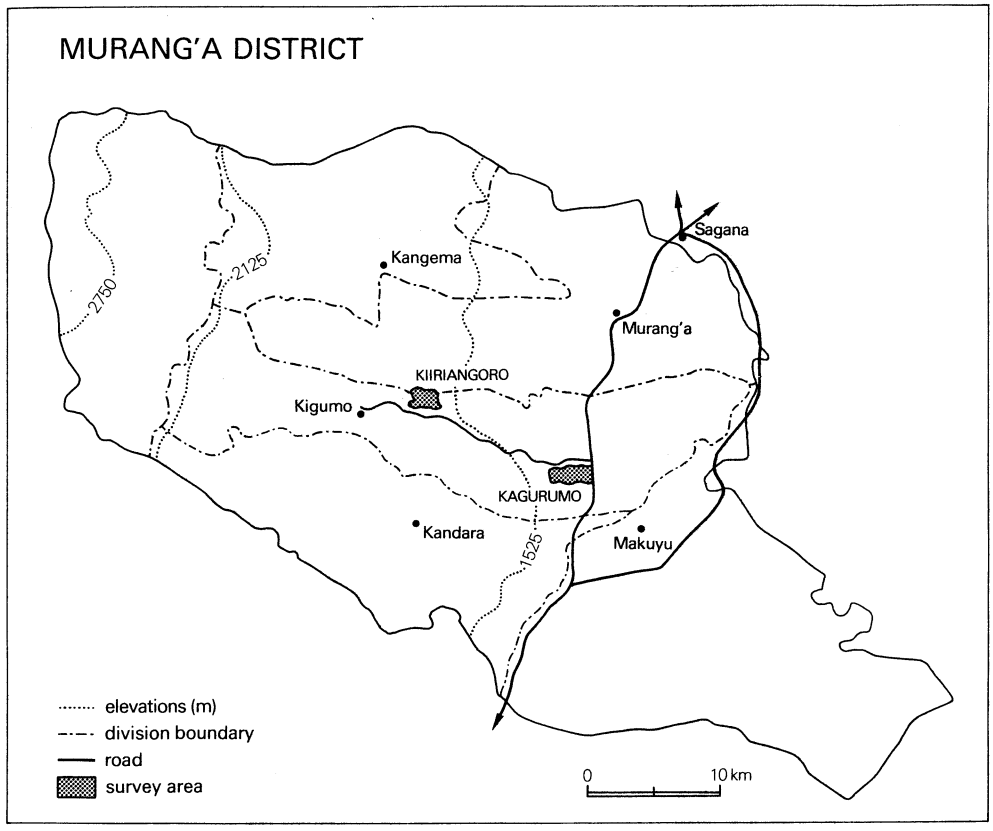
3. SURVEY METHODOLOGY

3.1. Survey Areas

Murang'a District is situated on the slopes of the Nyandarua mountain range and forms the traditional heartland of the Kikuyu. The survey locations were selected in Kigumo Divison which spreads from high to low, from steep parallel ridges covered with mountain forest at the upper end of the Division to low foothills with swampy valleys in the lower areas. Soils consist of well drained, dark-reddish brown, friable clay, humic nitosols, developed on basic igneous rocks. There are two rainy seasons which allow for two harvests a year. The long rains fall, between the end of March and the end of May, the short rains are in October and November. Of the two dry seasons the one between December and March is the more severe.

Two survey areas were selected for their differences in ecology. The upper area, known as Kiiriangoro, lies in Kirere location, not far from Kigumo town, the divisional headquarters. The second area, Kagurumo, is situated in the lower end

of the Division, in Gikaranga-Ruanganga location (see map below). Even to the casual observer the differences between the areas are evident. Kiiriangoro offers a green, lush landscape with steep ridges fairly close to each other, densely cultivated from the top of the hills down into the valleys. The soil on the steep hillsides is protected from erosion by trees and terraces. In the lower area, Kagurumo, the hills are flatter and broader, the valleys wide and swampy. Vegetation is less abundant and large areas are left uncultivated. Where the ridges happen to be more pronounced there is often evidence of erosion.



The difference in altitude between the two areas results in differences in rainfall and evaporation correspondent with different ecological zones.(5)

The upper area (UA), Kiiriangoro, at an altitude of approximately 1650 m. and with an estimated rainfall of 1200-1250 mm. is situated in the border region between ecological zones II and III. The area has good agricultural potential, many smallholders grow coffee and keep dairy cattle.

The lower survey area (LA), Kagurumo, at an altitude between 1400 and 1450 m. has an estimated rainfall of 1000-1050 mm. It lies in the border area between ecological zones III and IV where agricultural potential becomes marginal. Far less coffee is grown here. Livestock is more numerous except for graded cattle which do better in the upper area.

The population in the two areas differs considerably. At the time of the latest census, in 1979, the population density of the upper area was 747 people/km^2, while this figure was 337/km^2 in the lower area.(6)

The exact locations of the survey areas were chosen with a view to comparable transport and health facilities. Both are situated along a secondary ridge branching off from the main tarmac road through Kigumo Division, which had the advantage that both areas remained reasonably accessible during the rainy season. The survey areas were defined as all the land between the streams in the valleys to the left and right of the selected ridges. This includes smaller ridges originating from the main ridge.

3.2. Sample Composition

A systematic sampling procedure was developed with the help of cadastral maps which date from the time of land consolidation, around 1960. Starting from points at the same distance from the nearest health centres, and proceeding in a direction away from the health centre, all holdings in the two areas were visited. In the upper area the survey proceeded in a direction downhill, in the lower area uphill.

The survey concentrated on children in the age range of 6-59 months and holdings were selected for study when among the household(s) resident on the holdings there was at least one with children in that age range. Holdings where no people resided at all and holdings solely occupied by households without young children were excluded. In the course of the

DEFINITION OF TERMS

The domestic unit is defined as the people sleeping under one roof, including any older boys sleeping in a boys' house. Each unit usually has its own kitchen and is alternately referred to as household and family.

The term household is used in connection with the economic resources of the domestic unit, as in poor households and is the term mainly used in this report. The term family refers to the domestic cycle and composition of the domestic unit, as in young families.

A plot of land as registered at the land office is called a holding. Many holdings are occupied by related households, each allocated its own part of the holding. The land at the disposal of a household is called farm (or shamba, the local term), and includes the share in the holding, together with any land rented elsewhere or otherwise acquired.

A compound is the small residential area on a holding where one or more families have built their houses. The term extended family is used to refer to related families sharing a compound.

surveys more than 700 holdings were visited. In the lower area 200 holdings were not inhabited, in the upper area this was only the case with 80 holdings. (Reflecting the difference in population density between the two areas). In both areas about 60 holdings were occupied by households without children in the required age range, so that finally 400 of the 700 holdings had to be excluded.

In all, 293 holdings were included in the survey. About 60% consisted of cases where there was only one household with children aged 6-59 months present among the resident households. On some 30% of these holdings there were two or three households with young children, and in these cases one household was randomly selected. Where 4 or more households were eligible on one holding (5% of the cases) a pro rata number of households was selected.

The selected households were visited on a prearranged day. If the female guardian of the young children was absent on the appointed day, the household was replaced by another eligible household on the same holding, according to a pre-arranged random order. If no replacements were available or if the women in the other households were also absent, repeat visits were made. Refusals were not encountered but the households on a few holdings proved unavailable or were otherwise rejected for various reasons. Finally, detailed data were collected for 300 households (150 in each area) that represent 439 households with young children.

In each household the female guardian of the children in the required age range was interviewed. All respondents were Kikuyu. A detailed description of the characteristics of the survey areas, sample, holdings, households and respondents has been presented in the earlier companion report (H.N.S., 1983: 19-29).

Data collection took about six weeks per area, in Kiiriangoro from February 22nd till April 4th, 1978; in Kagurumo from April 27th till May 31st of the same year.

3.3. Research Assistants

The research assistants were young Kikuyu women from Kigumo Division, aged 20 to 25 years, with some years of secondary education. They were trained in methods of data collection for a period of six weeks prior to the actual surveys. Interviews were conducted in the vernacular.

3.4. Interview Schedule

The full interview schedule covered a variety of topics. Household characteristics and nutritional state of pre-school children have already been presented in the companion report. Nutritional knowledge, nutritional preferences and the food consumption of young children are treated in the present report. The sections of the interview schedule pertaining to these latter

topics are described below.

The questions on nutritional knowledge are listed in Appendix B. All questions were open-ended[7] and the topics covered include the recognition of malnutrition and the causes of kwashiorkor and marasmus. Other questions concern the preferred duration of breastfeeding and the treatment of child diarrhoea. The introduction of weaning foods and later the introduction to the adult diet is another important topic in child nutrition, hence some questions concern the age at which certain foods can be introduced. A final aspect is the frequency of meals considered necessary for young children. The exact phrasing of the questions is given in the appendix, the answer categories are self-evident and need no further clarification. The different questions do not lend themselves to easy quantitative scoring and are therefore difficult to aggregate. In previous reports, however, one composite score was introduced: the number of (semi-)solid foods respondents regarded as introduceable at an age of 4 months or younger. Although this score is not further used in the present report, it is nevertheless listed for future reference (Appendix B4c).

Nutritional preferences were assessed by a series of paired comparisons. Respondents were presented with a comparison between two foods and asked "Which food would you prefer to give to a two-year old child?". Preliminary studies among

Kikuyu women had shown that this technique is well suited to measuring maternal preferences and generally has sufficient reliability (Hoorweg & Niemeyer,1978b;1980).

The present schedule consists of comparisons between foods drawn from different food groups; the individual comparisons, 24 in all, are listed in Appendix C1. Sixteen comparisons consist of choices between foods high in energy and protein content (legumes, animal products) vs foods either low in proteins or low in both proteins and calories (cereals, roots & tubers, vegetables, fruits). Six items compare cereals with foods from the remaining food groups (roots & tubers, vegetables, fruits). Two final comparisons concentrate on kale, the popular dark leafy vegetable.(8)

For purposes of analysis results are aggregated by food group in Appendix C2: the average percentage of choices for legumes (beans and peas), animal products (meat and eggs), cereals (maize flour, millet flour and rice), roots & tubers (banana and potatoes), vegetables (cabbage and kale).

In previous reports a composite preference score was used based on the first 16 comparisons and in which one point was added to the score each time a high energy-high protein food was chosen. Scores can theoretically vary between 0 and 16, but in practice scores below 5 occur only incidentally. It is this score that has been used in the evaluation of the nutrition programmes to measure changes in nutritional preferences. The score as such is not utilized in the present report but it is

nevertheless listed in Appendix C3 for eventual future reference. The reliability of this 16-item scale among this group of respondents was calculated at .71 (Spearman-Brown), which is sufficiently high for group comparisons.

Food consumption of children between 6 and 59 months was recorded by means of a dietary recall for the previous day. In households with more than one young child, this 24-hour recall was recorded for the child nearest to two years of age. Each assistant carried a set of weighing scales including a Soehnle 8600 (max. 250g.); Waymaster (max 5kg.); and Salter 235 (max 25 kg. by 100 grs.). The mother was asked about the foods and drinks consumed by the child in the course of the previous day and night, starting with the first dish of the day and further in chronological sequence. She was requested to demonstrate the portions consumed with the help of a cup or plate, usually from her own household equipment. In the case of liquid dishes water was used to represent the volumes consumed. In the case of solid dishes the volumes were represented with the help of dry maize or dry beans. For certain items such as sweet potatoes, bananas and pancakes respondents were asked to indicate the respective sizes. For mixed dishes, the mothers were furthermore asked to indicate the relative proportions of certain ingredients. With the help of these proportions together with average recipes, the total weight of the cooked dish as well as the weight of the raw ingredients were estimated. (The average recipes had been collected earlier, during the training of the

assistants; they are listed in Appendix K). The food table by Platt (1962) was used next to calculate energy and nutrient content.

In one third of the households, a subsample of 100 cases, food consumption was furthermore actually observed over a period of 24 hours. The results for this dietary record are summarily presented in Appendix A, which contains an evaluation of the advantages and disadvantages of the dietary recall, as compared with the dietary record.

3.5. Weighting and Presentation of Data

All results are weighted for the number of households with children in the required age range present on the holding, i.e. the number of eligible households represented by the one household selected for detailed study. In this way close estimates are obtained for the 439 eligible households in the two survey areas, on the basis of 300 interviews. Confidence limits are quite narrow since a large part of the population was sampled on a 1:1 basis and the remainder on a 1:2 or 1:3 basis. The number of missing values, moreover is very small.

The numerical findings are presented in appendices B-H, which list the knowledge, preference and food consumption results in different degrees of detail. The main text in sections 4, 5, and 6 is illustrated by a series of figures that draw attention to certain findings or certain relations. For

purposes of clarity the number of observations on which individual data are based are not presented with each appendix or each figure. This information, i.e. the number of observations per cell, has been grouped together and is presented separately in appendix J.

4. NUTRITIONAL KNOWLEDGE AND PREFERENCES

In this section the general characteristics of nutritional cognition are reviewed together with the relation with formal education. Response percentages for various knowledge questions are presented in Appendix B, responses for nutritional preferences in Appendix C. The results are listed broken down according to educational level of the respondents. Results are also listed by ecological area and social class and these will be discussed in section 6.

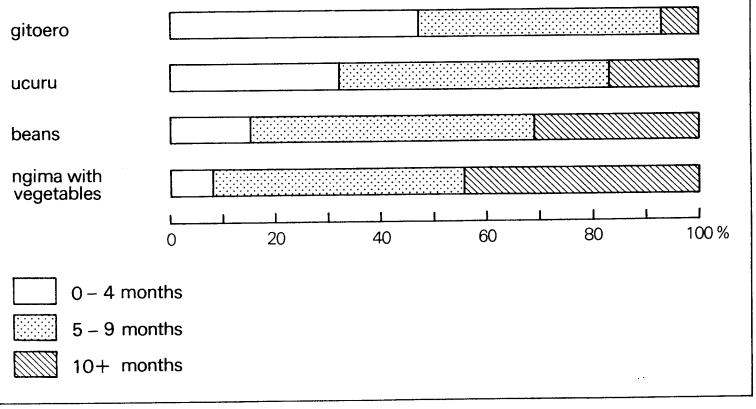
4.1. General Characteristics

It is evident that there is virtually universal recognition of the clinical signs of kwashiorkor among Kikuyu mothers (Question 1). There is also virtually universal recognition of the connection with nutrition, although the exact nature of the relation appears to be less clearly perceived (Q2). Forty percent of the mothers give answers that pertain to the quality of the child's diet. Another forty percent mention the lack of

a particular food as cause, and twenty percent mention insufficient amounts of food in general. Asked about the causes of marasmus (Q3) only half the mothers give a nutrition-related answer, most of them referring to insufficient amounts of food, fewer to the quality of the child's diet or specific nutritious foods. However, as many as fifty percent of the mothers mention other causes for marasmus, notably worms.

To supplement breastmilk Kikuyu mothers introduce the first solid and semi-solid foods at four or five months of age or even earlier. Certain foods may be introduced early, others late, although mothers show considerable individual variation (Q4). Nonetheless there exists a strict difference in timing among various solid and semi-solid foods or what may generally be termed 'weaning foods' (figure 1). Nearly half the mothers indicate that mashed gitoero of bananas and potatoes may be introduced at four months or earlier. Other foods may be intro-

Figure 1 INTRODUCTION AGE OF DIFFERENT FOODS
(Percent respondents mentioning ages of introduction within the periods indicated)



duced later, notably ucuru and beans. Ngima with vegetables is generally introduced even later - only half the mothers think it can be given before the age of ten months. Whole maize kernel is not considered fit for young children and githeri is only introduced around the age of two years.

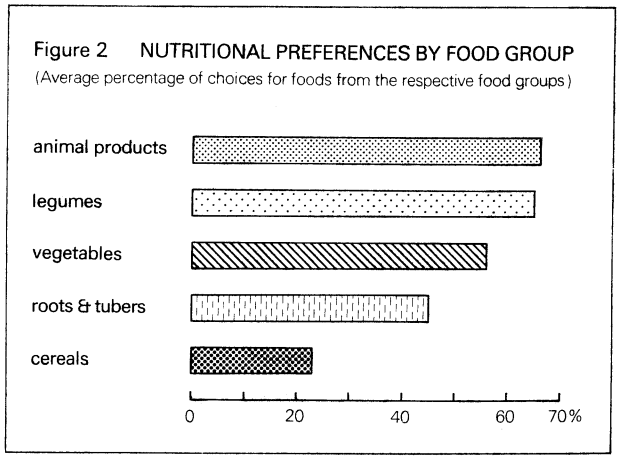
The preferred age to cease breastfeeding is around 15 months: 70 percent of the mothers prefer to end when the child is between ten and twenty months old (Q5). About 20 percent of the mothers indicate that they prefer to stop even later, while on the other hand, ten percent prefer to discontinue relatively early i.e. before 10 months of age. This accords with what is generally known about the duration of breastfeeding among Kikuyu mothers (CBS,1980;1983b).

One of the causes of child malnutrition in Africa lies in the bulky nature of certain diets which makes it difficult for children to consume enough food at the time of the meal sittings (Church,1979). Consequently, it is advisable that children be given something extra to eat between meals. Asked about this (Q6), 40 percent of the mothers replied affirmatively i.e. that children indeed need some food between meals, but fully 60 percent regarded this as unnecessary. As to the nature of these extras liquid foods like milk, tea and ucuru (the two latter are often prepared with milk) were most often mentioned, as well as fruits of all kinds. Only few mothers mentioned items such as eggs or one of the various staple foods.

Diarrhoea is an important occurrence in the causal chain leading to malnutrition and proper treatment is highly important in safeguarding the condition of the child. Present day Kikuyu beliefs appear to be generally in line with modern medical opinion (Q7). Three quarters of the mothers mention that when a child suffers from diarrhoea it should be given plain water or water with some sugar and/or salt added. About twenty-five per cent of the mothers mentioned various other foods less suitable for bringing the disturbance under control. Kikuyu mothers, moreover, widely agree that a child should not be given milk in that case (Q7b).

The percentage of choices for the different food-items included in the paired comparison scale are listed in Appendix C. Beans and eggs are highly favoured for young children. Both items are choosen 80-90% of the times that they are presented. Meat and peas are less preferred and receive about 50% of the potential choices, peas which are not widely grown in the area and meat which is generally too tough for consumption by young children. Equally preferred are bananas, potatoes and cabbage (45% of the choices) while oranges and kale rate somewhat higher with 60% of the choices. Rather surprisingly cereals such as maize flour and millet flour (30%) and rice (15%) are chosen infrequently in comparison with the other foods.

Figure 2 presents the nutritional preferences aggregated by food group. The bars picture the average percentage of mothers preferring legumes, animal products, cereals, roots &



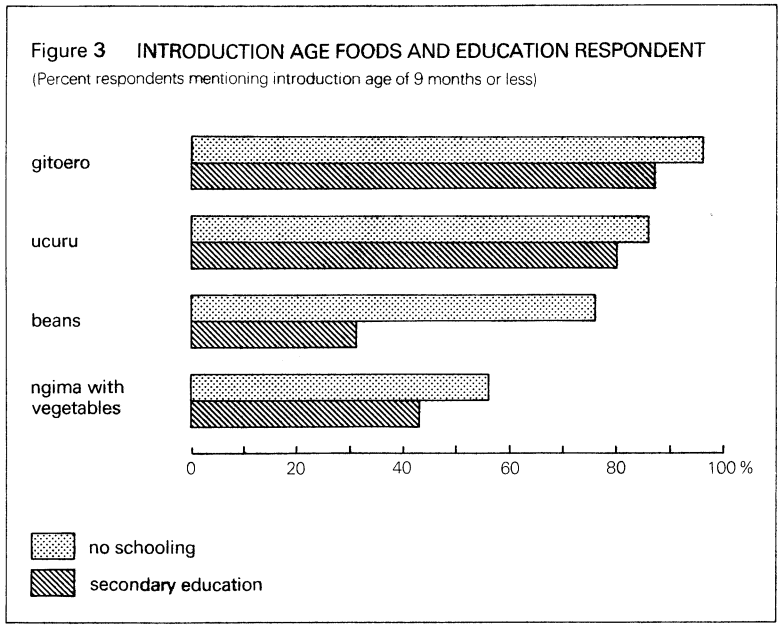
tubers, and vegetables on the occassions that these foods were presented. Legumes and animal products are most often chosen followed by vegetables and roots & tubers, with cereals receiving the least choices. As shown later by the actual consumption data in section 5, the low preference for cereals corresponds with a low consumption of finger millet and rice, but does not seem to accord with the amounts of maize flour eaten by young children of all age groups. Possibly maize flour is taken for granted as a common staple for young children. Most nutrition teaching tends to reinforce this attitude by emphasizing the importance of legumes and vegetables. Actually, maize flour has a relatively high calorie and medium protein content.

4.2. Education

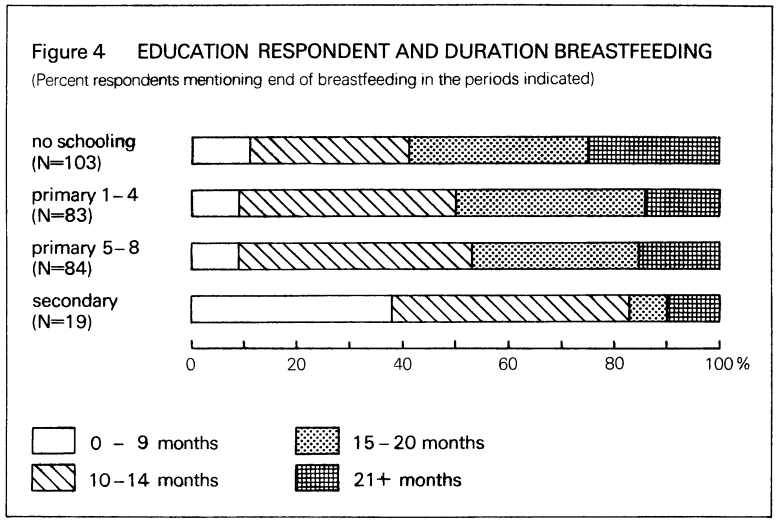
As already mentioned, appendices B & C also contain a breakdown of the knowledge and preference results by educational level. For this purpose mothers were divided into four groups, those without formal education, those who attended primary 1-4, those who reached primary 5-8, and those having reached secondary schooling. The last group more often mentions quality of feeding as a cause of kwashiorkor (Q2), and quantity of feeding as a cause of marasmus (Q3). They also regard it more often as necessary that a child should be given extra's in between meals (Q6), and more frequently mention milk, tea and ucuru in this connection (Q6b). They also mention water as treatment for diarrhoea more frequently (Q7). Although the differences in answer percentages are usually modest, they are consistent in that educated women appear more knowledgeable about child nutrition, something which has of course repeatedly been demonstrated in other surveys.

Results in respect of the introduction of solid foods (Q4) and the cessation of breastfeeding (Q5) merit special attention and are graphically presented in figures 3 & 4. Mothers with secondary education generally mention later ages at which to introduce solid foods. At the same time they prefer to stop breastfeeding considerably earlier.

The latter trend is known (CBS,1983b) but the later introduction of solid foods seems in apparent contradiction to this.



These differences in timing, however, mostly occur in respect of beans and ngima, but less with foods introduced early on, such as gitoero and ucuru. Educated mothers also tend to introduce their children to githeri, the main adult dish at a later stage. This suggests that educated mothers take a longer period during which they rely more on milk and more on (semi-)



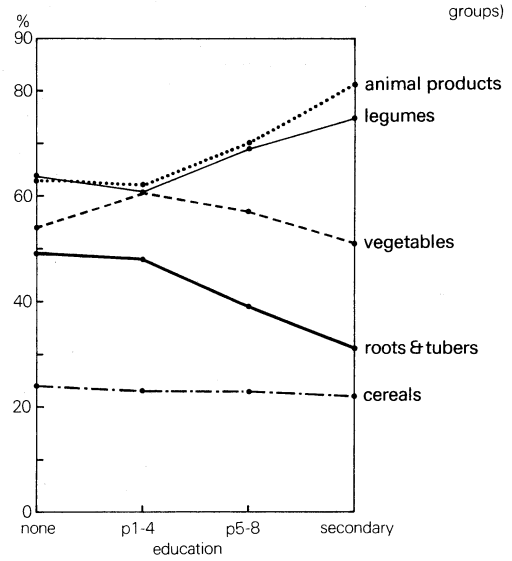
solid, easily digestible foods, before introducing the child to the solid, coarse githeri dishes taken from the family meal.(9)

Nutritional preferences are also related to educational level. Figure 5 shows the average percentage of choices for the five major food groups included in the schedule. The percentage of choices for legumes and animal products increases from 64% among women without formal education to 78% among women who have reached secondary level. Preferences for roots & tubers are, on the other hand, considerably lower among the well educated women.

In summary it is clear that in both respects, knowledge as well as preferences, there is an increasing awareness with education among Kikuyu mothers.

Figure 5 NUTRITIONAL PREFERENCES AND EDUCATION RESPONDENT

(Average percentage of choices for foods from the respective food groups)



5. FOOD CONSUMPTION

Food consumption results are listed in appendices D-H. For purposes of analysis children were divided into four different age groups. The first group (BF) includes all children who are still breastfed. They are children aged between 6 and 23 months, the average age of this group being 15 months. The second group includes all children under two years of age who are no longer breastfed. Most of these children are between 12 and 23 months, although a few are younger: the average age of this group is 18 months and they will be referred to as the group of one-year-olds. The third group includes all two-year-olds, while the final group includes the three and four-year-old children (table 2).

TABLE 2
CHILDREN SAMPLE: AGE COMPOSITION AND BREASTFEEDING

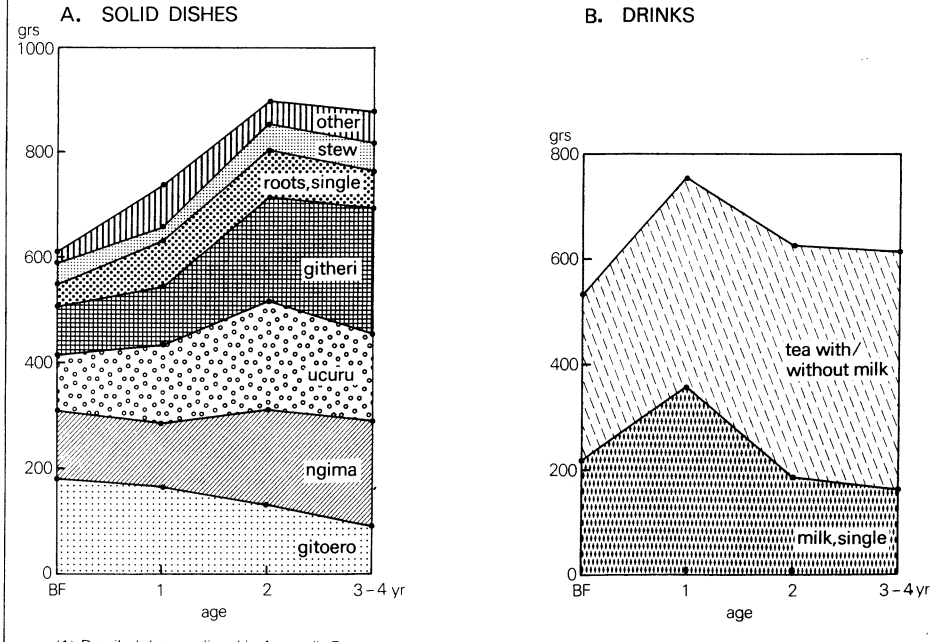
Group	N	Breast-feeding	Age Range (months)	Average Age[1] (months)
BF	31	yes	6-23	14.8 (3.6)
1yr	87	no	6-23	17.8 (4.1)
2yr	113	no	24-35	28.9 (3.5)
3-4yr	57	no	36-59	44.8 (6.8)

(1) Standard Deviation in brackets

Before discussing the food consumption results below it must be pointed out that the results for the first group (BF) are incomplete. Breastmilk consumption was not measured which means that the actual energy and protein intake were higher than calculated. The results for this group are nevertheless presented because they help to demonstrate the changes that occur in the diet of children during their first and second years.

Appendix D lists the consumption of dishes in two different respects: the percentage of children consuming various dishes and the average amounts of dishes consumed. Figure 6 gives a graphical presentation of the amounts consumed. Most striking are the large quantities of milk and tea that children

Figure 6 AVERAGE CONSUMPTION OF DISHES (GRS.) BY AGE GROUP[1]

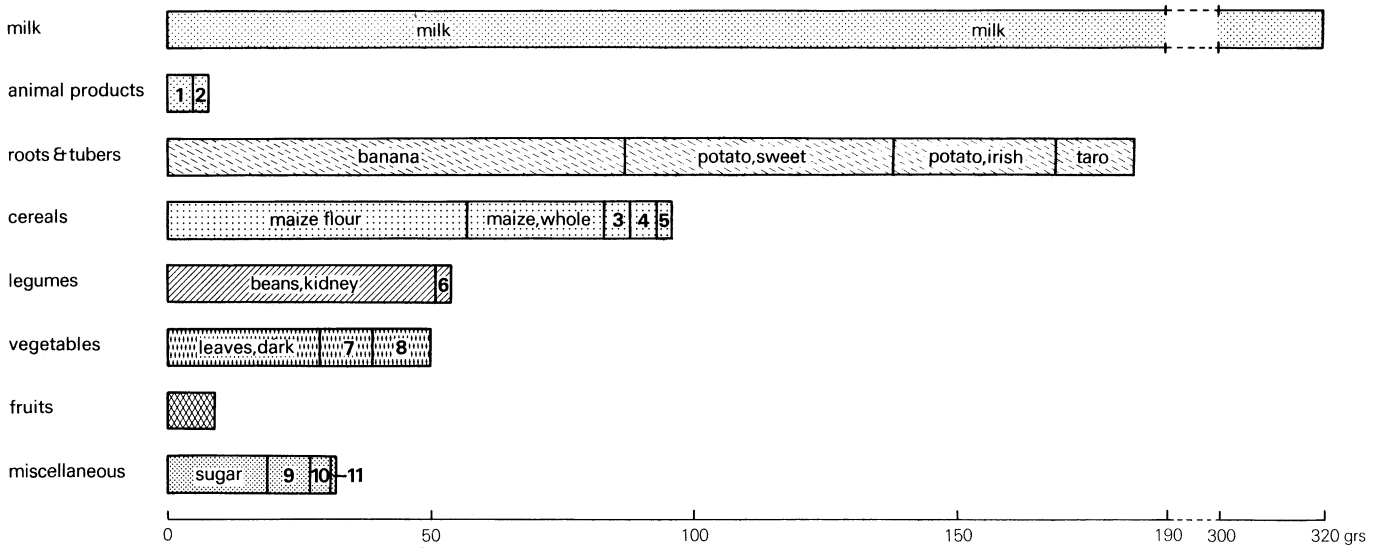


(1) Detailed data are listed in Appendix D

drink (tea on average contains 20% milk). Gitoero is the favourite dish for young children but its importance decreases as children grow older. At young ages ngima (stiff maize porridge) and ucuru (light porridge) are next in importance. The consumption of ngima increases as children grow older but the consumption of ucuru remains more or less constant. Furthermore, children eat more and more githeri from the age of two on. However, in this respect there is a potential source of confusion. Since whole maize kernels are regarded not suitable for young children, children are usually given the beans from the githeri dish with some token maize and only later are they given proportionally more maize.

The amounts of raw ingredients consumed by children of all age groups are graphically presented in figure 7, showing the average consumption in grams. Milk is by far the largest single ingredient (310 grs.)[10]. Among the solid foodstuffs the consumption of roots & tubers (180g.) far surpasses that of other foodgroups: cereals (100g.), legumes (50g.) and vegetables (50g.). Among the roots & tubers, green banana is eaten most, followed by sweet potatoes and Irish potato. Maize flour and whole maize account for most of the cereal consumption, and the traditional grains, sorghum and millet, appear to have only marginal importance for the children's diet. Kidney beans account for nearly all consumption of legumes, while dark leaves (kale) constitute most of the vegetables. The amounts of fruits and animal products are almost negligible, and only four

Figure 7 AVERAGE CONSUMPTION OF FOODS IN GRAMS (ALL AGE GROUPS; 6 – 59 MONTHS)[1]



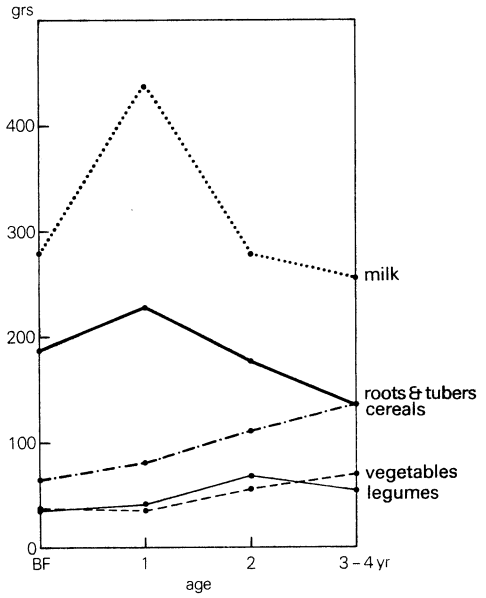
animal products	cereals	legumes	vegetables	miscellaneous
1 egg	3 sorghum flour	6 other	7 leaves, medium	9 bread
2 meat	4 wheat flour		and light green	10 fat
	5 rice		8 other	11 other

(1) Detailed data are listed in Appendix E

grams of fat are consumed daily. An average amount of 20 grams of sugar is furthermore taken daily, mostly in tea. Detailed data on raw ingredients are listed in Appendix E, with a breakdown by age group when at least a minimum number of observations were available.

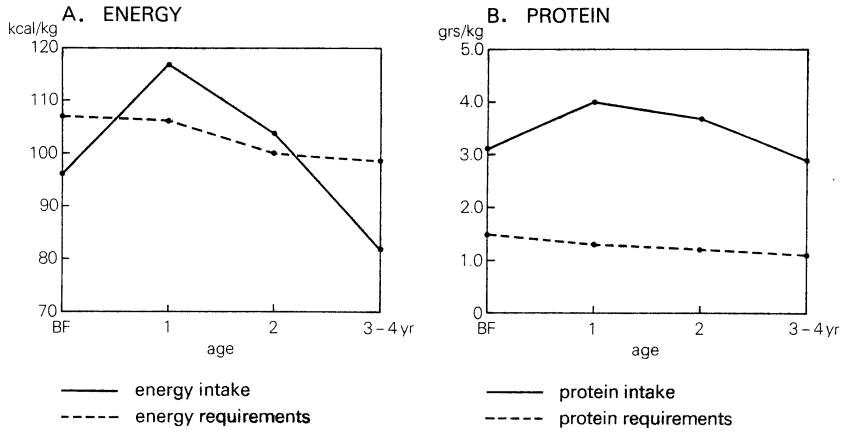
The amounts of foods consumed at different ages are listed in Appendix F, aggregated by food group. The results for the four major food groups and milk are graphically presented in figure 8. Milk accounts for the largest share of the daily intake and is highest amount young children who are no longer breastfed, but the amounts decrease at older ages, although still remaining fairly high. Young children also eat large amounts of roots & tubers but later on this decreases substan-

Figure 8 AVERAGE CONSUMPTION OF FOOD GROUPS (GRS.) BY AGE(1)



(1) Detailed data are listed in Appendix F

Figure 9 AVERAGE ENERGY INTAKE (KCAL.) AND PROTEIN INTAKE (GRS.) PER KILOGRAM BODY-WEIGHT



tially when the consumption of cereals, legumes and vegetables increases. Legume consumption peaks among two-year-olds, while cereals account for an ever larger share of the daily intake.

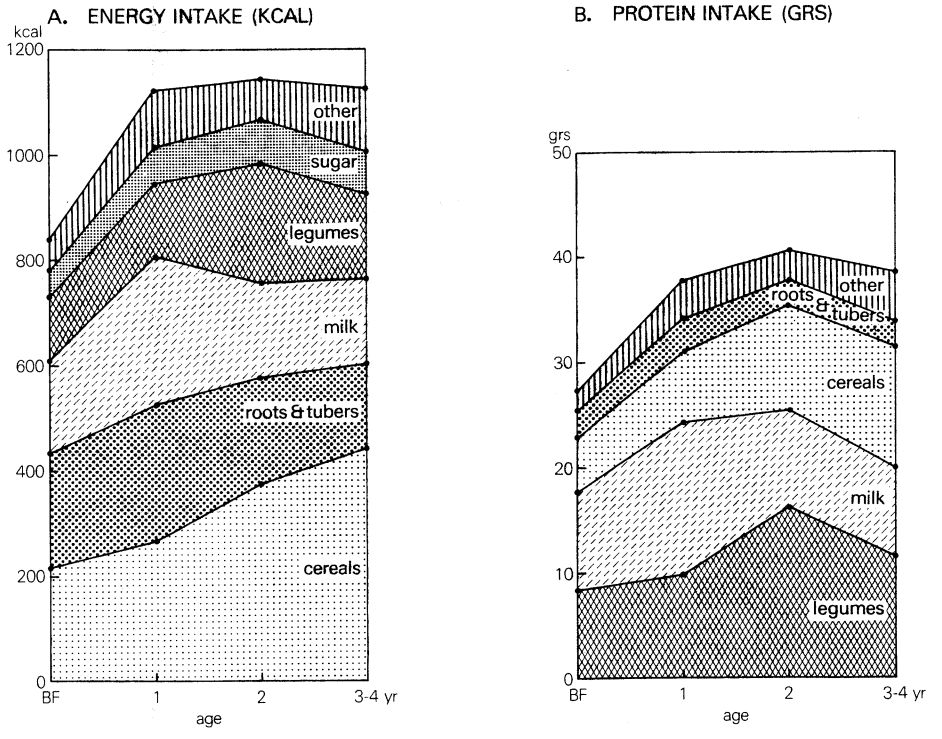
Average energy and protein intake reach fairly high levels among the one-yr age group but thereafter energy and protein levels remain virtually the same among the older age groups. (Appendix G).

In figure 9, the intake results are expressed in relative terms i.e. per kg/body-weight and compared with the recommendations as drawn up by FAO (1974). The breast milk consumption of the first group (BF) was not measured but the foods given in addition to breastmilk already cover all protein requirements and 90% of energy requirement (although this is,of course, less the case among the very youngest children). Among the one-year-olds energy and protein intake far surpass the FAO requirements for children of this age, even though these norms themselves

are often considered to be rather high. However, energy intake decreases relatively with age and, in fact, for the elder children, age three to four, falls below the recommended daily intake. Protein intake shows the same trend but due to the high levels recorded, it remains above recommendations.

The composition of the diet i.e. the relative amounts that the various food groups contribute to daily energy and protein intake is shown in figure 10. Despite the fact that milk and roots & tubers compose the bulk of food consumption, it is the smaller amount of cereals that contributes most to energy intake, 31% on average for all age groups combined. It is

Figure 10 AVERAGE DAILY INTAKE BY FOOD GROUP(1)



(1) Detailed data are listed in Appendix G1 & G2

followed in importance by roots & tubers (19%) and milk (19%), while legumes constitute the fourth source of energy with 16%. Protein intake is first of all provided by legumes (33%), next by milk (28%) and in this respect cereals take third place with 23%.

The previous section on nutritional cognition concluded with a discussion of the relation between nutritional awareness and education. Here we will do the same for food consumption. Appendix H presents the average energy and protein intake figures according to the educational level of the mother, among others. It is evident that there is no relation whatsoever between educational level and the nutrient intake of the young children. This is so when the results for all ages are combined, but also when they are reviewed by age group. Nutritional knowledge and preferences did show a relation with education, but it appears that these trends are not converted in respect of actual food consumption. This can be taken as an indication that child nutrition is not so much decided by the individual cognition of the mother but more by the general cultural practices, together with the available economic resources as will be demonstrated in the next section.

6. CHILD NUTRITION AND ENVIRONMENT

One aim of the present survey was to explore the influence of living conditions on child nutrition and nutritional status. The reader is referred to the companion report for a full description of the variations in ecology, economic and social conditions and their relation to nutritional status (H.N.S., 1983). A brief description of the main variations in conditions is given below, followed by a review of the relations with nutritional cognition and food consumption.

6.1. Variations in Ecology and Household Conditions

The survey areas differ mainly in terms of population density and type of farming activities. In the higher, more fertile area farms are relatively small and farmers tend to concentrate on one cash crop (coffee), in the lower area farmers have more land available and their agricultural activities are more diversified. More than half the households own one or more cows; milk is often sold to neighbours and although there are

no dairy co-operatives in the survey areas, some of the milk still finds its way elsewhere. A large part of the adult male population is engaged in migrant labour and employed elsewhere. The general standard of living in the two areas differs little, which indicates a balance between population pressure, carrying capacity of the land and income from outside sources.

Most of the differences between individual households can be understood in terms of economic resources and family composition. To rate the differences in economic resources between households a division in social class was developed, taking account of the degree of commercial farming and employment of the husband. According to this division 40 percent of the households should be classified as "poor" : households with very little involvement in the money economy. At the other end of the social spectrum there are "rich" households (20%) that have an income from commercial farming as well as regular employment. In between are the remaining households with only one of these two sources of income (40%)[11]. This division, in turn, is closely related to farm-size and thus to the potential for subsistence cultivation of food crops. Indeed, the large majority of rich households reported that they were able to grow enough food for home consumption, while less than half the medium households and fewer than one out of five poor households reported this to be the case.

Variations in family composition concern, firstly, the domestic stage of the family and, secondly, family size[12].

Three domestic stages can easily be distinguished: "young", "middle-stage" and "senior". The first period covers the early years of marriage, when the children, if any, are still under six[13]. The second, "middle-stage" begins when the first-born child starts going to school, and a third "senior stage" is reached when the eldest children reach adolescence (17 years). Since nearly all households consist of man, wife and children variations in family size occur mainly in respect of the number of children. Young children require most attention and a mother may be able to give 1 or 2 children of pre-school age (0-59 months) much more individual attention than when she has to look after 3 or more children of that age. Children of school-age (60 months-16 years) already require far less attention and they may even relieve the mother of some of her household chores. At the age of seventeen children are regarded as grown-up and are expected to contribute their labour to the household. Consequently, as regards child care, the number of pre-school children, whether few (1-2) or several (3 or more), appears to constitute an important, if not the most important aspect of family size.

In the companion report the anthropometric results were analyzed in respect of four aspects of the child's living environment: ecological area, social class, domestic stage and the number of young children in the household. Similarly in the present report the relations of these four variables with the nutrition of young children will be reviewed. In respect of

knowledge and preferences, however, only the differences according to area and social class will be presented (Appendix B & C); no relation between nutritional cognition and family composition was expected, or found.

6.2 Knowledge and Preferences

Examination of the answer percentages (Appendix B) shows that there are only minor differences in knowledge between the populations in the two areas. A very similar percentage of mothers recognizes kwashiorkor, lists quality of feeding as a cause, and indicates insufficient amounts of food as a cause for marasmus. The same is the case for the need to give extras between the main meals, the treatment of diarrhoea and the duration of breastfeeding. There is a slight suggestion that mothers in the lower area tend to introduce certain solid foods somewhat later, but the trend is minor and not supported by other evidence. Furthermore there are no differences between the areas in nutritional preferences for young children (Appendix C). This accords with earlier findings that there is little or no difference in food preferences between different areas of Central Province (Hoorweg & Niemeyer,1978b,1980c).

Analysis according to social class, however, does reveal differences. Mothers from rich households more often mention quality of feeding as the cause of kwashiorkor, they prefer to introduce gitoero rather early and beans rather late, and more

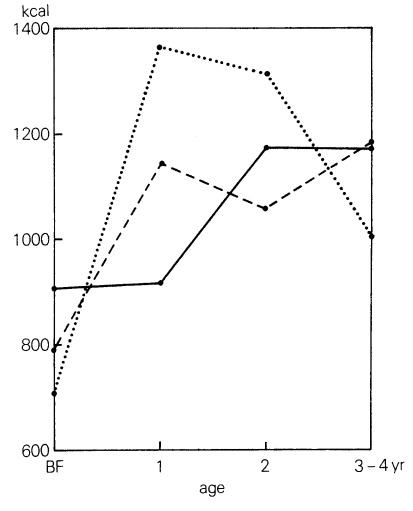
often mention water as treatment of diarrhoea. These differences, though, are small. Mothers from rich households also mention milk, tea and ucuru more often as an extra in between meals, which is understandable because they are more likely to have milk available from the cattle they own. They also tend to cease breastfeeding somewhat earlier while in their preferences they choose vegetables more often and roots & tubers less often. It must be pointed out, though, that women from rich households are generally far better educated (H.N.S,1983:44) and that the trends mentioned are less strong compared with the same trends that have been shown to exist with educational level of the mother. The existing relations between social class and nutritional awareness are accounted for by the higher level of education of women from rich households.

6.3. Food Consumption

Appendix H lists figures for energy and protein intake by area, social class, domestic stage and number of young children in the household. The results show a relation between energy intake and social class but no differences in energy intake corresponding with the three remaining variables and this remains so when the data are examined by age-group. Protein intake does not show any significant variations corresponding with the main environmental factors, and remains uniformly high.

Age-group-wise results for social class are presented for closer examination in figure 11. The largest differences in energy intake occur in the case of one-year and two-year-old children from rich households who have a considerably higher energy intake than children from other, less well-off households. This is particularly the case for one-year old children, children from poor families receiving only 900 KCal, children from medium households consuming 1150 KCal, and children from rich households 1350 KCal. This, of course, is the age at which Kikuyu children show the most serious signs of faltering and that the growth losses are incurred which are difficult to

Figure 11 AVERAGE ENERGY INTAKE (KCAL.) BY SOCIAL CLASS[1]



(1) Detailed data are listed in Appendix H4 Information on the number of cases is given in Appendix J

recover later on. These results are also in line with the previous finding that nutritional status was most severely affected among children from poor households (H.N.S,1983: 62-64).

No difference in energy intake exists between the survey areas. This accords with the finding that the average height--for-age of children in the two areas is the same (H.N.S., 1983:61), although some differences in weight-for-height between the two areas were noted in that report. This last finding was attributed to the start of the wet season which was more advanced in the lower area at the time of the survey than in the upper area. The fact that there is no corresponding difference in energy or protein intake, however, indicates that the cause of these purportedly seasonal fluctuations in weight must be sought elsewhere, notably in a higher incidence of infectious disease among children at that time of the year. Family composition is also found to be unrelated to food consumption. There are no differences in energy or protein intake between families of different stages or families differing in the number of pre-school children. The negative relation between nutritional status and number of young children in the household that was noted in the companion report, is not anteceded by a lower energy or protein intake among children from households with several young children. In the companion report it was already suggested that maternal attention is probably involved in this case which may result in underutilisation of

available foods because of a lesser amount of care given to individual children.

The relative contribution of different food groups to energy intake is presented by ecological area and, in view of the previous differences, by social class (Appendix G3 & G4). The differences in dietary composition between the two areas conform with what is known about the differences in agriculture between the areas (H.N.S.,1983:32). In the lower area there is a somewhat higher consumption of roots & tubers, but less consumption of milk. The higher consumption of vegetables in the lower area is in all likelihood due to minor differences in the timing of the surveys, already mentioned. The survey in the lower area coincided with the start of the rainy season so that plenty of greens became available in the next weeks. A further observation is that differences in dietary composition are relatively smallest among the one-year-olds, the vulnerable age group. Milk consumption at that age in the two areas is very similar, as is the consumption of roots and tubers.

In addition to the differences in energy intake between social classes there are also differences in respect of dietary composition, differences that are -by nature- complementary. In terms of energy intake and for all age groups combined it is evident that children from rich households consume much more milk, and that children from poor households consume more legumes (Appendix G4). The higher intake of legumes in poor households offers some compensation for the lesser intake of milk

but this higher intake of legumes mainly occurs among the two-year-old children. Among the one-year-old children from poor households such compensation seems to occur less. The previously mentioned differences in energy intake at the age of one year between rich households and other households can largely be traced to a lesser intake of cereals and milk among children from poor households.

7. CONCLUSION

The objective of this survey was to examine living conditions among the Kikuyu population, dietary patterns among young children and nutritional status of the child population. Economic and social conditions were described in the companion report together with nutritional status. The present report is concerned with nutritional cognition and food consumption.

In general Kikuyu mothers are reasonably conversant with important principles of child nutrition. They are generally able to recognize malnutrition and are aware of the nutritional causes. Most mothers wish to breastfeed their children till at least the age of one but most of them also introduce various (semi-)solid foods quite early. This is not to say that there is no room for improvement in nutritional knowledge. The understanding of the causes of malnutrition is often incomplete while the advisability of multiple feeds could be recognized more widely. Nevertheless there is no evidence of a serious lack of nutritional knowledge or of detrimental weaning practices as reported from elsewhere in Africa. This is a confir-

mation of the finding in the companion report that malnutrition is not primarily caused by ignorance but rather by economic conditions.

Kikuyu women furthermore have a strong preference for legumes and animal products for their young children. Vegetables and roots & tubers follow in that order. Surprisingly there is a rather low preference for cereal flours, despite the important role that ngima, maize porridge, plays in the daily diet. Possibly maize flour is taken for granted as a common staple for young children. Nevertheless it is noteworthy that roots & tubers and vegetables, despite their lower energy and protein content, are often preferred over cereals.

Kikuyu children have a fairly varied diet. There is a remarkably high consumption of milk, single or together with tea, and the importance of dairy farming for child nutrition in this region of Kenya is evident. Roots & tubers also contribute a major part of the diet, followed by cereals. With age the consumption of milk and roots & tubers decreases while the consumption of cereals increases. Almost half the amount of cereals consists of maize flour. Nonetheless, maize flour is not nearly as predominant an item in the daily diet as is generally assumed, while only very small amounts of sorghum and finger millet are consumed.

Protein consumption is high in all age groups. Among one- and two-year-olds energy intake is also above international recommended standards. But among the three to four-year-olds

energy intake falls somewhat below FAO requirements, with 85 KCal per kilogram-bodyweight, on average. Energy intake is mainly contributed by four food groups: roots & tubers; cereals; milk and legumes. The three latter food groups also account for most protein intake.

The analysis in the companion report demonstrated that the general standard of living in the two survey areas differs little despite the differences in ecology. In the upper, more fertile area farmers have relatively small farms and tend to concentrate on one cash crop. In the lower area, which is less fertile, farmers have more land available and their agricultural activities are more diversified. As regards food consumption no differences in energy and protein intake were observed between the children from the two areas. This accords with the finding in the previous report that there were no differences in nutritional status between the children either.

Formal education generally has a positive influence on nutritional cognition. Mothers with some years of secondary education are more aware of the general principles of child nutrition and have more positive nutritional preferences. It was also found that they tend to stop breastfeeding somewhat earlier than mothers in general, but that, on the other hand, they tend to introduce certain solid foods slightly later and that they prefer to wait a little longer before introducing the child to the full adult diet. In general, however, the actual food consumption of children was not related to the educational

level of their mothers. Apparently child nutrition is not so much decided by individual cognition of the mother but rather by prevailing cultural patterns and the availability of resources.

There is evidence that food consumption is strongly related to differences in social class and that the generally favourable findings on intake levels do not apply in the case of children from poor households. Energy intake of children from poor and medium households stays considerably behind that of children from rich households, and this is particularly so among the children in the vulnerable age group of one year. In this age group, the differences in average energy intake between children from different social classes range from 200 to 400 KCal., differences which are mostly the result of a lower consumption of milk and cereals. Other household characteristics, such as domestic stage and number of young children were not related with differences in energy intake.

In the companion report poor households with several children of pre-school age were identified as posing a nutritional high-risk environment. Children from poor households and children from crowded households (households with three or more children under six) showed a lower height than children from other households. The findings in this report indicate that the relation between social class and nutritional faltering is probably quite straightforward. Fewer available resources result in a lesser energy intake among young children,

particularly during the second year of life, which in turn leads to nutritional stunting. The pressure of several young children in the household, however, is not connected with a lower food consumption. The cause of the lesser nutritional status of children in such crowded households must probably be sought more in attentional factors, resulting in a lesser utilisation of available food.

The present results allow a further definition of the vulnerable group. In the poor households it is particularly the children in the age group of 6-23 months no longer breastfed who are at risk. Although a lack of economic resources poses a difficult obstacle to overcome, the findings nevertheless indicate how the diet of young children from such households can be improved and the elements that need to be stressed in nutrition education. Preferably children should be given more milk to drink and at the same time be given more maize flour to eat in the form of ucuru or ngima. When milk is not available and cannot be purchased either, mothers could be advised to rely more on legumes, something which they are likely to do anyway when the children reach the next age group of two years.

NOTES

1. Rainfall at Kiambu and Nyeri stations was 1464 mm and 905 mm in 1977, and 1473 mm and 1018 mm in 1978. The average annual rainfall for these two stations over the period 1975-82 was 1073 mm and 931 mm respectively (CBS,1983).

2. Official estimates of maize production in 1977 and 1978 in Central Province were 1.62 and 1.87 million bags which compares with an annual average of 1.91 million bags during the period 1976-81 (CBS,1976-1981).

3. Where reference is made in the text to beans, bananas or potatoes without further specification, kidney beans, green (cooking) bananas and Irish potatoes are meant.

4. For reasons of convenience we will refer to the group of roots, tubers and starchy fruits as 'roots & tubers' in short, and which therefore also includes green banana.

5. A description of the classification in ecological zones is given in the companion report (H.N.S.,1983:77).

6. Figures for the Kirere and Gikarangu sub-locations respectively (CBS,1981:37).

7. With one exception, question 6c, which offers a choice between two alternatives.

8. It must be pointed out that the paired comparison schedule used in this report is incomplete in the sense that not all possible comparisons between the different foods were presented to the respondents. All possible comparisons would have amounted to $1/2N(N-1) = 66$ comparisons and this was too large a number to be included in individual interview schedules. Earlier experience also learned that respondents generally lost interest when presented with such large numbers of comparisons

9. In this connection it is interesting to note that women with secondary education often mention milk, tea and ucuru as an

extra between meals, almost twice as often as women with less schooling (Appendix B, Q6a, first response).

10. It is possible that milk availability shows seasonal variations as a result of differences in feedings of animals at different times of the year. If such variation were in turn to result in variations in the milk consumption of young children, the time of the survey would not show peak consumption, since it coincides with the end of the dry season and the beginning of the rains.

11. Commercial farming. On the basis of various farm information a distinction was drawn between households that are relatively much involved and households that are not or only marginally involved in commercial farming. Households were included in the first group when there was a substantial involvement in one specific farming activity i.e. when half an acre or more was under coffee cultivation or when food crops were sold regularly. Secondly, households were included that did not concentrate on one specific activity but that were involved to a lesser degree in two or more simultaneous activities, i.e. when food crops were occasionally sold, and/or 0.3 acre or more was planted with coffee, and/or 4 cows or more were owned, and/or 10 chickens or more were kept. Lastly, the households that reportedly employed farm-labour were also included among the commercial farmers. The remaining households with none or only marginal commercial farming are mostly involved in subsistence farming, although this terminology suggests an absolute difference where, of course, there is only one of degree. The commercial farmers also grow foods for their own consumption, while the non-commercial farmers may sell some of their produce as well.

Employment of the husband is the other major source of income in households with young children. In fact, about 90% of the husbands did engage in some form of gainful activity, other than farming. About 35% had regular employment with government or industry, and some 17% were self-employed as traders, artisans and shopkeepers. Another 35% were engaged in day-labour of various kinds. Many self-employed did hold regular employment in the past which often gave them the financial means to start their enterprises. The income of these two groups is generally higher than that of the day-labourers, whose income is not only uncertain but whose wages are low. Even when day-labourers work in the urban areas where wages tend to be higher, the extra income is generally lost to the expense of living in town. As regards income from employment husbands (and households) were therefore classified as follows: not regularly employed (including day labourers and those not working outside their farm) and the regularly employed (also including the self-employed). With the help of this double classification, commercial farming and husband's employment, households were divided into three different income groups, or social classes:

Social Class	Incidence	Definition
Rich H.holds	21%	Regular employment & Commercial farming
Medium H.holds	26%	Regular employment & No Commerc.farming
Medium H.holds	12%	No reg. employment & Commercial farming
Poor H.holds	41%	No reg. employment & No Commerc.farming

About 20% of the households are in the favourable position where they have an income from both sources. According to rural standards these households are well-off and are here referred to as "rich". Next follow the "medium" households which have only one major source of income, either regular employment or commercial farming (38%). Finally there is a large group of "poor" households that are not in a position to farm commercially and where husbands have no regular employment either (41%). Although this class division is not based on farm size as such it is, of course, closely related, the average farm size of rich households being twice that of poor households, with medium households in between. This indicates that the poor not only have a smaller share in the money economy but are also less well off as regards subsistence potential. Indeed, among the rich households c. 75% reported that they are able to grow enough food for their own consumption, while c. 40% of the medium household reported that this was so, and even fewer of the poor households (c. 15%)

12. Domestic stage. Like newly weds everywhere, among the Kikuyu a "young family" also has to settle in. The young wife usually moves in with her husband's family and she has to learn how to adapt to her new relatives. The couple often has to wait some time before they are allocated land by the husband's father. The birth of the first child gives proof of the fertility of the union. Gradually, when it appears that the child(ren) will survive and that the marriage will last, the young woman establishes a position for herself among the other women of the extended family. This first period in the domestic stage roughly lasts until the first born child reaches the age of six. This is also roughly the age at which, traditionally, the child and its parents would have to go through the important second-birth ceremony, nowadays it is about the age at which the child starts attending primary school. Families next enter a stage with school-going children, increase in size till they reach their final or near-final number and generally consolidate their position. This "middle-stage" period takes some 10 years, until the next important step in the domestic cycle, when they become what can be called "senior" families. Traditionally this step was the circumcision of the first-born child, which for girls usually took place between the ages of 10 and 14 years, and for boys between 15 and 18 years. This was an important occasion not only for the child concerned but also for its parents, because it marked their acceptance among the elders of the tribe. In the present day such formal rites of passage for the parents have largely disappeared. Nevertheless the time when the first-born child reaches the age of 16 or 17 and comes to be regarded as an adult is still an important transition. At that age the child

has usually finished schooling and from then on is expected to contribute his or her labour to the household. It is at this point in time that children change from a liability into an asset. The distribution of families at different domestic stages among the survey population was as follows: young families (25%), middle-stage families (50%) and senior families (20%). At some time in the course of these years about half the families start to reside by themselves i.e. they no longer share the holding on which they live with their kinfolk, but become independent units. The size of the household also increases and more mouths have to be fed. Senior families indeed have more land available to farm and it appears that they use this mostly for growing more food crops. Still, in senior families fewer women report that they are able to grow enough food to feed the family. In general there is no relation between the domestic stage of the households and the social class achieved. Whether young or senior families, the number of poor or rich households is more or less the same.

Family size. Family size ranges from small units of only 3 or 4 people to large units of 9 people or more. Since the survey was limited to households with children aged 6-59 months, these households nearly all consisted of man, wife and children. Variation in family size therefore occurs mainly in respect of the number of children. The larger the family, the more children have to be looked after, and the greater the demands placed on the mother.
Family size as such means little as long as the ages of the children are not taken into account. Young children require most attention but Kikuyu children soon learn to look after themselves, and by the age of six start to do small jobs such as looking after the very youngest children. Later, when physically stronger, they have to carry water, collect firewood and generally help on the farm after school hours, the girls more so than the boys. Gradually children relieve the mother of some of her work. After the age of sixteen when most children are no longer at school, they are regarded as grown up and are expected to contribute their labour to the household. Children under the age of five (0-59 months) require most attention and place the greatest demands on the attention and care of the mother. When a mother has to look after several pre-school children she can give less attention to each child individually. The number of pre-school children is therefore an important household characteristic in respect of child care. Among the survey population, 65% of the mothers were looking after 1 or 2 pre-school children, 35% had to take care of 3 or more children of that age.

13. The exact definition of "young" families is households in which children are still under the age of six years, i.e. 72 months of age. This age limit should not be confused with the ages, 6-59 months, that delimitate the main group that is the subject of this survey, or the age limits of 0-59 months that define the group of pre-school children as such.

14. The overestimate for the amounts of stew is calculated as follows:

$$\frac{\text{157g. (Recall portion)} - \text{121g. (Observation portion)}}{\text{157g. (Recall portion)}} = 23\%$$

15. The overestimate for the amounts of roots, single, is calculated as follows:

$$\frac{\text{334g. (Recall portion)} - \text{220g. (Observation portion)}}{\text{334g. (Recall portion)}} = 34\%$$

16. The dishes that have a smaller standard deviation for the recall data are githeri, gitoero and tea. The possibility cannot be excluded that in the case of these dishes a reduction in variation actually occurs.

17. The frequency of milk consumption in the recall condition is 24% higher and consequently the amounts of milk consumed by the total group, listed in Appendix D, err by the same percentage. For the four different age groups this means that milk consumption, single, errs by 51g., 85g., 45g. & 39g., which amounts to 33, 54, 29 & 25 KCal respectively.

18. With a standard deviation of 400 KCal and a sample size of 300 cases, the standard error in the case of four equal-sized subgroups is 40 KCal; but when again subdivided by age, into 16 subgroups, the standard error for these groups easily reaches 100 KCal.

REFERENCES

Block, G. (1982) A review of validations of dietary assessment methods. American Journal of Epidemiology, 115, 492-505.

CBS (1976-1981) Crop Forecast Surveys, Nairobi: Central Bureau of Statistics.

CBS (1980) Kenya Fertility Survey: 1977-1978. First Report; Volume 1. Nairobi: Central Bureau of Statistics.

CBS (1981) Kenya Population Census, 1979: Vol. I. Nairobi: Central Bureau of Statistics.

CBS (1983a) Statistical Abstract. Nairobi: Central Bureau of Statistics.

CBS (1983b) Third Rural Child Nutrition Survey, 1982. Nairobi: Central Bureau of Statistics.

Church, M.A. (1979) Dietory factors in malnutrition: quality and quantity of diet in relation to child development. Proceedings Nutrition Society, 38, 41-49.

FAO (1974) Handbook on human nutritional requirements. Rome:Food and Agricultural Organisation.

Hoorweg, J. & Niemeyer, R. (1978a) Classification of Foods among the Kikuyu, NIRP Report No. 7. Leiden: African Studies Centre.

Hoorweg, J. & Niemeyer, R. (1978b) Preferences of Kikuyu Mothers for Children's Foods. NIRP Report No. 8. Leiden: African Studies Centre.

Hoorweg, J. & Niemeyer, R. (1980a) The impact of nutrition education at three health centres in Central Province,Kenya. ASC Research Report no. 10. Leiden: African Studies Centre.

Hoorweg, J. & Niemeyer, R. (1980b) The nutritional impact of the Pre-School Health Programme at three clinics in Central Provin ce, Kenya. ASC Research Report No. 11. Leiden: African Studies Centre.

Hoorweg, J. & Niemeyer, R. (1980c) Preliminary studies on some aspects of Kikuyu food habits. Ecology of Food and Nutrition, 9, 139-150.

Hoorweg, J. & Niemeyer, R. (1982) The effects of nutrition rehabi litation at three Family Life Training Centres in Central Province, Kenya. ASC Research Report No. 14. Leiden: African Studies Centre.

Hoorweg, J., Niemeyer, R. & Van Steenbergen, W. (1983) Nutrition Survey in Murang'a District, Kenya. Part 1: Relations between Ecology, Economic and Social Conditions, and Nutritional State of Pre-School Children. ASC Research Report No. 19. Leiden: African Studies Centre.

H.N.S. (1983) See Hoorweg, Niemeyer & Van Steenbergen, 1983.

Meilink, H. (1979) Smallholder farming in Kiambu, Muranga and Kirinyaga districts of Central Province, Kenya, with special reference to the three research areas. NIRP Report No. 11. Leiden: African Studies Centre.

NIRP (1976) Nutrition intervention and environment: Research propo sal. Leiden: African Studies Centre, Nutrition Intervention Research Project.

NIRP (1978) Revised Research Plan. NIRP Report No. 5. Leiden: African Studies Centre.

Platt, B.S. (1962) Tables of Representative Values of Foods commonly used in Tropical Countries (revised ed.). Medical Research Council, special report 302. London: HMSO.

APPENDIX A. ESTIMATING INDIVIDUAL FOOD CONSUMPTION: ASSESSMENT OF THE DIETARY RECALL AND THE DIETARY RECORD METHOD

With the Assistance of MARIAN GEUNS

A1. Introduction

A reliable assessment of food consumption is difficult due to large intra- and inter-individual variations in intake and also due to inaccuracies of measuring procedures. One way to counter the large variations in intake is to record food consumption not for only one day but for example, for three or even seven days. This makes the estimates of the consumption of individuals more accurate. In the case of large surveys, however, it is usually not possible to visit a household more than once or twice. In that case sufficiently large samples must be selected to achieve, at least, accuracy of group-wise results.

The dietary recall and the dietary record are the methods most commonly used to study food consumption. The dietary recall is an interview method that estimates food intake of the previous day with the help of the recollection of the respondents. Foods and drinks consumed are recalled and the quantities estimated with the help of household measures or food models. The dietary record, on the other hand, measures food consumption as it takes place. This recording is usually done by the researcher or his assistants (dietary observation) or by the members of the household themselves (self-record). The first alternative requires the presence of an observer and is time- and labour consuming. The second, recording by the subjects themselves, is not feasible in rural Kenya at present. Recall methods are less time-consuming but suffer potentially from inaccuracies of recollection and inaccuracies of estimates.

A number of studies, mostly in western countries, have compared results obtained by means of the two different methods. (Block,1982) The general conclusion from these studies is that there is reasonable agreement between overall, group-wise, results but that there is far less agreement between estimates of individual consumption. As regards the recall method, some authors mention a tendency of respondents to overestimate small quantities and underreport large quantities. This regression effect purportedly has no influence on group averages but tends to reduce variation in general (flat-slope syndrome). As regards dietary observations it has been suggested that respondents, usually housewives, tend to serve their 'best' and 'favourite' dishes on such days, resulting in various misrepresentations.

The present survey because of its scope and organization relies on the 24-hr recall method for the bulk of the data, as reported in the main text. A number of systematic observations, however, were concurrently collected in one third of the households included in the survey. They allow comparison with the recall findings and give some insight in the accuracy of the two respective methods.

A.2. Method

In a subsample of 100 cases, systematic observations on food consumption were recorded in addition to the regular interview schedule. Food preparation, and food consumption of all children, aged 6-59 months, was observed and recorded for one day and part of the next day. The morning of the first day was used to go through the regular interview schedule and to acquaint mothers with the dietary record procedures. The actual recording period covered 24 hours, starting after lunchtime on the first day, till the corresponding time the next day. All ingredients that were prepared and consumed were weighed in raw as well as cooked form, together with the amounts of cooking water and the weights of any left-overs.

As part of the regular interview schedule a 24-hr recall for the child nearest to two years of age was recorded as well. This information can be paired with the dietary observations for the same children. Since the recall covers the day previous to the visit to the household, the time period covered by the two methods is not the same, although of the same duration.

A3. Results and Discussion

Table 3A lists the percentage of children consuming various types of dishes under the two different conditions. Evidently, there is serious discrepancy between the two sets of results. According to the observations many more children eat githeri and single roots, and fewer children consume gitoero, ngima and milk. The differences with the recall results indicate misrepresentations in either one or both methods. One possibility is that the discrepancies are caused by faulty reporting during the recall, but a second, more likely, possibility is that women tended to prepare their favourite kinds of dishes when observed. That many more children were given githeri strongly indicates this. Githeri is not only a favourite dish but it also requires more time to prepare and can only be cooked when the mother is at home for several hours, as was usually the case when the assistants were visiting the households. The more frequent consumption of githeri resulted in accompanying changes in the frequency of other dishes. Gitoero and ngima were eaten less often but single roots more often, usually in addition to the githeri.

If this explanation holds true, as we think it does, it does not explain the lesser frequency of milk consumption which is also a highly regarded item in child feeding. It is likely that this is indeed due to faulty reporting i.e. that mothers tend to report milk consumption more often than is actually the case (This error, in turn, leads to a probable overestimate in the amounts of milk consumed single, of 24%).

Since different kinds of dishes were prepared when the observers were present it is of little use to continue with a further comparison between the two conditions as regards individual foods or aggregated foodgroups. It is, however, of interest to compare the amounts of dishes that are recorded under the two different methods.

TABLE 3
CONSUMPTION OF DISHES ACCORDING TO DIETARY RECORD AND ACCORDING TO DIETARY RECALL FOR THE PREVIOUS DAY (N=100)

	A. PERCENT CHILDREN CONSUMING THE DISHES LISTED		B. AVERAGE DAILY PORTIONS (g.) FOR CHILDREN CONSUMING THE DISHES LISTED[1]	
	Record	Recall	Record	Recall
Githeri	69%	48%	358 (243)	333 (184)
Gitoero	29%	44%	358 (299)	325 (170)
Ucuru	28%	26%	426 (206)	420 (235)
Ngima	36%	58%	281 (129)	292 (160)
Rice	4%	2%	*	*
Roots, single	38%	26%	220 (133)	334 (222)
Stew	15%	22%	121 (43)	157 (88)
Tea	68%	76%	590 (363)	569 (285)
Milk, single	43%	67%	357 (219)	382 (240)
Miscellaneous	36%	35%	112 (78)	114 (88)

*Only 4 and 2 observations available, respectively
(1) Standard Deviation in brackets

Most revealing in that case are not the general averages but rather the quantities that children actually consume when given these dishes: their daily portions (table 3B).

The recall estimates of the daily portions of two dishes, ucuru and ngima, are remarkably close to the observed amounts. The recall estimates for other dishes fall within a 10% margin of the observed amounts and well within the margin of chance variations. Only two kinds of dishes show sizeable differences between recall estimates and observed amounts. The daily amounts of stew and single roots as recalled are much larger than the portions actually observed. It is true that respondents generally found these dishes difficult to estimate and we must assume that the reported amounts for stew and single roots are overestimates. (These errors lead to a probable overestimate of the amounts of stew consumed of about 20%, and a probable overestimate in the amounts of roots consumed single, of about 30% [14,15]).

In addition to the average daily portions, table 3B also lists the standard deviations, a measure of the variation in scores. The supposed tendency of respondents to overestimate small quantities and underreport large quantities, the flat-slope phenomenon mentioned in the introduction, if present in this case, would lead to lesser variation among the recall data i.e. lower standard deviations. Although the standard deviations calculated for the observation data are large, they are not consistently lower in the case of the recall data. Although it is true that for three dishes the (recall) standard deviations are considerably smaller [16], this is not sufficient evidence for the existence of a generalized reduction in variation.

A4. Conclusion

Both recall and observation methods suffer from inaccuracies and for purposes of the present survey the recall method probably gives the more accurate picture of usual food consumption. The recall method, however, leads to overestimates of the consumption of milk (25%), single roots (30%) and stew (20%). Since the average consumption of the two latter dishes, as computed over all (300) children in the main sample, falls below 100 grs. (Appendix D2: 80g. and 40g. respectively) any resulting errors will be small, if not negligible. The possible error in milk consumption is larger and would result in corrections of the average energy intake of the respective age groups with 33-54-29-25 KCal.[17] Although not negligible such a correction would still not affect the main findings and conclusions of the report. For the solid dishes that constitute the remainder of the children's diets it appears that the amounts as estimated by the recall method are fairly accurate.

There is no indication of a general reduction in variance as a result of the recall method. The variation in intake, however, whether expressed in amounts of dishes, single foods or aggregated food groups is quite large. Consequently it is absolutely necessary to have sufficient cases to obtain reliable results that warrant further analysis. The number of observations utilized in the analysis of relations with area, social class, etc. are listed in appendix J. If we take a closer look at what is perhaps the most significant indicator, energy intake, it can be calculated that the standard error of the mean for the various subgroups varies between 40 and 100, depending on whether the analysis is limited to the main variable categories or whether these are subdivided by age group as well[18].

These large variations are one reason why the analysis in the present report is in some respects less detailed than in the companion report. Notably absent is an analysis of the effects on food consumption of possible interaction between the main social and economic variables, an analysis which was included in the companion report in respect of nutritional status (H.N.S.,1983:67-68). It may also be pointed out that the number of breastfed children is rather low, which makes the results for this group less reliable than the results for the other age groups.

PPENDIX B.[1]
UTRITIONAL KNOWLEDGE: RESPONSES (%) LISTED ACCORDING TO AREA, SOCIAL CLASS AND EDUCATIONAL EVEL OF THE RESPONDENTS

	TOTAL GROUP	AREA		SOCIAL CLASS			EDUCATION RESPONDENT			
		UA	LA[2]	POOR	MED.	RICH	NONE	1-4	5-8	SEC.
. When a child has a swollen body, red or grey hair and is miserable; what disease does it suffer from?										
kwashiorkor/higo[3]	98%	97	98	97	97	99	97	97	98	100
other/don't know	3%	3	2	3	3	1	3	3	3	0
. What causes higo?										
food: poor quality	40%	40	40	37	41	46	40	36	36	73
food: insufficient quantity	20%	28	12	21	24	12	26	15	23	3
mention individuals foods	37%	31	43	39	32	41	30	46	39	23
other/don't know	3%	1	4	3	4	1	5	2	2	0
3. What causes kuhoma[4]?										
food: poor quality	14%	20	8	16	11	16	15	12	13	20
food: insufficient quantity	25%	26	24	23	29	22	25	21	28	30
mention individual foods	12%	4	20	12	9	16	10	9	19	3
other/don't know	50%	50	49	50	52	46	51	58	41	47
4. At what age can a child start to eat the following dishes?										
(a) Solid foods										
gitoero 0 - 4 months	47%	56	38	47	44	53	50	56	35	47
5 - 9 months	46%	40	52	46	50	38	46	38	56	40
10+ months	7%	4	11	7	6	9	4	6	9	13
ucuru 0 - 4 months	32%	36	27	36	29	30	30	34	32	33
5 - 9 months	51%	46	57	50	51	53	56	44	52	47
10+ months	17%	18	16	15	20	16	14	22	16	20
beans 0 - 4 months	15%	18	12	14	20	9	19	17	9	17
5 - 9 months	54%	58	49	60	51	45	57	55	57	14
10+ months	31%	24	39	26	29	46	24	28	35	69
ngima 0 - 4 months	8%	8	8	9	8	7	7	10	6	13
with ve- 5 - 9 months	48%	53	43	46	47	52	49	53	45	30
getables 10+ months	44%	39	49	45	45	41	44	37	50	57
(b) Githeri										
0 -20 months	11%	15	7	11	11	12	7	20	9	3
21 -29 months	38%	36	39	42	30	42	42	37	37	23
30+ months	52%	50	54	48	59	46	51	43	54	73
(c) Composite Score[5]										
score: 0	40%	31	49	39	40	41	43	35	39	45
score: 1	32%	34	30	31	33	31	24	29	45	28
score: 2	19%	24	12	21	15	21	21	22	13	10
score: 3	8%	9	7	7	11	4	10	10	3	7
score: 4	3%	2	3	3	1	3	3	3	0	19
5. What is the best age at which to stop breastfeeding a child?										
0 - 9 months	12%	12	11	6	14	17	11	9	9	38
10 -14 months	38%	42	35	32	39	50	30	41	44	45
15 -20 months	32%	29	35	35	32	26	34	36	32	7
21+ months	18%	17	19	27	15	7	25	14	16	10

(1) The number of respondents/cases on which the figures in Appendices B-H are based, are listed separately, in Appendix J
(2) UA=Upper Area; LA=Lower Area
(3) The Kikuyu word higo literally means kidneys but also stands for kwashiorkor
(4) Kuhoma is the Kikuyu concept closest to marasmus: a condition in which the child does not grow well and has thin arms and leggs.
(5) The number of weaning foods out of the four weaning foods mentioned (gitoero, ucuru, beans, ngima), respondents regarded as introduceable at 4 months of age or younger.

ENDIX B. NUTRITIONAL KNOWLEDGE, CONTINUED

	TOTAL GROUP	AREA		SOCIAL CLASS			EDUCATION RESPONDENT			
		UA	LA	POOR	MED.	RICH	NONE	1-4	5-8	SEC.
When a child of 2 years eats three meals a day (breakfast, lunch, dinner); is that enough of does it need anything else?										
needs extra's	41%	40	43	43	38	46	39	39	46	47
enough	57%	57	57	55	61	54	59	60	54	53
don't know	1%	3	0	2	2	0	3	1	1	0
If answer: Needs extra's; What is needed? (More than one answer allowed)										
First : milk-tea-ucuru	39%	37	41	37	33	50	33	44	33	71
Response fruits	32%	29	34	24	46	28	19	35	44	21
(N=172) eggs	12%	16	9	15	14	5	19	4	13	7
high-energy fd	7%	7	7	12	4	3	19	2	-	-
other	10%	11	9	12	4	15	9	15	9	-
Second : milk-tea-ucuru	15%	16	14	16	14	15	29	5	10	22
Response fruits	34%	26	44	29	43	30	33	35	21	78
(N=79) eggs	27%	33	19	23	32	25	14	35	38	-
high-energy fd	11%	12	11	16	7	10	14	15	10	-
other	13%	14	11	16	4	20	10	10	21	-
ι. When a child suffers from kuharuo (=diarrhoea) which food or drinks should you give?										
water,plain	41%	38	44	35	45	45	39	36	47	47
water,with sugar and/or salt	34%	32	35	35	30	38	34	37	30	33
other	26%	30	21	30	25	17	28	27	23	20
. And which food or drinks should you not give?										
milk	85%	90	80	82	87	88	83	88	86	80
other	8%	4	12	11	8	4	9	6	10	7
no reply	7%	5	8	7	5	8	8	6	4	13
	100%	100	100	100	100	100	100	100	100	100

APPENDIX C.NUTRITIONAL PREFERENCES LISTED ACCORDING TO AREA, SOCIAL CLASS AND EDUCATIONAL LEVEL OF THE RESPONDENTS

	TOTAL GROUP	AREA		SOCIAL CLASS			EDUCATION RESPONDENT			
		UA	LA	POOR	MED.	RICH	NONE	1-4	5-8	SEC
C1. ITEM RESPONSES[1]										
1. Beans-Rice	97%	97	97	98	94	98	96	97	96	100
2. Beans-Finger millet	85%	85	86	84	85	88	86	85	84	90
3. Beans-Green banana	88%	92	84	87	91	84	88	86	94	73
4. Beans-Cabbage	83%	86	79	85	87	69	92	83	76	60
5. Peas-Maize flour	56%	51	61	50	59	61	52	49	59	93
6. peas-Kale	25%	21	28	31	18	25	23	15	29	57
7. Peas-Irish potato	56%	54	59	55	58	57	47	49	69	83
8. Peas-Orange	32%	38	27	32	32	33	28	23	43	47
9. Eggs-Rice	90%	88	92	88	90	94	86	96	90	90
10. Eggs-Finger millet	85%	82	88	84	88	82	84	82	87	90
11. Eggs-Green Banana	73%	75	71	71	72	77	66	70	80	93
12. Eggs-Cabbage	75%	77	73	74	78	71	84	71	69	70
13. Meat-Maize flour	60%	59	62	59	63	57	55	52	71	80
14. Meat-Kale	38%	27	48	37	36	41	34	26	46	70
15. Meat-Irish potato	61%	55	68	54	65	69	56	56	69	80
16. Meat-Orange	45%	43	48	44	46	47	40	41	50	77
17. Maize fl-Banana	22%	24	19	22	20	25	17	26	23	23
18. Maize fl-Cabbage	29%	30	28	36	22	27	35	22	28	23
19. Millet fl-Banana	38%	34	44	34	40	45	37	34	39	63
20. Millet fl-Cabbage	26%	26	26	32	21	22	24	19	34	27
21. Rice-Orange	17%	22	13	25	10	16	16	23	14	17
22. Rice-Irish potato	25%	22	28	27	19	28	23	17	27	57
23. Kale-Orange	49%	53	46	43	52	58	46	50	56	37
24. Kale-Irish potato	79%	89	70	73	82	87	77	78	84	79
C2. AGGREGATED RESPONSES FOR FIVE FOOD GROUPS[2]										
Legumes	65%	66	65	65	66	64	64	61	69	75
Animal Products	66%	63	69	64	67	67	63	62	70	81
Cereals	24%	25	23	26	21	24	24	23	23	22
Roots & Tubers	45%	44	45	47	44	41	49	48	39	31
Vegetables	57%	59	54	53	59	61	54	62	57	51
C3. PREFERENCE SCORE[3]										
Preference Score	10.5 (2.8)	10.3 (3.0)	10.7 (2.6)	10.4 (2.7)	10.6 (2.9)	10.5 (2.9)	10.1 (2.8)	9.8 (2.6)	11.1 (2.8)	12.5 (2.5)

(1) Presents the percentage of respondents choosing the first of the twoo foods listed; for example, 97% of all women preferred beans over rice.

(2) Presents the average percentage of choices for foods from the respective food groups, calculated as follows:
Legumes: Average of the 8 comparisons including beans and peas;
Animal Products: 8 comparisons including eggs and meat;
Cereals: 12 comparisons including maize flour, millet flour and rice;
Roots & Tubers: 8 comparisons including banana and Irish potato;
Vegetables: 8 comparisons including cabbage and kale.
No aggregate results for fruits are presented because only one fruit, orange, was included in the schedule and moreover, only included in four comparisons. The average percentage of choices for this single fruit and the respective breakdowns are as follows: 64% / 61-67 / 64-65-62 / 68-66-59-56 /.

(3) Presents the combined number of choices for beans, peas, eggs and meat on item 1 to 16 with standard deviations in parentheses.

APPENDIX D. CONSUMPTION OF DISHES

	D1. PERCENT CHILDREN CONSUMING THE DISHES LISTED					D2. AVERAGE AMOUNT (GRS.) OF DISHES CONSUMED				
	ALL AGE GROUPS	AGE GROUP[1] BF	1yr	2yr	3-4yr	ALL AGE GROUPS	AGE GROUP[1] BF	1yr	2yr	3-4yr
Githeri	58	33	45	66	73	168	92	112	196	238
Gitoero	41	57	48	36	29	140	181	166	133	93
Ucuru	37	28	29	45	36	171	107	147	208	167
Ngima	58	59	49	61	62	160	128	122	180	197
Rice	6	2	11	6	3	20	12	38	13	9
Roots, single	29	13	38	27	29	79	42	85	89	73
Stew	28	26	22	32	32	43	40	29	49	54
Tea	75	63	66	82	83	417	317	399	441	451
Milk, single	55	54	67	52	44	235	214	355	187	163
Miscellaneous	-	-	-	-	-	35	10	40	30	48
Total	-	-	-	-	-	1468	1143	1493	1526	1493

(1) BF = 6-23 months, breastfed
1yr = 6-23 months, weaned
2yr = 24-35 months
3-4yr= 36-59 months

PPENDIX E.
ONSUMPTION OF FOODS[1]

	E1. PERCENT OF CHILDREN CONSUMING THE FOOD LISTED					E2. AVERAGE AMOUNT (GRS.) OF FOODS CONSUMED				
	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr
EREALS										
0. Maize, fresh	4.6%	7	1	7	4	4.0g.	3	1	5	6
1. Maize, dry	22.3%	2	15	20	50	21.9g.	1	11	24	46
2. Maize, flour	49.4%	37	38	53	66	42.2g.	24	30	51	53
3. Maize, flour; brand	18.4%	37	21	15	12	15.1g.	23	22	12	8
0. Maize-soya, flour	0.2%	-	-	-	-	0.1g.	-	-	-	-
5. Finger millet, flour	1.6%	-	-	-	-	0.3g.	-	-	-	-
4. Rice	4.4%	2	5	5	3	2.7g.	4	2	3	3
6. Sorghum, flour	12.2%	9	13	17	4	5.1g.	4	6	7	2
8. Wheat, flour	5.1%	4	3	7	4	5.1g.	3	3	6	8
OOTS & TUBERS										
5. Banana	48.0%	57	62	40	39	86.5g.	117	123	69	50
6. Potato, Irish	32.6%	33	40	29	28	30.8g.	35	43	25	22
7. Potato, Sweet	15.5%	9	16	19	13	51.4g.	32	42	72	35
8. Taro	8.1%	2	12	5	10	15.6g.	3	20	10	26
RAIN LEGUMES										
4. Beans, kidney; dry	50.6%	33	37	60	63	51.4g.	35	41	67	44
6. Peas, pigeon; dry	1.2%	-	-	-	-	0.5g.	-	-	-	-
0. Beans, peas; fresh	0.9%	-	-	-	-	1.7g.	-	-	-	-
EGETABLES										
9. Carrots	1.4%	-	-	-	-	0.6g.	-	-	-	-
2. Eggplant/squash	2.3%	-	-	-	-	2.0g.	-	-	-	-
4. Leaves, light	9.0%	9	8	8	13	8.6g.	8	5	9	13
5. Leaves, medium	0.5%	-	-	-	-	0.9g.	-	-	-	-
6. Leaves, dark	28.1%	17	25	29	36	28.5g.	24	24	29	36
0. Pumpkin	5.8%	2	2	7	10	8.0g.	6	1	9	17
8. Tomato	8.8%	7	12	6	11	1.0g.	1	2	0.4	1
RUITS										
9. Avocado pear	0.7%	-	-	-	-	1.8g.	-	-	-	-
2. Lemon	1.4%	-	-	-	-	0.3g.	-	-	-	-
8. Mango	1.8%	-	-	-	-	2.6g.	-	-	-	-
1. Orange/Tangerine	1.2%	-	-	-	-	2.1g.	-	-	-	-
7. Passion fruit	1.6%	-	-	-	-	0.8g.	-	-	-	-
0. Paw paw	0.2%	-	-	-	-	0.2g.	-	-	-	-
4. Pineapple	0.2%	-	-	-	-	0.3g.	-	-	-	-
6. Plums	0.2%	-	-	-	-	0.8g.	-	-	-	-
IEATS & ANIMAL PRODUCTS										
1. Chicken	0.5%	-	-	-	-	0.1g.	-	-	-	-
8. Egg	10.6%	9	18	8	6	4.7g.	2	10	3	3
9. Meat (beef, goat)	3.2%	-	-	-	-	1.5g.	-	-	-	-
3. Milk, fresh	90.7%	89	95	87	91	319.6g.	278	435	276	255
6. Milkpowder, skimmed	0.5%	-	-	-	-	0.1g.	-	-	-	-
3. Milk, sour	0.5%	-	-	-	-	0.9g.	-	-	-	-
4. Milk, goat	0.2%	-	-	-	-	0.9g.	-	-	-	-
0. Liver	0.2%	-	-	-	-	0.1g.	-	-	-	-
IISCELLANEOUS										
6. Bread	9.2%	7	10	7	13	7.8g.	3	9	5	15
3. Cacao	0.9%	-	-	-	-	0.1g.	-	-	-	-
2. Cacao drink	0.7%	-	-	-	-	0.02g.	-	-	-	-
2. Fat	70.5%	63	70	73	71	3.8g.	4	4	4	4
4. Sugar	77.1%	70	71	82	81	18.5g.	13	18	20	19
3. Sugar cane	0.9%	-	-	-	-	0.6g.	-	-	-	-
5. Soft drinks, syrups	0.2%	-	-	-	-	0.2g.	-	-	-	-

(1) No breakdown by age group is given for foods that were consumed by less than 10 children or 3.3% of all cases

:NDIX F.
:AGE CONSUMPTION OF FOOD GROUPS (GRS.; STANDARD DEVIATION IN BRACKETS)

	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr	
:als	101 (82)	64 (57)	80 (78)	110 (77)	135 (94)	
:s & tubers	184 (201)	187 (181)	228 (201)	176 (217)	135 (170)	
.n legumes	54 (76)	35 (58)	41 (80)	68 (78)	53 (69)	
:tables	50 (80)	37 (82)	35 (60)	55 (89)	68 (85)	
.ts	9 (49)	0 -	13 (53)	6 (35)	12 (71)	
s & meat	6 (21)	2 (8)	10 (23)	3 (11)	9 (32)	
	4 (4)	4 (4)	4 (4)	4 (4)	4 (4)	
ar	18 (15)	13 (12)	18 (18)	20 (14)	19 (14)	
:ell.solid fds	1 (8)	0 -	0 -	2 (9)	1 (11)	
Subtotal: Solid foods	428 (207)	342 (153)	430 (191)	448 (218)	435 (225)	
:	321 (292)	278 (259)	438 (367)	278 (227)	255 (242)	
Subtotal: Raw Foods	751 (333)	620 (291)	872 (396)	724 (276)	693 (304)	
er, cooking	724	523	617	810	825	
Total consumed	1475 (471)	1143 (322)	1489 (535)	1534 (409)	1518 (484)	

APPENDIX G. ENERGY & PROTEIN INTAKE AND THE AVERAGE CONTRIBUTION OF VARIOUS FOODGROUPS TO DAILY INTAKE

	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr
G1. ENERGY INTAKE (KCAL)					
Total Energy Intake	1101 (400)	840 (266)	1124 (432)	1143 (369)	1127 (421)
Cereals	338 (281)	214	267	374	441
Roots & Tubers	213 (234)	218	260	204	159
Legumes	178 (250)	119	139	230	164
Vegetables	20 (32)	15	14	21	27
Fruits	7 (46)	0	14	4	8
Meat & Eggs	12 (45)	3	17	5	19
Fat	35 (35)	34	38	33	32
Sugar	74 (62)	52	70	81	77
Milk	206 (187)	178	280	178	163
Miscellaneous	20 (73)	8	22	13	38
G2. PROTEIN INTAKE (GRS)					
Total Protein Intake	38 (20)	27 (14)	38 (23)	41 (18)	39 (18)
Cereals	8.8 (7.5)	5.3	6.8	9.8	11.7
Roots & Tubers	2.6 (2.9)	2.5	3.1	2.6	2.2
Legumes	12.5(17.7)	8.4	9.9	16.3	11.5
Vegetables	1.7 (3.0)	1.3	1.3	1.8	2.2
Fruits	0.1 (0.5)	0.0	0.2	0.0	0.1
Meat & Eggs	0.9 (3.1)	0.3	1.4	0.5	1.3
Fat	0 (-)	0.0	0.0	0.0	0.0
Sugar	0 (-)	0.0	0.0	0.0	0.0
Milk	10.6 (9.6)	9.2	14.4	9.2	8.4
Miscellaneous	0.6 (2.3)	0.3	0.7	0.4	1.2

APPENDIX G. AVERAGE CONTRIBUTION OF FOOD GROUPS CONTINUED.

G3. ENERGY INTAKE (KCAL) BY AREA

	AREA[1]	ALL AGE GROUPS	AGE GROUP			
			BF	1yr	2yr	3-4yr
Total Energy Intake	UA	1105	906	1125	1132	1111
	LA	1098	784	1122	1155	1140
Cereals	UA	331	260	263	371	413
	LA	345	175	272	377	466
Roots & Tubers	UA	184	172	258	156	110
	LA	244	256	264	253	199
Legumes	UA	185	149	144	235	176
	LA	170	94	133	224	153
Vegetables	UA	12	15	8	13	19
	LA	27	16	23	30	33
Fruits	UA	12	0	19	8	13
	LA	3	0	7	0	4
Meat & Eggs	UA	16	1	18	9	33
	LA	7	5	16	1	9
Fat	UA	29	23	35	29	23
	LA	40	43	42	38	40
Sugar	UA	86	70	74	98	94
	LA	61	37	65	64	64
Milk	UA	225	204	269	199	205
	LA	186	157	296	157	128
Miscellaneous	UA	26	12	38	17	28
	LA	15	5	0	9	46

(1) UA=Upper Area; LA=Lower Area

APPENDIX G. AVERAGE CONTRIBUTION OF FOOD GROUPS CONTINUED

G4. ENERGY INTAKE (KCAL) BY SOCIAL CLASS

	SOCIAL[1] CLASS	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr
Total Energy Intake	P	1069	906	917	1174	1172
	M	1085	789	1147	1068	1180
	R	1201	708	1366	1312	1002
Cereals	P	348	214	184	408	567
	M	311	202	258	320	423
	R	369	243	383	437	327
Roots & Tubers	P	218	268	257	202	162
	M	209	192	259	202	159
	R	210	86	268	218	154
Legumes	P	190	167	125	252	147
	M	192	91	184	217	198
	R	124	0	97	190	139
Vegetables	P	18	17	11	18	30
	M	21	8	18	23	28
	R	20	28	14	28	21
Fruits	P	1	0	3	0	1
	M	7	0	4	5	20
	R	20	0	41	12	1
Meat & Eggs	P	10	1	25	3	11
	M	12	8	7	5	37
	R	14	0	22	13	9
Fat	P	28	32	29	27	28
	M	36	38	34	41	29
	R	44	33	55	32	40
Sugar	P	73	58	65	85	69
	M	73	26	68	82	82
	R	77	100	80	60	82
Milk	P	176	148	205	179	146
	M	203	225	283	162	163
	R	275	175	372	235	185
Miscellaneous	P	12	5	14	3	35
	M	20	0	24	11	44
	R	39	42	31	61	34

(1) P=Poor; M=Medium; R=Rich.

PPENDIX H. ENERGY AND PROTEIN INTAKE, BY AREA, SOCIAL CLASS, DOMESTIC STAGE, JMBER OF PRE-SCHOOL CHILDREN IN THE HOUSEHOLD AND EDUCATION OF THE MOTHER

	AVERAGE ENERGY INTAKE (KCAL.)					AVERAGE PROTEIN INTAKE (GRS)
	ALL AGE GROUPS	AGE GROUP BF	1yr	2yr	3-4yr	ALL AGE GROUPS
REA						
pper Area	1104 (415)[1]	906	1125	1132	1111	39 (19)[1]
wer Area	1098 (382)	784	1122	1155	1140	37 (20)
OCIAL CLASS						
oor H.holds	1069 (361)	906	917	1174	1172	37 (18)
edium	1085 (428)	789	1147	1068	1180	38 (21)
ich H.holds	1196 (405)	708	1366	1312	1002	40 (19)
OMESTIC STAGE						
oung families	1048 (335)	928	1083	1059	941	36 (19)
iddle-stage	1124 (434)	779	1126	1185	1184	40 (21)
enior families	1101 (361)	905	1221	1134	1032	36 (16)
JMBER OF PRE-SCHOOL CHILDREN						
-2 Pre-School	1105 (404)	834	1112	1195	1160	38 (19)
-4 Children	1092 (389)	852	1144	1140	957	38 (21)
DUCATION RESPONDENT						
one	1096 (419)	900	1065	1172	1136	38 (19)
rimary 1-4	1124 (376)	783	1310	1119	1163	38 (19)
rim. 5 and over	1089 (376)	775	1102	1136	1069	38 (20)

1) Standard deviation in brackets.

APPENDIX J. THE NUMBER OF RESPONDENTS/CASES CORRESPONDING WITH THE VAPIOUS SUBGROUPS IN APPENDICES B-H (OBSERVATIONS PER CELL)

	ALL AGE GROUPS	AGE GROUP			
		BF	1yr	2yr	3-4yr
TOTAL	290	31	87	113	57
AREA					
Upper Area	151	14	52	57	27
Lower Area	139	17	36	56	30
SOCIAL CLASS					
Poor Households	120	16	31	53	19
Medium	113	11	32	49	22
Rich Households	57	4	24	12	16
DOMESTIC STAGE					
Young Families	73	8	31	29	4
Middle-stage	164	18	44	64	38
Senior Families	53	5	12	20	15
NUMBER OF PRE-SCHOOL CHILDREN					
1-2 Pre-school	191	21	55	67	48
3-4 children	99	10	33	46	10
EDUCATION RESPONDENT					
None	103	16	27	40	21
Primary 1-4	83	10	15	38	21
Primary 5-8	84	6	35	29	14
Secondary	19	-	10	7	2

Appendix K. RECIPES USED TO CALCULATE THE DIETARY RECALL

K1. RAW INGREDIENTS (GRS.) PER 1000 GRAMMES COOKED DISH

Dish	MAIN INGREDIENTS[1]						OPTIONAL							
	TOTAL	MAIZE & BEANS	ROOTS & TUBERS	FLOUR	LEAFY VEGE-TABLES	RICE	MILK	SUGAR	FAT	TOMA-TOES	CAR-ROTS	LEMON	EGG	
Tea[2]							198-261[3]	40-69[3]						
Ucuru														
(thin)	82			82			113-128[3]	15-39[3]				49[4]		
(thick)	149			149			113-128[3]	15-39[3]				49[4]		
Ngima														
(soft)	376			376										
(hard)	515			515										
Githeri														
(watery)	480	480												
(dry)	600	600												
Mashed githeri	469	*			*									
(no roots & tubers)	648	*	*		*									
Fried githeri	469	*			*				10	40				
(no roots & tubers)	648	*	*		*				10	40				
Gitoero														
(watery)	564		*		*				19	38	68			
(medium)	784		*		*				19	38	68			
(dry)	967		*		*				19	38	68			
Rice	548		*			*								
Stew[5]														
(watery)	543				543				41	50				
(medium)	811				811				41	50				
(dry)	1000				1000				41	50				
Chapatis	713			713					66					
Pancakes	580			580					19					63

1) The quantities indicated with "*" are estimated according to the proportions mentioned by respondent.
2) Includes coffee and cocoa. For cocoa 8 grams is added to recipe.
3) If the ingredient is added without any further additions, the larger quantity is used.
4) If lemon is added no milk is added.
5) Meat, if added, is included into calculations according to the number of pieces consumed.

K2. ESTIMATED EDIBLE PORTION (GRS.) FOR SELECTED FOOD ITEMS

ROOTS & TUBERS

Irish potato		Cassava		Yam		Arrowroot		Pumpkin	
Small	20	small	60	small	245	small	80	small	1350
medium	35	medium	220	medium	450	medium	200	medium	1600
big	85	big	260	big	780	big	340	big	2600
		per 10 cm.							
Sweet potato		Banana							
small	100	very small	31						
medium	220	small	50						
big	340	medium	85						
very big	640	big	140						

FRUITS:

Orange		Pawpaw		Mango		Sugar cane		Passion fruit	33
small	60	small	300	small	58	small	27		
medium	100	medium	600	medium	104	big	33		
big	170	big	900	big	166	per 10 cm.			

ANIMAL PRODUCTS:

Egg		Meat pieces		Chicken					
small	38	small	5	leg	32	shoulder	89	liver	35
medium	46	medium	10	thigh	70	neck	65	hip	65
large	66	big	15	wing	24	stomach	50	whole back	180
								chest	180

CEREALS AND CEREAL PRODUCTS:

Maize cob		Bread		Scone	20	Chapati/pancake	
small	80	thin slice	30			small	125
medium	130	normal slice	50			medium	175
big	180	big slice	75			big	250
		whole bread	500				

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