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The Nutritional Status of Haitian Children.

(Report of a Field Survey) *

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and

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Malnutrition is one of the principal problems of child health in Haiti, as can be confirmed by rapid inspection of any hospital with accommodation for children in which one-quarter to one-half or more of the cots will be found to be occupied by serious cases with a principal diagnosis of protein-calorie malnutrition, especially kwashiorkor.

The purpose of the present study was to attempt to discover the significance of malnutrition in early childhood in the country as a whole, and, for this purpose, a survey was undertaken in June and July 1958 in 24 representative villages scattered throughout the five *Départements* of Haiti and in 2 slum-dwelling groups in the capital, Port-au-Prince. In all, 2,343 children were examined, including especially 1,322 young pre-school children aged between 1 and 3 years.

In addition, some information was collected on certain other topics relevant to the ecology of malnutrition, including possible etiological factors, methods of infant feeding, customs in child rearing, and the presence of certain miscellaneous pathological conditions, including malaria, yaws and skin diseases.

At the same time as the present study, an appraisal of agricultural resources, food habits and vital statistics was being carried out in the country by SEBRELL and his associates, together with nutritional clinical examinations of more than 3,000 older individuals in a number of villages and cities in the *Département du Nord, de l'Artibonite* and *de l'Ouest*, and biochemical determinations on blood and urine samples of about 15% of those examined (31).

Ecological Background.

Before describing the methods employed, results obtained and possible interpretations, it is necessary to summarize some of the more important aspects of the geographical, historical and socio-economic background in order to help understand the ecology of malnutrition in present-day Haiti.

The Republic of Haiti occupies the mountainous western third (10,700 square miles) of the Caribbean island at one time known as Santo Domingo (or Sainte Domingue), while the eastern two-thirds comprise the Dominican Republic (Fig. 1). The country is the second oldest in the western hemisphere, achieving independence from France in 1804 as a result of the efforts of the great Negro generals, Toussaint L'Ouverture and Jean-Jaques Dessalines, at a time when Napoleon was at the height of his power—a fact of great importance in understanding the proudly independent attitude of the Haitian people.

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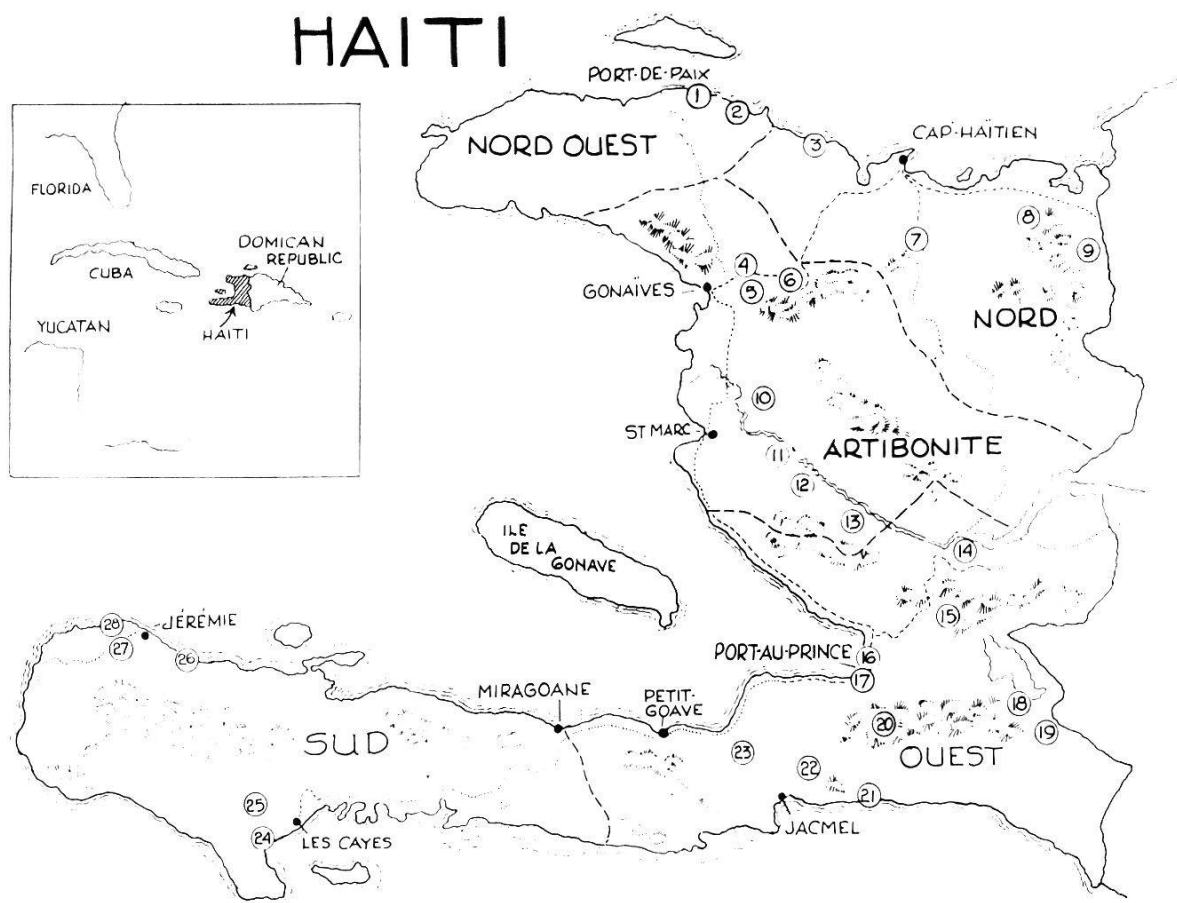


Fig. 1. Map of Republic of Haiti. (Circled numbers represent approximate position of villages or slum populations visited.) Key: (1) Carenage, (2) Berger, (3) Bord de Mer, (4) Passerelle, (5) Bassin, (6) Miguelle, (7) Carrefour Menard, (8) Grand Bassin, (9) Dosmond, (10) Hautes Feuilles, (11) Poterie, (12) Drouet, (13) Castra, (14) Domond, (15) Trou Caiman, (16) Nouvelle Cité, (17) La Saline, (18) Fond Parisien, (19) Les Roches, (20) Furcy, (21) Petit Mouillage, (22) Poste Pierre, (23) Musac, (24) La Corrière, (25) La Borde, (26) Gaumier, (27) La Ferme, (28) Trou Bonbon. (Visits to villages Nos. 3 and 23 were not successful and are not included.)

The population is almost all of predominantly African descent¹, with a small highly cultured Mulatto minority mostly living in the towns, especially Port-au-Prince, and usually engaged in commerce or in the major professions, such as law or medicine. The country is bilingual—French being the language of the educated élite, while Créole², which is spoken by all Haitians, is the only language of many villagers. The latter, which has much more difference from normal French than has the pidgin English of West Africa from standard English, is composed of distinctively pronounced French, words from various African languages, as well as a little Spanish (especially near the Dominican

¹ According to HERSKOVITS, the following are the most obvious West African heritages in present-day Haitian culture: the *coumbite* (cooperative work or "work-bee"), markets and women traders, polygamy ("*polygamie en fait*") (27) and *vodun*. Many dominant practices are Dahomean in origin.

² The word Créole, variously employed in different regions of the world, in Haiti appears to refer exclusively to this language, which, like so much of the "cultural mosaic" of Haiti, has been rightly termed the child of Africa and France.

border). The word-order and grammar are often quite dissimilar to standard French.

The population of Haiti is not known with any certainty, but is probably in the region of 3.5 million, with an estimated annual increase of 1.5 per cent. The illiteracy rate is very high, certainly over 90 per cent.

Four-fifths of the country, which is divided into five *Départements* (Fig. 1) is made up of mountainous terrain (ranging from 5-10,000 feet³). There are seven larger plains, the two most important being near to the town of Les Cayes and in the lower reaches of the Artibonite river. Probably only about one-third of the land is tillable, so that the high figure estimated for population density (350-400 per square mile) for the country as a whole is even greater relative to agriculturally productive land.

The picture of land-pressure due to increasing over-population is made still worse by uncontrolled soil erosion, associated with deforestation and cultivation in small patches with machete and hoe⁴, following initial clearing of the mountainside bush by burning. Failure to reinvigorate the soil with manure or fertilisers, the absence of crop rotation and poor storage facilities still further exaggerate "the grave problem of sustaining an expanding population on shrinking land resources" (36)⁵.

The fertility and natural productivity of the land varies a great deal in different regions depending upon the soil, the rainfall and the flatness or otherwise of the terrain. In general, the north and the border country are of low productivity, with poor, often arid land, while the southern peninsula is more naturally fruitful, especially the Cayes plain.

Ninety per cent of the Haitian population live in rural areas as peasant farmers, usually deriving a bare existence for their families from what can be grown on their small plots of land or on what they can purchase at the local markets for the small amount of money they make by selling produce. Tenure of land is insecure and the source of endless wasteful litigation as a result of complicated laws of inheritance and because of the fact that there has never been any mechanism for the registration of the title of land. There is a striking predominance of families working for their individual account as proprietors, lessees or tenant owners, and, in a 1943 survey, only 6% of the population were estimated as being employed for wages.

The main cash crop of the more fortunate peasant is coffee, for which, as a high altitude crop (over 1,500 feet), Haiti has a natural advantage; while large estates, both private and government-owned, of sisal, sugar-cane and bananas are to be found in the north. Other cash crops consist of bananas, cotton and cotton-seed oil, tobacco and rubber. There are few industries in the country, save those in Port-au-Prince and Cap Haitien connected with tourism (hotels, mahogany and rafia curios) and agriculture (processing of sugar-cane and rum distilling, decortication of sisal, rice milling). Mineral resources are not considered to be significant, except for some deposits of bauxite and the raw material for cement manufacture.

Communications in Haiti, with the exception of the road between Port-au-

³ The word "Haiti", reintroduced by Dessalines in 1808, is thought to have been the original Arawak name for the country, meaning "Land of Mountains".

⁴ The plough and wheelbarrow are not in general use.

⁵ Agricultural problems have been detailed in the recent SEBRELL report, in which mention is made of increasing difficulties in the past decade as a result of the depredations of the boll weevil on cotton, and of Panama disease and Sigatoka on banana crops (31).

Prince and Cap Haitien in the north, are very bad; most produce is carried to market on donkey back or on the heads of village women. A four-wheel drive vehicle, preferably a jeep, is needed for survey work and many rural mountain villages in the interior can only be visited by horse or mule. A number of roads between large towns are impassable in the rainy season; however, the Haitian Air Force operate regular passenger flights between the capital and other main towns.

In common with most parts of the world, slum areas exist around the major towns, especially the capital, and pose a considerable problem as more people drift into the "urban fringe" in search of employment. The Haitian Government is actively aware of this situation and is attempting to ameliorate matters by the development of workers' housing estates.

The majority (85-90%) of the Haitian population live an exclusively agricultural life, often in quite remote villages or scattered *cailles* (cottages). Both the size and the site of the village or *cailles* seem to depend to a large extent on the availability of flat, fertile land and of a reliably constant water supply from a river, spring, stream, muddy ditch or pond, so that, as would be expected, the larger villages are on the plains or flat country, while in the mountains isolated dwellings or small groups are the rule.

Cailles are usually built of mud (similar to the *adobe* of Mexico) and wattle, and are most often thatched. One to three rooms are usual. The kitchen consists of a separate room or shelter. Around the house, various trees, crops and vegetables are to be found, and vary with the soil and climate, as, for example, in the cool mountain regions at an elevation several thousand feet, in the rich tropical plain around Les Cayes and in the sandy soil of sea-side villages. A more detailed consideration of certain apparent agricultural and food-growing practices and geographical and seasonal differences is given later.

The Haitian peasant lives in close, almost symbiotic association with his domestic animals, in particular pigs, dogs, chickens and goats. Swine are usually found in an adjacent muddy pond, the "hogge's crawle" of 18th century England. Poultry is kept for three reasons, for the sale value of the eggs and birds in the market, and for the rearing of males for the national sport of cock-fighting. The apparent number of cattle—usually very few—varies with the agricultural productivity and wealth of the region. In some dry, arid and desolate villages, there are no cows at all; while, in the fertile plain round Les Cayes, most villagers appear to own at least one.

(It has been reliably estimated that on this plain—the principal milk producing region of Haiti—there are over 20,000 cattle, and historically, there is good support for this, as the island lying nearby off the coast—well-named Ile-à-vache—was one of the main sites for the cattle-raising *bouccaniers* of the seventeenth century.)

Village livestock of all types are plainly of poor quality, thin and often diseased. Anthrax was reported to be a significant problem, while an outbreak probably of the often lethal, so-called "swine cholera" was in progress in one village visited in the *Département du Nord-Ouest*. Pigs and goats are prevented from eating nearby crops by the large triangular wooden collars worn and the tight-growing cactus, equipped with both spines and irritant latex, planted to form an ingenious type of fencing.

Fishing is, up to the present, undertaken on a very limited scale using such relatively inefficient equipment as seine nets and fish traps for sea fishing, and traps built into simple "dams" constructed in shallow rivers. The *lambi* or conch (*Strombus gigas*) is caught in some coastal regions by boatmen using long trident-ended poles.

The village social structure usually appears to be headed by the *chef de section*, who act most efficiently as local village-level representatives of law

and order. They are appointed by the *Garde d'Haiti* (the combined police and army) authorities of the particular *Département* on a basis of natural leadership, personality and standing in the community. They receive a very small monthly salary, derive considerable prestige from the position, and are entitled to carry a revolver and a brass hat-badge with the Haitian crest. (The *chef de section* often played a considerable part in the practical organisation of examinations in the village. They were almost without exception men of character and intelligence, whose assistance was invaluable.) Other outstanding village notables varied from place to place, but sometimes included a priest, a wealthier peasant farmer or small shop-keeper. Their relative positions in the local social stratification was, of course, impossible to assess in the short visits made.

Marriage solemnized by a Church ceremony is not very common amongst the Haitian peasantry, often being regarded rather as a symbol of having achieved a certain economic level. More frequently an agreement is reached between the two families, whereby the man and woman live together without being formally married (*plaçage*). The wealthier peasant may have several "wives" under this system, each living on or near a separate piece of land. One of the complications of inheritance is due to different shares accorded to legitimate, natural (that is derived from *plaçage* unions) and illegitimate children (11).

Overtly the religion of the country is Christianity, mainly Roman Catholicism, but also Episcopalianism and other Protestant sects. In addition, and interwoven to a great extent, is the practice of *vodun*⁶, which, as MÉTRAUX emphasizes, is very much a living folk religion⁷ based on the belief that man is surrounded by a multitude of spirits, good and bad, and a pantheon of godlings and gods (*lwa* or *mystères*) (25). Natural events are due to the influence of these spirits, who may be propitiated and influenced by suitable ceremonies and ritual carried out by the *vodun* priest (*houngan*) and priestess (*mambo*) and their assistants. Similarly, evil spells (*wangas*) may be cast or deflected by suitable magical means. Although it is difficult for a brief visitor to the country to gauge the influence of *vodun* on the attitudes and philosophy of the peasant population, it seems likely that it is, in fact, of major importance.

Medically, the main significance of *vodun* and the general belief in the magical causation of events is in relation to disease etiology. As MÉTRAUX has vividly described, illness (especially in children) is, in the mind of the Haitian peasant, due to the influence of werewolves (*loups-garoux*), spirits of the dead, the evil-eye (*maljok*) and like phenomena (25). As in most peasant communities, as well as magical curers of disease, herbal remedies are very widely employed, both by actual villagers and herbal doctors (*docteur feuilles*). The problems associated with the practical application of scientific medicine and public health in this type of cross-cultural situation are increasingly well-known (13).

A peculiar belief that is very strong among Haitian peasants is that certain evil-doers can either bring back the recently dead, or by means of unknown poisons cause death to be simulated so that the grave may be opened soon after burial and the subject resuscitated as a will-less automaton or slave (*zombi*). A real and widespread dread of being made into a *zombi* is suggested by the

⁶ According to PARRINDER the word *vodun* is derived from a Dahomey word meaning "God" (28).

⁷ RODMAN quotes SEABROOK as comparing *vodun* with the vital aliveness of mediaeval Christianity, when miracles and mystical illuminations were common every-day occurrences, and "the high Gods enter by the back door and abide in the servant's lodge" (29).

heavy brick superstructures built over graves to prevent their being tampered with, and the practice of not burying immediately (as is the usual in most tropical climates) so that early decomposition can be detected, or of having a major artery cut to ensure the genuineness of death.

Artistically, Haiti is unique in the Caribbean and, although the large number of excellent poets and writers are, of course, confined to the small group of literate intellectuals, the present-day renaissance of Haitian painting has been mostly by untaught artists, many of whom are illiterate, while the music of Haiti, which includes a large number of folk songs, is of great merit. Even amongst the unlettered majority, the Créole language is rich in amusing and witty proverbs and sayings.

The central core of the hard life of the Haitian peasant has been well summed up by LEYBURN, who writes: "What really matters is having food to eat, avoiding bad luck in health and crops, having a wife and family, keeping on the right side of the spirits, and being able at night to dance, sing and tell tales with his friends" (22).

Survey Methods.

Sampling. Although theoretically the samples of the child population examined should have been rigidly guided by recognized statistical principles, this was not always possible, because, for example, population figures for the country as a whole, and hence for regions and towns, are not known; while practical considerations concerning transport and logistics were always paramount and unpredictable.

Basically, the survey attempted to examine the complete 1-3 year old populations of certain relatively circumscribed population units, such as villages, in representative areas of the country. Selection of representative samples presented no problem ethnically or culturally, as this is more-or-less uniform in the lower socio-economic majority with whom the survey was concerned. However, care had to be taken to include sampling in urban slums, as well as in diverse rural areas in different geographical, and hence agricultural, situations in the five *Départements*, including the seashore, the mountains and arid waterless regions.

Village selection. The four-person survey team based itself at different stages of the enquiry in the main town of the various regions (i.e. Jérémie for the *Département du Nord-Ouest*). Plans were then made—based on information gained by discussion with experienced officials, both locally and in the capital, and on such written information as could be found—to radiate out each day by four-wheel drive carry-all or jeep to what were considered probably to be representative geographical and agricultural areas of the district, preferably not more than three hours travelling away.

Certain problems were encountered in selecting villages or population-units within these areas. Firstly, unpredictable changes in roads, especially the rising of a river or the development of impassable mud, sometimes limited the choice. Secondly, the constant movement of population to and from villages for the very frequent rural markets presented a problem, as a market in a village not only alters the population of the actual place, which becomes crowded, but drains most mothers and some of their children from villages for miles around, which, in consequence, become semi-deserted⁸. As there was

⁸ The importance of the market-day system in the Haitian domestic culture pattern is stressed by SEBRELL et al. who note that it supplies a social outlet for the peasant women who are otherwise almost completely isolated from human contacts outside their own families (31).

no way of knowing village market-days in advance, they could only be discovered in the course of the actual survey, firstly by seeing the quiet, almost empty village with most *cailles* with closed doors and then by making enquiries. In practice, it was found that a market-day meant that the population dynamics were upset for some ten miles around the site of the actual market, so that the survey team had to move on accordingly to avoid the surrounding "drainage area".

A third problem was the lack of definition of villages in some parts of the country. In fact, villages are only a feature of rural Haiti in relatively flat regions, best exemplified by the Cayes plain, or by the sea-shore. In hilly, and especially mountainous, regions, *cailles* were in widely scattered small groups or even by themselves. A different method of approach was required in this type of situation, as described later.

In addition, a village selected *en route* in this fashion had to be of a population size that was estimated to be within the capacity of the team, a factor dependent upon not only the actual size of the place, but also the time of arrival and the estimated period to be spent on the return journey.

Lastly, the very few villages with medical dispensaries, such as those organized by the Oblate Order in the southern peninsula, were avoided, in view of the possible effect of this atypical facility on the health and nutrition of local children.

Because of these practical problems, several days were unproductive in that, because of deterioration of road conditions or frequent markets, no suitable sized village was reached before too late in the day.

Collection procedure. This varied in the three characteristic types of population grouping that were encountered.

(i) *Villages.* These were visited without preliminary arrangement or announcement, preferably in the first half of the morning, always on non-market days. In this way, it was hoped that only the child population of the actual village would be examined, without the additional probably predominantly sick children that would undoubtedly have been brought down from the surrounding hills, if previous notice had been given, thereby giving a false idea of actual conditions.

If a village were considered suitable, a leading citizen would be sought out, preferably the *chef de section*, if available, but if not a more influential member of the community could usually be found by his rather larger house. Initial explanation of the team's willingness to examine all children of certain age-groups and to treat those who were sick usually met with ready understanding. Chairs and tables were forthcoming from nearby *cailles* and three carefully spaced sites each with a table and two chairs were set up beneath suitable shady trees, preferably mangoes, and "fenced off" with string and sticks that formed part of the field equipment.

The children of the *chef de section* or other notables were examined first, and, as the arrival and activities of the group was always followed with considerable interest, neighbours soon followed this example. At the same time, news was also being spread from house to house through the village, both spontaneously and via messengers sent by the *chef de section* and by the team's driver. Such few children as accompanied one of their parents to the not-too-far distant fields were brought back. In this way, it is probable that all children in the village were in fact available for examination.

Initially, balloons were used as easily transportable inducements to stimulate attendance, but were completely unnecessary. Mothers brought their well and sick children with enthusiasm, because, apart from the novelty of the visit in the village routine, the simple treatment available and the "vaccination", as

the finger-prick was construed, were welcomed in a country with scanty medical services. (The popularity of the latter seemed probably to be related to the highly successful and much appreciated penicillin injection campaigns against yaws.) The main difficulty was in trying to confine the survey to children, and, in fact, really sick persons of all ages were always treated.

Lack of cooperation was only encountered in two villages visited, both in relatively prosperous rural areas, and both were abandoned as soon as this very atypical hostility became apparent.

(ii) *Mountainous regions*. In hilly or mountainous regions, no villages exist as such, and, under these circumstances, it was usually found necessary to visit a number of clusters of *cailles* one after another and to consider the results in reference to this combined population-unit. This was, of course, much more time-consuming, as each group of houses visited meant another period of explanation and organization.

(iii) *Slums*. Two slum areas were included. Both of these were in Port-au-Prince. The first was easy to examine as a circumscribed group, and consisted of the children of all families moved three days previously from a section of the slum of La Saline, which was being levelled by the Government, to the new workers' housing development, la Nouvelle Cité.

The second group of children were actually living in the slum known as La Saline. In this densely populated, sprawling area, it was felt that the only feasible method of examining a representative sample was by means of home-visiting, with portable scales, and examining all 1-3 years olds in randomly selected houses.

Practical details. The following practical routine was carried on in each village at the three tables previously referred to in the following sequence:

(i) *Weight*. Children were weighed naked on a simple beam-balance scale, which was frequently checked. The name, sex and alleged age were also recorded.

(ii) *Examination*. This was largely inspectional, although measurement of subcutaneous fat and of upper arm-circumference were made. This clinical nutritional assessment was made with the naked child seated opposite the examiner on the mother's knee; the presence of skin disease was also noted. Details of the schedule used are given later.

(iii) *History, blood film and minor treatment*. An approximate qualitative dietary history was obtained from mothers by direct questioning and discussion, which was often animated as mothers frequently showed a lively interest. This became easier as the general pattern of infant feeding in the country came to be understood to some extent. In addition, the age previously given was checked as carefully as possible.

Lastly a thick blood film and a Talquist haemoglobin test were taken. Minor treatment was given when indicated using a limited supply of the following simple, but effective and easily transported drugs: supplements: iron, poly-vitamin capsules; chemotherapy: sulphadiazine, disposable dibenzyl-penicillin ampoules, small supplies of chloramphenicol and chlortetracycline; eye therapy: sulphacetamide ointment (10%), silver proteinate (1% drops); anti-malarial: camoquine; anthelmintic: piperazine citrate; skin: salicylic acid ointment.

Field microscopy. It was impossible to collect stools in more than two villages, mainly owing to the unexpected nature of the team's visits. However, in a very few children with oedema, probably due to kwashiorkor, with associated anaemia, it was judged necessary to carry out a field examination of the stools using the McArthur portable microscope to determine if hookworm infection was playing any part in the particular child (23).

Age range. While the 1-3 year group was always examined, babies from

birth and older children up to 12 years were included too, if time was thought to be adequate, which largely depended on the size of the villages, the time of arrival and the estimated journey back in the evening.

Nutritional assessment. Clinical assessment of nutritional status was carried out according to a simplified modification of a schedule previously employed in Jamaica (21). Results were mainly recorded by ticks in column-type forms, where some categories were graded from 0 to +++ and others as positive or negative. Each degree of each sign recorded was predefined as carefully as possible, although in most cases this was difficult to achieve with objective preciseness.

1. *Hair.*

This was examined for two changes: lightening or alteration of colour (here termed "hypochromotrichia") and easy pluckability. Normal hair in young well-nourished Haitian children, as with other groups of mainly African descent, is composed of jet-black or dark brown, abundant, pepper-corn curls, which cannot be plucked out easily.

Hypochromotrichia. In order to attempt to introduce some objectivity into the assessment of hypochromotrichia, two hair colour charts obtained from women's hairdressers in America were tried out, but had to be abandoned almost at once as it was soon found that the hair changes seen in Haitian children in no way correspond to those depicted in the charts. As the colour changes seen were found to fall into a relatively limited range, a standard collection of hair samples from actual malnourished Haitian children was built up and referred to in each village. These colours ran through the following spectrum: black, dark-brown, light-brown, red-brown, red, blonde, white.

A further problem was in relation to the two variable degrees of involvement with hypochromotrichia—actual *area* of scalp-hair affected and *length* of hair involved.

Various types of hypochromotrichia were recorded by checking the following on the nutrition appraisal form: (i) the colour (B, DB, LB, RB, R, BI, W), (ii) the area of the scalp-hair affected (+ = peripheral ring, the so-called "fair-fringe" or "halo effect"), ++ = about half scalp hair involved, usually the outer half, +++ = all hair affected, and (iii) the length of the hair involved on vertex of scalp (+ = tips of hair, ++ = up to $\frac{1}{2}$ length, +++ = more than half length).

Easy pluckability. This sign was sought for in some villages later in the survey at the suggestion of Dr J. BENGUA of the Nutrition Section, WHO, for reasons mentioned later. The test was carried out by grasping a clump of hair over the crown of the scalp between the examiner's thumb and forefinger, and pulling firmly and smoothly for three seconds. Results were only recorded as negative or positive, when about 20 or more hairs could be plucked out easily and apparently painlessly.

2. *Eyes.*

The following signs were looked for in the eyes:

Anaemia. This was estimated clinically by inspection of the conjunctiva and graded as positive only with marked and definite anaemia.

Bitôt's spots. The presence of these quite characteristic subtriangular chalk-white or aluminium-paint spots of the conjunctiva just lateral to the limbus were noted if present.

3. *Lips.*

Angular stomatitis. + to +++ according to the degree of superficial fissuring and ulceration radiating out from the corners of the mouth.

4. *Gums.*

Swelling. + to +++, according to severity.

Bleeding. + on pressure, ++ and +++ spontaneous bleeding, according to degree.

Gingivitis. + minor marginal infection, ++ generalized gingivitis, +++ severe and generalized, with recession of gums.

5. *Secretory glands.*

Parotids. + to +++ according to degree of swelling.

Breasts. +, if considered swollen.

6. *Teeth.*

Caries. Presence or absence of visible carious cavities.

7. *Skin.*

Mosaic skin. + glazed, rather shiny, wrinkled appearance, ++ and +++ according to degree of severity of crackled mosaic appearance.

Follicular hyperkeratosis (Phrynoderma). Firm, spiny papules with horny points of keratin, giving "nutmeg" grater feel, usually on the extensor aspects of arms, legs, buttocks. + to +++ according to severity.

8. *Oedema.*

Presence or otherwise of pre-tibial oedema (as defined later).

9. *Viscera.*

Liver. Presence or otherwise of abnormal palpability, without grading.

10. *Musculo-skeletal.*

Bones. Presence of bony deformities (beading, bow legs, enlarged epiphyses, etc.) were noted.

Subcutaneous fat. Mid-biceps skinfold (using callipers) (as defined later).

Mid-biceps arm circumference (tape measure).

Results.

Nutritional status.

Although the survey was mainly concerned with the 1-3 year old group because of their known nutritional vulnerability, some younger and older children were also examined when the occasion permitted, so that results can be considered in three age-groups: A. infants (newborn up to 1 year), B. 1-3 year olds, C. older children.

A. *Infants.*

575 infants, aged up to twelve months, were examined in a total of 22 villages and one slum area. Whether a village's infant population were examined or not depended mainly upon the time available. The only minor difficulty encountered was that mothers in some places were reluctant to take their babies out of their houses during the first forty days of life.

Weights. Employing the Gómez weight classification, which is described later, 67% of the whole group of infants were considered to be normal, while the following were found with different degrees of malnutrition: 1st 17%, 2nd 15%, 3rd 1%.

Further analysis of these figures contrasts the usually excellent nutrition of the first six months with the slight, but definite, deterioration found in the second half of the year (Table I).

TABLE 1.

Degree of malnutrition by weight deviation in first and second halves of first year of life.

Age group (months)	Normal	Degree of malnutrition		
		1st	2nd	3rd
0—6	86 %	12 %	2 %	0 %
6—12	60 %	20 %	17 %	3 %

Nutritional syndromes. No identifiable clinical syndromes due to malnutrition were seen in the first eight months of life, while in the last quarter the following numbers of cases were recorded: kwashiorkor 6, “incomplete” kwashiorkor 4, nutritional marasmus 9, infantile scurvy 1 and rickets 2.

Anaemia, as judged clinically and by Talquist estimation, was present in about 5-10% of infants; while minor or moderate degrees of hypochromotrichia, usually light-brown in colour, was seen in 26%. Both were not striking or conspicuous features, and were almost exclusively confined to the last half of the first year.

Negative findings. No lesions of nutritional consequence were noted in the eye, mouth or skin, except those forming part of the nutritional syndromes already enumerated. Only the six children with kwashiorkor showed oedema.

B. 1-3 year olds.

Because of their well-known special nutritional vulnerability, the survey mainly concerned itself with children in this age-group, and the main purpose of the investigation was to discover the prevalence of malnutrition, especially that due to protein-calorie deficiency, in these young pre-school children (16).

General results. The following miscellaneous positive findings were detected: anaemia (as judged by combined clinical examination and Talquist test) 20%, mosaic skin of shins 7%, parotid enlargement 0%, hepatomegaly 3%, and “ascaris abdomen” 5%. In

addition, the following nutritional syndromes were seen: ariboflavinosis (unaccompanied by kwashiorkor) 7, rickets 5 (all, save one, from slum areas), follicular keratosis 7, infantile scurvy 1, Bitôt's spots 1.

Protein-calorie malnutrition.

In contrast with the relative infrequency of both classical textbook paediatric deficiency disease and of many miscellaneous stigmata of possible nutritional import (such as mosaic skin), it was found, as had been expected, that protein-calorie malnutrition⁹ was widespread and consideration had to be given to possible methods of measuring its prevalence within the framework of the schedule devised for the village-level examination already described. An abbreviated account of these results has been given elsewhere (18).

Methods of assessment. Three main simple modes of clinical assessment appeared to be available for use in the field in order to measure the prevalence of malnutrition due to protein-calorie deficiency in this age-group¹⁰. All had certain errors and limitations, and they can be best regarded as tentative and giving mutually complementary information. They may be termed: (1) Assessment by syndrome, (2) Assessment by nutritional index, (3) Assessment by weight deviation.

(1) *Assessment by syndrome.* An attempt was made during the survey to record the number of children whose general condition fitted into such recognizable clinical pictures as could be termed syndromes. The difficulty here, as appreciated by all working in this field in tropical paediatrics, is that—presumably as a result of such variable factors as types of weaning foods, length of breast feeding, presence and burden of intestinal parasites, associated infections and inherent genetic difference—a kaleidoscopic variety of clinical pictures can, and do, occur, often being difficult or impossible to classify with certainty. Nevertheless, the following four syndromes were looked for in each village, diagnosis being made on the spot by clinical inspection.

(i) *Kwashiorkor.* This well-recognized syndrome, probably due to severe protein lack in rapidly growing children with some, adequate or even a high intake of calories in the form of starchy largely carbohydrate foods, was the most objectively identifiable. Criteria for diagnosis were pitting oedema (at

⁹ The term "protein-calorie malnutrition" is used as lack of protein with varying levels of intake of calories, especially in the form of carbohydrate, appears to be mainly responsible etiologically (16).

¹⁰ This whole field has recently been reviewed by BENGGA, JELLIFFE and PEREZ (3).

least in the pre-tibial region), an obviously low body-weight, wasted muscles, with at least relatively "normal" overlying subcutaneous fat, and apathy, as evidenced by silent listless inertness, even during the minor trauma of finger-pricking. Some degree of "moon-face" was usually present. One or more of the following "variable" signs were often found, but were not regarded as necessary for diagnosis: hair changes (hypochromotrichia, sparseness, silkiness, straightness, pluckability), hepatomegaly, classical "flaky-paint" dermatosis, and signs of associated vitamin lack, especially ariboflavinosis.

(ii) *Incomplete kwashiorkor*. It has long been appreciated that, if classical cases of kwashiorkor are to be seen, then, equally, other less completely affected children must also occur. Apart from uncertainty in establishing criteria for diagnosis, it is also difficult to know what to term these cases. "Pre-kwashiorkor" has been suggested, but can be rejected, as many of these children may never go on to develop the complete picture. It would seem better temporarily to call these cases "mild" or "incomplete" kwashiorkor.

The criteria for diagnosis are the same as listed for kwashiorkor, save that oedema is not present. It will then be appreciated that the diagnosis of this condition in the field was based largely on inherently inaccurate clinical judgment of low body weight, wasted muscles with relatively normal subcutaneous fat, and apathy.

(iii) *Nutritional marasmus*. Diagnosis of this syndrome, probably due to an extremely low intake of all nutrients, including protein was based on the clinical picture of a very low weight, with marked wasting of both muscle and subcutaneous fat, without oedema or significant apathy. Associated signs of avitaminoses and hair changes were sometimes present.

(iv) *Nutritional dwarfing*. Children with what is here called "nutritional dwarfing" presented clinically as being obviously considerably underweight and undersized, while, at the same time, having relatively normal body proportions, including muscle and subcutaneous fat relatively proportional to their body size. Apathy was not present and there were usually no other physical stigmata. These undersized, stunted children may be considered as due to severe growth retardation as a result of an inadequate, but relatively balanced, diet.

Results. As will be observed, the clinical diagnosis of these four syndromes in the field is, with the exception of kwashiorkor, based mainly on subjective findings, with all the inaccuracies that this implies. (Suggested inter-relations between the clinical pictures of these four syndromes are shown in Fig. 2.)

The prevalence of kwashiorkor in the five *Départements* and the one slum group varied from 3 to 16%, with an average for the whole country of 7%. (Because of the critically diagnostic significance of oedema, these results are identical with those for the "oedema index".)

As expected the prevalence of "incomplete kwashiorkor" was higher than classical oedematous kwashiorkor, being 10% for the whole group. However, in the two most malnourished regions, the *Départements du Nord* and *Nord-Ouest*, actual kwashiorkor was seen slightly more frequently than incomplete forms of the syndrome. Nutritional marasmus was found in only 2% and nutritional dwarfing in 7% of the combined *Départements* (Table II).

TABLE II.
Prevalence of protein-calorie malnutrition syndromes in Haitian pre-school children in different Départements of the country. (Percentages given to nearest whole number.)

<i>Département</i>	Number of villages or groups	Number of children	Kwashiorkor		Incomplete kwashiorkor		Nutritional Marasmus		Nutritional Dwarfing	
			No.	%	No.	%	No.	%	No.	%
Nord-Ouest	2	86	8	9	6	7	2	2	5	6
Nord	3	171	28	16	19	11	3	2	13	8
Artibonite	7	300	13	4	34	11	1	0	16	5
Ouest	7	416	22	5	40	10	16	4	36	9
Sud	5	217	13	6	20	9	2	1	18	18
Combined Départements	24	1,190	82	7	119	10	24	2	88	7
Urban Slums	2	132	4	3	14	11	—	—	—	—
Total combined	26	1,322	86	7	133	10	—	—	—	—

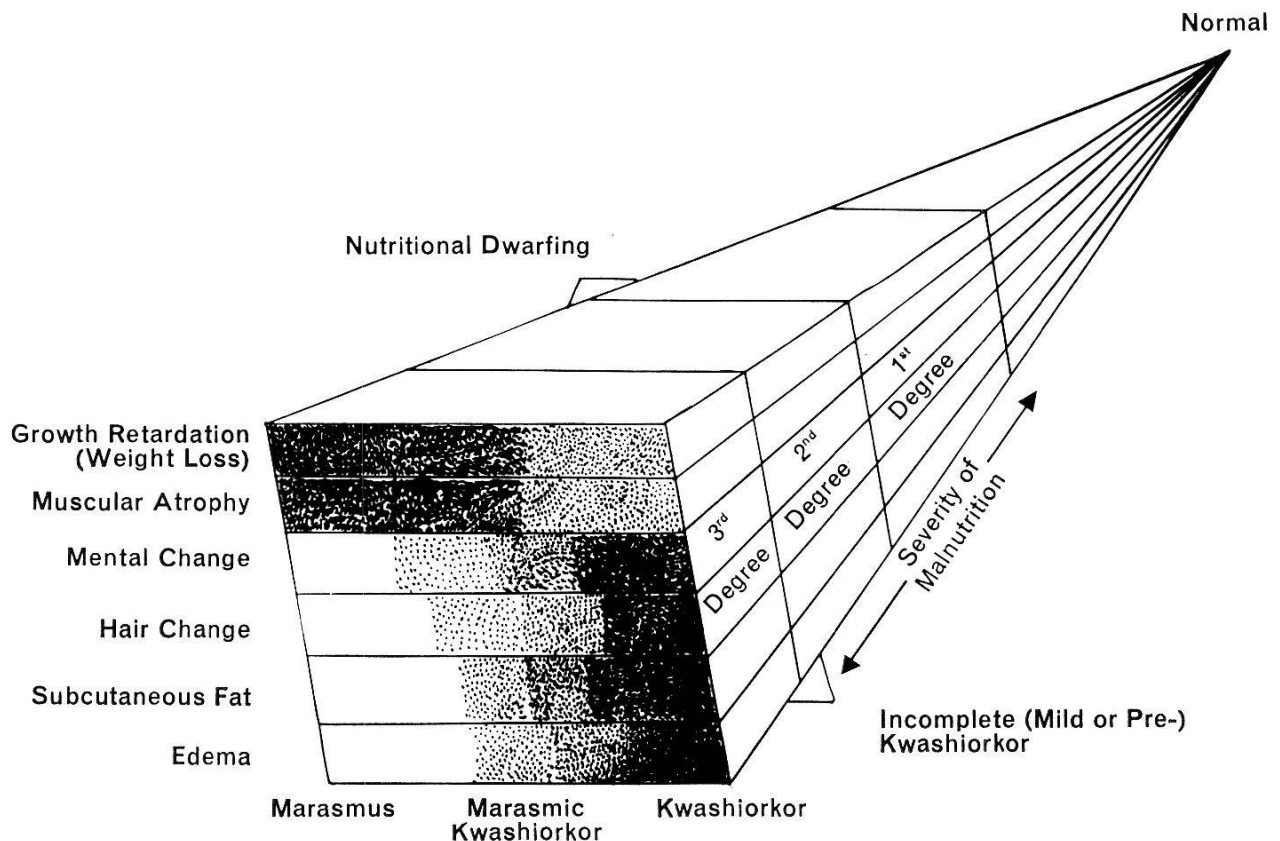


Fig. 2. Nutritional Pyramid, showing tentative inter-relationships between various clinical forms of protein-calorie malnutrition in tropical pre-school children. (Modified from BENGGA and SCRIMSHAW and INCAP workers [16].) Base shows usual gradation of *main* clinical features.

(2) *Assessment by nutritional indices.* Alternatively, attempts to assess the nutritional status of pre-school children in a tropical country, such as Haiti, can be made from data obtained in the following three ways:

- (a) vital statistics (i.e. 1-4 year old mortality rate).
- (b) laboratory tests (i.e. plasma proteins, liver histology, and chemistry).
- (c) clinical nutritional indices (3).

In the present type of field study, the collection of suitable vital statistics is impossible. The principal laboratory examination, which might have yielded useful results, would have been an assessment of the total and differential plasma protein levels, although interpretation might have been difficult in view of such possible variable influencing factors as liver damage, intestinal helminths, and malarial infection. However, it was not possible to carry out this test, principally because of problems with relation to taking blood from the external jugular or femoral veins of these small children in the remote villages visited and the effect of this procedure on the unsophisticated peasant mothers concerned. A further problem would have been transport, not only re-

frigeration, but, more difficult to overcome, the mechanical haemolysis of the blood samples resulting from several hours journey by jeep over very poor roads. Liver biopsies were also plainly impossible to carry out under field conditions.

Reliance had, therefore, to be placed on the use of certain stigmata or measurable physical signs which were felt might be used as public health indices of nutritional status, in the same approximate way that the splenic index is employed in malarial surveys (3).

As has been stressed recently by a similar type of study in Dakar, the clinical picture of malnutrition in the pre-school age group can vary considerably (32). Therefore, of the numerous physical signs recorded during the present survey, only three were considered as possibly being sufficiently constant as to be potentially useful as nutritional public health indices: (1) Oedema, (2) Arm muscle and fat measurements, (3) Hair changes. (Deviation of body weight could also be added here as a fourth index, but, in view of its special significance, it can be best considered separately later.)

(i) *Oedema*. According to most authorities, the two principal objective, easily measurable and constant physical signs in the syndrome of kwashiorkor are the low body weight and the oedema, beginning in the feet, ankles, and lower legs, and later sometimes involving the hands, forearms, lower back, and face.

Oedema was tested for in the pre-tibial region. Initially moderate pressure was used with one finger for a period of twenty seconds, but this was soon shortened to three seconds in view of the confusion arising from the slight pitting produced in normal children by prolonged pressure, especially in the hot weather found in Haiti during the summer months. In addition, the rule was adopted that if there was any doubt as to the validity of the pitting test, then oedema was not recorded.

Results. The 1-3 year old oedema index varied from 0 to 23% in different villages in Haiti (Table III); while the figure amongst the slum children was 3%. The over-all prevalence of oedema in this age-group in all the villages and two slum areas was 7%.

Theoretically, other possible causes of oedema in this group required differentiation, especially the nephrotic syndrome, severe hookworm anaemia and quartan malaria. In actual fact, all children with oedema in this age-group were found to be suffering from kwashiorkor, although field tests of the stools had to be carried out with a portable McArthur microscope in a few cases to exclude severe hookworm disease (23).

TABLE III.
*Prevalence of oedema in 1-3 year old children in 24 rural villages in all
 Départements of Haiti. (Percentages given to nearest whole number.)*

Département	Nord-Ouest		Nord		Artibonite								Ouest							Sud				
Village	Berger	Carenage	Grand Bassin	Dosmond	Carrefour Menard	Castra	Drouet	Poterie	Hautes Feuilles	Passerelle	Bassin	Miguelle	Petit Mouillage	Poste Pierre	Trou Caiman	Furey	Domond	Les Roches	Fond Parisien	La Corrière	La Borde	La Ferme	Trou Bonbon	Gaumnier
Number examined	70	16	53	43	75	49	37	28	49	47	70	20	63	43	67	29	66	26	122	41	30	55	45	46
Number positive	6	2	7	10	11	2	2	3	1	3	1	1	2	0	1	2	4	4	9	2	3	4	2	2
% positive	9	13	13	23	15	4	5	11	2	6	2	5	3	0	2	7	6	15	7	5	10	7	4	4

(ii) *Arm muscle and fat measurements.* In view of the realization that malnutrition in tropical pre-school children is most intimately concerned with deficiency of protein and calories in the diet, tests to evaluate the degree of a child's calorie and, more especially, protein depletion have been under constant consideration in recent years (3). While no method is, as yet, completely satisfactory, it would seem possible that a useful, rough gauge of depletion of these two nutrients may be obtained by directly measuring the body's principal stores—that is of subcutaneous fat as an index of calorie adequacy, and of voluntary muscle for evidence of protein depletion.

Simple measurements of this sort were carried out on most of the groups of children studied. The middle of the right upper arm, overlying the centre of the belly of the biceps, was chosen, because of its easy accessibility while the child was sitting on his mother's knee, the relatively circular nature of the limb at this point, the minimal involvement with oedema, and the fact that other investigators have also used this site. Two measurements were made—(a) the arm circumference, and (b) the biceps skin fold (measured with Harpenden standard pressure callipers [10] over the anterior surface of the middle of the belly of the biceps muscle).

Calculations. A cross-section through the middle of the upper arm shows that, excluding vessels and nerves, the limb can be visualized there as made up of two concentric circles—a smaller inner one formed by the humerus together with surrounding muscle, and also an outer circle formed by the actual arm circumference, containing humerus, muscle, and a thin peripheral ring of subcutaneous fat and skin (Fig. 3).

Measurements of either the diameter or the circumference of the humerus are not possible without radiological assistance and, in the present calculations, it has been assumed that this bone does not vary as markedly in diameter in malnutrition as does the overlying fat and especially the muscle tissue, and its variations have been ignored.

Of the two measurements already referred to, the arm circumference (C_1) is in fact the circumference of what may be termed the muscle and subcutaneous fat compartments; while the skin-fold(s) represents *twice* the actual thickness of the subcutaneous fat. (As noted by HAMMOND the skinfold measured is in fact a parallel-sided fold composed of two thickness of subcutaneous fat and skin [10]).

Using these two measurements, it is possible to calculate the approximate circumference of the "inner" circle composed principally of muscle (C_2):

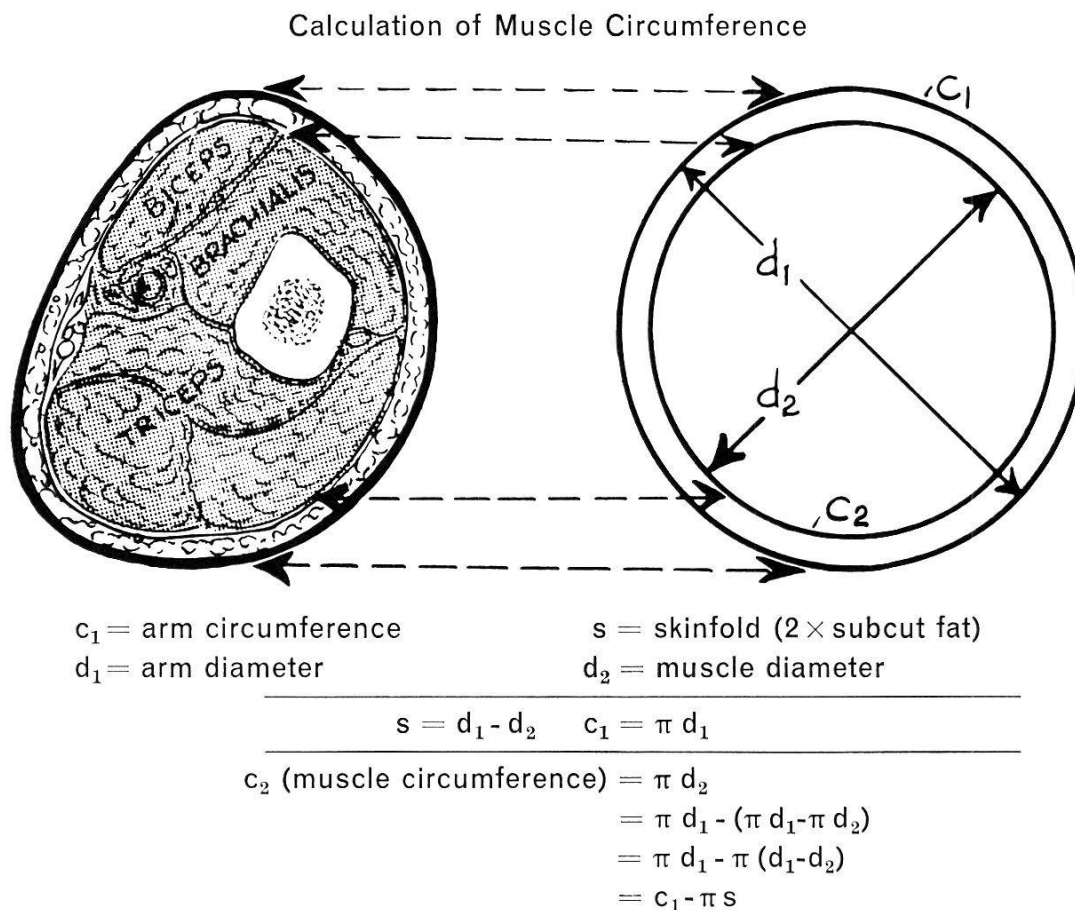


Fig. 3. Calculation of muscle circumference from measurement of arm circumference and skinfold thickness.

Results. As usual with any type of anthropometric data in tropical children, two problems required consideration—firstly, the question of age (which will be considered later) and, secondly, the absence of standards. The latter deficit was kindly made good by Dr. VERITY WILLS of the Medical Research Council Tropical Metabolism Research Unit, University College of the West Indies, Jamaica, who made available results of a large series of measurements of both biceps skinfolds and of arm circumferences in mainly “normal” Jamaican children of similar ethnic type—that is of mainly African descent—to those examined in Haiti.

Based on these Jamaican figures, together with personal observations of the range of results between apparently normal Haitian pre-school children and those with kwashiorkor, arbitrary levels were selected for “low arm circumference”. For children from 12-24 months, this was taken as 14.25 cm., and for the older 25-36 months children, 14.5 cm. Both levels represent about 80% of the Jamaican average figures. In the 19 groups examined in this way between 60 and 88% were found to have a low arm circumference with an over-all average of 69%.

Calculation of the muscle circumference was undertaken in the

7 villages and 2 slum groups where skinfold measurements had been taken. Again arbitrary levels were selected based both on personal experience in Haiti and on calculations from the Jamaican figures. A low muscle circumference was recorded with results of 12.5 cm. or below for 12-24 months old children, and with 13 cm. or lower for 25-36 months olds. (Again these levels represented about 80% of the average for Jamaican children.) In the 7 villages of children so examined, 67% showed a low muscle circumference.

(iii) *Hair changes*. Two hair changes were recorded—lightening of colour (hypochromotrichia) and “easy pluckability”. Certain difficulties became apparent with regard to these signs and will be discussed later.

Results. In the 14 villages so examined, easily pluckable hair was present in from 10 to 65%, with an average of 52%. The overall hypochromotrichia index was 54%, with a range of from 43 to 84% (Table IV).

(3) *Assessment by weight deviation*. For some years the Mexican school of paediatrics, under the direction of Dr. F. GÓMEZ, has advocated the classifying of malnutrition in early childhood into categories or degrees depending upon the percentage deviation of the weight below the average or mean for the group (i.e. first degree malnutrition from 75-90% of the average weight, second degree from 60-75%, and third degree below 60%) (8).

As no Haitian standards are available, the average weights drawn up from mainly “normal” Jamaican children of African descent by Dr. VERITY WILLS were employed¹¹. As usual with this type of survey in a rural tropical peasant group, difficulties were encountered with regard to the children’s ages. In a very few cases, birth certificates (*extraits de naissance*) were easily available, while, in a surprisingly high percentage, mothers did not know the child’s exact age, but could recite the day, month and year (and even the hour and day of the week) of the child’s birth.

In the rest of the mothers, it was possible to arrive at at least the year of age, which could then be checked by reference to the date of local “time-marking” events, both political and natural. It may be noted that in this relatively young age-group (1-3 years), peasant mothers usually know how many years old their children are, but become less certain as the years pass and the particular child increases in age and is succeeded by younger siblings.

In the present survey, if the age was known with reasonable certainty, the weight recorded was compared with the Jamaican average for this exact age-group. If, however, only the year of age

¹¹ These figures are themselves 20% below average American figures.

TABLE IV.

Comparison of nutritional status of 1-3 year old Haitian children in all five Départements and two slum regions as assessed by oedema, low arm circumference, easily pluckable hair, hypochromotrichia and degree of malnutrition by weight deviation. (Percentages given to nearest whole number.)

<i>Département</i>	No. of villages or groups	No. of children	Oedema		Low arm circumference		Easily pluckable hair		Hypochromotrichia		Deviation of weight					
			No. positive	% positive	No. positive	% positive	No. positive	% positive	No. positive	% positive	1st deg.		2nd deg.		3rd deg.	
											No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.
Nord-Ouest	2	86	6	9	35	49	55/81	68	63/80	79	35	41	29	34	1	64
Nord	3	171	28	16	95/159	60	—	—	94/141	67	63	37	65	38	13	83
Artibonite	7	300	13	4	—	—	—	—	128/260	50	102	34	44	15	6	59
Ouest	7	416	22	5	123	30	141/290	49	161/352	46	156	38	59	14	8	54
Sud	5	217	13	6	86/213	40	46/93	49	93/212	43	79	36	47	22	7	61
Combined	24	1,190	82	7	340/874	39	242/464	52	539/1045	51	435	37	244	21	35	60
Slums	2	132	4	3	29/94	31	36/68	53	83/98	84	40/94	43	22/94	23	2/94	68
Combined Slums and Départements	26	1,322	86	7	369/968	38	278/532	52	622/1143	54	475/1284	37	266/1284	21	37/1284	61

was known, the Jamaican standard used was that of half-way through this year. Thus, for example, all children noted as being in their second year of life were compared with the Jamaican average for 2½ years. Results are shown in Table IV.

C. Older children.

In a few villages, older children were examined in the over 3 years to 6 years group, and occasionally up to 12 years. The total examined was small and, as in certain areas some children of this age would have been at school or working in the fields, the results obtained cannot be considered as having the same rough statistical validity as do those of the more intensively surveyed pre-school children.

(a) 3-6 year group.

Weights. The 273 children of this age, although not comparable with the pre-school group, were mostly underweight, only 37% being classifiable as "normal", while the following fell into the different degrees of malnutrition: 1st 40%, 2nd 23%, 3rd 1%.

Syndromes. Gross malnutritional syndromes were not very common: kwashiorkor 6, "incomplete" kwashiorkor 3, nutritional dwarfing 2, and follicular keratosis 3 (one with early bilateral Bitôt's spots).

Miscellaneous findings. The following miscellaneous positive findings were detected: angular stomatitis 3%, anaemia 18%, mosaic skin of the shins 16%, parotid enlargement 6%, hepatomegaly 8%, marked hypochromotrichia 37%, caries 14%, and "ascaris abdomen" 3%.

(b) Over 6-12 year group.

Weights. In the small sample of school-age children (173) examined, body weights were low, but definitely improved compared with earlier age-groups. They were analyzed into the following groups: "normal" 55%, 1st degree malnutrition 35%, 2nd degree 10%, 3rd degree 0%.

Syndromes. Although not specifically examined in most villages, in several places older children with more obvious malnutrition were brought by parents to be treated, and including these sick children, the following syndromes were seen: kwashiorkor 2 (aged 7 and 14 years), nutritional dwarfing 1, ariboflavinosis 1, follicular keratosis 1 and cirrhosis of the liver 1.

Miscellaneous findings. The following positive miscellaneous findings were made: angular stomatitis 2%, anaemia 12%, mosaic

skin 20%, parotid enlargement 8%, hepatomegaly 9.6%, marked hypochromotrichia 23%, caries 13%, and "ascaris abdomen" 3%.

Comment on older children. Although not at all statistically representative, these findings clearly show the progressive decline of serious, potentially fatal malnutrition in older children that has come to be recognized as usual in most tropical regions, which is especially mirrored by the relative uncommonness of identifiable nutritional syndromes and by the improvement of the distribution of children in the Gómez weight classification.

The typical older Haitian child in the lower socio-economic group is rather slender, underweight, with poor subcutaneous fat and with a small, but wiry, musculature. The abdomen is often somewhat protuberant, and sometimes of the "ascaris abdomen"¹² variety. Caries is common. Hypochromotrichia is still frequent, but much less so than in younger age groups.

Child feeding.

Approximate information concerning methods of child feeding and associated facets of the local home economics was obtained by visiting markets, by questioning mothers, and by observing food preparation in village kitchens.

Foods available. There was considerable variation in foods available depending on such factors as the season, nearness to the sea and altitude. An account of this has been given by MÉTRAUX (22) while SEBRELL et al. have recently analyzed current information and should be consulted for details of Haitian "patterns of intake" (31).

Animal protein. Apart from breast-milk which, as noted later, is fortunately almost always available to the young child, animal protein, as in most tropical regions, is in very short supply. The availability of cows' milk varies with the number of cattle kept. In the relatively rich Cayes plain most families own a cow, while in many villages elsewhere sometimes only one or two cows are to be found in the whole place. Under the latter circumstances, the very limited amount of milk available would be partly drunk by the owner's family, but most would be sold. Tinned milk, usually in a powder form, is available in shops in larger towns, but is quite beyond the price-range of the peasant population. Goats are widely kept, but, apparently only as a source of meat. There is a definite and strong prejudice against drinking goat's milk, as discussed later.

Fish is widely appreciated but again is only to be found in very limited supplies. In most of the country, especially inland, salt or smoked herring and cod are sold in small quantities at markets. Their popularity is, of course, partly based on the fact that they keep without going bad.

¹² The clinical entity "ascaris abdomen" is seen in the poorly nourished tropical children with a heavy burden of roundworms. The thin-walled belly is both sagging and protuberant, and worm-filled small bowel can be palpated (and sometimes seen).

Sea-water fish are caught in relatively small amounts by coastal villages, one reason for not trying for larger catches being difficulties with preservation and transport. Close in-shore various types of sardines are caught with seine nets; while catches from deeper water include a wide variety of larger fish, such as the different types of snapper. Fresh-water fish are caught to a limited extent in traps in fast-flowing shallow rivers, and by boys of the village with simple hooks and lines in the canals, streams and flooded rice fields of the Artibonite valley and elsewhere.

Animal meat also plays a very limited part in the peasant's dietary, especially in child feeding, as when taken it is usually reserved for the men of the family (28). The meats occasionally available, in order of commonness, consist of pork, goat and beef. The slaughtered animal has to be sold very rapidly as no form of storage is available, so that each carcass is cut up into a large number of very small pieces. Domestic fowls and wild ducks, which are caught in certain regions, are also often sold.

Chicken's eggs are eaten very rarely by the Haitian peasant, being regarded rather as a "cash crop" and sold in the market. (Only one egg was observed being cooked in a villager's kitchen in the course of many such visits made in all places visited during the survey.) They certainly are at present of absolutely no significance in infant feeding.

There seems to be little in the way of small game in most of Haiti, with the exception of guinea fowl in some areas, so that not much supplementation of animal protein supplies can be gained in this fashion.

Vegetable protein foods. The main potential sources of vegetable are the numerous local varieties of legume. The principal of these are the red, white and black species of *Phaseolus vulgaris* (*pois rouge, blanc and noir*). Other legumes include black-eye peas (*pois inconnu*) (*Vigna sinensis*), Lima beans (*pois souche*) (*Phaseolus lunatus*), and Congo peas (*pois congo*) (*Cajanus indicus*). A popular mixture sold in most markets was known as *pois à la manière* or *pois mélangé*, consisting of red, black and Lima beans, together with one apparently not used much by itself, known as *pois de cayette*.

Although widely available, these legumes are still relatively expensive and probably comprise the most costly everyday item in the peasant dietary. While there is a geographical and seasonal variation in prices, red peas and the mixture (*pois à la manière*) usually cost most, about 5-6 *gourdes* (\$ 1.66-2.00) per large tin (*grande marmite*)¹³.

Mainly carbohydrate, starchy foods. Staple, mainly carbohydrate foods vary in different parts of the country. Maize is probably the most important, and is usually sold on the cob or as a coarse flour (*maïs moulu*).

Plantains (*bananes*), yams, malanga (*Xanthosoma terviride*), and sweet potatoes are widely used. Millet (*petit mil*) grows particularly on the inland mountain slopes; while rice assumes a similar importance in the plains, especially in the Artibonite valley, while elsewhere it has very much become a "prestige food". The banana, or *figue banane* as it is known in Haiti, is little used and regarded as rather a luxury item. Wheat flour (*farine de France*) is imported and used for making bread and simple buns sold in the market. Bread fruit (*arbre véritable*) is important in season, while cassava is used to prepare

¹³ Foods are usually sold in the markets by the *grande marmite* (5 lbs), *petite marmite* (about one-seventh of the former), *godet* (or small cup, six of which equal one *grande marmite*). Items such as fish, meat and liver are sold by the piece. Liquids are sold by standard sized bottles, either cola or rum.

The Haitian coinage consists of the *gourde* (= 20 U.S. cents) and the *kob* (1/100th of a *gourde*).

flour (*farine de manioc*), which is then employed in making large rounded "leaves" of unleavened bread (*pain de cassave*). Sugar, village-prepared from cane, is universally used.

Of the major carbohydrate foods of calorific importance, maize usually appears to be cheapest (1 *gourde* per *grande marmite* of *maïs moulu*), as compared with rice at 2.8 *gourdes* per *grande marmite*.

Some temperate-zone carbohydrate root vegetables, such as potatoes, carrots and beetroots, are grown in cooler mountain regions, and form part of the diet there, although probably mostly intended for the markets of nearby towns, especially Port-au-Prince. Sugar-cane forms a popular "snack", especially for children. Actual sugar employed by the poorer groups is the crude brown product prepared in rural areas from cane.

Fats. The Haitian peasant diet is very low in both animal and vegetable fats. Apart from the seasonal use of avocados (*Persea gratissima*) and the use of a minimal quantity of pork lard (*manteque*) in cooking, little else is taken. The ackee (*Blighia sapida*), an important source of vegetable fat in the nearby island of Jamaica, appears to be used in only a very limited area of the country adjacent to the town of Jérémie.

Miscellaneous vegetables. A wide variety of different green leafy vegetables are used, including types of semi-wild and cultivated spinach. Chocho (*mirliton*) (*Sechium edule*) and aubergines appear to be widely used.

Cabbage, cauliflower and onions are grown in cool mountain regions, probably mainly as cash crops for sale in markets.

Fruits. Of the many different fruits cultivated or growing half-wild in Haiti, the mango is the most important. During the season this forms the principal food, as regards bulk and calories, of the rural population, a fact appreciated by early Haitian Generals who coincided their campaigns with the mango season.

Other fruits include oranges, papaya, shaddock (*chadeque*) (*Citrus decumana*), coconuts (by the sea), naseberries (*Achras sapota*), guavas and grenadines (*Passiflora quadrangularis*). The Haitian abricot (*Mammea americana*) is found in the south. Avocados are also considered as "fruit".

Beverages. The three principal drinks of adults are coffee (if it can be obtained), *clairin* (white rum) and various herbal teas or *infusions*, which may be prepared from the leaves or other parts of many different types of plants.

Methods of cooking.

The rural Haitian kitchen is in a small separate hut, with the cooking-fire on the ground. The pots used are either metal or dried calabashes, and the fuel—a costly item—is either wood or charcoal.

With these limitations, it is easy to understand that almost all dishes appear to be boiled, and in the nature of mainly vegetables stews, containing variable mixtures of beans, maize, plantain, bread-fruit, rice, etc., with, if possible, an extremely small piece of meat or fish added. Spices, such as garlic, cloves, cinnamon and aniseed, are employed as flavouring. A few foods are cooked directly on the hot ashes (*bouccané*), including corn-on-the-cob, *malanga* and yams.

Most peasant families appear to have one main cooked meal daily, usually in the late afternoon just before sunset, based on the vegetable stew type of dish previously mentioned. Other meals are more in the nature of "snacks", usually in the early morning and at mid-day, and often consist of such items as corn-on-the-cob, cold left-overs, mangoes, sugarcane and herbal teas (*infusions*).

Bought foods are available from some roadside peddlers and also in the

markets, and include bread and fried fritters (*beignets*), buns made of wheat flour (*farine de France*), corn "pudding", made from *maïs moulu* paste boiled inside leaves, and various vegetable stews with rice.

Child feeding.

Breast-feeding. Questioning of 707 mothers with children of up to two years of age in 14 villages showed that breast-feeding was apparently almost universally successful (99%) in the first six months of life, falling off to 81% in the second half of the first year. From 12-18 months of age, over half were still breast-feeding, while from 18-24 months this had dropped to 9%. No children were said to be breast-fed, or were seen doing so, over the age of two years.

Although these figures are based on questioning alone and give no idea as to either the frequency of feeding or the amount of milk received, they were supported by the way mothers could be observed to breast-feed their children in the village. Insufficient urban mothers were questioned in only one area (*Nouvelle Cité*) to be able to judge if any falling-off in breast-feeding had occurred, as has been noted in other tropical towns. In this small group roughly the same pattern was found as in rural regions.

According to HERSKOVITS, complete "weaning" from the breast may be accomplished in a day or two by a combination of painting bitter herbs on the breasts, sleeping apart from the mother and the offering of the child's favourite food as a consolation (11).

Herbal infusions. One of the earliest items to be given the young baby are herbal infusions, similar to the "bush teas" of Jamaica (1). These appear to be made from different parts of a wide range of plants. As in Jamaica, they seem sometimes to be used as flavouring alone, although some are believed to have either preventive or curative medicinal properties.

Herbal infusions appear to be started for young Haitian children in the first few months of life. Those most commonly employed appear to be made from the fresh leaves of various fruit-bearing trees, such as orange and soursop, or from "garden herbs", such as mint.

The place of these preparations nutritionally is uncertain, although it seems likely that they may be a source of supply of ascorbic acid and riboflavin. The subject is complex, as indicated by an investigation in Jamaica, which showed that over 100 plants were used for "bush teas" there, some of which were probably harmful (1, 18, 33). There is no definite knowledge as to possible toxicity of any of the plant preparations used in Haiti.

Starchy gruels. A wide variety of different mainly carbohydrate, starchy foods, used as gruels or pastes, were employed in feeding young infants. Choice by the particular mother would appear to depend upon various factors, including her financial position, the local geographico-climatic and agricultural situation, and the season of the year.

These foods can be considered under two headings: (1) imported, (2) locally produced. Imported items included such corn (maize) products as cornstarch and "Maizena", prepared oatmeal (*avoine*), wheat flour (*farine de France*), sago and crackers (used for preparing *soupe de biscuit*). Locally produced items included items such as the plantain (boiled and mashed), banana (especially *farine de poubon*, a flour made from sun-dried bananas of the poubon variety), rice, corn (maize) (both the milled flour, *maïs moulu*, and a preparation made by squeezing the juice from the green corn cob, known as *akassin*), sweet potato, yam and *malanga*.

The usual pattern in regard to these mainly carbohydrate foods is that a few mothers (about 10%) introduce small quantities of one of the finer, smoother gruels, prepared, for example, from wheat flour, crushed crackers (*biscuits*), cornstarch or *akassin* during the first three months of life.

Between the ages of 3 and 6 months, other starchy foods are added by some mothers, so that about 25% of children will be so fed at this time. The foods will often be sago, oatmeal, gruel of *farine de poubon*, etc.

In the second half year of life, the diet will include in most cases a variety of carbohydrate foods including those already mentioned, together with *maïs moulu*, crushed plantain, rice, sweet potato, mashed yam, etc. Usually quite early in the second year, the peasant child will be having a full range of all the carbohydrate foods taken by the adult population.

Protein-foods. In view of the known frequency of malnutrition associated with protein deficiency, especial attention was paid to the commonness of usage and age of introduction of the major protein foods—milk, fish, meat, eggs and legumes.

With regard to cow's milk, in 14 villages 71% of 707 mothers questioned stated that their children aged up to two years were receiving cow's milk. However, further questioning showed that in almost all cases the quantity taken was extremely small, sometimes being only a few ounces weekly, or even monthly. Although no country-wide consumption figures are available, it is certain that, with the exception of agriculturally prosperous regions, such as the Cayes plain, cow's milk plays little part in the diet of most

young Haitian children of the lower socio-economic group, because of the relatively high cost of the limited milk available. Goat's milk is not usually drunk, probably partly for cultural reasons mentioned later. Tinned milk, whether condensed, evaporated or powdered, is beyond the financial range of Haitian peasant mothers and is almost never employed.

The situation with regard to fish appears to vary in different regions, as would be expected, and is mainly related to its local availability. In general, it would seem that mothers are often willing to give their children fish towards the end of the first year of life, but that usually very little is available, and this will habitually be a small piece of smoked or salted cod or herring cooked in with general stew. Fish is probably only of significance in infant feeding in some families in certain coastal regions, where fresh sardines may be given once or twice weekly.

Although chickens are to be found in all villages, eggs were almost never being used to feed infants or young children. As mentioned elsewhere, this seems probably mainly to be related to the fact that eggs are one of the few sources of spending money and are usually sold in the market; while, in addition, it is felt by some mothers that eggs are too indigestible for young children. Meat of all varieties plays no part in infant feeding because of its cost.

The most financially available protein foods are the legumes, of which, as noted earlier, numerous varieties are to be found. Questioning showed the usual wide range of variation, but, in general, it was found that, while probably about 20% of mothers introduced *sauce pois* into their children's diets in the second six months of life, the majority did not do so until early in the second year. It must also be recalled that even legumes, especially the preferred red beans, are somewhat costly relatively to the very small budget available to the mother.

Food attitudes. Although on a rapid visit, such as the present one, food attitudes possibly relevant to malnutrition in early childhood are difficult to discover, and even more to evaluate as to commonness or practical importance. Nevertheless, the following were noted as being apparently quite widespread.

Salt. Attitudes with regard to table salt were interesting. Firstly, mothers always wanted to know if salt could still be given when one of the medicines supplied by the survey had been prescribed, but apparently were willing to do so if reassured as to the harmlessness of so doing. Secondly, many mothers appeared to be unwilling to give their babies food with salt added in the early months of life, so that some women seemed to equate the eating of more solid foods (*gros manger*) with the taking of salt (*manger*

sel), as opposed to the sweetened gruels (*manger douce*) employed early on.

Lastly, as a further peculiarity with regard to salt, there is an apparently widespread belief that a *zombi* has to be kept on a salt-free diet, and that if salt is given, he will be aroused from his trance-like state.

Whether these attitudes are in any way connected consciously or otherwise is not known. It is interesting to note that in some regions salt is stated to be placed on the baby's tongue at the time of baptism.

It is also difficult to know if any of these attitudes concerning salt can act as a "cultural block" in regard to local child feeding (14). Whether, for example, the use of solid foods may be delayed on this account.

Hot-cold. Some ideas concerning the inherent "hotness" or "coldness" of foods are held by some Haitians, at least with regard to certain items. Thus, melon, pineapple, coconut water, soursop, and some types of mango are thought to be cold; while milk, eggs, maize (including *maïs moulu*) and certain mangoes are regarded as being hot. How much this type of attitude influences infant feeding would require much more detailed investigation; it certainly seems less important than, for example, the hot-cold food attitudes of parts of India, which have been shown to be significant in this respect (14). In some places, it was implied that certain illnesses were also classified in the same way, so that, as in India, diarrhoea, which was thought to be hot, would mean that milk, which is also hot, might be stopped if the child developed loose stools. Whether this type of attitude is the main cause of the therapeutic starvation often precipitating kwashiorkor in Haiti is again not known, but it is probably not very relevant.

Diet in puerperium. While no food restriction was recognized as taking place during pregnancy, in some villages women must not eat fresh fish, egg plant, white beans, pork, lard and all fruit for two to three months after delivery.

Miscellaneous. Certain foods are not usually eaten in Haiti. Outstanding among these is goat's milk, and although most poorly-fed goats would anyhow give only a poor yield, their milk appears to be as repugnant to them as to the Yoruba of Western Nigeria (10). Enquiry usually leads to replies that the flavour and taste were not liked, or, occasionally, that goat's milk was only for old men. However, it has been reported that goat's milk is given to people suffering from tuberculosis (31).

Corn meal (*maïs moulu*) is considered too indigestible for young children, perhaps partly because of its "hotness". Eggs, as noted

earlier, are mainly sold, but again often appeared to be regarded as being beyond a young child's digestive capacity.

Although usually probably not of significance in child feeding, even in seaside villages, man's universal selectivity in choosing his "food" from surrounding eatable items is well shown by the poor Haitian peasant's unwillingness to consume sea-urchins (*Tripteneustes esculentus*), lobsters or mangrove oysters (*Crassostrea rhizophorae*).

Customs in childhood. For some forty days after delivery, the neonate is well wrapped-up and kept in the seclusion of the home, according to some to avoid exposure to *loups-garoux* (werewolves) and other evil spirits, which are felt to be especially dangerous at this period (25). The village midwife (*sage femme*) delivering the baby will usually have cut the cord with a dirty knife and dressed it with various preparations, including those containing nutmeg (*muscade*) and charcoal. Under these circumstances, especially with the close contact between man and animals characteristic of the Haitian village, both septicaemia and tetanus neonatorum are very common (5). (One of the most hopeful approaches to the reduction of neonatal mortality is by giving simple courses of instruction, largely in cleanliness and elementary hygiene, to village *sage-femmes*, and this has been done in various hospitals in the country including the Hôpital Albert Schweitzer).

Nutmeg is also used on the baby's head, especially over the anterior fontanelle, about which, as elsewhere in the world, mothers often feel anxiety. In general, there is great care taken not to expose the head of the small baby unnecessarily and one, or two, rather tight bonnets are customarily worn.

If a baby is being weaned from the breast, the mother may employ an interesting minor form of "sympathetic magic". A piece of *bois mesquite* (stalk of the castor oil bush) is hung round the woman's neck, and, as the wood shrivels, so the breast milk is meant to dry up.

A wide variety of local remedies, including herbal brews, were being used therapeutically such as one prepared from dried banana leaves for toothache and another made from soursop leaves (*Anona muricata*) employed as a sedative. Therapeutic cautery, in the form of circles on the cheeks and forehead had been used in some villages to treat epilepsy, as could be detected by the scars visible on the faces of older children.

Very many different necklaces were worn by young children. Some of these seemed to be mainly considered as "teething rings", including the tooth of a dog or of an alligator, a crab's claw or a nutmeg, although the animal teeth may well also have had a magical symbolism. A variety of other objects were found in these necklaces, including green *citrons* (limes), and wooden or coloured beads. Some of these appeared to be intended to have a preventive function, while others were part of treatment. An interesting practice, also seen in Jamaica, is the fact that some parents do not cut their children's hair until they can talk, as it is believed that to do so earlier may mean that dumbness would result.

From the point of view of malnutrition, probably the most significant practices are the common usage of too prolonged starvation in the treatment of diarrhoea, and the frequent doses of laxatives and such toxic anthelmintics as santonin and oil of chenopodium in the treatment when worms are suspected.

Miscellaneous diseases. While not part of the survey proper, certain information was accumulated on the local disease pattern in childhood.

(1) *Dental conditions.* Caries was looked for roughly in all children examined, although only larger cavities or extractions could be recorded. The overall prevalence of caries, with one or more teeth involved, varied as follows in the different age groups: infants 0%, 1-3 year olds 3%, over 3-6 year olds 14%, and over 6-12 year olds 13%.

Considerable variation was found from place to place, possibly related in part to the fluoride content of the local water supply. Thus, in the 3-6 year age group in Passerelle the caries rate was 22%; while in Castra it was only 2%.

A finding noted elsewhere, as by THOMSON in Fiji (35) and by JELLIFFE et al. in Jamaica (21) was the commonness of crescentic "carved-out" caries affecting the adjacent sides of the incisors.

There was little evidence of obvious gingivitis. Thinned, delicate-looking, rather transparent, decalcified teeth, were common in some villages, often resulting in a very ground-down edge to the incisors. Clinically identifiable dental fluorosis was not seen.

(2) *Yaws.* Until recently yaws was extremely common in Haiti and it was estimated by DUVALIER in 1945 that, prior to the modern campaigns, probably 80% of the rural population was affected (6).

In the last five years or so, a complete change has been brought about by mass treatment campaigns organized by the Haitian Ministry of Health, WHO/UNICEF and ICA in which repository penicillin aluminium monostearate injections have been used. The organization of these campaigns and results up to 1954 have been summarized by SAMAME (30).

In the course of the present survey, in the 24 villages and two slum areas visited, as well as the 2,343 children actually examined, both the acutely and the chronically ill of all ages were usually brought along for advice, so that it is highly likely that yaws cases would have been seen. In fact, and as an index of the apparent effectiveness of previous anti-yaws measures, no obviously affected children were detected at all in the main groups examined; while only three probably active infections were seen in older persons—a possible *early* gangosa in a man in the twenties, and a young woman and a girl with a scattered rather serpiginous lesion, somewhat suggestive of secondary yaws.

As would be expected, the healed residua of destructive late lesions were remarked quite frequently in adults, and included sabre tibiae, nasal deformity from gangosa, and lymphostatic ver-

rucosis of the feet from the scarring of previous yaws ulcers of the legs.

(3) *Malaria*. The fullest report on the malaria situation in Haiti was published by PAUL and BELLERIVE in 1947 (27). They describe the results of a country-wide survey in which 31,285 children were examined in 826 primary schools, among whom the spleen rate was 18.4% and the parasite rate 46.3%. Of the positive slides, 86.6% showed *Pl. falciparum*, 8.9% *Pl. malariae* and 1.9% *Pl. vivax*.

In the present survey, 2,062 thick blood films were examined for malarial parasites from 23 rural villages. Results are shown in Table V. Positive slides were found in the following age-groups: 0-12 months 10%, 1-3 years 16%, over 3-6 years 8%, over 6-12 years 9%. As only the complete pre-school child population was *always* examined the only statistically significant conclusion to be drawn is that the 1-3 year parasite index was 16%.

Analysis of the species of malaria parasite responsible showed: *Pl. falciparum* 89%, *Pl. malariae* 6%, and *Pl. vivax* 5%.

The prevalence of malaria varied a great deal from one village to another as would be expected in such a mountainous country as Haiti. Briefly, such hillside or mountainside villages as Furey showed no children with a parasitaemia; while the low-lying coastal settlements of La Ferme and Trou Boubon showed 28% and 29% positive respectively.

(4) *Veno-occlusive disease and Vomiting Sickness*. These two conditions have both been described in the relatively nearby island of Jamaica. Veno-occlusive disease of the liver has been shown to occur there as the result of hepato-toxic substances drunk in certain herbal infusions, or "bush teas", especially species of *Crotalaria* and *Senecio*, and to lead on ultimately in some cases to cirrhosis of the liver (18, 33).

By contrast, in Haiti there seems no evidence that this condition occurs. Only one child with probable cirrhosis of the liver was seen during the whole survey, and the condition is not observed commonly in children in hospital according to experienced local paediatricians. In addition, according to available botanical information, species of *Crotalaria* and *Senecio* are probably not usually drunk in the *infusions* of Haiti.

The Vomiting Sickness of Jamaica has been shown to be due to eating immature ackees (*Blighia sapida*), apparently a highly popular food only in the island of Jamaica. The clinical picture is due to toxic hypoglycaemia produced by the action of hypoglycins found in the immature ackee on the liver, where gluconeogenesis is blocked (34). Although this syndrome is unknown in Haiti, it is

TABLE V.

Prevalence of malarial parasites in Haitian children in 23 rural villages, analyzed by age and by type of parasite.
(Percentage to nearest whole number.)

<i>Département</i>	Village	0-12 months		1-3 years		Over 3-6 years		Over 6-12 years		All children		<i>Pl. falciparum</i>		<i>Pl. malariae</i>		<i>Pl. vivax</i>	
		No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.	No. + ve.	% + ve.
Nord-Ouest	Berger	13/40	33	37/70	53	—	—	—	—	50/110	45	47/50	94	0	0	3/50	6
Nord	Grand Bassin	0/20	0	3/53	6	1/60	2	1/13	8	5/146	3	5/5	100	0	0	0	0
	Dosmond	1/20	5	4/43	9	—	—	—	—	5/63	8	1/4	25	0	0	3/4	75
	C. Menard	4/30	13	15/75	20	—	—	—	—	19/105	18	18/19	95	0	0	1/19	53
Artibonite	Castra	1/14	7	8/49	16	3/39	8	5/46	11	17/148	12	17/17	100	0	0	0	0
	Drouet	0/19	0	4/37	11	2/29	7	0/17	0	6/102	6	6/6	100	0	0	0	0
	Poterie	0/12	0	0/28	0	0/23	0	1/12	8	1/75	1	1/1	100	0	0	0	0
	H. Feuilles	0/29	0	0/49	0	0/24	0	—	—	0/102	0	0/0	0	0	0	0	0
	Passerelle	5/19	26	6/47	13	2/31	7	4/31	13	17/128	13	16/17	94	1/17	6	0	0
	Bassin	0/42	0	0/70	0	1/39	3	0/20	0	1/171	0.6	1/1	100	0	0	0	0
	Miguette	—	—	4/20	20	2/15	13	2/13	15	8/48	17	8/8	100	0	0	0	0
Ouest	Petavie	1/33	3	3/63	5	—	—	—	—	4/96	4	4/4	100	0	0	0	0
	P. P. Louis	1/23	4	8/36	22	—	—	—	—	9/59	15	6/9	66	3/9	33	0	0
	Trou Caiman	1/34	3	7/67	10	—	—	—	—	8/101	8	8/8	100	0	0	0	0
	Furey	0/12	0	0/29	0	—	—	—	—	0/41	0	0	0	0	0	0	0
	Les Roches	0/12	0	0/26	0	—	—	—	—	0/26	0	0	0	0	0	0	0
	FondParisien	—	—	10/82	12	—	—	—	—	10/82	12	10/10	100	0	0	0	0
	Domond	4/26	15	7/67	11	—	—	—	—	11/93	12	10/11	—	0	0	1/11	0
Sud	La Carriere	0/26	0	3/41	7	1/11	9	—	—	4/78	5	4/4	100	0	0	0	0
	La Borde	0/22	0	2/30	7	1/9	11	—	—	3/61	5	3/3	100	0	0	0	0
	La Ferme	2/23	9	15/55	27	10/19	53	—	—	27/97	28	24/27	89	3/27	11	0	0
	Trou Bonbon	6/34	18	11/45	24	—	—	—	—	17/58	29	11/17	65	0	0	5/17	24
	G. Tesstasse	10/23	43	30/46	65	—	—	—	—	40/69	6	33/40	83	7/40	18	0	0
Total rural		49/483	10	177/1,128	16	23/299	8	13/152	9	262/2,059	13	233/261	89	14/261	6	13/261	5

interesting to note that there is a very small area in the village of Marfranc near to Jeremie in the *Département du Sud* in which ackee trees grow and there the toxicity of the young fruits appeared to be well understood by the local peasant population.

(5) *Skin disease*. A note was kept of the more obvious skin diseases seen in children included in the survey.

In children in each of the age groups, prickly heat (*boutons de chaleur*) (*miliaria rubra*), often with superadded infection, was the commonest lesion, being present in well over half of them. The distribution of the characteristic papulo-vesicular rash was principally on the neck, the chest, upper back and forehead. The prevalence of miliaria during the hot summer survey period was plainly related to climate, being present in 80% in such humid low-lying villages as Castra, while no children were so affected in the mountain village of Furcy.

This finding, together with the recent account of the commonness of miliaria in Bengali children in India (15), stresses the fact that, contrary to text-book teaching, this condition, far from being confined to visitors to tropical regions, is also a considerable minor problem among indigenous children, both by adding to their general burden of misery and as a result of secondary sepsis.

Skin infection, presumably by staphylococci and streptococci, often in the form of pustular impetigo or boils, was seen in about 5% of the whole group, frequently as secondarily infected miliaria. Coccidiosis was observed quite commonly.

Scabies appeared to have a relatively limited age-range, occurring (at least in its most obvious clinical form) in infants (approximately 1%) rather than older children. It seems likely that a degree of tolerance develops with the repeated exposures of early life. The only two cases of probable Norwegian scabies seen were in young babies.

Disease of the scalp in babies was usually due to secondary infection of seborrhoeic "cradle-cap" (*chapellette*), inadequately cleaned and crusted with various applications, including oils and nutmeg powder. Impetiginous infection of the scalp was also commonly present in pre-school children. Ringworm of the scalp was found in about 2% of the limited number of school children examined. Probable favus was noted only once.

Various other skin lesions were seen occasionally, including four children with depigmented macules suggestive of early leprosy, three "tropical ulcers" in older children, three young infants with the condylomata of congenital syphilis, and one girl with an anthrax malignant pustule of the face.

(6) *Intestinal parasites*. Owing to difficulties with collection,

stools were only obtained from 70 pre-school children in five villages. A direct microscopical examination in the field showed 49 (70%) to have at least one intestinal parasite. Ova of the following helminths were found: *A. lumbricoides* 32 (46%), *Tr. trichuris* 6 (9%) and *A. duodenale* 1 (1%). In addition, cysts or trophozoites of *Giardia intestinalis* were present in 17 (27%) and of *E. histolytica* in 3 (4%).

These results can in no way be regarded as statistically significant, and indeed there is probably difference between the prevalence of different parasites in various geographical regions of the island.

(7) *Various diseases.* As would be expected, a complete cross-section of tropical paediatric practice was observed in the villages. However, an analysis of miscellaneous diseases seen in children actually examined in the survey, or, more usually, in older children or adults brought along for treatment, indicated that certain types of conditions were especially common. Probably the most important were those due to "sepsis", including carbuncles, dental abscesses, cellulitis and infected pulp spaces of the hand. Clinically identifiable tuberculosis, usually of the glands of neck or bone, especially in the form of Pott's disease, was often seen. Small outbreaks of various infectious diseases were taking place in some villages at the time of visits, including conjunctivitis, whooping cough and infective diarrhoea.

Discussion.

Field assessment.

As noted earlier, a somewhat elaborate code for nutritional assessment was planned and used initially. Thus, hair changes were graded from 0 to + + +. Field experience showed the impossibility both of defining and of recognising with certainty such shades of difference, and results were re-graded into "positive" or "negative". So that, for example, "hypochromotrichia" had to be re-defined as any lightening of the hair affecting the whole scalp and at least half the hair length.

In addition, it became apparent that it was, at least in the present rapid country-wide type of study, better to concentrate on recording certain fairly clear-cut signs rather than widening the scope too widely to embrace large numbers of such ill-defined stigmata of doubtful significance as, for example, mosaic skin of the shins.

The best "nutritional indicators" to employ will, of course, vary

with the purpose of any particular survey. If general in scope and if time permits, note can and should be made of doubtful, possibly nutritional, or para-nutritional, stigmata. If, on the other hand, the survey is rapid, covering a wide area and "problem-centred", it is best to employ certain simple, fairly easily defined and probably reasonably specific signs as "nutritional indicators", in the same way that splenomegaly is used in malarial surveys.

Methods of assessment of the prevalence of protein-calorie malnutrition in early childhood in the field have been discussed earlier in this paper (3). The present survey indicated that useful public health information could be obtained by a combination of two main, and possibly two subsidiary, "nutritional indicators".

The two former were 1) the pre-tibial "oedema index" (as defined previously) which showed the geographical prevalence of only one severe form of protein-calorie malnutrition, that is kwashiorkor, and 2) the weight deviation below normal as judged by the Gómez classification.

The Gómez system plainly has certain limitations. Thus, wasted children with advanced infections, such as tuberculosis, or with marked dehydration may be included, and, indeed, in some instances it may be a somewhat academic consideration as to whether or not they should be included as examples of secondary or conditioned malnutrition. Secondly, this method does not differentiate between different forms of malnutrition, that is between the various syndromes, although, and of as much importance, it does permit an approximate grading as to prognosis. Thus, although children with third degree malnutrition in a Haitian village will comprise those with nutritional marasmus and with kwashiorkor, all will in fact be seriously ill with a poor prognosis. In fact, in some situations, this classification by weight may aid in formulating public health policy as to the disposal of malnourished children detected in clinics and centres.

In addition, the incompleteness of classification by weight as a measure of the severity of protein-calorie malnutrition in a community is emphasized by the fact that some children with kwashiorkor, if either very oedematous or with marked subcutaneous fat ("sugar babies") or, especially, with both, may be found to be second, or even, first degree by weight, especially if assessed before subsidence of oedema.

Another problem with the Gómez classification is with regard to the average weights used as a standard. Probably it would be best to consider two standards in future community studies of this sort—one being based on well-nourished, apparently healthy local children, and the other employing some internationally

known standard, such, for example, as that given in Nelson's Text-book for Pediatrics.

Nevertheless, despite these difficulties, the Gómez classification does appear to be an important, simple device for measuring the public health significance of protein-calorie malnutrition in this age-group.

Two subsidiary "nutritional indicators" of possible use in this context are the "low arm circumference" and certain hair signs.

Muscle and fat measurements have been used insufficiently in the field of tropical paediatrics, but may well offer useful information in assessing the extent of protein and calorie depletion in a pre-school population. However, as with even such obvious anthropometric data as body weight, the lack of standards has been, and for some time will be, a limiting factor.

Moreover, in the arm measurements described and in the calculations made from them, certain approximations must be recognised. Firstly, the arm circumference and the underlying muscle do not in fact form exact circles. The subcutaneous fat varies at different parts of the normal child's arm circumference, being thicker over the triceps than the biceps; while alterations in fat deposits or of muscle thickness in malnutrition in this age-group may not be uniform all over the body, so that the biceps skinfold and the mid-upper arm measurements may not be representative. In addition, the measurements made are entirely linear, whereas the tissues to be measured—subcutaneous fat and muscle—would appear ideally to require assessment by volume or by weight.

Apart from its value as an actual measure of subcutaneous fat, the biceps skinfold (or possibly an average value obtained from the skinfolds over the biceps, triceps, and medial and lateral aspects of the upper arm) is needed to calculate the muscle circumference, and, although the calculation already outlined (based on the formula $C_2 = C_1 - \Pi s$) is a simple one, it has to be considered if, in fact, this is necessary, not from an anthropometric point-of-view, but when attempting to use muscle wasting as a nutritional public health index.

In all protein-calorie syndromes in this age-group, with the exception of certain cases of kwashiorkor (especially the so-called "sugar-babies"), deficient muscle appears to be accompanied by a slight or marked lowering of thickness of subcutaneous fat, so that a "positive" low muscle circumference is always accompanied by a low arm circumference. Conversely, any severe decrease of the much smaller "compartment" formed by the subcutaneous fat always appears to be accompanied by marked muscle deficit,

as, for example, in both nutritional marasmus and nutritional dwarfing.

However, certain more fatty cases of kwashiorkor, especially in the occasional child with "sugar-baby" kwashiorkor, which is seen in Haiti as in Jamaica, there exists the possibility that *increased* subcutaneous fat may sometimes "compensate" in thickness for underlying wasted muscle. That this can occasionally occur in the extreme sugar-baby type of kwashiorkor was confirmed in the present survey.

It is then suggested that, for practical public health purposes, the "positive" low arm circumference can tentatively be equated with a low muscle circumference and hence considered as an index of wasting or poor development of muscle. This appears to be confirmed by the close similarity of these two indices—low arm circumference (73%) and low muscle circumference (67%)—in seven Haitian villages. However, much further investigation and analysis is needed on a wide scale to verify the value of this simply-obtained "nutritional indicator".

Two possible hair changes appeared to have practical possibilities for assessment in the field. Thus, in the latter part of the survey, easily pluckable hair (*pelo facilmente desprendible*) was recorded, as suggested by Central American workers (3). Certain problems and ambiguities were discovered. Firstly, it was a difficult test to define precisely, with such variables as how hard the observer pulled and how many hairs so plucked constituted a positive result. In addition, local scalp conditions, such as extensive infected seborrhoea, were common in this age-group in Haitian village children and also appeared to be associated with easily pluckable hair. Also a practical point deserving consideration is that children in this age-group, especially boys in the third year of life, frequently have their hair either shaved or cut very close so that testing for this sign becomes impossible.

More importantly, it has not yet been established that easily pluckable hair is either a relatively constant feature of protein-calorie malnutrition (with the exception of kwashiorkor), or, conversely, that it cannot occur with other diseases, such as anaemia. However, despite these criticisms, and despite the obvious need for further standardization of the test and for investigation of its correlation with malnutrition, it certainly deserves further trial as a simple field index.

It became apparent that hypochromotrichia was a "nutritional indicator" of rather doubtful significance. Thus, three typical cases of kwashiorkor showed normal coloured hair, while healthy well-fed children occasionally showed red-brown hair. Other variables

complicate the picture, such as degree of exposure to sun and salt spray, dustiness and general cleanliness of the hair, and the fact that it was frequently cut in young boys.

Probably hypochromotrichia will not be of use in this respect until the causes of the different types of colour change are known. However, at present it does seem to give an *extremely crude* indication of the commonness of protein-calorie malnutrition, in that in groups of really well-fed African children the condition is quite uncommon.

Pattern of malnutrition.

In broad terms, the survey emphasized two facts. Firstly, that malnutrition had its main emphasis in the 1-3 year period, so that of a total of 100 children with kwashiorkor seen in the field during the whole survey, the age distribution was as follows: up to 1 year 6%, 1-3 years 86%, over 3-6 years 6%, over 6 years 2%.

Secondly, it was clear that protein-calorie malnutrition was much commoner than other clinical nutritional disease in young children. This is stressed by Table VI.

TABLE VI.

Comparison of prevalence of protein-calorie malnutrition and other forms of malnutrition in 1,322 Haitian pre-school children.

Protein-calorie malnutrition	Positive	Miscellaneous malnutrition and other findings	Positive
(1) <i>Gómez weight classification</i>			
1st degree	37%	Bitôt's spots	1 case
2nd degree	21%	Follicular hyperkeratosis	7 cases
3rd degree	3%	Rickets	5 cases
(2) <i>Syndromal classification</i>			
Kwashiorkor	7%	Scurvy	1 case
Incomplete kwashiorkor	10%	Ariboflavinosis	7 cases
Nutritional marasmus	2%	Anaemia	20%
Nutritional dwarfing	7%		
(3) <i>Nutritional indices</i>			
Oedema index	7%	Mosaic skin (shins)	7%
Low arm circumference index	69%	Parotid enlargement	0
Easily pluckable hair index	52%	Hepatomegaly	3%
Hypochromotrichia index	54%	Caries	3%

Magnitude of problem.

The dimensions of protein-calorie malnutrition in Haiti is indicated by the 1-3 year old oedema (and kwashiorkor) indices of 7%, suggesting that, in this age-group at this socio-economic level and in the country as a whole, approximately 1 out of 14 children were likely to have been suffering from kwashiorkor at the time of the survey.

That other severe forms of malnutrition due to protein-calorie lack are common is suggested by the classification of the pre-school children by weight deviation, which shows 37% with first degree malnutrition, 21% with second degree, and 3% with third degree, giving an all-embracing figure of 61% for children seen in the survey with first, second, and third degrees of malnutrition.

Lastly, confirmatory evidence of widespread protein-calorie deficiency is indicated by the fact that 69% of all the children examined showed what was considered to be an abnormally low arm circumference, probably principally related to wasting or poor development of muscle tissue.

All in all, the survey results suggest that, whereas the prevalence of kwashiorkor is 7%, some degree of malnutrition due to deficiency of protein and calories is much commoner and affects about two-thirds of the present-day Haitian 1-3 year old children in the lower socio-economic group.

The commonness of kwashiorkor is also emphasized by the fact that the disease is well recognized by peasant mothers as *maladie enflée* (swollen disease) as being an only too frequent feature of the weaning period; while a probable gauge of the public health significance of protein-calorie malnutrition is the high mortality in early childhood, which may be such that, as calculated by SEBRELL, only about one out of two children survive to reach their fifth birthday (31).

Etiology of protein-calorie malnutrition.

In Haiti, as elsewhere, the etiology of kwashiorkor is complex, although principally due to a protein-poor, largely carbohydrate diet during the "transitional" 1-3 year period. However, this faulty diet may be given to a tropical infant for one or more of the following reasons: (a) poverty or lack of availability of protein foods, (b) incorrect ideas and prejudices about certain foods, (c) lack of knowledge of the nutritional needs of the growing child (19). In Haiti, while all three of these may be relevant, it is the first which is most important, as shown by the better nutritional

status of children living on the comparatively rich Cayes plain in the South, where the soil is relatively fertile, the rainfall good, and cow's milk often available. In fact, in a peasant agricultural economy such as that of Haiti, malnutrition can be correlated to a great extent with the productivity of available land, and can, therefore, be affected by such factors as season of the year, in relation to foods grown and to cash crops, and by disasters, both man-made, such as political disturbances, and natural, such as high winds and hurricanes.

The only encouraging feature in infant feeding in Haiti is that so-called "prolonged" breast feeding is carried on easily by the majority of village mothers. Additional foods given, as noted earlier, consist almost entirely of carbohydrate. Animal protein foods are in very short supply and cannot be afforded by most mothers, except as regards cow's milk in the Cayes plain and fish in some coastal villages.

The part played in Haiti by various infections as precipitating factors is unknown. Two children with kwashiorkor were seen during the survey whose illness appeared to have been initiated by whooping cough. Ascariasis, ancylostomiasis and malaria may be of importance in this context in different parts of the country.

Ill-advised therapy, given by the mother herself or sometimes even on the advice of medical personnel, may sometimes act as a conditioning factor. In particular repeated dosing with toxic anthelmintics and castor oil, and the excessive starvation of poorly nourished infants with diarrhoea may be cited.

Prevention of protein-calorie malnutrition.

As is well-known, this problem is invariably multi-facetted, and it is easier to list possible theoretical ways of improving the situation than to put them into practice or to decide on priorities. All the following will require consideration:

(1) *Economic and educational*¹⁴—continued political tranquillity, improved road communication, extended educational facilities for children and for adults, initiation of industrial endeavour, improvement in agriculture (as is hoped will result from better irrigation when the Peligre dam is functioning as intended) and of fisheries.

(2) *Medical*—improvement in output of adequately trained doctors, nurses and other para-medical personnel, increased number of hospitals and especially health centres throughout the country.

¹⁴ Details of suggested approaches are given in the Report of United Nations Mission to Haiti (36).

From the more immediate point of view, two principles of approach can be noted:

- (i) the supply of high-protein food for the age-group at risk,
- (ii) health education.

With regard to the former, dried skimmed milk (issued for use as a powder to be mixed with gruels or semi-solids) might be a possibility because of Haiti's nearness to the world's main milk producer, the United States of America. The scheme would, however, have to be considered on a long-term basis, and the milk should be sold at a very cheap price rather than issued free, in the same sort of way as with the National Dried Milk in Britain during the second World War. Problems would be great in relation to distribution in a country with poor road communications and few health centres.

Health education is also needed, because, although poverty and lack of availability are of most importance, nevertheless mothers could in some cases use the limited range of foods available to better purpose in feeding their young children. In particular, the earlier introduction of carefully prepared bean dishes, such as pastes or soups, and the use of eggs, which are occasionally available, would require emphasis. Dishes suggested would, of course, have to be based as far as possible on customary food practices and real considerations of such matters as fuel shortage and storage difficulties.

All in all, it would seem that the best approach to the problem of protein-calorie malnutrition in early childhood in Haiti might be through the development of static or mobile health centres in different regions of the country, possibly with sessions held in association with markets, and in which disease could be treated, dried skimmed milk issued and health education of mothers undertaken.

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Zusammenfassung.

In der Republik Haiti wurde im Juni und Juli 1958 in 24 charakteristischen Dörfern und 2 Armenvierteln eine Untersuchung über den Ernährungszustand speziell von sämtlichen Kindern im Alter von 1 bis 3 Jahren durchgeführt.

Die Einschätzung des Ernährungszustandes wurde an 1322 vorschulpflichtigen Kindern nach folgenden Kriterien vorgenommen: 1. Syndrome; 2. Ernährungsindices (einschließlich Oedeme, geringer Oberarmumfang, Hypochromotrichie und leicht ausreißbare Haare); 3. Untergewicht nach der Klassifikation von Gómez.

Die Ergebnisse sind nach Dörfern und nach Departementen zusammengestellt. Für das ganze Land gelten folgende Feststellungen, in Prozenten ausgedrückt: Oedeme 7%, geringer Oberarmumfang 38%, Haarausfall 52%, Hypochromotrichie 54%, Gewichtsklassifikation nach Gómez: 1. Grades 37%; 2. Grades 21%; 3. Grades 3%. Klinische Unterernährung, abgesehen von derjenigen, die durch den Mangel an Eiweiß-Kalorien verursacht wird, war nicht verbreitet.

Die Befragung von 707 Frauen mit Kindern bis zu 2 Jahren ergab, daß Säuglinge beinahe ausnahmslos 6 Monate lang erfolgreich gestillt werden können und, daß mehr als die Hälfte der Kinder im Alter von 12—18 Monaten immer noch Muttermilch bekommen. Die Ernährung der Kleinkinder besteht hauptsächlich aus verschiedenen stärkehaltigen Breien. Tierische Proteine (Milch, Fisch, Eier) spielen bei der Kinderernährung kaum eine Rolle, da sie sehr teuer und nur schwer erhältlich sind, abgesehen von einigen wenigen Orten. Nur 20% der Kinder erhalten Gemüse nach dem 6. Lebensmonat. Gewisse Ernährungsgewohnheiten und allgemeine Regeln für das Großziehen von Kindern werden beschrieben.

Der Ernährungszustand einiger Säuglinge bis zu 1 Jahr und einer Anzahl größerer Kinder bis zu 12 Jahren wurde auch geprüft. Bei diesen beiden Gruppen sind bedeutend weniger Mangelercheinungen festgestellt worden.

Ebenfalls berücksichtigt wurde die Häufigkeit einiger anderer Krankheitserscheinungen, wie Zahnkaries, Hautkrankheiten, Darmparasiten, Frambösie (sehr selten) und Malaria. Letztere zeigte bei der Kontrolle im «dicken Tropfen» einen 1—3 Jahre alten Index von 16% (*Pl. falciparum* 89%, *Pl. malariae* 50% und *Pl. vivax* 5%).

Der Autor bespricht sodann die Etiologie der Eiweiß-Mangelerscheinungen in Haiti sowie die Methoden, welche allenfalls dazu angetan wären, die Lage zu verbessern.

Résumé.

Une enquête a été menée en juin et juillet 1958 dans 24 villages types et dans 2 quartiers pauvres de la République d'Haïti. Une attention plus particulière a été accordée aux enfants âgés de 1 à 3 ans.

Cette enquête a porté sur l'état de nutrition chez 1322 enfants d'âge préscolaire. L'état de nutrition a été évalué au moyen 1. de syndrome, 2. d'indices nutritifs (comprenant œdème, maigreur du bras, hypochromotrichie et cheveux pouvant être arrachés facilement), 3. diminution du poids au-dessous de la moyenne, d'après la classification Gómez.

Les résultats sont donnés par village et par département. Les plus importants pourcentages, valables pour tout le pays, sont : œdème 7 %, maigreur du bras 38 %, chute des cheveux 52 %, hypochromotrichie 54 %, classification du poids d'après Gómez 1^{er} degré 37 %, 2^e degré 21 %, 3^e degré 3 %. Mise à part la sous-alimentation due à la carence en calories protidiques, la sous-alimentation clinique n'est pas répandue.

L'interrogatoire de 707 mères d'enfants âgés de 2 ans et moins, a démontré que l'allaitement était pratiqué presque toujours avec succès pendant les 6 premiers mois, et que plus de la moitié des enfants étaient encore nourris au sein entre 12 et 18 mois. L'alimentation des jeunes enfants consiste principalement en purées variées à base d'amidon. L'alimentation protidique animale (lait, poisson, œufs) ne joue qu'un petit rôle dans la nutrition des petits enfants, en raison du prix élevé et de la difficulté à se procurer ces produits, excepté dans quelques rares endroits. 20 % seulement reçoivent des légumes à partir de 6 mois. L'auteur décrit ensuite certaines attitudes vis-à-vis des aliments ainsi que quelques coutumes générales concernant l'éducation des enfants.

L'état de nutrition d'un certain nombre de bébés jusqu'à 1 an et d'enfants jusqu'à 12 ans a aussi été examiné. On remarque chez ces derniers beaucoup moins de sous-alimentation.

L'auteur note aussi la prédominance de certaines conditions comprenant les caries dentaires, les maladies de la peau, les parasites intestinaux, le pian (très rare) et la malaria. Cette dernière, contrôlée sur goutte épaisse, présente un indice parasitaire de 1 à 3 ans de 16 % (*Pl. falciparum* 89 %, *Pl. malariae* 5 % et *Pl. vivax* 5 %).

L'auteur discute ensuite l'étiologie de la carence en calories protidiques à Haïti ainsi que les méthodes possibles en vue d'améliorer la situation.
