

Dup
Report No. 885

A STUDY OF FOOD INTAKE
IN TWO AREAS OF NEW GUINEA

(with special emphasis on breast feeding
and diets of mothers and children)

by

Sheila H. MALCOLM

for the

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

in collaboration with the

SOUTH PACIFIC COMMISSION

Rome, 1958

FAO/58/6/4644

SPC Library



32501

Bibliothèque CPS

SPC 612.3
MAL
B

CONTENTS

	<u>Page</u>
I. Assignment	1
II. Brief comparison of two areas	1
Environmental circumstances	1
Public Health arrangements	2
Mortality rates	2
Economic conditions and food	3
Varieties of food	3
Biak	3
Sorong	4
III. Dietary investigations	5
A. Breast feeding	5
Breast feeding habits	5
Breast milk estimations	5
Results	6
Biak	6
Sorong	6
B. Estimation of amounts of food consumed and their nutrient content in family groups	8
Selection of families and composition of groups	8
Methods used to estimate food intake	8
Results	11
(i) Food pattern of children from 0 to 24 months	12
(a) children during the first year of life	12
(b) children aged between 13 and 24 months	13
(c) caloric and protein contents of children's diets	15
(ii) Food pattern of children over 12 years and adults	15
IV. Some physical and physiological characteristics noted in different age groups	19
V. Discussions and conclusions	19

REPRODUCTION OF THIS DOCUMENT IS PERMITTED
BY ANY INDIVIDUAL OR ORGANIZATION
FOR NON-COMMERCIAL PURPOSES
ON THE CONDITION THAT THE
ORIGINAL SOURCE IS PROPERLY CITED

I. ASSIGNMENT

For the year 1957 the Food and Agriculture Organization of the United Nations agreed to make available the services of a dietitian:

1. To cooperate with the staff of the South Pacific Commission in the implementation of the Commission's nutrition programme in the South Pacific region;
2. To assist the nutrition programmes of the territorial administrations for
 - (a) the development and/or establishment of pilot projects and demonstration centres,
 - (b) the further study of infants' diets and nutrition with particular reference to the weaning period;
3. To provide a dietary background for an investigation of nutritional conditions and serum protein levels in contrasting conditions. Emphasis was laid on the study of diets of mothers and children including estimations on quantity and quality of breast milk.

At the invitation of the Government of Netherlands New Guinea, the assignment was carried out in that Territory where circumstances required amendments of the original plans to the form shown above.

Assistance to the government nutrition programme was given through discussions with appropriate personnel, demonstrations and preparation of training material for staff of local origin. Activities in this part of the assignment are reported elsewhere.

II. BRIEF COMPARISON OF TWO AREAS

Netherlands New Guinea covers an area of 160,000 square miles and has a population of approximately 700,000. It presents many types of country to which are related rather typical and varying dietary patterns. Though all the New Guineans are Melanesian in origin, there are many differences in physical characteristics, language, customs and social structure between different population groups. Environments are also different. The two places visited were examples of a rural and an urban community.

Environmental circumstances

The Biak villages visited are situated at an altitude of about 1,000 feet in precipitous hill country, two hours walk from the North coast of Biak Island, and ten hours walk from Biak township. The Sorong group chosen is

living in the Netherlands New Guinea Petroleum Company's compound which is built on the flat coastal margin at Sorong, five minutes walk from the sea. These people have many contacts with the outside world; they live according to the company's time table and so their village routine is a thing of the past.

Both adult communities were illiterate or semi-literate, though schools exist in both groups, being better in the Sorong compound.

Housing is supplied for Papuan employees by the Petroleum Company. Houses are too crowded and not always ideally planned. They consist typically of long blocks of connected room units, built on a cement base. Each family occupies a through unit of three rooms. Cooking, washing, ablutions and sanitary facilities are detached. In the older type of housing these may be communal, while newer types have separate ones for each family.

Biak houses are constructed of local material usually parts of sago palm. Such houses are dark, dirty and completely closed without windows. Others are better planned to provide some light and air. Furniture is crude if present at all. Water must be carried in bamboos from the nearest stream which may be some distance away.

Clothing amongst the Biak group consists of sarongs for women, shorts and shirts for men. Men and small children frequently use only a G-string. Sorong people are always more or less fully clothed in the compound, except for small pre-school children.

The Sorong population selected for investigations consisted only of the immediate family of the worker. In the Biak villages however the population included the old, the feeble, the incapacitated and the adopted children. All of these required a share of the food available, which with limited supplies meant less for others, as well as a greater work burden on the fit members of the community. Some Biak men were away on working projects. Their absence involved added strain on the women left behind who have to find food for their families without the aid of their husbands.

Public health arrangements

In Sorong measures had been established for control of hookworm, malaria and skin infections. Adequate hospital facilities are close at hand. At Biak, sanitary facilities are almost nil and incidence of hookworm was found to be high. Interior spraying of houses for malaria control had just been commenced. Skin infections were more common, for hospitals were some distance away, and water for washing was scarce.

Mortality rates

The data on mortality rates was limited at Sorong and practically non-existent for Biak. The information available suggested a much heavier infantile mortality in the latter, but data on causes of death in either area were sufficient to permit an attempt at establishing a relation between the mortality rates and the dietary picture.

Economic conditions and food

The Biak group grow nearly all their foods by shifting cultivation of the land around villages, or obtain them by foraging, hunting or bartering with the coastal populations. The nearest store from which to buy imported or canned foods is on the North coast, and has only a limited supply of merchandise. In any case the almost negligible income prevents the people from availing themselves of such commodities.

The Sorong group receive weekly rations and a small wage, or only wages in lieu of rations. There are Chinese stores with a wide choice of food and other goods. Company stores stock all foods issued in rations and others at a lower price than the Chinese stores. A small amount of locally grown fresh vegetables and fruit is for sale. Some families grow a little food on land situated $\frac{1}{2}$ to 1 hour walking distance from the compound.

Varieties of foods

Biak

The Biak group is dependent upon a subsistence economy. Following the social pattern, the greater part of the work necessary to support and feed the community is done by women. Most foods are planted by women in gardens, though men assist in clearing and fencing gardens, and cutting sago palms.

The staple food is taro (Colocasia spp.). Next in importance to taro in the diet is sago flour made from sago palms (Metroxylon), the number of which is limited. Other foods grown in much smaller quantities are corn, 'maize' (Zea mays), bananas (Musa spp.), sweet potato (Ipomea batatas), yam (Dioscorea sp.) and manioc (Manihot dulcis). Only a small number of coconut palms were mature as they had only been recently planted.

Green leaves are commonly eaten, such as the leaves of hibiscus (Hibiscus manihot), amaranth (Amaranth spp.), manioc (Manihot dulcis), gnetum (Gnetum gnemon), pawpaw (Carica papaya), pumpkin (Cucurbita pepo), taro (Colocasia). Stems, ferns and bamboo shoots are also used.

Fruits of the citrus family, pawpaw and other small fruits are available in season. Some unsuccessful effort has been made to introduce peanuts (Arachis hypogaea) and beans (green gram, Phaseolus spp.).

Foods of animal origin are pigs, chickens, bush birds, eggs, and, from the streams, shrimps, eels, fish, tiny shellfish and crabs. Dried fish from the coast is occasionally bought or procured by barter. Sago grubs are sometimes found in the palms. Lizards, flying foxes, opossums are caught occasionally. The amounts of these animal foods eaten daily during our visit were very small and, as a regular supply, could not be relied upon. Pigs and chickens are often sold for money. The "wet" season may affect stream fishing; it was reported that when the streams were low during the dry season, fishing is easier.

Sorong

In Sorong the same foods were used by those in receipt of rations as by those receiving wages in lieu of rations. This was unusual, for a diet of foods new to Papuans, bought and chosen by them, is usually poorly balanced as a result of ignorance. However in this case, the little difference in food consumption in the two groups was probably due to the fact that purchasing was done in company stores stocking ration foods. Enriched rice, dried green gram, dried salted fish, canned beef and mackerel, sweetened and unsweetened condensed milk, canned green beans, fresh onions, dehydrated cabbage, (seldom used by Papuans), sugar, fermented fish and tamarind pastes made up the ration issue. Some of the milk issued was sold to Chinese store keepers, as milk is a new and unfamiliar food to Papuans and "kang kung" (Ipomea aquatica) was often purchased in its place.

III. DIETARY INVESTIGATIONS

A. Breast feeding

Breast feeding habits

The methods used for estimating the quantity and quality of breast milk shall give as close an imitation of natural conditions as possible. It was therefore necessary to consider the breast feeding habits of the two groups of women concerned.

In Sorong, mothers were known to cease breast feeding during the first year frequently supplementing or replacing breast milk with other milk feedings easily available to employees of the Petroleum Company. Pregnancy occurring before the infant is one year of age is a rather common reason for early weaning. Few mothers were employed for wages or engaged in food growing.

At "well baby" clinics the mothers are taught to breast feed at regular intervals and not to sleep with their child. There was a noticeable tendency in some mothers to follow this teaching, though others, particularly those new to the compound followed the breast feeding pattern of village mothers.

In the Biak hill villages, every child seen in the first year of age was breast fed; frequently breast feeding continued into the second or even the third year. No other milk than breast milk was used at all.

It is customary for the mothers to sleep with their suckling infant and the child would feed three or four times during the night. Through the day, infants aged 0 to 4 months are suckled irregularly though frequently. As they grow older they are suckled at less frequent intervals according to the activities of the mother. When the latter is away, the child is usually left in the care of an older child, a grandparent, or other relative.

Breast milk estimation

Direct estimation of breast milk was done at Biak only. In Sorong, the lactation pattern was noted by studying hospital records and by observation in the Company compound.

Breast milk expressions were made every 4 hours, except at 3 a.m., for 24 consecutive hours. The breast milk of each mother concerned was stripped at the commencement of the 24 hour period. The mother expressed her milk except for the stripping which was done by the dietician or by one of the assisting Papuan nurses. Breast pumps were not used as they were not so acceptable as manual expression. Papuan nurses stayed with the mothers to see the child did not suckle between expression.

Breast milk expressed was measured and a small sample bottled. The remainder, and other milk to replace the breast milk taken for analyses were given to the child in a bottle or in a cup.

The bottled sample was immersed in boiling water for 20 minutes, labelled and put on ice in a thermos flask. This was then despatched by a runner to Biak town whence it was sent to Holland by air. Results of qualitative analysis will be published separately.

Results

Biak

Among the 700 inhabitants seen in the hill villages of Biak, most mothers were examined. No mothers having a child less than 15 months of age were noted to be pregnant and no child was breast fed by a pregnant mother.

Results of investigations are given in Tables I and II.

TABLE I

Period of breast feeding of children up to the age of 3 years

Age of child (in months)	3 - 12	13 - 18	19 - 24	25 - 30	31 - 36	Total
Number of mothers	18	19	4	11	5	57
Number of children breast fed	18	19	2	2	0	

TABLE II

Quantitative estimation of breast milk

Age of child (in months)	3 - 7	8 - 12	13 - 18	19 - 24	25 - 30	Total
Number of mothers	6	12	19	2	2	41
Average amount of milk in 24 hours (in cc.)	435	359	276			
Range (in cc.)	269-525	110-735	65-505	175-338		

Sorong

The number of infants breast fed, mixed fed, or bottle fed was ascertained from cards taken from hospital records of Papuan infants attending clinics in the year 1956-1957. The lactation pattern is summarized in Table III.

TABLE III

Incidence of breast feeding, part and complete weaning of infants living in the Petroleum Company compound

Age of infant (in months)	2	3	4	5	6	7	8	9	10	11	12
Number of infants*	57	56	50	46	38	34	32	26	19	12	9
Number breast fed	43	36	26	23	19	14	11	8	3	3	1
Number mixed fed	10	16	17	18	13	14	12	6	5	-	-
Number fully weaned	4	4	7	5	6	6	9	12	11	9	8

* The number of infants decreases as the months go by because of incomplete records.

Birth spacing has a relation to breast feeding as a pregnant mother usually weans her child. To study the birth spacing of Papuan infants born in the Petroleum Company compound, the records of all the children delivered in the first half of 1956 were extracted from the hospital files. There were 80 of these. Mothers also had individual records of the previous deliveries which occurred while they lived in the compound. From such records, Table IV was prepared showing the number of months between two successive births.

TABLE IV

Months between births	10	12	13	15	16	17	18	19	20	21	22	23	24	30	33	39
Number of births	1	4	4	4	5	3	2	4	2	3	1	4	3	1	1	1

These figures, incomplete as they are, show that under the conditions described there was a significant proportion of women who would become pregnant in the first 6 months after confinement and a higher proportion in the second 6 months. It would be safe to say that these figures are considerably higher than those which could be obtained in many rural Papuan groups.

B. Estimation of amounts of food consumed
and their nutrient content in family groups

Selection of families and composition of groups

In Sorong and in Biak families were chosen which included pregnant or lactating women.

In the case of Sorong, choice was confined to Papuan living in the Petroleum Company compound for more than 2 years and in receipt of rations and wages or in receipt of wages only. The differences in the food eaten by these two groups were insufficient to justify a separate treatment of the results.

In the case of Biak, possible differences in food consumed due to economic position, did not seem sufficiently pronounced to affect food intake. Social and seasonal factors however have some effect on the intake of the individual households. The study was made during the "wet" season.

A record of individual members of families selected was made. Height, weight, estimate age, physiological condition (pregnancy, lactation) and family relationship were noted. These data were then set out as shown in Table V (Sorong) and VI (Biak).

Methods used to estimate food intake

Papuan nurses and interpreters assisted the dietician in the survey. Scales used were accurate to 5 gms.

Food was weighed after cooking and records were made of the amount of food apportioned to each member of the family. In this way a more satisfactory account of the division of food within the family was obtained than by arbitrary division of the total consumed.

Each morning the proposed activities and whereabouts of each family were noted. At night, record was made of foods consumed between meals.

Records were kept for 7 consecutive days. In a few cases investigations had to be reduced to 3 to 5 days.

The total food weighed for each individual during the period of recording was divided by the number of days of observation. These individual estimates were then grouped according to approximate ages and once more averaged by the number of individuals in each group.

There was considerable difference in amounts of food consumed by any individual from day to day but the average consumption over 7 days showed slight differences between individuals in the same group of age. This day to day difference in food intake of the individual is due to irregular eating habits and is more pronounced in the Biak group whose food supplies are also irregular.

TABLE V

Grouping of persons included in the dietary estimate in the Serong Petroleum Company compound (14 hours each with a family of 3 to 10 persons)

Median height or range (cm.)	Median weight or range (kg.)	Number in group	Sex	Age
51 - 55	3.0 - 3.5	2	F	2 months
61	6.5	1	M	4 months
63 - 70	5.5 - 6.15	3	M and F	10 - 11 months
76 + 1 - 6	9 + 1 - 2	8	"	12 - 14 "
91 + 18 - 15	12 + 5 - 3	21	"	3 - 6 years
120 + 10	19 + 6 - 4	14	"	7 - 10 "
139 + 4 - 7	31 + 4 - 6	5	"	11 - 15 "
	48 + 14 - 9	11 (8 pregnant 3 lactating)	F	18 - 35 "
149 + 10 - 13	41 + 12 - 10	11 (8 married 3 single)	F	18 - 35 "
161 + 5 - 15	51 + 7	11	M	20 - 35 "
TOTAL		87		

Notes: Total population: 1,244 approx.

310 married couples had 456 children under 6 years
and 166 over 6 years of age.

TABLE VI

Grouping of persons included in the dietary estimates in Biak hill villages (12 houses each with 2 or more families of 10 to 14 persons each, sometimes including guests)

Median height or range (cm.)	Median weight or range (kg.)	Number	Sex	Age
50	3.0	1	F	2 weeks
53 - 61	3.4 - 6.5	2	F	3 months
63 - 68	5.7 - 8	3	M and F	4 - 9 months
65 - 70	5.7 - 6.7	4	"	10 "
73 + 2 - 4	7 + 3 - 1	10	"	12-24 "
98 + 11 - 13	13 + 5 - 2	18	"	3 - 6 years
118 + 10 - 8	21 + 6 - 3	15	"	7 - 10 "
142 + 4 - 1	35 + 2	5	"	11 - 15 "
146 + 6 - 3	42 + 5 - 2	(10 married, 12 lactating 4 pregnant over 5 months)	F	18 - 30 "
150 + 18 - 11	41 + 12 - 10	22	F	18 - 50 "
157 + 6 - 5	49 + 6 - 8	18	M	20 years and over
TOTAL		124		

Note: Total population: 1,000 approx.

Nutrient values of foods were taken from various published food analysis tables. Values for cooked sago paste, cooked taro, cooked rice, bean porridge, etc. were calculated by weighing ingredients before cooking and cooked dishes thereafter. Few composite recipes were encountered.

Results

The results are presented for age groups, first in terms of type and quantity of foods eaten and secondly in terms of nutrient contents.

(i) Food pattern of children from 0 - 24 months

(a) Children during the first year of life

TABLE VII

Average daily food intake over 4 - 7 days observation of
9 Biak and 6 Sorong children under the age of 12 months

Foods eaten		BIAK			SORONG		
Edible portion	Quantity consumed (in g.)	Age of Children (in mo.)	Number of Children	Quantity consumed (in g.)	Age of Children (in mo.)	Number of Children	
Milks							
Breast milk	215 - 735	2 - 10	9	-	2 - 10	3	
Other milk							
*Unsweetened condensed				40 - 130	2 - 10	4	
*Sweetened condensed				25 - 30	10 - 11	2	
Powder milk (mixed)				240	2	1	
*as purchased, before mixing with water							
Starches and Sugar							
Bread	+	-	-	8	11	1	
Rice (cooked)	-	-	-	240 - 341	10 - 11	3	
Taro (cooked)	50 - 200	5 - 10	6	-	-	-	
Sugar	+	-	-	+	10 - 11	2	
Fats							
Margarine	+	9	1	+	-	-	
Meats and Fish							
Pigs (cooked)	+	9	1	-	-	-	
Salted fish (cooked)	+	9	1	-	-	-	
Eggs (cooked)	-	-	-	20	10	1	
Green leafy vegetables							
Green leaves (cooked)	+	9	1	-	-	-	
Ipomea aquatica (cooked)	+	-	-	2	10	1	
Fruits							
Green papaya (cooked)	+	9	1	-	-	-	
Tea - Coffee	+	-	-	+	11	1	

+ negligible amount; educational value.

(b) Children aged between 13 and 24 months.

TABLE VIII

Average daily food intake over 3 - 6 days observation of
9 Biak and 8 Sorong children aged between 13 and 24 months

Foods eaten		BIAK			SORONG		
Edible portion	Quantity consumed (in g.)	Age of Children (in mo.)	Number of children	Quantity consumed (in g.)	Age of Children (in no.)	Number of children	
Milks							
Breast milk	65 - 505	12 - 18	6	-	-	-	
Other milk	-	-	-	-	-	-	
*Unsweetened condensed	-	-	-	5 - 10	15 - 23	6	
*Sweetened condensed	-	-	-	5 - 10	15 - 23	4	
* as purchased, before mixing with water							
Starches and Sugar							
Bread	-	-	-	10 - 36	16 - 23	3	
Rice (cooked)	30	24	1	266 - 500	15 - 23	8	
Taro (cooked)	200 - 525	12 - 24	9	-	-	-	
Sago Paste	25 - 200	16 - 24	3	15	15	1	
Sago Flour, baked	53	24	1	-	-	-	
Cassava root (cooked)	-	-	-	10 - 30	22 - 23	4	
Banana (raw and cooked)	25 - 50	13 - 24	3	10	20	1	
Potatoes (imported, cooked)	-	-	-	10 - 21	16 - 20	2	
Sugar	-	-	-	5 - 10	15 - 23	8	
Fats							
Coconut oil	-	-	-	5 - 10	15 - 22	4	
Meats and Fish							
Dried deer (cooked)	-	-	-	+	16 - 22	2	
Corned beef (cooked)	-	-	-	7 - 20	15 - 23	7	
Pig fresh (cooked)	6	24	1	-	-	-	
Fresh fish (cooked)	-	-	-	5 - 17	16 - 23	6	
Mackorel (tinned)	-	-	-	15 - 30	20 - 23	5	
Clam (tinned)	-	-	-	10	15 - 23	2	
Eggs	-	-	-	8	15	1	
Legumes							
Dried green gram porridge	-	-	-	20	15 - 23	2	
Green gram sprouted	-	-	-	5 - 25	15 - 23	5	
Green leafy vegetables							
Green leaves (cooked)	10 - 50	13 - 24	8	9	20	1	
Ipomea aquatica (cooked)	-	-	-	7 - 47	15 - 23	8	
Other vegetables and Fruits							
Green beans (tinned)	-	-	-	3 - 11	20 - 23	3	
Pumpkin (cooked)	70	13	1	-	-	-	
Citrus (raw)	12	16	1	-	-	-	

+ negligible amount; educational value.

Comments on Tables VII and VIII

Infants in the Biak group are breast fed up to one year; in most cases weaning occurs before the 18th month. During the first half of the second year, the amount of breast milk received daily by the average child is appreciable, i.e. 276 g. Breast milk is the only milk available.

In addition to breast milk Biak children in their first year receive only taro, usually premasticated. All other foods have only an educational value. During the second year, rice, sago, bananas, fresh pig, green leaves and fruit are progressively added to taro. Amounts are usually small and feeding is irregular.

In Sorong the picture is entirely different. Weaning occurs during the first year, sometimes as early as the second month. However, other milks, particularly unsweetened condensed milk, are available to every mother in sufficient amounts in regular and reliable supply because it is included in the ration issue.

A variety of other foods also supplies with the ration issue are available. These include enriched rice, dried green gram, "kang kung" (*Ipomea aquatica*) leaves, tinned meat and fish. Fresh fruit are used in very small amounts.

(c) Calorie and protein content of children's diets during the second-year-of life

TABLE IX

	Age (months)	Weight (kg.)	Calories	Animal protein (in g.)	Vegetable protein (in g.)	Total protein (in g.)	Protein per 100 calories	Protein per Kg. (in g.)
SORONG	15	7.5	750	7	11.5	18	2.40	2.40
	16	9.0	718	6	11.8	18	2.50	2.0
	20	8.5	881	13	14.5	27	3.06	3.17
	22	11.5	891	11	12	23	2.58	2.0
	23	9.0	826	13	10	23	2.78	2.55
	23	9.0	755	6.8	10.2	17	2.25	1.88
	23	9.0	978	9	16	25	2.55	2.77
	23	9.1	1,122	4	19	23	2.04	2.52
BIAK	12	6.6	530	1.8	5	6.8	1.28	1.03
	13	7.3	496	1.8	4.5	6.3	1.27	.86
	13	6.1	460	.7	5	5.7	1.23	.93
	16	6.7	687	3	6.7	9.7	1.41	1.44
	18	8.3	743	1.2	8	9.2	1.23	1.10
	18	7.0	590	2.8	5.2	8	1.35	1.14
	24	9.0	740	-	8.4	8.4	1.13	.93
	24	10.0	523	-	5	5	.95	.50
	24	10.0	650	.4	4.3	4.3	.66	.43
	24	10.0	756	.4	5.2	5.6	.74	.56

Comments

There is a striking difference in the amount of protein available in the diets of the children. Almost all of the Sorong children received more than 2.0 g. of protein per kilogram of body weight whereas the diet of the Biak children seldom contained more than 1.0 g. of protein per kilogram of body weight.

Identical comments can be made on the caloric value of the diet.

(ii) Food pattern of children over 2 years and adults

In the two communities studied in Biak and in Sorong there is only a slight difference in the quality and preparation of foods used by children over two years and by adults. This will explain why the diets of the different age groups are presented in the same tables: Table X showing the foods available and the amounts consumed, while Table XI gives the results in food values. The results for Biak and Sorong are reported in the same table in order to demonstrate the difference in the food pattern between the two areas.

[illegible]

TABLE XI

Average daily nutrient content of food intake in age groups

Nutrients		Age 3 - 6 years		6 - 10 years		10 - 15 years		18 - 50 years			
		Place									
		Biak	Sorong	Biak	Sorong	Biak	Sorong	Biak	Sorong	Biak	Sorong
	Number of persons surveyed	18	21	15	14	5	5	26	22	18	11
Calories		1,036	1,360	1,250	1,402	1,250	1,393	1,320	1,646	1,470	1,876
Total protein	g.	10	41	11	39	13	35	13	41	16	51
Vegetable protein	"	10	18	11	20	13	19	13	22	16	30
Animal protein	"		23	.3	19	.3	16	.3	19	.3	21
Fat	"	4	20	4	28	4	27	4	36	5	42
Carbohydrate	"	238	230	265	240	290	245	324	265	340	310
Calcium	mg.	300	420	286	340	375	196	359	201	440	282
Iron	"	8	10.2	8	8.9	10	9.9	10	12.7	12	14.7
Total Vitamin A.	I.U.	6,356	4,880	7,377	4,622	8,058	3,438	10,125	6,708	10,400	7,866
Pro-vitamin A	"		600		342		218		230		328
Carotene	mg.	6,356	4,280	7,377	4,280	8,058	3,220	10,125	6,478	10,400	7,538
Thiamine	"	1.7	1.04	1.5	1.11	2.1	1.19	2.0	1.26	2.4	1.45
Riboflavin	"	.32	1.23	.3	1.52	.4	1.50	.4	1.72	.4	1.79
Niacin	"	2	10.1	1.7	11.7	2.2	11.2	2.2	13.7	2.6	15.4
Ascorbic acid	"	99	28	106	40	126	25	128	38	153	52

Comments

Biak

Food was greatly lacking in variety. Taro is the staple food supplemented and sometimes replaced by sago. Green leaves are also a common article of the diet. Animal foods are scarce and during the survey were seen to be consumed in very small amounts.

Food intake is irregular. A number of food taboos apply to pregnant and lactating women. The quantity of food available and its distribution within the family appears to be affected by social habits as well as by environmental conditions.

According to European standards, the calorie intake is marginal and the protein intake very low, with only slight variations with age and body weight.

Sorong

In contrast with the peoples in Biak, the Sorong group were using imported foods almost entirely.

Their food supply, except in fresh vegetables and fruit, was regular and reliable. The protein and calorie intake of women was more satisfactory than that of the Biak women. For all the age groups it is remarkable to note that the protein intake varies slightly. A child between the ages 6 to 10 years received 41 g. of total protein per day, the same amount as a female adult.

IV. SOME PHYSICAL AND PHYSIOLOGICAL CHARACTERISTICS NOTED IN DIFFERENT AGE GROUPS

Height and weight of individuals in the Biak villages and in the Sorong Petroleum Company compound were at all ages less than those of Europeans.

Sorong children appeared in better physical condition than those of Biak. But there was insufficient evidence to draw any conclusions as to whether they were in optimum health and their diet adequate.

Children in their second and third years often showed poor muscular development, enlarged abdomens, narrow shoulders, thin legs and arms. These conditions were seen more frequently in the Biak group where several pronounced cases were noted.

Dry sparse depigmented hair was commonly observed in Biak children of one year up to 12 years or more. The good effect of an appropriate treatment supports the opinion that the condition is of nutritional origin.

Some cases combined dry sparse brownish hair with a pallor of the skin which was at the same time dry, thin and crackled in appearance. Oedema was associated on several occasions. A severe case died in hospital and following autopsy was diagnosed as kwashiorkor.

Enlarged livers and spleens were common in the Biak group; malaria as well as malnutrition may account for this condition. Enlarged but painless parotid glands were extremely common findings and very marked in school children. Slow mental response was also a rather noticeable feature.

There was a tendency for people to lose weight in middle age. Women who had 4 or 5 children and were in the older age group had definitely a lower weight as a group than women just before or just after marriage.

The lactation process in the Papuan woman requires still further investigation. It is quite remarkable that a woman averaging 41 kgs. weight and living on a diet that supplies her with 1,350 calories and 13 g. of protein can produce in the first year after delivery an amount of breast milk of 400 cc. (approx.) per day without apparent physical deterioration.

V. DISCUSSIONS AND CONCLUSIONS

In undertaking the investigations reported above, it was thought to be more useful to study the physical status of the people in relation to environment and diet rather than to make a comparison of the differences between the actual diets and the allowances recommended for Europeans. Interest lay rather in discovering the level at which the nutrient intake becomes marginal, in other words in linking insufficiency or doubtful sufficiency of nutrient intake with the actual dietary findings.

There were considerable differences in the social and economic conditions of the two communities selected. In the hill villages of Biak, the inhabitants had minimum contacts with the outside world and lived on typical subsistence economy. On the contrary the employees of the Sorong Petroleum Company followed the regimented schedule of life set up by a foreign organisation and lived almost entirely on imported foods issued as rations or purchased from wages.

Certain symptoms and physical signs were noticeable and common in the Biak group but not in the Sorong group. Their occurrence in people living on a diet low in protein and calories at least suggests that these had some relation with the diet as many of them are known to be related to a poor food intake.

Many dietary surveys already carried out in the Pacific show that in a number of places the intake of one or more nutrients is below the allowances recommended for Europeans. In some groups the difference is very noticeable; at the same time there may be rather well defined signs and symptoms of dietary insufficiency though this is by no means invariable. Where it does exist this situation can sometimes be improved by educational measures, if the composition of the unsatisfactory diet is the primary cause. Yet it happens that in some communities the possibility of food production appears to be limited at least under existing conditions.

There is still much to be learned about the possibilities of expanding subsistence food production from simple agricultural and fishing activities but it is sometimes difficult to imagine how in particular areas the agricultural production could be raised sufficiently to meet the differences between recommended allowances for Europeans and a vulnerable diet such as has been described in the Biak hill villages. Unfortunately it has not yet been possible to set out recommended allowances which could be safely taken to ensure the perfect health and nutritional condition of New Guineans, and which would at the same time state a more practical level at which to aim when planning agricultural programs.

Another difficulty lies in establishing weight/height tables which will not only show the present picture but can be used to set up realistic standards at which to aim. Observations showed that height and weight for both groups were below that of Europeans from birth to adulthood.

The importance of basic problems in the two areas was not the same. In Sorong most of the necessary foods were available and if nutritional problems exist, they could be much improved by education in the use of these foods. In Biak, the necessary protein and possibly calorie producing foods were in short supply and even when those available were used to the best advantage, the problem would not be solved. Here in fact there is a shortage of total food, as well as a shortage in the necessary variety of foods. So the important problem is first to produce these foods.

Educational programs must be modified to suit environment, social structure, and foods available. The two areas visited illustrate this point clearly. Urban and country problems provide many contrasting conditions such as the foods which are available for the people. The pattern of life in different economic and social structures necessitates a different approach when planning educational programs. This is particularly the case with programs relating to infant and maternal welfare. The prevailing length of the period of breast feeding in particular areas is linked with the necessity of finding infant foods to replace breast milk particularly in the first and also in the second year. The difference in foods available in different places, and the necessity of choosing balanced infant diets from different food patterns, and the shortage of suitable concentrated protein foods, and sometimes calorie foods in given areas, must all be considered when training nurses engaged in mother and child care who will be required to work in a variety of circumstances. New Guinea can, to a degree, be "zoned" into typical areas, each with their own specific problems. This is a practical method of dealing with the subject. As part of the assignment, a draft of teaching material, suitable for using in a course for training nurses in mother and child care, was submitted for consideration to the administration.