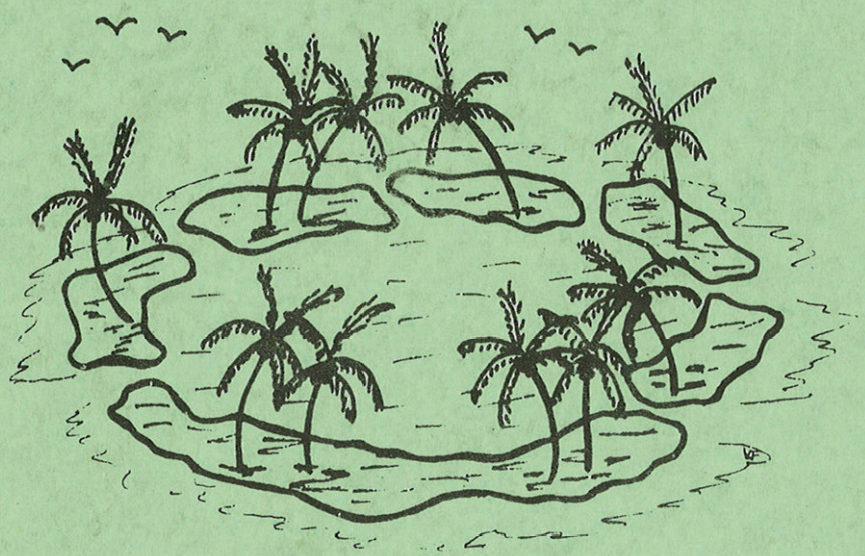
No. 27 January 31, 1954

ATOLL RESEARCH BULLETIN

27. *Nutrition Study in Micronesia*

by MARY MURAI



Issued by

THE PACIFIC SCIENCE BOARD

National Academy of Sciences—National Research Council

Washington, D. C., U.S.A.

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It is a pleasure to commend the far-sighted policy of the Office of Naval Research, with its emphasis on basic research, as a result of which a grant has made possible the continuation of the Coral Atoll Program of the Pacific Science Board.

It is of interest to note, historically, that much of the fundamental information on atolls of the Pacific was gathered by the U. S. Navy's South Pacific Exploring Expedition, over one hundred years ago, under the command of Captain Charles Wilkes. The continuing nature of such scientific interest by the Navy is shown by the support for the Pacific Science Board's research programs, CDA, SIH, and ICCP, during the past six years. The Coral Atoll Program is a part of SIH.

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NUTRITION STUDY IN MICRONESIA

SCIENTIFIC INVESTIGATIONS IN MICRONESIA

Pacific Science Board

National Research Council

Mary Murai
Honolulu, Hawaii
August 1953.

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To the many others who helped to make my stay on Majuro and Truk so pleasant, I wish to express my gratitude and appreciation.

NUTRITION STUDY IN MICRONESIA

INTRODUCTION

OBJECTIVE:

To make a study of dietary habits and nutritional status of inhabitants and the nutrient composition of basic plant and animal foods in at least two islands with somewhat contrasting conditions for the purpose of developing effective methods of gathering nutrition information necessary for promoting educational and developmental programs conducive to improved conditions.

PROCEDURE:

Two islands were selected for which some medical, anthropological or other pertinent observations had been reported under the CIMA or SIMI programs.

Majuro in the Marshall Islands was selected as representative of a "low" island and Udot in the Truk district, Eastern Caroline Islands, as a "high" island.

The field activities in the Marshall Islands covered the period from January 18 through May 29, 1951. The field activities in the Caroline Islands covered the period from June 27 through October 8, 1951.

Samples of native foods for nutrient analysis were also collected at this time. The samples were sent to the Foods and Nutrition Department, University of Hawaii Agricultural Experiment Station, where Professor Carey D. Miller directed the chemical analysis of the samples.

PART I

NUTRITION STUDY ON MAJURO ISLAND, MARSHALL ISLANDS

Majuro Atoll lies 7 degrees 05' North, 171 degrees 23' East, about ten miles West of Arno Atoll; it is 21 miles in an east and west direction. There are more than 50 low coral islands, of which Majuro island, the largest, stretches along the southern side for a distance of about 14 miles.

I. Planning and organizing the survey.

Before beginning the actual collection of data for the nutrition survey, time was spent in acquiring some knowledge of village life, gaining cooperation of inhabitants, becoming familiar with local foodstuffs, and local methods of preparing and cooking meals. At the same time, an attempt was made to learn enough of the native language to be able to understand simple terms which would be helpful when gathering data for the survey.

This preliminary work was done on Uliga, where it was possible to contact Marshallese officials and persons of authority and influence on the locality from whom help could be obtained, as the success of the survey, to a large degree, depended on obtaining such cooperation.

The teacher trainee group at the school, who had come from many islands of the Marshalls, helped by volunteering information on Marshallese terminology for foods, preparation of foods and description of foods used in native villages.

A list is given of Marshallese foods with a brief description of the foods which are produced locally.

A LIST OF MARSHALLESE FOODS WITH A BRIEF DESCRIPTION IN ENGLISH OF EACH FOOD

MARSHALLESE	ENGLISH
Bop	Pandanus fruit.
Eroum	Boiled or baked pandanus.
Mōkan	Cooked and preserved pandanus fruit.
Beru	Pandanus and arrowroot flour cooked together as a dessert.
Joanrong	Pandanus juice.
Jokanrul	Meat of baked or boiled pandanus fruit mixed with grated coconut and baked.
Jakaka	Shredded fresh pandanus dried for almost one week and used as a confection.
Kōbeo	Raw pandanus fruit.
Mā	Breadfruit.
Konjin	Baked breadfruit--roasted and skin scraped off before eating.
Boljej	Green breadfruit is taken and stored until it ripens. Both core and skin are removed. Hole is filled with coconut milk from grated coconuts. Hole is covered with part of core, then breadfruit is wrapped with green breadfruit, leaves tied with pandanus roots and baked about half an hour.
Kōbjar	Baked breadfruit in um or pit.
Jokkob	Breadfruit porridge--both core and skin are removed. Breadfruit is cut into pieces, boiled, mashed, mixed with coconut milk. Salt to taste.

MARSHALLESE	ENGLISH
Ainbat ben	Breadfruit is cored and skinned. Cut into pieces and boiled. After it is boiled once, it is again boiled with coconut milk.
Bwiro	Preserved breadfruit. 1. Skin is removed, core taken out and breadfruit cut into half. 2. Then breadfruit is put in a basket and left overnight anchored in the waters of the lagoon. 3. Breadfruit is taken from the lagoon and left overnight on the ground to soften. 4. Breadfruit is then put in a pit, covered with dried breadfruit leaves and left for about six months. 5. Eat when needed.
Jankwin	Made from Mijiwan (seeded) breadfruits. Take while green from tree and let ripen. Take out seeds, core, and skin. Put breadfruit in large coconut leaves which are woven into coconut leaf baskets. Put baskets in earth oven and leave overnight. Take out, unwrap, flatten out and leave out in sun to dry. After breadfruit is dried, roll and wrap in pandanus leaves and tie with sennit twine into rolls.
Manakajen	Made from preserved fermented breadfruit of the seedless variety of Artocarpus incisus. Preserved breadfruit is taken from the pit and compressed into slabs in "coconut cloth" (fibrous, mesh-like stipule of the coconut tree) and left out in the sun. It is usually left for one week until it becomes very hard, never exposing it to fire. How to eat manakajen: The slabs are broken up into small pieces and soaked overnight in cold water. The breadfruit is then washed and cleaned several times in water. The mixture is put in a cloth bag and the water strained out. The preserved breadfruit is put on a board and gently kneaded until it becomes sticky.
Ieok	At this stage, breadfruit can be mixed with coconut milk and jekamai (coconut syrup), wrapped in fresh breadfruit leaves and put in the earth oven to bake for two hours.

MARSHALLESE	ENGLISH
Cbubwe	After kneading until breadfruit becomes sticky, mix with coconut milk, wrap in coconut leaves and roast in open fire.
Bitrō	After kneading, breadfruit with added water can be boiled. Water with sugar is boiled, then the breadfruit mixture is dropped in the boiling water and boiled for two hours. The finished product resembles dumplings.
Ni	Coconut.
Jekaro	Coconut sap.
Mere	Meat of the immature coconut.
Iu	Embryo of the sprouting coconut.
Waini	Meat of the ripe coconut.
Jakamai	Jekaro boiled for four hours or more until it becomes a syrup (coconut syrup).
Jekajeje	Jekaro boiled for half an hour.
Amedama	Coconut candy made from a mixture of jakamai and grated coconuts.
Lukor	Iu and jekaro made into a pudding.
Iutir	Baked iu.
Jiab	Heart of the palm tree.
Ren in ni	Water of the drinking coconut.
Jimanin	Fermented coconut.
Bolonar	Immature embryo of the sprouting coconut.
Al	Coconut milk.
Kabran	Banana.
Ainbat kabran	Boiled banana.
Fry kabran	Fried banana.
Jenkunin kabran	Dried banana halves.
Jukjuk in kabran	Boiled bananas in skin. Mashed and mixed with grated coconut meat. Sugar or jekaro added for flavoring.

MARSHALLESE	ENGLISH
Kābran̄ emmer	Ripe banana.
Umum kābran̄	Baked banana in um.
Iik	Fish.
Iukor	Raw fish eaten with grated coconut meat, limes, and salt.
Iik umum	Baked fish in umum.
Fry iik	Fried fish with salt for flavoring.
Iik sol	Preserved fish. Head and bones are removed from fresh fish. Salted overnight. Dried for about one week.
Iik monaknok	Dried fish baked in umum and dried for one week.
Iik kālāl	Boiled fish with coconut milk.
Soup in iik	Boiled fish soup with breadfruit, arrowroot flour, rice and iu.
Iik jin	Fish cooked on heated rocks.
Iik jinbatat	Smoked fish—coconut husks and dried pandanus husks are used for smoking.
Shiokara	Salted entrails of tuna or bonito fish.
Bao	Chicken.
Bao umum	Baked chicken.
Bao ainbat	Boiled chicken.
Soup in bao	Chicken soup with breadfruit, rice and iu.
Taktake	Boiled chicken with green papayas cooked with soy sauce and sugar.
Fry bao	Fried chicken.
Koniekin pik	Pork.
Ainbat pik	Boiled pork.
Umum pik	Baked pork.
Fry pik	Pork fixed with shoyu and fried.

MARSHALLESE	ENGLISH
Pik sol	Preserved pork (salted).
Wōr	Lobster.
Ainbat wōr	Boiled lobster.
Jinkar wōr	Lobster cooked on heated rocks.
Mōj	Eel
Ainbat in mōj	Boiled eel.
Umum in mōj	Baked eel.
Mōj kālāl	Boiled eel with coconut milk.
Iaraj	Cyrtosperma chamissonis.
Ainbat iaraj	Boiled Cyrtosperma chamissonis.
Umum iaraj	Baked Cyrtosperma chamissonis.
Iaraj killel	Cyrtosperma chamissonis boiled in coconut milk.
Jukjuk in iaraj	Mashed Cyrtosperma chamissonis with grated coconut meat.
Mokmok	Arrowroot flour.
Likōbla	Arrowroot flour and jekaro mixed together.
Benben in mokmok	Arrowroot flour, jekaro and grated coconut meat.
Jup in mokmok	Arrowroot flour, iu, fish and coconut milk.
Kebjeltak	Arrowroot flour, crackers, and jekaro.
Jamkok	Arrowroot flour with grated coconut meat from semi-ripe coconuts and baked.
Banke	Pumpkin.
Ainbat in banke	Boiled pumpkin.
Bere banke	Pumpkin is boiled and mashed. Grated coconuts and sugar are added and the mixture is baked.
Jokkob in banke	Boiled pumpkin and rice.
Rimuj	Mollusk baked and boiled.
Barulep	Coconut crab boiled or baked on hot rocks.

MARSHALLESE	ENGLISH
Raj-sol	Whale preserved with salt.
Ke-umum	Baked porpoise.
Won-umum	Turtle, baked and preserved.
Kwet-ainbat and umum	Octopus, boiled and baked.
Ninet (Ratak) or Net (Rālik)	Squids, boiled and baked.
Lupenwon - ainbat and umum	Turtle eggs, baked and boiled.
Pako	Shark, baked and boiled.
Jojo	Flying fish.
Mamo	Sardine.
Tou	Mackarel.
Mon	Red snapper.
Bwebwe	Tuna fish.
Lajabil	Bonito.
Jirul	Shellfish.
Bejiwak	Black tern.
Mejo	White tern.
Ak	Frigate bird.
Nana	Booby gannet.
Kalo	Sea gull.
Mule	Pigeon.
Kear Mot	Grey tern.
Memej	Black tern.
Jekar	Black tern.
Koak	Rail.
Kot kot	Turnstone.
Ran (Ratak) or Roñonbat (Rālik)	Wild duck.

FOODS AVAILABLE IN THE MARSHALL ISLANDS FOR THE MARSHALLESE

Stores were visited and prices collected during the time spent on Uliga, Marshall Islands to gather information about food purchasing and food availability. Imported food for native consumption was available at the Island Trading Company of Micronesia, Marshallese wholesalers, and retailers. A few organizations bought in small quantities from firms in the United States, but the Island Trading Company supplied the main bulk of food going to these stores.

The Island Trading Company of Micronesia had as its purpose the promotion of economic advancement and self-sufficiency of the inhabitants of the Trust Territory. The company fostered the development of private industry and commerce, adjusted the policies to encourage such developments and withdrew from any particular district or activity as soon as private enterprise demonstrated it could adequately meet the needs of the people.

Only a standard list of items were stocked. The items were bought from the Naval Supply Center, Naval Procurement Office, San Francisco, or other Island Trading Company channels. Purchases were made anywhere in the world, when it was to the best advantage to the company.

In general, sales prices were intended to cover all costs private enterprise would have to bear. Food supplies were sold to wholesalers, retailers, and directly to consumers; each group had a different set of food prices.

TABLE 1

FOODS AVAILABLE AT THE ISLAND TRADING COMPANY

AND PRICES AS OF MARCH, 1951

FOOD	WHOLESALE per lb.	RETAIL per lb.	CONSUMER per lb.
Rice	12 cents	12 cents	13 cents
Sugar	13 cents	14 cents	15 cents
Flour	9 cents	10 cents	11 cents
Coffee	62 cents	66 cents	72 cents
Biscuits	33 cents	35 cents	38 cents
Corned beef (12 oz. can)	57 cents/can	61 cents/can	66 cents/can
Tea	$1.13	$1.19	$1.30

TABLE 2

INDIGENOUS WAGE SCALES FOR THE MARSHALL ISLANDS

Group (I)	Apprentices	(minimum rate)	0.11 cents/hr.
Group (II)	Unskilled	(minimum rate)	0.17 cents/hr.
Group (III)	Semiskilled	(minimum rate)	0.21 cents/hr.
Group (IV)	Skilled	(minimum rate)	0.25 cents/hr.
Group (V)	Supervisors	(minimum rate)	0.29 cents/hr.
Group (VI)	Professionals	(minimum rate)	$40 per month

An average unskilled laborer receives about $28 per month. $90 per month is considered the highest salary paid to a Marshallese in Uliga.

Salary scales were low and food prices were comparable to the prices found in the United States where the wage scale is higher.

A number of Marshallese worked for the Civil Administration Unit for five and a half days of the week. Sunday was observed as the Sabbath and the Marshallese did not work. They spent most of the day in church. Food for Sunday was cooked on Saturday except in Darrit and Kwajalein where they cooked on Sunday.

The author asked about the possibility of fishing to help augment the food supply but the Marshallese felt that they did not have the time to fish and, therefore, must depend on imported canned foods. They found that getting sufficient food was an economic hardship, especially the protein foods, such as canned meats, canned fish and evaporated milk.

Marshallese stores

There were six retail stores and sixteen bakeries owned by Marshallese. The most important one was the Majuro Trading Association, a Marshallese co-operative composed of about 200 members. Some of the prices as of March, 1951 quoted by the Association were as follows:

Rice	11 cents/lb.
Soy sauce	$1.27/gal.
Sugar	13 cents/lb.
Saloon pilot cracker	33 cents/lb.
Flour	9 cents/lb.

Canned beef stew with vegetables	59 cents/#2 can
Canned evaporated milk (when available)	23 cents/#2 can

The storekeepers felt that the demand always exceeded the food supply.

Other food establishments

There were sixteen bakeries, two restaurants and a delicatessen. The bakeries sold eight-ounce loaves of bread for ten cents and an eight-ounce doughnut for five cents. They usually baked four times a week, and sold about fifty loaves a day. Bread is baked in large kerosene drums set in the coral lengthwise and the top cut away. The section which is cut out is covered with a piece of tin. A fire is made by using coconut husks and wood for fuel. Loaves of bread are put on sheets of tin and placed over the fire.

One restaurant was visited. The menu for lunch consisted of canned beef stew, boiled rice, coffee, and bread. Fish, pork or any other available food is substituted for the main dish. The daily menu does not vary except for the main dish. A plate lunch cost twenty five-cents or fifteen dollars on a monthly basis. Three meals were served every day of the week. Raw food supplies were bought from the Island Trading Company store once a month. Breakfast was served from 5:00 a. m. to 7:00 a. m.; lunch from 10:30 a. m. to 12:00 noon; and supper from 3:30 p. m. to 7:30 p. m.

Studying foods eaten, how they were eaten, and native food preparation at the school kitchen and at the labor camp, where they had communal cook-houses, gave more knowledge of diet patterns of the Marshallese. It was learned that large round doughnuts were used frequently and large amounts of sugar were always taken with tea. Such information was valuable later when interviewing subjects. For example, when tea was mentioned in the dietary intake records, the amount of sugar taken could be asked and such information could be included which might otherwise have been omitted. Finding doughnuts in the diets of the Marshallese was a surprise at first but later on inquiry found that they were a common and popular food in most of Micronesia. To have doughnuts mentioned in their dietaries became a common occurrence.

A field trip to the outlying districts furnished information about food consumption away from a naval base, foods available, types of utensils used, and other methods of food preparation.

Although a number of reports by others had been read, they did not furnish sufficient information to enable one to begin without making a preliminary survey. This preliminary residence in the community at Uliga was invaluable in that the knowledge gained about the manner of life, religion, and politics provided the necessary background information on habits and beliefs of the Marshallese.

The investigator had gained enough knowledge to be able to identify foods at sight, and had enough experience to estimate amounts of foods taken,

as most utensils used in the village were brought from a central store and they were alike. Thus, without changing the routine procedures of the villagers with experimentation, deviations from the normal were kept at a minimum so that data collected would be indicative of their daily normal consumption of food. The survey went along smoothly and was completed in a shorter time due to preliminary planning, thus keeping the natives interested in food intake records which were kept willingly. This would have been difficult to do if the survey had been an unduly long, dull, and tedious procedure.

Other factors considered in planning and organizing the survey

1. Unit of survey

In Micronesia, a family unit is different from one in our society. A household was selected as a unit for the survey. A group who lived and ate together, usually consisting of blood relatives and relatives by adoption, was considered a household group and comparable to our family unit.

2. Sampling

The selection of subjects was influenced by availability of families, distances to be covered, attitude of people towards the survey, and presence of leading members of the community who were in close touch with people and could explain to them the purposes of the survey and introduce them to the investigator.

No statistician was available to give technical aid in choosing the sample. An attempt was made to get a representative sample of families from the Jolab district of Majuro village who were within walking distance according to the random sampling plan, giving each group the same chance of being included. Roads were good and well marked so that one could travel distances by foot. Various income groups were included, such as copra workers, storekeepers, the King and others. Many age groups, males, females, lactating women, pregnant women, and children were included. Most age groups were included but there were very few of the intermediate school age group and young adults who were either at school in Uliga, or worked in government positions at Uliga.

3. Time period

A seven day period was chosen so that any variation in food patterns would be included and thus give a more accurate account of food intakes. Diet in Majuro village goes through seasonal changes as the harvesting of vegetable crops determined the food patterns. The diet was monotonous and showed very little day to day variation.

4. Interpreter

It was necessary to employ an interpreter. He was a local person who knew local foods and sources from which they were obtained. He was familiar with the cooking and eating customs of the community. This was necessary to detect any deviation from normal which may be introduced to impress the

investigator. He was aware of local habits and beliefs concerning the preparation and cooking of food so was less likely than a stranger to introduce resentment. As he was a local person, he was trusted more than an outsider and received a greater degree of co-operation from the group under survey. The techniques of interviewing and other relevant business was discussed before the survey was begun.

5. Record forms

Formal record forms were unnecessary. Informal records of the diary type were kept in bound notebooks in a uniform manner.

6. Publicity

Many means of obtaining co-operation were used such as the news items in the base newspaper about the survey which was translated into Marshallese and released to people in Majuro village. Personal visits to the King and village chiefs with gifts to explain the survey and having them pass the information on to their subjects.

III. NUTRITION SURVEY IN MAJURO VILLAGE, MAJURO ISLAND, MARSHALL ISLANDS

1. Preparation for survey in Majuro village

After the orientation period on Uliga was over, the necessary equipment, canned foods and other items, were taken to Majuro Island by Coast Guard boat.

Miss Eleanor Wilson, Protestant missionary, accompanied me to Majuro village and introduced me to the community leaders. It was very helpful to have Miss Wilson, who was respected and well-liked by the villagers, to take the investigator into a predominantly Protestant community.

There were two political groups on Majuro Island and since both groups were to be included in the study, formal calls with gifts were made to both leaders.

All this was done Saturday morning. Saturday afternoon was devoted to thoroughly cleaning the native house. An office, housekeeping and working units were set up in the house. Scales, gram and pound, and other tools for research were ready for use. The interpreter was interviewed and hired.

Church services were attended on Sunday where everyone in the community met. During the service, I was introduced to the villagers and had an opportunity to talk to them about the study and to become acquainted with them. Monday morning visits to families were begun with the interpreter.

Type and extent of waste was investigated in detail from pilot samples. In order that the accuracy of household measurements could be checked, and to obtain further information about the degree of waste and edible portions of common foods, a series of weighings were taken of common native foods. For example, data was necessary about edible portion that could be obtained from one pandanus key, the amount of drinking fluid from one immature nut, how much spoon meat could be obtained from one coconut and other similar

facts. Foods were measured and weighed on a gram scale. By determining these figures, the villagers could write down the number of various foods such as two pandanus keys or three drinking coconuts. For a few foods, which appeared most frequently on dietaries, the food eaten by a number of subjects was measured and weighed in order to arrive at a more accurate estimation of the serving size. Foods such as boiled rice, taro, and breadfruit were weighed to determine in grams the amounts recorded in household measurements of foods, such as a serving of rice in an enamel dish, coconut shell, or messkit; a roasted breadfruit, half of a breadfruit, heaping tablespoon of sugar and other food items. As stated before, since most household utensils were alike as source of supply was the same, an average weight could be used for the various foods.

Several types of fish were weighed after cooking to determine edible portions by removing wastage and refuse such as bones, head and entrails.

Households were visited at random once during their weekly period at meal time. One meal was weighed to determine in grams the amount of food consumed and also to check accuracy of food amounts as noted by subjects. Food was always served cold and it was divided as evenly as possible among the members of the household. Adults took certain portions and children (6 to 10 years of age) got about half of the adult portion.

Recipes were made up for mixed cooked dishes. Many cooked food samples were brought back to the University of Hawaii Agricultural Experiment Station for chemical food analysis which were used in interpreting and calculating the diets.

2. Routine procedure of the interview

The number interviewed in a given time depended on the distances involved, as well as on the average time taken per interview. The average number per day was about eight households. Household visits began about seven in the morning and the last visit ended about six at night. Lunch was eaten at home or with villagers when invited at meal time.

Daily visits were made to the households. On the initial visit, the investigator and household members became acquainted with each other. Several things were discussed, such as the procedure to be followed for the survey and the data to be recorded. At this time, the villager displayed dishes, spoons, cups, glasses, coconut shells and other utensils and equipment used in eating so that the investigator knew what they were reporting in terms of household measurements. Individual consumption was determined by recording individual food intake in terms of servings and household measures. Portions were given as edible portions except for certain foods which were given in numbers as mentioned before in this report. Information about the household was also recorded at this time. A day's record was to be kept in Marshallese and they were to be collected the following day. When records were collected each item was discussed in detail and anything of ambiguous nature was clarified and recorded in the notebook on the premises. Some reports were given verbally and these were recorded in the notebook, also. Each person in the household was interviewed separately. Mothers were questioned about food intakes of smaller children. All food consumed during the day including between meal feedings were recorded. Data was not recorded as meal to meal as the number of meals daily differed according to individuals. There were no set

meal hours nor any definite number of meals consumed daily.

3. Data collected

a. Basic data
   1. Kinds of foods eaten
   2. Distribution of foods among meals and between meal feedings
   3. Amounts eaten in numbers of foods, servings, or household measurements
   4. Time period for seven days

b. Information about household
   1. Composition of the family
      a. Number
      b. Sex
      c. Age to nearest year
      d. Other members of the household
      e. Names - all names used in the past
      f. Other relevant information
         1. Pregnancy
         2. Lactation
      g. Occupation

c. Example of a household for one week
   1. Information about the household
      Members of the household
      (a) Male, 40 years old, husband, copra maker
      (b) Female, 38 years old, wife, lactating woman
      (c) Female, 5 years old
      (d) Female, 3 months, 12 days old
      (e) Female, 70 years old, grandmother

   2. Food data

      40 years old man

Monday	
Rice, boiled, white	700 grams
Coconut, drinking (fluid only)	1
Breadfruit, Bukdrol, roasted	400 grams
Fish, Mouij, baked (edible portion)	100 grams
Tuesday	
Bread, white, fresh	8 ounces
Tea, black	1 cup
Sugar, white, granulated	2½ teaspoons
Rice, boiled, white	300 grams
Jawit, baked (edible portion)	300 grams
Taro, Kaliklik, boiled	500 grams
Water	1 cup
Milk, evaporated	2 teaspoons
Sugar, white, granulated	2 teaspoons
Wednesday	
Baru (little crab)	10
Rice, boiled, white	700 grams

Bread, white, fresh	4 slices
Coconut, drinking (fluid only)	1
Pandanus, raw	13 keys
Tea, black	2 cups
Sugar, white, granulated	4 teaspoons

Thursday

Rice, boiled, white	500 grams
Fish, Kuban, baked	400 grams
Tea, black	2 cups
Sugar, white, granulated	4 tablespoons
Coconut, drinking (fluid only)	2
Pandanus, raw	13 keys
Coconut, mature, meat	200 grams

Friday

Fish, Net, baked	200 grams
Bread, white, fresh	4 ounces
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons
Coconut, drinking, (fluid only)	1
Pig, roasted	100 grams
Breadfruit, Batakdak, roasted	400 grams

Saturday

Rice, boiled, white	400 grams
Breadfruit, roasted, Bukdrol	200 grams
Fish, Mouij, baked	200 grams
Coffee	2 cups
Sugar, white, granulated	4 tablespoons

Sunday

Breadfruit, Bukdrol, roasted	200 grams
Pig, roasted	100 grams
Doughnut	1
Rice, boiled, white	400 grams
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons

38 years old woman

Monday

Rice, boiled, white	700 grams
Coconut, drinking (fluid only)	1
Breadfruit, Bukdrol, roasted	400 grams
Fish, Mouij, baked	100 grams

Tuesday

Taro, Kaliklik, boiled	500 grams
Coconut, mature, meat	200 grams
Tea, black	2 cups
Pandanus, raw	3 keys

Wednesday

Rice, boiled, white	300 grams
Taro, Wan, boiled	200 grams

Coconut, drinking (fluid only)	1
Coconut, spoon meat	1
Pandanus, raw	11 keys
Tea, black	2 cups
Sugar, white, granulated	2 teaspoons

Thursday

Rice, boiled, white	500 grams
Fish, Kuban, baked	400 grams
Tea, black	2 cups
Sugar, white, granulated	4 tablespoons
Coconut, drinking (fluid only)	2
Pandanus, raw	13 keys
Coconut, mature, meat	200 grams

Friday

Fish, Net, baked	200 grams
Bread, white, fresh	4 ounces
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons

Saturday

Rice, boiled, white	400 grams
Breadfruit, Bukdrol, roasted	200 grams
Fish, Mouij, baked	200 grams
Coffee	2 cups
Sugar, white, granulated	4 tablespoons

Sunday

Breadfruit, Bukdrol, roasted	200 grams
Pig, roasted	100 grams
Doughnut	1
Rice, boiled, white	400 grams
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons

5 years old female

Monday

Rice, boiled, white	300 grams
Breadfruit, Bukdrol, roasted	200 grams
Salted fish, Mouij, boiled	50 grams

Tuesday

Fish, Jawit, baked	50 grams
Rice, boiled, white	100 grams
Sausage, pork	50 grams
Tea, black	1 cup
Sugar, white, granulated	½ teaspoon

Wednesday

Rice, boiled, white	200 grams
Pandanus, raw	5 keys
Coconut, drinking (fluid only)	1
Coconut, spoon meat	1
Tea, black	½ cup
Sugar, white, granulated	½ tablespoon

Thursday	
Rice, boiled, white	200 grams
Fish, Kuban, baked	150 grams
Pandanus, raw	4 keys
Coconut, mature, meat	50 grams
Tea, black	1 cup
Sugar, white, granulated	1 tablespoon
Friday	
Fish, Net, baked	100 grams
Bread, white, fresh	2 ounces
Coconut, drinking (fluid only)	1
Pig, roasted	100 grams
Breadfruit, Batakdak, roasted	100 grams
Saturday	
Doughnut	1
Rice, boiled, white	200 grams
Fish, Mouij, baked	100 grams
Breadfruit, Bukdrol, roasted	200 grams
Coffee	1 cup
Sugar, white, granulated	1 teaspoon
Sunday	
Breadfruit, Bukdrol, roasted	100 grams
Pig, roasted	100 grams
Doughnut	1
Rice, boiled, white	200 grams
Tea	1 cup
Sugar, white, granulated	1 tablespoon

Baby 3 months, 12 days old

Monday	
Coconut, drinking (fluid only)	4 ounces
Milk, breast	
Tuesday	
Milk, evaporated	4 ounces
Water, boiled	3 teaspoons
Milk, breast	
Wednesday	
Milk, evaporated	2 ounces
Milk, breast	
Thursday	
Milk, evaporated	2 ounces
Water, boiled	2 ounces
Milk, breast	
Water, boiled	4 ounces
Friday	
Coconut, drinking (fluid only)	8 ounces
Milk, breast	

Saturday	
Milk, evaporated	4 ounces
Water, boiled	4 ounces
Milk, breast	
Sunday	
Coconut, drinking (fluid only)	4 ounces
Milk, breast	

70 years old woman

Monday	
Rice, boiled, white	700 grams
Coconut, drinking (fluid only)	1
Breadfruit, Bukdrol, roasted	400 grams
Fish, Mouij, baked	100 grams
Tuesday	
Taro, Kaliklik, boiled	500 grams
Coconut, mature, meat	200 grams
Tea, black	1 cup
Sugar, white, granulated	2 teaspoons
Pandanus, raw	3 keys
Wednesday	
Rice, boiled, white	300 grams
Taro, Wan, boiled	200 grams
Coconut, drinking (fluid only)	1
Coconut, spoon meat	1
Pandanus, raw	11 keys
Tea, black	1 cup
Sugar, white, granulated	2 teaspoons
Thursday	
Rice, boiled, white	500 grams
Fish, Kuban, baked	400 grams
Tea, black	2 cups
Sugar, white, granulated	4 tablespoons
Coconut, drinking (fluid only)	2
Pandanus, raw	13 keys
Coconut, mature, meat	200 grams
Friday	
Fish, Net, baked	200 grams
Bread, white, fresh	4 ounces
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons
Saturday	
Rice, boiled, white	400 grams
Breadfruit, Bukdrol, roasted	200 grams
Fish, Mouij, baked	200 grams
Coffee	2 cups
Sugar, white, granulated	4 tablespoons
Sunday	
Breadfruit, Bukdrol, roasted	200 grams
Pig, roasted	100 grams
Doughnut	1
Rice, boiled, white	400 grams
Tea, black	1 cup
Sugar, white, granulated	2 tablespoons

Treatment of the dietary survey data

From the detailed dietary record of each subject, the consumption of each food was recorded, tabulated and calculated.

The calorie value and the nutrients supplied by these foods were then determined by the use of food composition tables.

The tables used were as follows:

1. Food Values of Portions Commonly Used, Bowes and Church. (1)

2. Composition of Foods. U.S.D.A. Agriculture Handbook No. 8. (2)

3. Composition of Foods Used in Far Eastern Countries. Agriculture Handbook No. 34. (3)

4. Food Values of Portions Commonly Used, Hawaii Supplement to Bowes and Church, Carey D. Miller, Marian Weaver and Stella Okita. (4)

5. Protein, Fat, Mineral and Vitamin Content of South Pacific Island Foods. Unpublished data on native foods, brought back from field by author, from the laboratories of Professor Carey D. Miller, Foods and Nutrition Department, University of Hawaii Agricultural Experiment Station, Honolulu, Hawaii. (5)

The composite cooked dishes were converted back to raw weight equivalents of ingredients used.

The calorie and nutrient values of the diet were expressed on a per person per day basis.

Assessment of adequacy of diets

To assess the adequacy of diets, appropriate standards must be used as the basis of comparison. The Recommended Daily Dietary Allowances, Revised 1948, Food and Nutrition Board, National Research Council (6), were used as standards. Since definite figures were not given for phosphorus, Sherman's standards were used (7). For fat allowances, 25% of the calories intake for each age group was taken as suggested in the report of Food Consumption Levels in the United States, Canada and the United Kingdom (8).

The average per capita intake for calories and nutrients, as determined in the survey, was compared with the average per capita recommended allowances.

Comparison of the actual intake of individuals with these allowances indicates how closely intake approaches the recommended level for calories and various nutrients for optimum health. Conclusions can then be drawn as to which persons have a dietary status less favorable than others.

RESULTS

Infants under one year of age

Intake records for infants under one year of age were collected for eight subjects. Calories and nutrient values were calculated whenever possible, however, intakes of breast feeding were not recorded. Therefore, all calculations exclude breast milk intakes.

There were three female infants on a diet of breast milk and boiled water. One subject was two weeks old; another, one month old; and the third, six months old.

One female infant of three months had the following foods in her diet: breast milk, boiled water, evaporated milk, and drinking fluid of immature coconuts. The daily intake was estimated at 81 grams of coconut fluid, 2 ozs. of evaporated milk diluted with 2 ozs. of boiled water, and 2 ozs. of boiled water. Calculated daily caloric and nutrient values were as follows: calories, 87; protein, 4 gms.; fat, 4.4 gms.; carbohydrate, 7.94 gms.; calcium, 151.11 mgs.; phosphorus, 112.64 mgs.; iron, 0.19 mgs.; vitamin A, 219.4 I. U.; thiamine, 27.4 mcgs.; riboflavin, 205.58 mcgs.; niacin, 0.11 mgs.; and ascorbic acid, 32 mgs.

One female infant of six months of age had for a day's intake, breadfruit either baked or roasted, 16 mgs.; evaporated milk, 4 ozs. diluted with 4 ozs. of boiled water; coconut sap, 56 gms.; boiled water, 4 ozs.; and breast milk. Calculated daily caloric and nutrient values were as follows: calories, 144.88; protein, 5.34 gms.; fat, 5.91 gms.; carbohydrate, 15.19 gms.; calcium, 180.94 mgs.; phosphorus, 155.10 mgs.; iron, 0.47 mgs.; vitamin A, 292.6 I. U.; thiamine, 53.34 mcgs.; riboflavin, 280.93 mcgs.; niacin, 0.54 mgs.; and ascorbic acid, 12.96 mgs.

One female infant of eight months had a diet of breast milk, evaporated milk, boiled water, boiled white rice, bread, tea with sugar, and soda crackers. Taking a day's intake, consumption was estimated at 4 ozs. of evaporated milk diluted with 4 ozs. of water; 4 ozs. of boiled water; 15 gms. of boiled rice; 15 gms. of white bread; 1 cup of tea with 1/2 teaspoon of sugar; and breast milk. Calculated daily caloric and nutrient values were as follows: calories, 84.72; protein, 1.76 gms.; fat, 1.05 gms.; carbohydrate, 16.63 gms.; calcium, 3.52 mgs.; phosphorus, 18.56 mgs.; iron 0.28 mgs.; vitamin A, 1.47 I. U.; thiamine, 30.41 mcgs.; riboflavin, 13.65 mcgs.; niacin, 0.23 mgs.; and a trace of ascorbic acid.

The daily estimated consumption of one male infant of eight months: breast milk; evaporated milk, 5 ozs. diluted with 5 ozs. of boiled water; boiled water, 8 ozs; and roasted breadfruit, 30 gms. Calculated daily caloric and nutrient values were as follows: calories, 278.4; protein, 12.89 gms.; fat, 14.14 gms.; carbohydrate, 25.23 gms.; calcium, 441.06 mgs.; phosphorus, 363.68 mgs.; iron, 0.66 mgs.; vitamin A 713.1 I. U.; thiamine, 117.73 mcgs.; riboflavin, 660.58 mcgs.; niacin, 0.76 mgs.; and 2.16 mgs. ascorbic acid.

One male infant of eleven months had the following foods in his dietary: breadfruit, roasted; boiled pandanus keys; coconut embryos;

drinking fluid of immature coconuts; boiled white rice; ripe bananas; white bread; doughnuts; soda crackers; limes; white granulated sugar; and baked or boiled fish. The daily estimated intake was as follows: breadfruit roasted, 350 gms.; boiled pandanus keys, 50 gms.; coconut embryos, 150 gms., fluid of immature coconuts, 100 gms.; boiled white rice, 150 gms.; and ripe bananas, 60 gms. Calculated daily nutrient intakes were as follows: calories, 944.43; protein, 23.06 gms.; fat, 6.92 gms.; carbohydrate, 196.99 gms.; calcium, 180.81 mgs.; phosphorus, 433-36 mgs.; iron, 10.96 mgs.; vitamin A, 1239.98 I. U.; thiamine, 676.10 mcgs.; riboflavin, 524.22 mcgs.; niacin, 8.56 mgs.; and ascorbic acid, 17.26 mgs.

Table 3 shows the daily quantities of various nutrients per person and comparison with NRC allowances of one hundred sixty-one subjects from the ages of 1 through 70 years of age.

There were forty-eight children, ages one through twelve years of age; forty-six males, ages thirteen through 70 years of age; and sixty-seven females, ages one through 70 years of age; included among the adult females are pregnant and lactating women. They are divided into different age groups, giving the number of subjects in each group, sex, range of each nutrient, number of subjects in each group, average NRC allowances and number below allowances and percent of subjects below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin and ascorbic acid.

1. Calories

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 406 to 1304 calories, and the average per person was 823 calories. The average figure was 68% of the NRC allowances of 1200 calories. Twenty-two subjects or 92% were below allowances and two subjects or 8% were above allowances.

Table 3.

Dietary Studies of the Marshallese of Majuro Village, Majuro Atoll, Marshall Islands by Mary Murai

Daily Quantities of Various Nutrients per Person
and Comparison with National Research Council Allowances

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	N.R.C. allowances	Number below allowances	Percent below allowances
Calories									
1-3	24	M/F	406-1304	< 500	3	823	1200	22	92
				500-1499	21				
4-6	12	M/F	471-1635	< 500	1	1096	1600	11	92
				500-1499	10				
				1500-2499	1				
7-9	6	M/F	1095-1827	1000-1999	6	1269	2000	6	100
10-12	6	M/F	1193-1913	1000-1999	6	1577	2500	6	100
13-15	3	M	597-1910	500-1499	1	1385	3200	3	100
				1500-2499	2				
13-15	3	F	1469-1521	1000-1999	3	1487	2600	3	100
16-20	2	M	1186-3294	1000-1999	1	2240	3800	2	100
				3000-3999	1				
16-20	4	F	972-1703	500-1499	3	1323	2400	4	100
				1700-2699	1				
21-60	33	M	407-2187	< 500	1	1469	3000	33	100
				500-1499	17				
				1500-2499	15				
21-60	36	F	499-2483	< 500	1	1365	2400	35	97
				500-1499	22				
				1500-2499	13				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
61-70	8	M	640-1684	500-1499	4	1302	2400	8	100
				1500-2499	4				
61-70	9	F	368-1829	<500	1	1197	2000	9	100
				500-1499	5				
				1500-2499	3				
Pregnant women	4	F	714-1375	500-1499	4	1013	2400	4	100
Lactating women	11	F	1081-2078	1000-1999	9	1695	3000	11	100
				2000-2999	2				
Protein (gm.)									
1-3	24	M≠F	5-49	<20	11	26	40	21	88
				20-39	10				
				40-59	3				
4-6	12	M≠F	14-91	<20	2	42	50	8	67
				20-39	5				
				40-59	3				
				90-109	2				
7-9	6	M≠F	39-64	20-39	1	52	60	3	50
				40-59	2				
				60-79	3				
10-12	6	M≠F	35-88	30-49	1	62	70	5	83
				50-69	4				
				80-109	1				
13-15	3	M	23-80	20-39	1	49	85	3	100
				40-59	1				
				80-109	1				
13-15	3	F	52-69	50-69	3	59	80	3	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	2	M	42-142	40-59	1	92	100	1	50
				140-159	1				
16-20	4	F	28-81	20-39	2	52	75	3	75
				60-79	1				
				80-109	1				
21-60	33	M	8-134	<20	3	54	70	27	82
				20-39	9				
				40-59	10				
				60-79	8				
				120-139	3				
21-60	36	F	8-85	<20	5	47	60	26	72
				20-39	7				
				40-59	14				
				60-79	8				
				80-99	2				
61-70	8	M	23-50	20-39	3	42	70	8	100
				40-59	5				
61-70	9	F	13-76	<20	3	38	60	7	78
				20-39	2				
				40-59	2				
				60-79	2				
Pregnant women	4	F	20-63	20-39	3	32	85	4	100
				60-79	1				
Lactating women	11	F	34-88	30-49	2	62	100	11	100
				50-69	6				
				70-89	3				
Fat (gm.)									
1-3	24	M/F	1-37	<20	22	13	33	23	96
				20-49	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
4-6	12	M/F	8-50	< 20	7	21	44	11	92
				20-49	4				
				50-79	1				
7-9	6	M/F	10-36	< 20	3	21	56	6	100
				20-49	3				
10-12	6	M/F	21-52	20-49	5	30	69	6	100
				50-79	1				
13-15	3	M	17-48	< 20	2	28	89	3	100
				40-79	1				
13-15	3	F	17-30	< 20	1	25	72	3	100
				20-49	2				
16-20	2	M	5-60	< 20	1	32	105	2	100
				60-89	1				
16-20	4	F	3-28	< 20	3	15	67	4	100
				20-49	1				
21-60	33	M	2-95	< 20	16	24	83	32	97
				20-49	16				
				90-119	1				
21-60	36	F	2-50	< 20	10	23	67	35	97
				20-49	26				
61-70	8	M	3-32	< 20	5	16	67	8	100
				20-49	3				
61-70	9	F	2-34	< 20	5	19	56	9	100
				20-49	4				
Pregnant women	4	F	2-19	< 20	4	8	67	4	100
Lactating women	11	F	10-44	< 20	3	27	83	11	100
				20-49	8				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Calcium (mg.)									
1-3	24	M/F	48-647	< 200	14	229	1000	24	100
				200-399	7				
				500-699	3				
4-6	12	M/F	112-627	< 200	4	303	1000	12	100
				200-399	4				
				400-599	3				
				600-799	1				
7-9	6	M/F	129-1028	< 200	1	534	1000	4	67
				200-399	2				
				400-599	1				
				1000-1299	2				
10-12	6	M/F	112-1028	<200	1	486	1200	6	100
				200-399	1				
				400-599	3				
				1000-1299	1				
13-15	3	M	188-509	< 200	1	313	1400	3	100
				200-399	1				
				400-599	1				
13-15	3	F	150-714	< 200	1	442	1300	3	100
				400-599	1				
				700-999	1				
16-20	2	M	289-690	200-399	1	489	1400	2	100
				600-799	1				
16-20	4	F	191-375	< 200	1	277	1000	4	100
				200-399	3				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
21-60	33	M	92-1029	< 200	6	390	1000	32	97
				200-399	10				
				400-599	13				
				600-799	2				
				800-999	1				
				1000-1199	1				
21-60	36	F	112-799	< 200	4	363	1000	36	100
				200-399	19				
				400-599	9				
				600-799	4				
61-70	8	M	145-768	< 200	2	308	1000	8	100
				200-399	4				
				400-599	1				
				600-799	1				
61-70	9	F	177-662	< 200	3	375	1000	9	100
				200-399	4				
				400-599	1				
				600-799	1				
Pregnant women	4	F	107-319	< 200	2	205	1500	4	100
				200-399	2				
Lactating women	11	F	213-667	200-399	4	466	2000	11	100
				400-599	4				
				600-799	3				
Phosphorus (mg.)									
1-3	24	M/F	157-868	< 200	3	404	1000	24	100
				200-399	12				
				400-599	5				
				600-799	2				
				800-999	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
4-6	12	M/F	218-928	200-399	3	572	1000	12	100
				400-599	4				
				600-799	2				
				800-999	3				
7-9	6	M/F	466-1125	400-599	3	732	1200	6	100
				800-999	2				
				1000-1999	1				
10-12	6	M/F	481-1745	400-599	1	925	1200	5	83
				600-799	1				
				800-999	3				
				1500-1699	1				
13-15	3	M	302-752	302-500	1	552	1320	3	100
				602-752	2				
13-15	3	F	572-782	500-699	2	655	1200	3	100
				700-899	1				
16-20	2	M	673-2422	600-799	1	1547	1320	1	50
				>2000	1				
16-20	4	F	360-1911	300-499	1	867	1200	2	50
				700-899	1				
				>1200	2				
21-60	33	M	299-1784	200-399	5	744	1320	30	91
				400-599	9				
				600-799	9				
				800-999	6				
				1200-1399	2				
				>1400	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
21-60	36	F	32-1704	< 200	1	661	1320	35	97
				200-399	2				
				400-599	10				
				600-799	16				
				800-999	5				
				1200-1399	1				
				>1400	1				
61-70	8	M	360-986	200-399	2	601	1320	8	100
				400-599	3				
				600-799	2				
				800-999	1				
61-70	9	F	313-1319	200-399	3	582	1320	9	100
				400-599	3				
				600-799	2				
				1200-1399	1				
Pregnant women	4	F	287-810	200-399	3	451	1800	4	100
				800-999	1				
Lactating women	11	F	597-1097	400-599	1	840	1800	11	100
				600-799	4				
				800-999	3				
				1000-1199	3				
Iron (mg.)									
1-3	24	M/F	1-12	< 5	7	6	7	15	62
				5-9	13				
				10-14	4				
4-6	12	M/F	3-11	< 5	2	8	8	4	33
				5-9	9				
				10-14	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
7-9	6	M/F	5-17	5-9 10-14 >15	3 2 1	10	10	3	50
10-12	6	M/F	8-15	5-9 10-14 >15	1 4 1	11	12	4	67
13-15	3	M	5-11	5-9 10-14	2 1	8	15	3	100
13-15	3	F	6-12	5-9 10-14	2 1	9	15	3	100
16-20	2	M	8-27	5-9 >15	1 1	17	15	1	50
16-20	4	F	5-17	5-9 10-14 >15	1 1 2	6	15	2	50
21-60	33	M	4-19	< 5 5-9 10-14 > 15	3 11 10 9	10	12	21	64
21-60	36	F	4-18	< 5 5-9 10-14 > 15	4 13 16 3	10	12	24	67
61-70	8	M	5-15	5-9 10-14 >15	5 2 1	8	12	6	75
61-70	9	F	5-28	< 5 5-9 10-14 >15	1 4 2 2	11	12	7	78

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Pregnant women	4	F	4-10	< 5	1	7	15	4	100
				5-9	2				
				10-14	1				
Lactating women	11	F	7-17	5-9	2	12	15	8	73
				10-14	6				
				>15	3				
Vitamin A (I.U.)									
1-3	24	M/F	29-6569	< 499	9	1404	2000	20	83
				500-999	6				
				1000-1999	5				
				>2000	4				
4-6	12	M/F	52-9346	< 499	5	2019	2500	10	83
				500-999	3				
				1000-1999	1				
				>2000	3				
7-9	6	M/F	77-10231	< 499	4	3508	3500	4	67
				>2000	2				
10-12	6	M/F	118-10230	<499	4	2550	4500	5	83
				>2000	2				
13-15	3	M	88-1781	< 499	1	901	5000	3	100
				500-999	1				
				1000-1999	1				
13-15	3	F	79-824	< 499	2	332	5000	3	100
				500-999	1				
16-20	2	M	140-3458	< 499	1	1799	6000	1	50
				>2000	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
16-20	4	F	138-2853	<499	1	1119	5000	4	100
				500-999	2				
				>2000	1				
21-60	33	M	83-12067	< 499	20	1307	5000	30	91
				500-999	7				
				1000-1999	1				
				>2000	5				
21-60	36	F	72-10231	< 499	19	1524	5000	32	89
				500-999	6				
				1000-1999	3				
				>2000	8				
61-70	8	M	74-1865	< 499	6	436	5000	8	100
				500-999	1				
				1000-1999	1				
61-70	9	F	82-7231	< 499	5	1375	5000	8	89
				1000-1999	3				
				>2000	1				
Pregnant women	4	F	209-1730	< 499	1	1040	6000	2	50
				500-999	1				
				1000-1999	2				
Lactating women	11	F	148-8693	< 499	3	2499	8000	10	91
				500-999	3				
				1000-1999	1				
				>2000	4				
Thiamine (mcg.)									
1-3	24	M/F	124-1192	< 200	1	503	600	18	75
				200-499	12				
				500-799	9				
				800-1099	1				
				1100-1399	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
4-6	12	M/F	380-1064	200-499	5	642	800	9	75
				500-799	4				
				800-1099	3				
7-9	6	M/F	284-1259	200-499	3	631	1000	5	83
				500-799	1				
				800-1199	1				
				1100-1399	1				
10-12	6	M/F	417-1221	200-499	1	801	1200	5	83
				500-799	2				
				800-1099	2				
				1100-1399	1				
13-15	3	M	377-1435	200-499	1	939	1500	3	100
				800-1099	1				
				1400-1699	1				
13-15	3	F	708-772	500-999	3	745	1300	3	100
16-20	2	M	721-2109	721	1	1415	1700	1	50
				2109	1				
16-20	4	F	452-1021	200-499	1	801	1200	4	100
				500-799	1				
				800-1099	2				
21-60	33	M	431-2045	200-499	3	944	1500	28	85
				500-799	13				
				800-1099	8				
				1100-1399	3				
				1400-1699	4				
				>1500	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
21-60	36	F	296-2090	200-499	7	809	1200	31	86
				500-799	14				
				800-1099	10				
				1100-1399	3				
				>1500	2				
61-70	8	M	447-1875	200-499	2	839	1200	7	88
				500-799	3				
				800-1099	2				
				>1500	1				
61-70	9	F	345-1494	200-499	2	683	1000	8	89
				500-799	6				
				1400-1699	1				
Pregnant women	4	F	546-933	500-799	3	718	1500	4	100
				800-1099	1				
Lactating women	11	F	121-1910	<200	1	876	1500	10	91
				500-799	5				
				800-1099	1				
				1100-1399	3				
				>1500	1				
Riboflavin (mcg.)									
1-3	24	M/F	99-964	<500	18	409	900	23	96
				500-799	5				
				800-1099	1				
4-6	12	M/F	221-700	<500	9	439	1200	12	100
				500-799	3				
7-9	6	M/F	365-863	<500	3	563	1500	6	100
				500-799	2				
				800-1099	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
10-12	6	M/F	471-831	< 500	3	621	1800	6	100
				500-799	2				
				800-1099	1				
13-15	3	M	320-877	< 500	1	622	2000	3	100
				500-799	1				
				800-1099	1				
13-15	3	F	459-653	< 500	1	568	2000	3	100
				500-799	2				
16-20	2	M	684-1583	500-799	1	1133	2500	2	100
				>1500	1				
16-20	4	F	458-832	< 500	2	637	1800	4	100
				500-799	1				
				800-1099	1				
21-60	33	M	367-1477	< 500	9	726	1800	33	100
				500-799	15				
				800-1099	3				
				1100-1399	5				
				1400-1699	1				
21-60	36	F	375-1318	< 500	12	648	1500	36	100
				500-799	18				
				800-1099	4				
				1100-1399	2				
61-70	8	M	351-1150	< 500	3	619	1800	8	100
				500-799	4				
				1100-1399	1				
61-70	9	F	383-958	< 500	5	550	1500	9	100
				500-799	3				
				800-1099	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Pregnant women	4	F	262-770	< 500	2	485	2500	4	100
				500-799	2				
Lactating women	11	F	384-1293	< 500	1	786	3000	11	100
				500-799	6				
				800-1099	3				
				1100-1399	1				
Niacin (mg.)									
1-3	24	M/F	3-14	< 10	23	11	6	8	33
				10-19	1				
4-6	12	M/F	6-16	< 10	10	9	8	5	42
				10-19	2				
7-9	6	M/F	10-15	10-19	6	12	10	0	0
10-12	6	M/F	9-17	< 10	2	12	10	2	33
				10-19	4				
13-15	3	M	9-18	< 10	1	13	15	2	67
				10-19	2				
13-15	3	F	11-14	10-19	3	12	13	2	67
16-20	2	M	9-25	< 10	1	17	17	1	50
				20-29	1				
16-20	4	F	8-12	< 10	1	10	12	3	75
				10-19	3				
21-60	33	M	7-40	< 10	7	13	15	23	70
				10-19	21				
				20-29	4				
				40-49	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
21-60	36	F	7-20	< 10	11	12	12	17	47
				10-19	24				
				20-29	1				
61-70	8	M	8-15	< 10	3	12	12	3	38
				10-19	5				
61-70	9	F	7-15	< 10	5	10	10	4	44
				10-19					
Pregnant women	4	F	6-11	< 10	3	8	15	4	100
				10-19	1				
Lactating women	11	F	10-21	10-19	9	16	15	5	45
				20-29	2				
Ascorbic Acid (mg.)									
1-3	24	M/F	3-114	< 10	13	20	35	20	83
				10-29	6				
				30-49	3				
				> 50	2				
4-6	12	M/F	1-78	< 10	5	30	50	8	67
				10-29	2				
				30-49	1				
				> 50	4				
7-9	6	M/F	5-47	< 10	3	19	60	6	100
				10-29	1				
				30-49	2				
10-12	6	M/F	6-57	< 10	2	26	75	6	100
				10-29	2				
				30-49	1				
				> 50	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
13-15	3	M	6-88	< 10	2	33	90	3	100
				> 50	1				
13-15	3	F	3-9	< 10	3	6	80	3	100
16-20	2	M	8-32	< 10	1	20	100	2	100
				30-49	1				
16-20	4	F	7-47	< 10	2	10	80	4	100
				10-29	1				
				30-49	1				
21-60	33	M	3-88	< 10	22	14	75	32	97
				10-29	6				
				30-49	3				
				> 50	2				
21-60	36	4	4-88	< 10	21	13	70	35	97
				10-29	12				
				30-49	1				
				> 50	2				
61-70	8	M	7-34	< 10	6	11	75	8	100
				10-29	1				
				30-49	1				
61-70	9	F	4-32	< 10	4	13	70	9	100
				10-29	4				
				30-49	1				
Pregnant women	4	F	6-18	< 10	3	9	100	4	100
				10-29	1				
Lactating women	11	F	5-71	< 10	6	17	150	11	100
				10-29	3				
				> 50	2				

For twelve male and female subjects, 4 to 6 years of age, the range was from 471 to 1635 calories, and the average per person was 1096 calories. The average figure was 68% of the NRC allowances of 1600 calories. Eleven subjects or 92% were below allowances and one subject or 8% was above the allowance.

For six male and female subjects, 7 to 9 years of age, the range was from 1095 to 1827 calories, and the average per person was 1269 calories. The average figure was 63% of the NRC allowances of 2000 calories. Six subjects or 100% were below allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 1193 to 1913 calories, and the average per person 1577 calories. The average figure was 63% of the NRC allowances of 2500 calories. Six subjects or 100% were below allowances.

For three male subjects, 13 to 15 years of age, the range was from 597 to 1910 calories, and the average per person was 1385 calories. The average figure was 43% of the NRC allowances of 3200 calories. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 1469 to 1521 calories, and the average per person was 1487 calories. The average figure was 57% of the NRC allowances of 2600 calories. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 1186 to 3294 calories, and the average per person was 2240 calories. The average figure was 59% of the NRC allowances of 3800 calories. Two subjects or 100% were below allowances.

For four female subjects, 16 to 20 years of age, the range was from 972 to 1703 calories, and the average per person was 1323 calories. The average figure was 55% of the NRC allowances of 2400 calories. Four subjects or 100% were below allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 407 to 2187 calories, and the average per person was 1469 calories. The average figure was 49% of the NRC allowances of 3000 calories. Thirty-three subjects or 100% were below allowances.

For thirty-six female subjects, 21 to 60 years of age, the range was from 499 to 2483 calories, and the average per person was 1365 calories. The average figure was 57% of the NRC allowances of 2400 calories. Thirty-five subjects or 97% were below allowances and one subject or 3% was above the allowance.

For eight male subjects, 61 to 70 years of age, the range was from 640 to 1684 calories, and the average per person was 1302 calories. The average figure was 54% of the NRC allowances of 2400 calories. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 368 to 1829 calories, and the average per person was 1197 calories. The average figure was 60% of the NRC allowances of 2000 calories. Nine subjects

or 100% were below allowances.

For four female subjects, pregnant women, the range was from 714 to 1375 calories, and the average per person was 1013 calories. The average figure was 42% of the NRC allowances of 2400 calories. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 1081 to 2078 calories, and the average per person was 1695 calories. The average figure was 56% of the NRC allowances of 3000 calories. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred fifty-seven subjects or 97% were below allowances and four subjects or 3% were above allowances.

2. Protein

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 5 to 49 grams, and the average per person was 26 gms. The average figure was 65% of the NRC allowances of 40 gms. Twenty-one or 88% were below allowances and three subjects or 12% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 14 to 91 gms., and the average per person was 42 gms. The average figure was 84% of the NRC allowances of 50 gms. Eight subjects or 67% were below allowances and four subjects or 33% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 39 to 64 gms., and the average per person was 52 gms. The average figure was 87% of the NRC allowances of 60 gms. Three subjects or 50% were below allowances and three subjects or 50% were above allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 35 to 88 gms., and the average per person was 62 gms. The average figure was 88% of the NRC allowances of 70 gms. Five subjects or 83% were below allowances and one subject or 17% was above the allowance.

For three male subjects, 13 to 15 years of age, the range was from 23 to 80 gms., and the average per person was 49 gms. The average figure was 58% of the NRC allowances of 85 gms. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was 52 to 69 gms., and the average per person was 59 gms. The average figure was 74% of the NRC allowances of 80 gms. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 42 to 142 gms., and the average per person was 92 gms. The average figure was 92% of the NRC allowances of 100 gms. One subject or 50% was below the allowance and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 28 to 81 gms., and the average per person was 52 gms. The average figure

was 69% of the NRC allowances of 75 gms. Three subjects or 75% were below allowances and one subject or 25% was above the allowance.

For thirty-three male subjects, 21 to 60 years of age, the range was from 8 to 134 gms., and the average per person was 54 gms. The average figure was 77% of the NRC allowances of 70 gms. Twenty-seven subjects or 82% were below allowances and six subjects or 18% were above allowances.

For thirty-six female subjects, 21 to 60 years of age, the range was from 8 to 85 gms., and the average per person was 47 gms. The average figure was 78% of the NRC allowances of 60 gms. Twenty-six subjects or 72% were below allowances and ten or 28% were above allowances.

For eight male subjects, 61 to 70 years of age, the range was from 23 to 50 gms., and the average per person was 42 gms. The average figure was 60% of the NRC allowances of 70 gms. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 13 to 76 gms., and the average per person was 38 gms. The average figure was 63% of the NRC allowances of 60 gms. Seven subjects or 78% were below allowances and two or 22% were above allowances.

For four female subjects, pregnant women, the range was from 20 to 63 gms., and the average per person was 32 gms. The average figure was 38% of the NRC allowances of 85 gms. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 34 to 88 gms., and the average per person was 62 gms. The average figure was 62% of the NRC allowances of 100 gms. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred thirty or 81% were below allowances and thirty-one or 19% were above allowances.

3. Fat

For twenty-four male and female subjects, 1 to 3 years of age, the range was from one to 37 gms., and the average per person was 13 gms. The average figure was 39% of the NRC allowances of 33 gms. Twenty-three subjects or 96% were below allowances and one subject or 4% was above the allowance.

For twelve male and female subjects, 4 to 6 years of age, the range was from 8 to 50 gms., and the average per person was 21 gms. The average figure was 48% of the NRC allowances of 44 gms. Eleven subjects or 92% were below allowances and one subject or 8% was above the allowance.

For six male and female subjects, 7 to 9 years of age, the range was from 10 to 36 gms., and the average per person was 21 gms. The average figure was 37% of the NRC allowances of 56 gms. Six subjects or 100% were below allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 21 to 52 gms., and the average per person was 30 gms. The average figure was 43% of the NRC allowances of 69 gms. Six subjects or 100% were

below allowances.

For three male subjects, 13 to 15 years of age, the range was from 17 to 48 gms., and the average per person was 28 gms. The average figure was 31% of the NRC allowances of 89 gms. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was 17 to 30 gms., and the average per person was 25 gms. The average figure was 35% of the NRC allowances of 72 gms. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 5 to 60 gms., and the average per person was 32 gms. The average figure was 30% of the NRC allowances of 105 gms. Two subjects or 100% were below allowances.

For four female subjects, 16 to 20 years of age, the range was from 3 to 28 gms., and the average per person was 15 gms. The average figure was 22% of the NRC allowances of 67 gms. Four subjects or 100% were below allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 2 to 95 gms., and the average per person was 24 gms. The average figure was 29% of the NRC allowances of 83 gms. Thirty-two subjects or 97% were below allowances and one subject or 3% was above the allowance.

For thirty-six female subjects, 21 to 60 years of age, the range was from 2 to 50 gms., and the average per person was 23 gms. The average figure was 34% of the NRC allowances of 67 gms. Thirty-five subjects or 97% were below allowances and one subject or 3% was above the allowance.

For eight male subjects, 61 to 70 years of age, the range was from 3 to 32 gms., and the average per person was 16 gms. The average figure was 24% of the NRC allowances of 67 gms. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 2 to 34 gms., and the average per person was 19 gms. The average figure was 34% of the NRC allowances of 56 gms. Nine subjects or 100% were below allowances.

For four female subjects, pregnant women, the range was from 2 to 19 gms., and the average per person was 8 gms. The average figure was 12% of the NRC allowances of 67 gms. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 10 to 44 gms., and the average per person was 27 gms. The average figure was 32% of the NRC allowances of 83 gms. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred fifty-seven subjects or 97% were below allowances and four subjects or 3% were above allowances.

4. Calcium

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 48 to 647 mgs., and the average per person was 229 mgs. The average figure was 23% of the NRC allowances of 1000 mgs. Twenty-four subjects or 100% were below allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 112 to 627 mgs., and the average per person was 303 mgs. The average figure was 30% of the NRC allowances of 1000 mgs. Twelve subjects or 100% were below allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 129 to 1028 mgs., and the average per person was 534 mgs. The average figure was 53% of the NRC allowances of 1000 mgs. Four subjects or 67% were below allowances and two subjects or 33% were above allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 112 to 1028 mgs., and the average per person was 486 mgs. The average figure was 40% of the NRC allowances of 1200 mgs. Six subjects or 100% were below allowances.

For three male subjects, 13 to 15 years of age, the range was from 188 to 509 mgs., and the average per person was 1400 mgs. The average figure was 22% of the NRC allowances of 1400 mgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 150 to 714 mgs., and the average per person was 442 mgs. The average figure was 34% of the NRC allowances of 1300 mgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 289 to 690 mgs., and the average per person was 489 mgs. The average figure was 35% of the NRC allowances of 1400 mgs. Two subjects or 100% were below allowances.

For four female subjects, 16 to 20 years of age, the range was from 191 to 375 mgs., and the average per person was 277 mgs. The average figure was 28% of the NRC allowances of 1000 mgs. Four subjects or 100% were below allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 92 to 1029 mgs., and the average per person was 390 mgs. The average figure was 39% of the NRC allowances of 1000 mgs. Thirty-two subjects or 97% were below allowances and one subject or 3% was above the allowance.

For thirty-six female subjects, 21 to 60 years of age, the range was from 112 to 799 mgs., and the average per person was 363 mgs. The average figure was 36% of the NRC allowances of 1000 mgs. Thirty-six subjects or 100% were below allowances.

For eight male subjects, 61 to 70 years of age, the range was from 145 to 768 mgs., and the average per person was 308 mgs. The average figure was 31% of the NRC allowances of 1000 mgs. Eight subjects or 100% were

below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 177 to 662 mgs., and the average figure was 375 mgs. The average figure was 37% of the NRC allowances of 1000 mgs. Nine subjects or 100% were below allowances.

For four female subjects, pregnant women, the range was from 107 to 319 mgs., and the average per person was 205 mgs. The average figure was 20% of the NRC allowances of 1500 mgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 213 to 667 mgs., and the average per person was 466 mgs. The average figure was 23% of the NRC allowances of 2000 mgs. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred fifty-eight subjects or 98% were below allowances and three subjects or 2% were above allowances.

5. Phosphorus

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 157 to 868 mgs., and the average per person was 404 mgs. The average figure was 40% of the NRC allowances of 1000 mgs. Twenty-four subjects or 100% were below allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 218 to 928 mgs., and the average per person was 572 mgs. The average figure was 57% of the NRC allowances of 1000 mgs. Twelve subjects or 100% were below allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 466 to 1125 mgs. The average figure was 61% of the NRC allowances of 1200 mgs. Six subjects or 100% were below allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 481 to 1745 mgs., and the average per person was 925 mgs. The average figure was 77% of the NRC allowances of 1200 mgs. Five subjects or 83% were below allowances and one subject or 17% was above the allowance.

For three male subjects, 13 to 15 years of age, the range was from 302 to 752 mgs., and the average per person was 552 mgs. The average figure was 42% of the NRC allowances of 1320 mgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 572 to 782 mgs., and the average per person was 655 mgs. The average figure was 54% of the NRC allowances of 1200 mgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 673 to 2422 mgs., and the average per person was 117% of the NRC allowances of 1320 mgs. One subject or 50% was below the allowance and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 360 to 1911 mgs., and the average per person was 867 mgs. The average figure was 72% of the NRC allowances of 1200 mgs. Two subjects or 50% were below allowances and two subjects or 50% were above the allowance.

For thirty-three male subjects, 21 to 60 years of age, the range was from 299 to 1784 mgs., and the average per person was 744 mgs. The average figure was 56% of the NRC allowances of 1320 mgs. Thirty subjects or 91% were below allowances and three subjects or 9% were above allowances.

For thirty-six female subjects, 21 to 60 years of age, the range was from 32 to 1704 mgs., and the average per person was 661 mgs. The average figure was 50% of the NRC allowances of 1320 mgs. Thirty-five or 97% were below allowances and one subject or 3% was above the allowance.

For eight male subjects, 61 to 70 years of age, the range was from 360 to 986 mgs., and the average per person was 601 mgs. The average figure was 45% of the NRC allowances of 1320 mgs. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 313 to 1319 mgs., and the average per person was 582 mgs. The average figure was 44% of the NRC allowances of 1320 mgs. Nine subjects or 100% were below allowances.

For four female subjects, pregnant women, the range was from 287 to 810 mgs., and the average per person was 451 mgs. The average figure was 25% of the NRC allowances of 1800 mgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 597 to 1097 mgs., and the average per person was 840 mgs. The average figure was 47% of the NRC allowances of 1800 mgs. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred fifty-three subjects or 95% were below allowances and eight subjects or 5% were above allowances.

6. Iron

For twenty-four male and female subjects, 1 to 2 years of age, the range was from 1 to 12 mgs., and the average per person was 6 mgs. The average figure was 86% of the NRC allowances of 7 mgs. Fifteen subjects or 62% were below allowances, and nine subjects or 38% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 3 to 11 mgs., and the average per person was 8 mgs. The average figure was 100% of the NRC allowances of 8 mgs. Four subjects or 33% were below allowances and eight subjects or 67% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 5 to 17 mgs., and the average per person was 10 mgs. The average figure was 100% of the NRC allowances of 10 mgs. Three subjects or 50% were below allowances, and three subjects or 50% were above allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 8 to 15 mgs., and the average per person was 11 mgs. The average figure was 92% of the NRC allowances of 12 mgs. Four subjects or 67% were below allowances and two subjects or 33% were above allowances.

For three male subjects, 13 to 15 years of age, the range was from 5 to 11 mgs., and the average per person was 8 mgs. The average figure was 53% of the NRC allowances of 15 mgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 6 to 12 mgs., and the average per person was 9 mgs. The average figure was 60% of the NRC allowances of 15 mgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 8 to 27 mgs., and the average per person was 17 mgs. The average figure was 113% of the NRC allowances of 15 mgs. One subject or 50% was below the allowance and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 5 to 17 mgs., and the average per person was 6 mgs. The average figure was 40% of the NRC allowances of 15 mgs. Two subjects or 50% were below allowances and two subjects or 50% were above allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 4 to 19 mgs., and the average per person was 10 mgs. The average figure was 83% of the NRC allowances of 12 mgs. Twenty one subjects or 64% were below allowances and twelve subjects or 36% were above allowances.

For thirty six female subjects, 21 to 60 years of age, the range was from 4 to 18 mgs., and the average was 10 mgs. The average figure was 83% of the NRC allowances of 12 mgs. Twenty four subjects or 67% were below allowances and twelve subjects or 33% were above allowances.

For eight male subjects, 61 to 70 years of age, the range was from 5 to 15 mgs., and the average per person was 8 mgs. The average figure was 67% of the NRC allowances of 12 mgs. Six subjects or 75% were below allowances and two subjects or 25% were above allowances.

For nine female subjects, 61 to 70 years of age, the range was from 5 to 28 mgs., and the average per person was 11 mgs. The average figure was 92% of the NRC allowances of 12 mgs. Seven subjects or 78% were below allowances and two subjects or 22% were above allowances.

For four female subjects, pregnant women, the range was from 4 to 10 mgs., and the average per person was 7 mgs. The average figure was 47% of the NRC allowances of 15 mgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 7 to 17 mgs., and the average per person was 12 mgs. The average figure was 80% of the NRC allowances of 15 mgs. Eight subjects or 73% were below allowances and three subjects or 27% were above allowances.

For the total group of one hundred sixty-one subjects, one hundred five subjects or 65% were below allowances and fifty-six subjects or 35% were above allowances.

7. Vitamin A

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 29 to 6569 I. U., and the average per person was 1404 I. U. The average figure was 70% of the NRC allowances of 2000 I. U. Twenty subjects or 83% were below allowances and four subjects or 17% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 52 to 9346 I. U., and the average per person was 2019 I. U. The average figure was 81% of the NRC allowances of 2500 I. U. Ten subjects or 83% were below allowances and two subjects or 17% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 77 to 10,231 I. U., and the average per person was 3508 I. U. The average figure was 100% of the NRC allowances of 3500 I. U. Four subjects or 67% were below allowances and two subjects or 33% were above allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 118 to 10,230 I. U., and the average per person was 2550 I. U. The average figure was 57% of the NRC allowances of 4500 I. U. Five subjects or 83% were below allowances and one subject or 17% was above allowance.

For three male subjects, 13 to 15 years of age, the range was from 88 to 1781 I. U., and the average per person was 901 I. U. The average figure was 18% of the NRC allowances of 5000 I. U. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 79 to 824 I. U., and the average per person was 332 I. U. The average figure was 7% of the NRC allowances of 5000 I. U. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 140 to 3458 I. U., and the average per person was 1799 I. U. The average figure was 30% of the NRC allowances of 6000 I. U. One subject or 50% was below the allowance, and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 138 to 2853 I. U., and the average per person was 1119 I. U. The average figure was 22% of the NRC allowances of 5000 I. U. Four subjects or 100% were below allowances.

For thirty three male subjects, 21 to 60 years of age, the range was from 83 to 12,067 I. U., and the average per person was 1307 I. U. The average figure was 26% of the NRC allowances of 5000 I. U. Thirty subjects or 91% were below allowances and three subjects or 9% were above allowances.

For thirty six female subjects, 21 to 60 years of age, the range was from 72 to 10,231 I. U., and the average per person was 1524 I. U.

The average figure was 30% of the NRC allowances of 5000 I. U. Thirty-two subjects or 89% were below allowances and four subjects or 11% were above allowances.

For eight male subjects, 61 to 70 years of age, the range was from 74 to 1865 I. U., and the average per person was 436 I. U. The average figure was 9% of the NRC allowances of 5000 I. U. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 82 to 7231 I. U., and the average per person was 1375 I. U. The average figure was 27% of the NRC allowances of 5000 I. U. Eight subjects or 89% were below allowances and one subject or 11% was above the allowance.

For four female subjects, pregnant women, the range was from 209 to 1730 I. U., and the average per person was 1040 I. U. The average figure was 17% of the NRC allowances of 6000 I. U. Two subjects or 50% were below allowances and two subjects or 50% were above allowances.

For eleven female subjects, lactating women, the range was from 148 to 8693 I. U., and the average per person was 2499 I. U. The average figure was 31% of the NRC allowances of 8000 I. U. Ten subjects or 91% were below allowances and one subject or 9% was above the allowance.

For the total group of one hundred sixty-one subjects, one hundred forty subjects or 87% were below allowances and twenty-one subjects or 13% were above allowances.

8. Thiamine

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 124 to 1192 mcgs., and the average per person was 503 mcgs. The average figure was 84% of the NRC allowances of 600 mcgs. Eighteen subjects or 75% were below allowances and six or 25% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 380 to 1064 mcgs., and the average per person was 642 mcgs. The average figure was 80% of the NRC allowances of 800 mcgs. Nine subjects or 75% were below allowances and three or 25% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 284 to 1259 mcgs., and the average person was 631 mcgs. The average figure was 63% of the NRC allowances of 1000 mcgs. Five subjects or 83% were below allowances and one subject or 17% was above the allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 417 to 1221 mcgs., and the average per person was 801 mcgs. The average figure was 67% of the NRC allowances of 1200 mcgs. Five subjects or 83% were below allowances and one subject or 17% was above the allowance.

For three male subjects, 13 to 15 years of age, the range was from 377 to 1435 mcgs., and the average per person was 939 mcgs. The average figure was 63% of the NRC allowances of 1500 mcgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 708 to 772 mcgs., and the average per person was 745 mcgs. The average figure was 57% of the NRC allowances of 1300 mcgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 721 to 2109 mcgs., and the average per person was 1415 mcgs. The average figure was 83% of the NRC allowances of 1700 mcgs. One subject or 50% was below the allowance and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 452 to 1021 mcgs., and the average per person was 801 mcgs. The average figure was 67% of the NRC allowances of 1200 mcgs. Four subjects or 100% were below allowances.

For thirty three male subjects, 21 to 60 years of age, the range was from 431 to 2045 mcgs., and the average per person was 944 mcgs. The average figure was 63% of the NRC allowances of 1500 mcgs. Twenty eight subjects or 85% were below allowances and five subjects or 15% were above allowances.

For thirty six female subjects, 21 to 60 years of age, the range was from 296 to 2090 mcgs., and the average per person was 909 mcgs. The average figure was 67% of the NRC allowances of 1200 mcgs. Thirty one or 86% were below allowances, and five subjects or 14% were above allowances.

For eight male subjects, 61 to 70 years of age, the range was from 447 to 1875 mcgs., and the average per person was 839 mcgs. The average figure was 70% of the NRC allowances of 1200 mcgs. Seven subjects or 88% were below allowances and one subject or 12% was above the allowance.

For nine female subjects, 61 to 70 years of age, the range was from 345 to 1494 mcgs., and the average per person was 683 mcgs. The average figure was 68% of the NRC allowances of 1000 mcgs. Eight subjects or 89% were below allowances and one subject or 11% was above the allowance.

For four female subjects, pregnant women, the range was from 546 to 933 mcgs., and the average per person was 718 mcgs. The average figure was 48% of the NRC allowances of 1500 mcgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 121 to 1910 mcgs., and the average per person was 876 mcgs. The average figure was 58% of the NRC allowances of 1500 mcgs. Ten subjects or 91% were below allowances and one subject or 9% was above the allowance.

For the total group of one hundred sixty-one subjects, one hundred thirty six subjects or 85% were below allowances and twenty-five subjects or 15% were above allowances.

9. Riboflavin

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 99 to 964 mcgs., and the average per person was 409 mcgs. The average figure was 45% of the NRC allowances of 900 mcgs. Twenty-three

subjects or 96% were below allowances and one subject or 4% was above the allowance.

For twelve male and female subjects, 4 to 6 years of age, the range was from 221 to 700 mcgs., and the average per person was 439 mcgs. The average figure was 36% of the NRC allowances of 1200 mcgs. Twelve subjects or 100% were below allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 365 to 863 mcgs., and the average per person was 563 mcgs. The average figure was 37% of the NRC allowances of 1500 mcgs. Six subjects or 100% were below allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 471 to 831 mcgs., and the average per person was 621 mcgs. The average figure was 34% of the NRC allowances of 1800 mcgs. Six subjects or 100% were below allowances.

For three male subjects, 13 to 15 years of age, the range was from 320 to 877 mcgs., and the average per person was 622 mcgs. The average figure was 31% of the NRC allowances of 2000 mcgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was 459 to 653 mcgs., and the average per person was 568 mcgs. The average figure was 28% of the NRC allowances of 2000 mcgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 684 to 1583 mcgs., and the average per person was 1133 mcgs. The average figure was 45% of the NRC allowances of 2500 mcgs. Two subjects or 100% were below allowances.

For four female subjects, 16 to 20 years of age, the range was from 458 to 832 mcgs., and the average per person was 637 mcgs. The average figure was 35% of the NRC allowances of 1800 mcgs. Four subjects or 100% were below allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 367 to 1477 mcgs., and the average per person was 726 mcgs. The average figure was 40% of the NRC allowances of 1800 mcgs. Thirty-three subjects or 100% were below allowances.

For thirty-six female subjects, 21 to 60 years of age, the range was from 375 to 1318 mcgs., and the average per person was 648 mcgs. The average figure was 43% of the NRC allowances of 1500 mcgs. Thirty-six subjects or 100% were below allowances.

For eight male subjects, 61 to 70 years of age, the range was from 351 to 1150 mcgs., and the average per person was 619 mcgs. The average figure was 34% of the NRC allowances of 1800 mcgs. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 383 to 958 mcgs., and the average per person was 550 mcgs. The average

figure was 37% of the NRC allowances of 1500 mcgs. Nine subjects or 100% were below allowances.

For four female subjects, pregnant women, the range was from 262 to 770 mcgs., and the average per person was 485 mcgs. The average figure was 19% of the NRC allowances of 2500 mcgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 384 to 1293 mcgs., and the average per person was 786 mcgs. The average figure was 26% of the NRC allowances of 3000 mcgs. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred sixty or 99% were below allowances and one subject or 1% was above the allowance.

10. Niacin

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 3 to 14 mgs., and the average per person was 11 mgs. The average figure was 180% of the NRC allowances of 6 mgs. Eight subjects or 33% were below allowances and sixteen subjects or 67% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 6 to 16 mgs., and the average per person was 9 mgs. The average figure was 112% of the NRC allowances of 8 mgs. Five subjects or 42% were below allowances and seven subjects or 58% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 10 to 15 mgs., and the average per person was 12 mgs. The average figure was 120% of the NRC allowances of 10 mgs. Six subjects or 100% were above allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 9 to 17 mgs., and the average per person was 12 mgs. The average figure was 120% of the NRC allowances of 10 mgs. Two subjects or 33% were below allowances and four subjects or 67% were above allowances.

For three male subjects, 13 to 15 years of age, the range was from 9 to 18 mgs., and the average per person was 13 mgs. The average figure was 87% of the NRC allowances of 15 mgs. Two subjects or 67% were below allowances and one subject or 33% was above the allowance.

For three female subjects, 13 to 15 years of age, the range was from 11 to 14 mgs., and the average per person was 12 mgs. The average figure was 92% of the NRC allowances of 13 mgs. Two subjects or 67% were below allowances and one subject or 33% was above the allowance.

For two male subjects, 16 to 20 years of age, the range was from 9 to 25 mgs., and the average per person was 17 mgs. The average figure was 100% of the NRC allowances of 17 mgs. One subject or 50% was below the allowance and one subject or 50% was above the allowance.

For four female subjects, 16 to 20 years of age, the range was from 8 to 12 mgs., and the average per person was 10 mgs. The average figure was 83% of the NRC allowances of 12 mgs. Three subjects or 75% were below allowances and one subject or 25% was above the allowance.

For thirty-three male subjects, 21 to 60 years of age, the range was from 7 to 40 mgs., and the average per person was 13 mgs. The average figure was 87% of the NRC allowances of 15 mgs. Twenty-three subjects or 70% were below allowances and ten subjects or 30% were above allowances.

For thirty-six female subjects, 21 to 60 years of age, the range was from 7 to 20 mgs., and the average per person was 12 mgs. The average figure was 100% of the NRC allowances of 12 mgs. Seventeen subjects or 47% were below allowances and nineteen or 53% were above allowances.

For eight male subjects, 61 to 70 years of age, the range was from 8 to 15 mgs., and the average per person was 12 mgs. The average figure was 100% of the NRC allowances of 12 mgs. Three subjects or 38% were below allowances and five subjects or 62% were above allowances.

For nine female subjects, 61 to 70 years of age, the range was from 7 to 15 mgs., and the average per person was 10 mgs. The average figure was 100% of the NRC allowances of 10 mgs. Four subjects or 44% were below allowances and five subjects or 56% were above allowances.

For four female subjects, pregnant women, the range was from 6 to 11 mgs., and the average per person was 8 mgs. The average figure was 53% of the NRC allowances of 15 mgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 10 to 21 mgs., and the average per person was 16 mgs. The average figure was 107% of the NRC allowances of 15 mgs. Five subjects or 45% were below allowances and six subjects or 55% were above allowances.

For the total group of one hundred one subjects, seventy-nine subjects or 49% were below allowances and eighty-two subjects or 51% were above allowances.

11. Ascorbic Acid

For twenty-four male and female subjects, 1 to 3 years of age, the range was from 3 to 114 mgs., and the average per person was 20 mgs. The average figure was 57% of the NRC allowances of 35 mgs. Twenty subjects or 83% were below allowances and four subjects or 17% were above allowances.

For twelve male and female subjects, 4 to 6 years of age, the range was from 1 to 78 mgs., and the average person was 30 mgs. The average figure was 60% of the NRC allowances of 50 mgs. Eight subjects or 67% were below allowances and four subjects or 33% were above allowances.

For six male and female subjects, 7 to 9 years of age, the range was from 5 to 47 mgs., and the average per person was 19 mgs. The average figure was 32% of the NRC allowances of 60 mgs. Six subjects or 100% were below allowances.

For six male and female subjects, 10 to 12 years of age, the range was from 6 to 57 mgs., and the average per person was 26 mgs. The average figure was 35% of the NRC allowances of 75 mgs. Six subjects or 100% were below allowances.

For three male subjects, 13 to 15 years of age, the range was from 6 to 88 mgs., and the average per person was 33 mgs. The average figure was 37% of the NRC allowances of 90 mgs. Three subjects or 100% were below allowances.

For three female subjects, 13 to 15 years of age, the range was from 3 to 9 mgs., and the average per person was 6 mgs. The average figure was 7% of the NRC allowances of 80 mgs. Three subjects or 100% were below allowances.

For two male subjects, 16 to 20 years of age, the range was from 8 to 32 mgs., and the average per person was 20 mgs. The average figure was 20% of the NRC allowances of 100 mgs. Two subjects or 100% were below allowances.

For four female subjects, 16 to 20 years of age, the range from 7 to 47 mgs., and the average per person was 10 mgs. The average figure was 12% of the NRC allowances of 80 mgs. Four subjects or 100% were below allowances.

For thirty-three male subjects, 21 to 60 years of age, the range was from 3 to 88 mgs., and the average per person was 14 mgs. The average figure was 19% of the NRC allowances of 75 mgs. Thirty-two subjects or 97% were below allowances and one subject or 3% was above the allowance.

For thirty-six female subjects, 21 to 60 years of age, the range was from 4 to 88 mgs., and the average per person was 13 mgs. The average figure was 18% of the NRC allowances of 70 mgs. Thirty-five subjects or 97% were below allowances and one subject or 3% was above the allowance.

For eight male subjects, 61 to 70 years of age, the range was from 7 to 34 mgs., and the average per person was 11 mgs. The average figure was 15% of the NRC allowances of 75 mgs. Eight subjects or 100% were below allowances.

For nine female subjects, 61 to 70 years of age, the range was from 4 to 32 mgs., and the average per person was 13 mgs. The average figure was 18% of the NRC allowances of 70 mgs. Nine subjects or 100% were below allowances.

For four female subjects, pregnant women, the range was from 6 to 18 mgs., and the average per person was 9 mgs. The average figure was 9% of the NRC allowances of 100 mgs. Four subjects or 100% were below allowances.

For eleven female subjects, lactating women, the range was from 5 to 71 mgs., and the average per person was 17 mgs. The average figure was 11% of the NRC allowances of 150 mgs. Eleven subjects or 100% were below allowances.

For the total group of one hundred sixty-one subjects, one hundred fifty-one subjects or 94% were below allowances and ten subjects or 6% were above allowances.

Table 4 summarizes the daily quantities of various nutrients per person and comparison with National Research Council Allowances of children and adult male subjects of Majuro Village, Majuro Island, Marshall Islands. There were forty-eight children, males and females, and forty-six males. There were twenty-four male and female children between the ages of 1 through 3 years of age; twelve male and female children between the ages of 4 through 6 years of age; six male and female children between the ages of 7 to 9 years of age; and six male and female subjects between the ages of 10 through 12 years of age.

There were forty-six male subjects. There were three subjects, 13 through 15 years of age; two subjects, 16 through 20 years of age; thirty-three subjects, 21 to 60 years; eight subjects 61 through 70 years.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given.

I. CHILDREN

a. 1 to 3 years of age

For twenty four males and females, 1 to 3 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 823 calories, which was 68% of the NRC allowances of 1200 calories. Ninety-two percent of the subjects were below allowances.

2. Protein: average intake was 26 gms., which was 65% of the NRC allowances of 40 gms. Eighty-eight percent of the subjects were below allowances.

3. Fat: average intake was 13 gms., which was 39% of the NRC allowances of 33 gms. Ninety-six percent of the subjects were below allowances.

4. Calcium: average intake was 229 mgs., which was 23% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 404 mgs., which was 40% of the NRC allowances of 1000 mgs. Forty percent of the subjects were below allowances.

6. Iron: average intake was 6 mgs., which was 86% of the NRC allowances of 7 mgs. Sixty-two percent of the subjects were below allowances.

7. Vitamin A: average intake was 1404 I. U., which was 70% of the NRC allowances of 2000 I. U. Eighty-three percent of the subjects were below allowances.

Table 4.

Dietary Study - Majuro Village, Marshall Islands

Summary of Daily Quantities of Various Nutrients per Person and Comparison with National Research Council Allowances. by Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Males and Females (children)											
1 to 3 years (24)*											
Average intake	823	26	13	229	404	6	1404	503	409	11	20
NRC allowances	1200	40	33	1000	1000	7	2000	600	900	6	35
% of allowances	68	65	39	23	40	86	70	84	45	180	57
% of subjects below allowances	92	88	96	100	100	62	83	75	96	33	83
4 to 6 years (12)											
Average intake	1096	42	21	303	572	8	2019	642	439	9	30
NRC allowances	1600	50	44	1000	1000	8	2500	800	1200	8	50
% of allowances	68	84	48	30	57	100	81	80	36	112	60
% of subjects below allowances	92	67	92	100	100	33	83	75	100	42	67
7 to 9 years (6)											
Average intake	1269	52	21	534	732	10	3508	631	563	12	19
NRC allowances	2000	60	56	1000	1200	10	3500	1000	1500	10	60
% of allowances	63	87	37	53	61	100	100	63	37	120	32
% of subjects below allowances	100	50	100	67	100	50	67	83	100	0	100
10 to 12 years (6)											
Average intake	1577	62	30	486	925	11	2550	801	621	12	26
NRC allowances	2500	70	69	1200	1200	12	4500	1200	1800	10	75
% of allowances	63	88	43	40	77	92	57	67	34	120	35
% of subjects below allowances	100	83	100	100	83	67	83	83	100	33	100

* Figure in ( ) indicate number of subjects studied.

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Males											
13 to 15 years (3)*											
Average intake	1385	49	28	313	552	8	901	939	622	13	33
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	43	58	31	22	42	53	18	63	31	87	37
% of subjects below allowances	100	100	100	100	100	100	100	100	100	67	100
16 to 20 years (2)											
Average intake	2240	92	32	489	1547	17	1799	1415	1133	17	20
NRC allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	59	92	30	35	117	113	30	83	45	100	20
% of subjects below allowances	100	50	100	100	50	50	50	50	100	50	100
21 to 60 years (33)											
Average intake	1469	54	24	390	744	10	1307	944	726	13	14
NRC allowances	3000	70	83	1000	1320	12	5000	1500	1800	15	75
% of allowances	49	77	29	39	56	83	26	63	40	87	19
% of subjects below allowances	100	82	97	97	91	64	91	85	100	70	97
61 to 70 years (8)											
Average intake	1302	42	16	308	601	8	436	839	619	12	11
NRC allowances	2400	70	67	1000	1320	12	5000	1200	1800	12	75
% of allowances	54	60	24	31	45	67	9	70	34	100	15
% of subjects below allowances	100	100	100	100	100	75	100	88	100	38	100

* Figure in ( ) indicate number of subjects studied.

8. Thiamine: average intake was 503 mcgs., which was 84% of the NRC allowances of 600 mcgs. Seventy-five percent of the subjects were below allowances.

9. Riboflavin: average intake was 409 mcgs., which was 45% of the NRC allowances of 900 mcgs. Ninety-six percent of the subjects were below allowances.

10. Niacin: average intake was 11 mgs., which was 180% of the NRC allowances of 6 mgs. Thirty-three percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 20 mgs., which was 57% of the NRC allowances of 35 mgs. Eighty-three percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calcium and phosphorus with all twenty-four subjects below allowances. Ninety-six percent of the subjects were below allowances for fat and riboflavin; 92% of the subjects were below allowances for calories; 88% of the subjects were below allowances for protein; 83% of the subjects were below allowances for both vitamin A and ascorbic acid; 75% of the subjects were below allowances for thiamine; and 62% of the subjects were below allowances for iron.

Only 33% of the subjects were below allowances for niacin, 67% were above allowances.

b. 4 to 6 years of age

For twelve males and females, 4 to 6 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1096 calories, which was 68% of the NRC allowances of 1600 calories. Ninety-two percent of the subjects were below allowances.

2. Protein: average intake was 42 gms., which was 84% of the NRC allowances of 50 gms. Sixty-seven percent of the subjects were below allowances.

3. Fat: average intake was 21 gms., which was 48% of the NRC allowances of 44 gms. Ninety-two percent of the subjects were below allowances.

4. Calcium: average intake was 303 gms., which was 30% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 572 mgs., which was 57% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 8 mgs., which was 100% of the NRC allowances of 8 mgs. Thirty-three percent of the subjects were below allowances.

7. Vitamin A: average intake was 2019 I. U., which was 81% of the NRC allowances of 2500 I. U. Eighty-three percent of the subjects were below allowances.

8. Thiamine: average intake was 642 mcgs., which was 80% of the NRC allowances of 800 mcgs. Seventy-five percent of the subjects were below allowances.

9. Riboflavin: average intake was 439 mcgs., which was 36% of the NRC allowances of 1200 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 9 mgs., which was 112% of the NRC allowances of 8 mgs. Forty-two percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 30 mgs., which was 60% of the NRC allowances of 50 mgs. Sixty-seven percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calcium, phosphorus, and riboflavin with twelve subjects below allowances. Fat and calories followed with 92% of the subjects below allowances; Vitamin A with 83% of the subjects below allowances; thiamine with 75% of the subjects below allowances; and protein and ascorbic acid both with 67% of the subjects below allowances. Thirty-three percent of the subjects were below allowances for iron and 42% of the subjects were below allowances for niacin; 67% of the subjects were above allowances for iron and 58% of the subjects were above allowances for niacin.

c. 7 to 9 years of age

For six males and females, 7 to 9 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1269 calories, which was 63% of the NRC allowances of 2000 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 52 gms., which was 87% of the NRC allowances of 60 gms. Fifty percent of the subjects were below allowances.

3. Fat: average intake was 21 gms., which was 37% of the NRC allowances of 56 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 534 mgs., which was 53% of the NRC allowances of 1000 mgs. Sixty-seven percent of the subjects were below allowances.

5. Phosphorus: average intake was 732 mgs., which was 61% of the NRC allowances of 1200 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 10 mgs., which was 100% of the NRC allowances of 10 mgs. Fifty percent of the subjects were below allowances.

7. Vitamin A: average intake was 3508 I. U., which was 100% of the NRC allowances of 3508 I. U. Sixty-seven percent of the subjects were below allowances.

8. Thiamine: average intake was 631 mcgs., which was 63% of the NRC allowances of 1000 mcgs. Eighty-three percent of the subjects were below allowances.

9. Riboflavin: average intake was 563 mcgs., which was 37% of the NRC allowances of 1500 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 120% of the NRC allowances of 10 mgs. None of the subjects were below allowances.

11. Ascorbic acid: average intake was 19 mgs., which was 32% of the NRC allowances of 60 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, fat, phosphorus, riboflavin and ascorbic acid with six subjects below allowances. Thiamine followed with 83% of the subjects below allowances; calcium and Vitamin A both with 67% of the subjects below allowances.

For protein and iron, the percentage of subjects were equally divided with 50% below and 50% above allowances. All the subjects or 100% were above allowances for niacin.

d. 10 to 12 years of age

For six males and females, 10 to 12 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1577 calories, which was 63% of the NRC allowances of 2500 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 62 gms., which was 88% of the NRC allowances of 70 gms. Eighty-three percent of the subjects were below allowances.

3. Fat: average intake was 30 gms., which was 43% of the NRC allowances of 69 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 486 mgs., which was 40% of the NRC allowances of 1200 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 925 mgs., which was 77% of the NRC allowances of 1200 mgs. Eighty-three percent of the subjects were below allowances.

6. Iron: average intake was 11 mgs., which was 92% of the NRC allowances of 12 mgs. Sixty-seven percent of the subjects were below allowances.

7. Vitamin A: average intake was 2550 I. U., which was 57% of the NRC allowances of 4500 I. U. Eighty-three percent of the subjects were below allowances.

8. Thiamine: average intake was 801 mcgs, which was 67% of the NRC allowances of 1200 mcgs. 83% of the subjects were below allowances.

9. Riboflavin: average intake was 621 mcgs., which was 34% of the NRC allowances of 1800 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 120% of the NRC allowances of 10 mgs. Thirty-three percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 26 mgs., which was 35% of the NRC allowances of 75 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, fat, calcium, riboflavin, and ascorbic acid with six subjects below allowances. Eighty-three percent of the subjects were below allowances for protein, phosphorus, vitamin A and thiamine. Sixty-seven percent of the subjects were below allowances for iron.

Thirty-three percent of the subjects were below allowances for niacin and sixty-seven percent were above allowances.

II. MALES

a. 13 to 15 years of age

For three males, 13 to 15 years of age, the daily quantities of various nutrients per person and comparisons with NRC allowances are aummarized here:

1. Calories: average intake was 1385 calories, which was 43% of the NRC allowances of 3200 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 49 gms., which was 58% of the NRC allowances of 85 gms. One hundred percent of the subjects were below allowances.

3. Fat: average intake was 28 gms., which was 31% of the NRC allowances of 89 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 313 mgs., which was 22% of the NRC allowances of 1400 mgs. One hundred percent of the subjects were below allowances of 1400 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 552 mgs., which was 42% of the NRC allowances of 1320 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 8 mgs., which was 53% of the NRC allowances of 15 mgs. One hundred percent of the subjects were below allowances.

7. Vitamin A: average intake was 901 I. U., which was 18% of the NRC allowances of 5000 I. U. One hundred percent of the subjects were below allowances.

8. Thiamine: average intake was 939 mcgs., which was 63% of the NRC allowances of 1500 mcgs. One hundred percent of the subjects were below allowances.

9. Riboflavin: average intake was 622 mcgs., which was 31% of the NRC allowances of 2000 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 13 mgs., which was 87% of the NRC allowances of 15 mgs. Sixty-seven percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 33 mgs., which was 37% of the NRC allowances of 90 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin and ascorbic acid. Sixty-seven percent of the subjects were below allowances for niacin.

b. <u>16 to 20 years of age</u>

For two males, 16 to 20 years of age, the daily quantities of various nutrients per person and comparisons with the NRC allowances are summarized:

1. Calories: average intake was 2240 calories, which was 59% of the NRC allowances of 3800 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 92 gms., which was 92% of the NRC allowances or 100 gms. Fifty percent of the subjects were below allowances.

3. Fat: average intake was 32 gms., which was 30% of the NRC allowances or 105 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 489 mgs., which was 35% of the NRC allowances of 1400 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 117% of the NRC allowances of 1320 mgs. Fifty percent of the subjects were below allowances.

6. Iron: average intake was 17 mgs., which was 113% of the NRC allowances of 15 mgs. Fifty percent of the subjects were below allowances.

7. Vitamin A: average intake was 1799 I. U., which was 30% of the NRC allowances of 6000 I. U. Fifty percent of the subjects were below allowances.

8. Thiamine: average intake was 1415 mcgs., which was 83% of the NRC allowances of 1700 mcgs. Fifty percent of the subjects were below allowances.

9. Riboflavin: average intake was 1133 mcgs., which was 45% of the NRC allowances of 2500 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 17 mgs., which was 100% of the NRC allowances of 17 mgs. Fifty percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 20 mgs., which was 20% of the NRC allowances of 100 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, fat, calcium, riboflavin, and ascorbic acid; 50% of the subjects were below allowances for protein, phosphorus, iron, vitamin A, thiamine and niacin.

c. 21 to 60 years of age

For thirty-three males, 21 to 60 years of age, the daily quantities of various nutrients per person and comparisons with the NRC allowances are summarized here:

1. Calories: average intake was 1469 calories, which was 49% of the NRC allowances of 3000 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 54 gms., which was 77% of the NRC allowances of 70 gms. Eighty-two percent of the subjects were below allowances.

3. Fat: average intake was 24 mgs., which was 29% of the NRC allowances of 83 gms. Ninety-seven percent of the subjects were below allowances.

4. Calcium: average intake was 390 mgs., which was 39% of the NRC allowances of 1000 mgs. Ninety-seven percent of the subjects were below allowances.

5. Phosphorus: average intake was 744 mgs., which was 56% of the NRC allowances of 1320 mgs. Ninety-one percent of the subjects were below allowances.

6. Iron: average intake was 10 mgs., which was 83% of the NRC allowances of 12 mgs. Sixty-four percent of the subjects were below allowances.

7. Vitamin A: average intake was 1307 I. U., which was 26% of the NRC allowances of 5000 I. U. Ninety-one percent of the subjects were below allowances.

8. Thiamine: average intake was 944 mcgs., which was 63% of the NRC allowances of 1500 mcgs. Eighty-five percent of the subjects were below allowances.

9. Riboflavin: average intake was 726 mcgs., which was 40% of the NRC allowances of 1800 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 13 mgs., which was 87% of the NRC allowances of 15 mgs. Seventy percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 14 mgs., which was 19% of the NRC allowances of 75 mgs. Ninety-seven percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories and riboflavin; 97% of the subjects were below allowances for fat, calcium, and ascorbic acid; 91% of the subjects were below allowances for phosphorus and vitamin A; 85% of the subjects were below allowances for thiamine and 82% of the subjects were below allowances for protein. Seventy percent of the subjects were below allowances for niacin and 64% of the subjects were below allowances for iron.

d. 61 to 70 years of age

For eight males, 61 to 70 years of age, the daily quantities of various nutrients per person and comparisons with the NRC allowances are summarized here:

1. Calories: average intake was 1302 calories, which was 54% of the NRC allowances of 2400 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 42 gms., which was 60% of the NRC allowances of 70 gms. One hundred percent of the subjects were below allowances.

3. Fat: average intake was 16 gms., which was 24% of the NRC allowances of 67 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 308 mgs., which was 31% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 601 mgs. which was 45% of the NRC allowances of 1320 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 8 mgs., which was 67% of the NRC allowances of 12 mgs. Seventy-five percent of the subjects were below allowances.

7. Vitamin A: average intake was 436 I. U., which was 9% of the NRC allowances of 5000 I. U. One hundred percent of the subjects were below allowances.

8. Thiamine: average intake was 839 mcgs., which was 70% of the NRC allowances of 1200 mcgs. Eighty-eight percent of the subjects were below allowances.

9. Riboflavin: average intake was 619 mcgs., which was 34% of the NRC allowances of 1800 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 100% of the NRC allowances of 12 mgs. One hundred percent of the subjects were below allowances

11. Ascorbic acid: average intake was 11 mgs., which was 15% of the NRC allowances of 75 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, vitamin A, riboflavin, and ascorbic acid; 88% of the subjects were below allowances for thiamine; and 75% of the subjects were below allowances for iron.

Thirty-eight percent of the subjects were below allowances for niacin and 62% of the subjects were above allowances.

Table 5 summarizes the daily quantities of various nutrients per person and comparison with National Research Council Allowances for female subjects of Majuro village, Majuro Island, Marshall Islands.

There were sixty-seven females: three subjects, 13 through 15 years of age; four subjects, 16 through 20 years; thirty-six subjects, 21 to 60 years; nine subjects, 61 through 70 years; four pregnant women, and eleven lactating women. The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given.

Table 5.

Dietary Study - Majuro Village, Marshall Islands

Summary of Daily Quantities of Various Nutrients per Person and Comparison with National Research Council Allowances. By Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Females											
13 to 15 years (3)*											
Average intake	1487	59	25	442	655	9	332	745	568	12	6
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	57	74	35	34	54	60	7	57	28	92	7
% of subjects below allowances	100	100	100	100	100	100	100	100	100	67	100
16 to 20 years (4)											
Average intake	1323	52	15	277	867	6	1119	801	637	10	10
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	55	69	22	28	72	40	22	67	35	83	12
% of subjects below allowances	100	75	100	100	50	50	100	100	100	75	100
21 to 60 years (36)											
Average intake	1365	47	23	363	661	10	1524	809	648	12	13
NRC Allowances	2400	60	67	1000	1320	12	5000	1200	1500	12	70
% of allowances	57	78	34	36	50	83	30	67	43	100	18
% of subjects below allowances	97	72	97	100	97	67	89	86	100	47	97
61 to 70 years (9)											
Average intake	1197	38	19	375	582	11	1375	683	550	10	13
NRC allowances	2000	60	56	1000	1320	12	5000	1000	1500	10	70
% of allowances	60	63	34	37	44	92	27	68	37	100	18
% of subjects below allowances	100	78	100	100	100	78	89	89	100	44	100

* Figure in ( ) indicate number of subjects studied.

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Pregnant women (4)*											
Average intake	1013	32	8	205	451	7	1040	718	485	8	9
NRC allowances	2400	85	67	1500	1800	15	6000	1500	2500	15	100
% of allowances	42	38	12	20	25	47	17	48	19	53	9
% of subjects below allowances	100	100	100	100	100	100	50	100	100	100	100
Lactating women (11)											
Average intake	1695	62	27	466	840	12	2499	876	786	16	17
NRC allowances	3000	100	83	2000	1800	15	8000	1500	3000	15	150
% of allowances	56	62	32	23	47	80	31	58	26	107	11
% of subjects below allowances	100	100	100	100	100	73	91	91	100	45	100

* Figure in ( ) indicate number of subjects studied.

III. FEMALES

a. 13 to 15 years of age

For three females, 13 to 15 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized:

1. Calories: average intake was 1487 calories, which was 57% of the NRC allowances of 2600 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 59 gms., which was 74% of the NRC allowances of 80 gms. One hundred percent of the subjects were below allowances.

3. Fat: average intake was 25 gms., which was 35% of the NRC allowances of 72 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 442 gms., which was 34% of the NRC allowances of 1300 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 655 mgs., which was 54% of the NRC allowances of 1200 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 9 mgs., which was 60% of the NRC allowances of 15 mgs. One hundred percent of the subjects were below allowances.

7. Vitamin A: average intake was 332 I. U., which was 7% of the NRC allowances of 5000 I. U. One hundred percent of the subjects were below allowances.

8. Thiamine: average intake was 745 mcgs., which was 57% of the NRC allowances of 1300 mcgs. One hundred percent of the subjects were below allowances.

9. Riboflavin: average intake was 568 mcgs., which was 28% of the NRC allowances of 2000 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 92% of the NRC allowances of 13 mgs. Sixty-seven percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 6 mgs. which was 7% of the NRC allowances of 80 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin and ascorbic acid.

Sixty-seven percent of the subjects were below allowances for niacin.

b. 16 to 20 years of age

For four females, 16 to 20 years of age, the daily quantities of various nutrients per person and comparisons with the NRC allowances are summarized:

1. Calories: average intake was 1323 calories, which was 55% of the NRC allowances of 2400 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 52 gms., which was 69% of the NRC allowances of 75 gms. Seventy-five percent of the subjects were below allowances.

3. Fat: average intake was 15 gms., which was 22% of the NRC allowances of 67 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 277 mgs., which was 28% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 867 mgs., which was 72% of the NRC allowances of 1200 mgs. Fifty percent of the subjects were below allowances.

6. Iron: average intake was 6 mgs., which was 40% of the NRC allowances of 15 mgs. Fifty percent of the subjects were below allowances.

7. Vitamin A: average intake was 1119 I. U., which was 22% of the NRC allowances of 5000 I. U. One hundred percent of the subjects were below allowances.

8. Thiamine: average intake was 801 mcgs., which was 67% of the NRC allowances of 1200 mcgs. One hundred percent of the subjects were below allowances.

9. Riboflavin: average intake was 637 mcgs., which was 35% of the NRC allowances of 1800 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 10 mgs., which was 83% of the NRC allowances of 12 mgs. Seventy-five percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 10 mgs., which was 12% of the NRC allowances of 80 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, fat, calcium, vitamin A, thiamine, riboflavin, and ascorbic acid.

Seventy-five percent of the subjects were below allowances for protein and niacin; 50% of the subjects were below allowances for both phosphorus and iron.

c. 21 to 60 years of age

For thirty-six females, 21 to 60 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized:

1. Calories: average intake was 1365 calories, which was 57% of the NRC allowances of 2400 calories. Ninety-seven percent of the subjects were below allowances.

2. Protein: average intake was 47 gms., which was 78% of the NRC allowances of 60 gms. Seventy-two percent of the subjects were below allowances.

3. Fat: average intake was 23 gms., which was 34% of the NRC allowances of 67 gms. Ninety-seven percent of the subjects were below allowances.

4. Calcium: average intake was 363 mgs., which was 36% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 661 mgs., which was 50% of the NRC allowances of 1320 mgs. Ninety-seven percent of the subjects were below allowances.

6. Iron: average intake was 10 mgs., which was 83% of the NRC allowances of 12 mgs. Eighty-three percent of the subjects were below allowances.

7. Vitamin A: average intake was 1524 I. U., which was 30% of the NRC allowances of 5000 I. U. Eighty-nine percent of the subjects were below allowances.

8. Thiamine: average intake was 809 mcgs., which was 67% of the NRC allowances of 1200 mcgs. Eighty-six percent of the subjects were below allowances.

9. Riboflavin: average intake was 648 mcgs., which was 43% of the NRC allowances of 1500 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 100% of the NRC allowances of 12 mgs. Forty-seven percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 13 mgs., which was 18% of the NRC allowances for 70 mgs. Ninety-seven percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calcium and riboflavin; ninety-seven percent of the subjects were below allowances for calories, fat, phosphorus, and ascorbic acid; 89% of the subjects were below allowances for vitamin A; 86% of the subjects were below allowances for thiamine; 72% of the subjects were below allowances for protein; and 67% of the subjects were below allowances for iron. Forty-seven percent of the subjects were below allowances and 53% were above allowances for niacin.

d. 61 to 70 years of age

For nine females, 61 to 70 years of age, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized:

1. Calories: average intake was 1197 calories, which was 60% of the NRC allowances of 2000 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 38 gms., which was 63% of the NRC allowances of 60 gms. Seventy-eight percent of the subjects were below allowances.

3. Fat: average intake was 19 gms., which was 34% of the NRC allowances of 56 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 375 mgs., which was 37% of the NRC allowances of 1000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 582 mgs., which was 44% of the NRC allowances of 1320 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 11 mgs., which was 92% of the NRC allowances of 12 mgs. Seventy-eight percent of the subjects were below allowances.

7. Vitamin A: average intake was 1375 I. U., which was 27% of the NRC allowances of 5000 I. U. Eighty-nine percent of the subjects were below allowances.

8. Thiamine: average intake was 683 mcgs., which was 68% of the NRC allowances of 1000 mcgs. Eighty-nine percent of the subjects were below allowances.

9. Riboflavin: average intake was 550 mcgs., which was 37% of the NRC allowances of 1500 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 10 mgs., which was 100% of the NRC allowances of 10 mgs. Forty-four percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 13 mgs., which was 18% of the NRC allowances of 70 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, fat, calcium, phosphorus, riboflavin and ascorbic acid; 89% of the subjects were below allowances for vitamin A and thiamine; 78% of the subjects were below allowances for protein and iron.

Forty-four percent of the subjects were below allowances for niacin and 56% were above allowances.

e. Pregnant women

For four pregnant women, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized:

1. Calories: average intake was 1013 calories, which was 42% of the NRC allowances of 2400 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 32 gms., which was 38% of the NRC allowances of 85 gms. One hundred percent of the subjects were below allowances.

3. Fat: average intake was 8 gms., which was 12% of the NRC allowances of 67 gms. One hundred percent of the subjects were below allowances.

4. Calcium average intake was 205 mgs., which was 20% of the NRC allowances of 1500 gms. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 451 mgs., which was 25% of the NRC allowances of 1800 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 7 mgs., which was 47% of the NRC allowances of 15 mgs. One hundred percent of the subjects were below allowances.

7. Vitamin A: average intake was 1040 I. U., which was 17% of the NRC allowances of 6000 I. U. Fifty percent of the subjects were below allowances.

8. Thiamine: average intake was 718 mcgs., which was 48% of the NRC allowances of 1500 mcgs. One hundred percent of the subjects were below allowances.

9. Riboflavin: average intake was 485 mcgs., which was 19% of the NRC allowances of 2500 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 8 mgs., which was 53% of the NRC allowances of 15 mgs. One hundred percent of the subjects were below allowances.

11. Ascorbic acid: average intake was 9 mgs., which was 9% of the NRC allowances of 100 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin, niacin and ascorbic acid. Fifty percent of the subjects were below allowances for vitamin A.

f. Lactating women

For eleven lactating women, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized:

1. Calories: average intake was 1695 calories, which was 56% of the NRC allowances of 3000 calories. One hundred percent of the subjects were below allowances.

2. Protein: average intake was 62 gms., which was 62% of the NRC allowances of 100 gms. One hundred percent of the subjects were below allowances.

3. Fat: average intake was 27 gms., which was 32% of the NRC allowances of 83 gms. One hundred percent of the subjects were below allowances.

4. Calcium: average intake was 466 mgs., which was 23% of the NRC allowances of 2000 mgs. One hundred percent of the subjects were below allowances.

5. Phosphorus: average intake was 840 mgs., which was 47% of the NRC allowances of 1800 mgs. One hundred percent of the subjects were below allowances.

6. Iron: average intake was 12 mgs., which was 80% of the NRC allowances of 15 mgs. Seventy-three percent of the subjects were below allowances.

7. Vitamin A: average intake was 2499 I. U., which was 31% of the NRC allowances of 8000 I. U. Ninety-one percent of the subjects were below allowances.

8. Thiamine: average intake was 876 mcgs., which was 58% of the NRC allowances of 1500 mcgs. Ninety-one percent of the subjects were below allowances.

9. Riboflavin: average intake was 786 mcgs., which was 26% of the NRC allowances of 3000 mcgs. One hundred percent of the subjects were below allowances.

10. Niacin: average intake was 16 mgs., which was 107% of the NRC allowances of 15 mgs. Forty-five percent were below allowances.

11. Ascorbic acid: average intake was 17 mgs., which was 11% of the NRC allowances of 150 mgs. One hundred percent of the subjects were below allowances.

One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, riboflavin and ascorbic acid; 91% of the subjects were below allowances for vitamin A and thiamine; and 73% of the subjects were below allowances for iron. Forty-five percent of the subjects were below allowances for niacin and 55% were above allowances.

The averages of nutrient intake of one hundred sixty-one Marshallese of Majuro village are classified in relation to NRC Recommended Dietary Allowances. The average intakes are given as percentages of NRC Recommended Dietary Allowances. The results are given in Table 6.

Table 6.

Classification of Averages of Nutrient Intake of one hundred sixty-one Marshallese of Majuro village in Relation to NRC Recommended Dietary Allowances

Nutrient	Classification of Average Intake as Percentage of NRC Recommended Dietary Allowances		
	90 to 100% and over	70 to 89%	Under 70%
	Number of individuals		
Calories	7	29	125
Protein	47	44	70
Fat	4	3	154
Calcium	3	4	154
Phosphorus	13	15	133
Iron	67	33	61
Vitamin A	21	5	135
Thiamine	33	29	99
Riboflavin	2	6	153
Niacin	94	33	34
Ascorbic acid	11	5	145

The intakes of calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, and ascorbic acid were much below recommended allowances. One hundred fifty-four subjects were in this "under 70% of NRC recommended allowances group" for fat and calcium. Others in the same group were as follows: 153 subjects for riboflavin, 145 subjects for ascorbic acid, 135 subjects for vitamin A, 133 subjects for phosphorus and 125 subjects for calories.

For the nutrients with average intakes of 90 to 100% or more of NRC recommended allowances, niacin intakes were met by the greatest number of individuals. Iron had the next highest number of individuals.

DISCUSSION

No attempt has been made in this study to determine whether the diet the Marshallese are consuming is adequate for their physiological needs. The diets were assessed by comparing the intake records with the National Research Council allowances.

The value and limitations of dietary allowances and their use have been a subject of many discussions. Criticisms may be made in the use of these dietary standards for comparison, as these standards were drawn up primarily from studies of individuals and populations of the western world. Little is known about the physiological requirements of nutrients of the Marshallese. These requirements are influenced in varying degrees by body size, climate, activity, and other factors.

In order to have some information of body sizes of Marshallese, 255 male and female Marshallese, from the ages of 9 months through 70 years, participants in this dietary survey, were weighed and measured by the author.

Table 7 shows the weights and heights of 255 male and female Marshallese subjects from 9 months through 70 years of age. The weights are given in pounds showing the range and average; heights are given in inches showing the range and average.

TABLE 7.

WEIGHTS AND HEIGHTS OF MARSHALLESE SUBJECTS

by Mary Murai

Age (yrs.)	Sex	Number of subjects	Weight (pounds) Range	Weight (pounds) Average	Height (inches) Range	Height (inches) Average
9 months	M&F	2	20-25	22	16-20	18
1-3	M	21	20-30	25	20-30	25
	F	3	20-33	28	22-30	27
4-6	M	6	30-35	32	36-40	38
	F	6	25-30	27	34-40	37
7-9	M	3	42-60	50	40-50	44
	F	3	40-60	48	41-54	45
10-12	M	2	58-60	59	48-54	51
	F	7	64-88	77	51-59	55
13-15	M	8	70-120	99	55-66	61
	F	23	77-130	103	52-64	59
16-20	M	56	95-164	123	55-69	64
	F	42	80-146	109	55-64	60
21-60	M	34	102-190	138	58-67	64
	F	22	80-170	123	57-67	61
61-70	M	8	130-158	139	59-67	63
	F	9	110-120	115	59-60	59

The average weights of Marshallese were compared with average weights of Americans of the same age group to obtain the difference between the Marshallese and Americans.

Table 8 shows the differences between average body weights of the Marshallese and American subjects of the same age group.

Table 8.

Comparison of Average Weights of Marshallese with Weights of Americans Given for Each Age Group in the Table of Recommended Daily Allowances, National Research Council.

Age groups	Weights of Americans Weight in lbs.	Weights of Marshallese Weight in lbs.	Difference in lbs.
1 to 3	27	27	0
4 to 6	42	30	-12
7 to 9	58	49	- 9
10 to 12	78	68	-10
13 to 15 (girls)	108	103	- 5
16 to 20 (girls)	122	109	-13
13 to 15 (boys)	108	99	- 9
16 to 20 (boys)	141	123	-18
21 and over (females)	123	123	0
21 and over (males)	154	138	-16

Marshallese subjects had smaller body sizes when compared with American subjects of the same age group. The exceptions were the 1 to 3 years old group, and the females 21 and over age group. The average weights were the same for the Marshallese and American subjects in these two groups.

In spite of these differences in body size, some yardstick had to be used for comparison and since recommended allowances represent certain levels of intake considered desirable, they were used as standards for this study. As stated in "Recommended Dietary Allowances, Revised 1948" (N.R.C. Reprint and Circular Series No. 129, Oct. (1948):

"The quantitative data in the accompanying table are intended to represent exactly what is implied in a literal interpretation of the words recommended dietary allowances. Hence in contrast to some previously promulgated standards, the data in the following table are rather to be understood as representing levels of nutrient intakes which the Food and

Nutrition Board recommends as normally desirable goals or objectives.

"The recommendations are not called 'requirements' because they are intended to represent not merely the literal (minimal) requirements of average individuals, but levels enough higher to cover substantially all individual variations in the requirements of normal people.

"The figures here recommended are, therefore, generally higher than average requirements but generally lower than the doses used to meet needs created by pathological states of certain environmental conditions or in compensating for an earlier period of depletion...."

Other dietary standards have been used by international groups, the two most frequently used for references are the standards proposed by the Committee on Nutrition of the British Medical Association (9) and the Canadian standards approved by the Canadian Council on Nutrition (10).

Goldsmith (11) compared the American, British and Canadian dietary standards in her paper. "The most striking difference is the much lower recommendation for ascorbic acid in the Canadian and British standards than in the Recommended Dietary Allowances of this country. The recommended intakes for the B vitamins and for calcium are also lower, especially in the Canadian. The recommended intake of vitamin A is lower in the Canadian than in the other standards, since the recommendation is made in terms of carotene, rather than in terms of a mixed diet furnishing vitamin A as 2/3 carotine and 1/3 preformed vitamin A. recommended intake of iron is also lower in the Canadian standard. These differences are in line with expectations since the Canadian standard is a nutritional floor and approaches minimal requirements. The British standard is an allowance for maintenance of good nutrition in the average person, and the United States allowances are designed for maintenance of good nutrition of substantially all normal persons and include a margin of safety."

Calories

The Committee on Calorie Requirements of the Food and Agriculture Organization (FAO) of the United Nations (12) has formulated a standard for calories. "The recommendations made.....represent a considered attempt to provide practical guidance on the requirement of population and population groups. The method followed was to assign numerical value to the calorie requirements of a fully defined "reference', and to indicate (also in numerical form) the adjustments to these values which may be made in order to calculate the requirements of individuals differing from the reference in age, body size, temperature of environment, and activity."

"The reference man and woman are 25 years old and live in the temperate zone at a mean annual external temperature of 10 degrees Centigrade. They consume a well-balanced diet and are fully healthy. The degree of activity of the man is that involved in occupation in light industry; that of the woman is the activity appropriate to general household duties or light industrial work. The mean calorie requirements of the reference man and woman on a year-round basis are judged to be 3,200 and 2,300 calories per day respectively."

"It is estimated that requirements in the third trimester of pregnancy are increased by approximately 450 calories daily. In lactation, requirements are increased by 1,000 calories daily, this figure being based on the assumption that the period of lactation is 6 months and the average quantity of milk given by the mother at 3 months after delivery is 850 milliliters."

"The reference children belong to the same type of population as the reference adults and live in the same climatic environment. These values are the 'recommended allowances' of the National Research Council, U. S. A."

"The reference adolescents are 18 years old and weigh 60 kilograms (boys) and 50 kilograms (girls). In health and activity they are similar to the reference children. The requirements of such adolescents at 16 and 19 years of age inclusive are judged to be 3,800 and 2,400 calories for boys and girls respectively."

"Calorie requirements are influenced by body size. It is recommended that the formulae $E = 152.0\ (W)^{0.73}$ (Men) and $E = 123.4\ (W)^{0.73}$ (Men) and E = total calorie requirements and W = body weight (kg.), be used to calculate the requirements of adults according to body size when their activity is that of the reference."

"No adjustments for body size should be applied to children under 16. During the years from 16 to 20, body size is approaching final mature dimensions. In populations in which the average weight of adolescents is less than that of the reference adolescents, adjustments should be made on the basis of the mature size attained at age 25 rather than the actual weight of adolescents. In such circumstances, requirements for males from 16 to 19, inclusive should be reckoned as 120 percent of the requirements of well-nourished active males of 25 years in the same population, the corresponding percentage for females being 105."

A scale to allow for the effect of increasing age on calorie requirements is suggested. According to this scale, requirements at 25 years of age are decreased by 7.5 percent for every 10 years beyond the age of 25."

"The existence of an approximately linear relationship between calorie expenditure and mean annual external temperature was assumed. It is recommended tentatively that for every 10 degrees departure in mean annual temperature from the reference temperature of 10 degrees Centigrade, requirements should be adjusted by 5 percent of requirements at the reference level, the 5 percent being subtracted for higher temperatures and added for lower temperatures."

"The degree of activity directly influence calorie requirements. It is considered that in most populations the mean activity will approximate the degree of activity assigned to the reference adults. No adjustments should be made for activity under 16 years of age. In the scale recommended for children, the activity of boys and girls is assumed to be the same under the age of 13, though in some populations the activity of boys exceeds that of girls at an earlier age than this."

The above recommendations were followed and the calorie requirements of Marshallese were calculated by taking into consideration body size, age, and environmental temperature. Using the equation: $E = (1.1875 - 0.0075A)(1.050 - 0.005T) a W^{0.73}$, where E = total requirements, A = age in years, T = temperature in degrees Centigrade, W = body weight in kilograms. The mean external temperature of the Marshall Islands was taken as 27 degrees Centigrade.

The calorie requirements of Marshallese of various ages living in the Marshall Islands calculated by using the FAO formula for calorie requirements are summarized in Table 9.

Table 9

Calculated Calorie Requirements for Marshallese of Various Ages Living in the Marshall Islands and NRC Recommended Calorie Requirements

	Age	Weight kg.	Calculated Calorie Requirements calories	NRC Requirement
Adolescents				
Men	16-20		3434	3800
Women	16-20		2263	2400
Pregnant women	16-20		2713	2400
Lactating women	16-20		3263	3000
Adults				
Women	21	56	2195	2400
Pregnant women	21	56	2645	2400
Lactating women	21	56	3195	3000
Women	35	56	1971	2400
Pregnant women	35	56	2421	2400
Lactating women	35	56	2971	3000
Women	45	56	1810	2000
Women	65	52	1414	2000
Men	21	63	2949	3000
Men	35	63	2679	3000
Men	45	63	2433	3000
Men	65	63	2003	2400

In most cases, the calculated calorie requirements were lower than the "recommended allowances" of the National Research Council.

Protein

The protein standard for the recommended allowances for adults are based on 1 gm. protein daily for each kilogram of body weight, which is a generous allowance. Leitch and Duckworth (13) concluded in their study that an average maintenance requirement of about 50 gms. per day per normal adult was sufficient. Hegsted, Tsongas, Abbott, and Stare (14) did experiments on protein requirements of adults on 26 adults ranging in age from 19 to 50 years. They were on a basal low-protein diet with approximately 50% of the protein supplied by white bread, 12% by other cereals, 30% by vegetables, and 8% by fruits, protein requirements were between 30 and 40 gms. per 70 kilograms of body weight. With supplements of meat or wheat germ added to the above diet, even less total food protein was required for healthy maintenance. They concluded that the National Research Council allowance for protein of 1 gm. per kilogram of body weight was generous and the allowance could be reduced to 50 gms. for a 70 kilogram adult and still provide approximately 30% margin above requirement.

Calcium

The National Research Council's recommended allowances aims to cover the needs of not less than about 99% of the normal adults of the U. S. population. Leitch (15) concluded that the maintenance requirement is approximately 0.55 gms. of calcium per day for normal human adults regardless of body weight. The calcium requirements are being reviewed again by a subcommittee of the Committee of Dietary Allowances of the Food and Nutrition Board. New allowances will be recommended soon.

Vitamin A

Sherman (16) in his book says, "There is no reason to doubt and good reason to suppose that, in human as in rat nutrition, best results in long-term experience will require at least 2 to 4 times as much Vitamin A value as suffices for minimal adequacy. If the minimal adequate amount is taken, it is about 3000 I. U. for normal adult maintenance, from 6000 to 12,000 would be scientifically more logical allowance (than the 5000 I. U. allowance of the National Research Council) to provide both for individual variations in requirement and for the maintenance of such a bodily reserve as has been found to be favorable to higher health and longer life."

"Vitamin A values of dietaries depend largely upon the precursor carotene rather than on vitamin A itself, and the doubts as to the completeness of availability of these precursors in digestion and assimilation, one will logically prefer to have his intake of vitamin A value nearer the top than the bottom of the 6000-12,000 I. U. zone..."

"Also it is scientifically sound in principle to provide liberal intakes of a nutrient which seems to be involved in so many different functions and in so many major and minor ills as is vitamin A, even if some of these involvements are not entirely clear."

Thiamine

Daum et al (17) concluded that the minimal daily thiamine requirement of young adults of twenty-one to thirty-eight years of age, weighing 55 to 64 kg. and requiring approximately 2500 calories per day for maintenance of body weight was adjusted to be very close to 0.63 mg. thiamine or on the order of 0.25 to 0.30 mg. thiamine per 1000 calories of mixed diet. The NRC allowance of thiamine is approximately 100 percent more than the minimal requirements. The minimum daily requirements, Food and Drug Administration, Federal Security Agency, (18) for thiamine is given as 1.00 mg. daily for adults.

Riboflavin

Horwitt et al (19) observed the effects of diets restricted in riboflavin in 15 male subjects. They studied the excretion of riboflavin in the urine and suggested that the riboflavin requirement of a resting adult to be between 1.1 and 1.6 mgs. per day. They concluded that allowances below 0.6 mg. per day are insufficient to support normal tissue repair, and that a reserve of riboflavin could not be maintained on levels of intake below 1.1 mg. The NRC allowances are based on body weight and allow about 25 percent margin of safety.

Niacin

The amino acid tryptophane can be converted to niacin in the human body, therefore, the requirements for niacin depends on intakes of food containing tryptophane.

The NRC allowance of niacin was set at ten times the corresponding allowances of thiamine for both sexes and all ages. According to Sherman (20), "As yet, we do not know: (1) what part of the niacin requirement will be 'biologically enriched' in niacin by the bacteria of the digestive tract; or (2) the degree of trustworthiness of present estimates either of the niacin requirements of human nutrition or the niacin content of some types of food."

Ascorbic acid

The following data are given by Sherman (21) as standards for ascorbic acid: "A daily intake of 25 milligrams of vitamin C by normal adults (other than women in pregnancy and lactation who need decidedly more) or 1.0 milligrams per 100 calories of food in family dietaries, might be regarded as a minimum sufficing for prevention of the gross signs of scurvy. Fifty milligrams for adult maintenance and 2 milligrams per 100 calories for family dietaries, might be regarded as medium standard. One hundred milligrams per adult, or 4 mg. per 100 calories of family food, one may approximate the presumably optimal allowance sufficing to keep the body 'saturated'."

"The values given in the (National Research Council's) Table represent a conservative appraisal of all the evidence that is available, but they should not be regarded as 'saturation' levels. More generous

intakes (may) result in considerably higher concentrations in the tissues." (22)

Goldsmith (23) concluded "that the purposes and philosophy behind any dietary standard must be appreciated for proper application. In some situations, standard based on minimal requirements are useful and in others, standards representing nutritional goals are more durable. For certain nutrients, recommendations should be related to body size, for caloric consumption, or for still others, to active metabolizing tissue or to the individual. There are many gaps in our knowledge of even minimal requirements and very few quantitative data relative to optimal needs."

SUMMARY

Weekly dietary records of one hundred sixty-one subjects of Majuro village, Majuro Island, Marshall Islands, from the ages of 1 through 70 years of age, were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. These figures were then compared with National Research Council Allowances.

Taking the total group of one hundred sixty-one subjects, the following results were obtained when daily intakes were compared with National Research Council allowances:

1. Calories: one hundred fifty-seven subjects or 97% were below allowances, four subjects or 3% were above allowances.

2. Protein: one hundred thirty subjects or 81% were below allowances, thirty-one subjects or 19% were above allowances.

3. Fat: one hundred fifty-seven subjects or 97% were below allowances, four subjects or 3% were above allowances.

4. Calcium: one hundred fifty-eight subjects or 98% were below allowances, three subjects or 2% were above allowances.

5. Phosphorus: one hundred fifty-three subjects or 95% were below allowances, eight subjects or 5% were above allowances.

6. Iron: one hundred five subjects or 65% were below allowances, fifty-six subjects or 35% were above allowances.

7. Vitamin A: one hundred forty subjects or 87% were below allowances, twenty-one subjects or 13% were above allowances.

8. Thiamine: one hundred thirty-six subjects or 85% were below allowances, twenty-five subjects or 15% were above allowances.

9. Riboflavin: one hundred sixty subjects or 99% were below allowances, one subject or 1% was above allowances.

10. Niacin: seventy-nine subjects or 49% were below allowances, eighty-two subjects or 51% were above allowances.

11. Ascorbic acid: one hundred fifty-one subjects or 94% were below allowances, ten subjects or 6% were above allowances.

The percentage of subjects who failed to meet NRC allowances was greater than those who did meet allowances for the following nutrients: calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, and ascorbic acid.

Ninety-nine percent of the subjects were below allowances for riboflavin; 98% of the subjects were below allowances for calcium; 97% of the subjects were below allowances for calories and fat; 95% of the subjects were below allowances for phosphorus; 94% of the subjects were below allowances for ascorbic acid; 87% of the subjects were below allowances for vitamin A; 85% of the subjects were below allowances for thiamine; 81% of the subjects were below allowances for protein; and 65% of the subjects were below allowances for iron.

Eighty-two subjects or 51% were above allowances for niacin, and seventy-nine subjects or 49% were below allowances.

There were forty-eight children, males and females, forty-six males and sixty-seven females. Of these, there were twenty-four male and female children between the ages of 1 through 3 years of age; twelve male and female children between the ages of 4 through 6 years of age; six male and female children between the ages of 7 and 9 years of age; and six male and female subjects between the ages of 10 through 12 years of age.

Of the males, there were three subjects, ages 13 through 15 years of age; two subjects, 16 through 20 years; thirty-three subjects, 21 to 60 years; eight subjects, 61 to 70 years of age.

Of the females, there were three subjects, 13 through 15 years; four subjects, 16 through 20 years; thirty-six subjects, 21 to 60 years; nine subjects, 61 through 70 years; four pregnant women, and eleven lactating women.

Taking each age group separately, the following results were obtained when daily intakes were compared with National Research Council Allowances:

I. Children

a. 1 to 3 years of age. One hundred percent of the subjects were below allowances for calcium and phosphorus with all twenty-four subjects below allowances. Ninety-six percent of the subjects were below

allowances for fat and riboflavin; 92% of the subjects were below allowances for calories; 88% of the subjects were below allowances for protein; 83% of the subjects were below allowances for both vitamin A and ascorbic acid; 75% of the subjects were below allowances for thiamine; and 62% of the subjects were below allowances for iron. Only 33% of the subjects were below allowances for niacin and 67% were above allowances.

b. 4 to 6 years of age. One hundred percent of the subjects were below allowances for calcium, phosphorus, and riboflavin, with twelve subjects below allowances. Ninety-two percent of the subjects were below allowances for fat and calories; 83% of the subjects were below allowances for vitamin A; 75% of the subjects were below allowances for thiamine; and 67% of the subjects were below allowances for protein and ascorbic acid. Thirty-three percent of the subjects were below allowances for iron and 42% of the subjects were below allowances for niacin. Sixty-seven percent of the subjects were above allowances for iron and 58% of the subjects were above allowances for niacin.

c. 7 to 9 years of age. One hundred percent of the subjects were below allowances for calories, fat, phosphorus, riboflavin and ascorbic acid with six subjects below allowances. Eighty-three percent of the subjects were below allowances for thiamine; 67% of the subjects were below allowances for calcium and Vitamin A. For protein and iron, the percentage of subjects were equally divided with 50% below and 50% above allowances. All subjects or 100% were above allowances for niacin.

d. 10 to 12 years of age. One hundred percent of the subjects were below allowances for calories, fat, calcium, riboflavin and ascorbic acid with six subjects below allowances. Eighty-three percent of the subjects were below allowances for protein, phosphorus, vitamin A and thiamine. Sixty-seven percent of the subjects were below allowances for iron. Thirty-three percent of the subjects were below allowances for niacin and 67% were above allowances.

II. Males

a. 13 to 15 years of age. One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin and ascorbic acid. Sixty-seven percent of the subjects were below allowances for niacin.

b. 16 to 20 years of age. One hundred percent of the subjects were below allowances for calories, fat, calcium, riboflavin and ascorbic acid; 50% of the subjects were below allowances for protein, phosphorus, iron, vitamin A, thiamine and niacin.

c. 21 to 60 years of age. One hundred percent of the subjects were below allowances for calories and riboflavin; 97% of the subjects were below allowances for fat, calcium and ascorbic acid; 91% of the subjects were below allowances for phosphorus and vitamin A; 85% of the subjects were below allowances for thiamine; and 82% of the subjects were below allowances for protein. Seventy percent of the subjects were below allowances for niacin and 64% of the subjects were below allowances for iron.

d. 61 to 70 years of age. One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, vitamin A, riboflavin and ascorbic acid; 88% of the subjects were below allowances for thiamine; and 75% of the subjects were below allowances for iron. Thirty-eight percent of the subjects were below allowances for niacin and 62% were above allowances.

III. Females

a. 13 to 15 years of age. One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin and ascorbic acid. Sixty-seven percent of the subjects were below allowances for niacin.

b. 16 to 20 years of age. One hundred percent of the subjects were below allowances for calories, fat, calcium, vitamin A, thiamine, riboflavin, and ascorbic acid. Seventy-five percent of the subjects were below allowances for protein and niacin; 50% were below allowances for both phosphorus and iron.

c. 21 to 60 years of age. One hundred percent of the subjects were below allowances for calcium and riboflavin; 97% of the subjects were below allowances for calories, fat, phosphorus, and ascorbic acid; 89% of the subjects were below allowances for vitamin A; 86% of the subjects were below allowances for thiamine; 72% of the subjects were below allowances for protein; and 67% of the subjects were below allowances for iron. Forty-seven percent of the subjects were below allowances and 53% were above allowances for niacin.

d. 61 to 70 years of age. One hundred percent of the subjects were below allowances for calories, fat, calcium, phosphorus, riboflavin and ascorbic acid; 89% of the subjects were below allowances for vitamin A and thiamine; 78% of the subjects were below allowances for protein and iron. Forty-four percent of the subjects were below allowances for niacin and 56% were above allowances.

e. Pregnant women. One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin, niacin and ascorbic acid. Fifty percent of the subjects were below allowances for vitamin A.

f. Lactating women. One hundred percent of the subjects were below allowances for calories, protein, fat, calcium, phosphorus, riboflavin and ascorbic acid; 91% of the subjects were below allowances for vitamin A and thiamine; and 73% of the subjects were below allowances for iron. Forty-five percent of the subjects were below allowances for niacin and 55% were above allowances.

RECOMMENDATIONS BASED ON DIETARY STUDIES

Food consumption in the Marshall Islands is dependent on seasonal changes due to the ripening of various plant foods. The breadfruit season begins in May and is picked through the summer until September. In the latter part of the summer, bwiro and jankwin, the preserved forms are made which are eaten after the season is over, particularly in the period from March to May, when food is not so plentiful. In October the pandanus season begins, and they provide the principal food until March; pandanus is preserved as mokan. In the winter, arrowroot is made into flour. Taro can be eaten all year round but in the summer breadfruit is preferred. At other times of the year it (taro) is popular, principally in spring and fall, between the breadfruit and pandanus seasons. Thus, nutrient contents of the diets differ at various times of the year.

There is no storage of fresh foods; the usual procedure is to collect food for the day in Majuro village.

Imported foods have become a very important part of their diet. The food patterns are a combination of local food products and imported foods.

A list is given of the food items commonly consumed by Marshallese studied in this dietary survey.

FOOD ITEMS COMMONLY CONSUMED BY MARSHALLESE STUDIED IN THIS DIETARY SURVEY

1. BREADS

   Bread, white

   Doughnuts

2. CEREALS AND CEREAL DISHES

   Rice, white

   Rice, soft - polished white rice, coconut sap and coconut milk, boiled

   Jaibo - mixture of coconut sap, coconut milk and white flour

3. CRACKERS

   Soda crackers

4. FISH, CRUSTACEA AND SIMILAR FOODS

Marshallese Name	Scientific Name	Common Name
Ail	Acanthurus olivaceus Bloch	Surgeon Fish or Tang
Autok	Chelon vaigiensis (Quoy & Gaimard)	Mullet
Baru lep	Birgus latro	Coconut or Robber crab
Baruwan	Cardisoma hirtipes	Just plain land crab
Bulok	Naso lituratus (Bloch)	Surgeon fish Tang
Bwebwe	Neothunnus macropterus (Temminck & Schlege)	Yellow fin Tuna
Chilu	Katsuwonus pelamis (Linnaeus)	Skipjack
Chiriul	Turbo setosus Gmelin	Cat's eye (most common)
	Turbo argyrostomus Linne	Cat's eye
Imim	Melichthys vidua (Solander) Rhinecanthus aculeatus (Linnaeus)	Trigger fish
Jawe	Plectropomus truncatus (Fowler)	Jewfish or Grouper
Jo	Mulloidichthys samoensis (Günther)	Goatfish - Red mullet
Kuban	Acanthus triostegus triostegus (Linnaeus)	Surgeon fish, Tang
Lere	Balistidae	Trigger fish
Likup	Cymolutes praetextatus (Quoy & Gaimard)	Wrasse
Meret (Mera)	Family Scaridae	Parrotfish
Mermer	Siganus punctatus (Bloch)	
Momo	Epinephelus merra Bloch	Sea Bass, grouper
Molle	Siganus rostratus (Valenciennes)	
Ikmouij	Scaridae	Parrotfish
Pako	probably Carcharhinus melanopterus (Quoy & Gaimard)	Shark

4. FISH (continued)

Marshallese Name	Scientific Name	Common Name
Jojo	Exocoetidae	Flying fish
Lukerr	Canarium Luhuenum Luhuanum (Linné)	

Canned

Salmon, entire content, natural

Sardines, Pacific, entire content

Sardines, Pacific, tomato sauce

Sardines, Maine, in oil

5. FRUITS

Bananas (Kābran)

Eating - Jibuki and Marshallese varieties (Musa sapientum)

Cooking - Mōkarkar

Breadfruit (Mā)

Seeded Mijiwan roasted, baked, or boiled
(seeded variety, Artocarpus incisus)

Seedless Batakdak roasted, baked, or boiled
(seedless variety, Artocarpus incisus)

Bukdrol roasted, baked, or boiled
(seedless variety, Artocarpus incisus)

Preserved Bwiro

Coconut sep Jekaro

Coconut sep, boiled Jejajeje

Limes (Citrus aurantifolia)

Pandanus (Pandanus sp.)

Lojekerer variety fresh and boiled

Joibeb fresh and boiled

Paste bop, mokan

5. FRUITS (continued)

Papayes (Carica papaya L.)

6. MEATS, FRESH

Pork

7. MEAT, SAUSAGE AND SIMILAR PRODUCTS

Beef, corned

Meat, luncheon

Sausage, Vienna

8. MILK

Milk, canned, evaporated (mostly for infants, not for general population)

9. NUTS

Coconut	meat of mature nut	waini (Cocos nucifera)
	drinking fluid of immature nut	ni
	meat of immature nut	mere
	embryo of sprouting nut	iu

10. SUGAR

Sugar, white, granulated

11. SWEETS - CANDY AND SIMILAR FOODS

Candies, hard

Gum

12. VEGETABLES

Taro	Wan	Cyrtosperma chamissonis (Schott) Merr.
	Kaliklik	Cyrtosperma chamissonis (Schott) Merr.
	Buroro	Cyrtosperma chamissonis (Schott) Merr.

13. MISCELLANEOUS

Tea

Good food consumption depends on both education and economics. Better levels of consumption of the right foods should be taught to all the people.

1. Calories and fat

A constant supply of fuel is required by the body. This need is met by the carbohydrate, fat and protein foods. Carbohydrate and fatty foods are the chief source of energy as protein is used mainly for body building. The combustion of foods to carbon dioxide, water and nitrogen yields the energy which permits the body to carry on its activities. The calorie is the standard for the measurement of the energy value of foods and is also used to express the energy requirements of the body.

In this study, from the total of one hundred sixty-one subjects, one hundred fifty-seven subjects of Majuro village or 97% were below NRC allowances for calories for their age and sex.

To increase the caloric intake, food consumption must be increased, especially the foods high in fat and carbohydrate. Fats widely distributed in both plants and animals, and are contained in varying proportions in nearly all the natural foods. Fats constitute the most concentrated food. They yield two and a half times more calories than carbohydrates or proteins. Fats are known to be carriers of vitamins and fatty acids which are now recognized to be essential. Carbohydrate foods are good economical fuel sources, while both the carbohydrate and fatty foods have a protein sparing power.

The energy foods are the following:

1. Starches and sugars: cereals, macaroni, spaghetti, bread, potatoes, white and sweet; corn, beans, rice, sugar, sugar syrup, coconut syrup, jellies, and jams, fruits and vegetables, especially Cyrtosperma chamissonis (iaraj), breadfruit (mā), bananas (kābran), and arrowroot flour (mokmok).

2. Fats: vegetable and animal oils; nuts, mature coconuts (waini), flesh of the immature coconut (Mere), and peanut butter.

2. Protein

Protein, an organic compound which contains nitrogen, is necessary to build, maintain, and repair various tissues of the body. The greatest proportion of the body tissues is composed of protein and it is an indispensable constituent of every living cell.

Out of one hundred and sixty-one subjects of Majuro village, one hundred thirty or 81% were below NRC allowances for protein.

Protein is supplied largely from animal sources, such as meat, poultry, fish, crustacea, eggs, milk, and also from vegetable sources particularly seeds and nuts. Unfortunately, protein foods are expensive food items, but for the money expended, milk is an economical food as it supplies besides protein of high quality, fat, carbohydrate, calcium, phosphorus, iron, vitamin A, riboflavin, niacin and vitamin D. Children should have 3 to 4 cups daily; adolescents, boys and girls 1 quart; pregnant and lactating women 1 quart; and everyone else 1 to 3 cups daily. Eggs constitute a relatively costly food compared with their contribution of nutrients. More fresh fish could be included in the diets and dried beans and legumes, such as soybeans, can be a good source of protein. In general, protein from animal sources are more often of higher quality than those from plant origin.

Protein foods are as follows: meats, eggs, fish, eels, sea fowls, ducks, whales, turtles, turtle eggs, crustacea; nuts, whole cereals, dried peas and beans. Legumes are rich in protein and can be a partial substitute for meat in the diet. Breadfruit, fresh and preserved (bwiro, jankwin, manakajen); breadfruit seeds (colé); sweet potatoes (iaraj); Cyrtosperma chamissonis; cocconuts; pandanus (bop, mokan), fresh and paste are sources.

3. Calcium and phosphorus

The two minerals, calcium and phosphorus, are essential for proper bone and teeth development. They also play a part in the regulation of the internal activities of the body.

Calcium participates in blood coagulation, shares in regulation of cardiac and uterine muscle action, is important to capillary permeability, activates many enzymes and is essential for the functioning of voluntary and autonomic nervous systems.

Phosphorus is an essential constituent of all cells, is a constituent of various enzymes, is essential for protein metabolism, for formation of phospholipids, participates in the carbohydrate cycle and muscle metabolism, and is interrelated with the action of calcium, vitamin D, and the parathyroid hormones.

Out of one hundred sixty-one subjects, one hundred fifty-eight subjects or 98% were below allowances for calcium. One hundred fifty-three subjects or 95% were below allowances for phosphorus. Milk is the best source of calcium and it also contains considerable phosphorus. Phosphorus is more generally distributed in both animal and vegetable foods than calcium. Fish is an excellent source of phosphorus and meat is a very good source. Dried beans are excellent sources of phosphorus. Green leaves have a fairly liberal amount of calcium in relation to their total solids. Bones of small fish supply calcium and phosphorus. Vegetables and fruits are on the whole low in phosphorus. Bananas (kābran), pandanus (bop), breadfruit (mā) seeded and seedless), breadfruit seeds (colé), sweet potatoes, Cyrtosperma chamissonis (iaraj), coconuts (waini), coconut embryo (iu), flesh of immature coconuts (mere), sweet potato leaves, and other edible green leaves are sources.

4. Iron

The amount of iron in the body is small but the role it plays is very important. Iron is an essential part of hemoglobin of blood and the main function is to carry oxygen so that oxidation and reduction processes are carried on within the cells. It is also a component of chromatin which is found in all living cells and plays a fundamental part in their activity. Lack of iron in the diet can cause nutritional anemia.

Of one hundred sixty-one subjects of Majuro village, one hundred five subjects or 65% were below NRC allowances.

Since enriched flour was used, iron intakes were higher than expected. Flour is used extensively in breads, doughnuts, pancakes, jaibo and other prepared dishes. When flour is imported from other countries, there is no assurance that it is enriched and iron intake values will be lowered to a great extent. Enriched flour has added iron, thiamine, riboflavin, and niacin.

Iron is found in lean meat, fish, eggs, liver, dried beans, green vegetables, potatoes, dried fruits and mature legumes. Iaraj (Cyrtosperma chamissonis), mature cocoanuts (waini), flesh of immature cocoanuts (mere), breadfruit (mā), fresh and preserved; (bwiro, jankwin and manakajin) and breadfruit seeds (colé) are vegetable sources.

5. Vitamin A

Vitamin A is necessary for normal growth and development. It is needed to protect and keep healthy the epithelial cells which line the tracts and organs of the body. These cells become stratified and keratinized and result in disease, lowered resistance and failure to reproduce. The adaptation of the eye to a change in light is related to vitamin A and is a cause of night blindness. Vitamin A is also important in the formation of teeth as the enamel forming cells are like epithelia and are affected by a lack of vitamin A.

One hundred sixty-one subjects of Majuro Village, one hundred forty subjects or 87% were below NRC allowances.

Orange yellow and green parts of plants are superior to other parts of the plant for vitamin A such as yellow squash, yellow sweet potatoes, yellow turnips, and yellow corn. Bright green thinner leaves are richer than pale thick ones. Green vegetables: spinach, cabbage, mustard green and sweet potato tops. Fruits: bananas, papayas, cantaloupes, pineapples and oranges. Fish liver oils, milk, eggs, flesh of fish such as tuna, mackeral, swordfish, whale, salmon and shark are good sources of vitamin A. Pandanus (bop, mokan), fresh and preserved; breadfruit (ma, bwiro, jankwin and manakajin), fresh and preserved are good sources.

6. Thiamine

Thiamine is involved in carbohydrate metabolism and is essential for maintenance of good appetite, normal digestion and intestinal tonus.

It is also necessary for growth, fertility and the normal functioning of the nervous tissue.

Of one hundred sixty-one subjects of Majuro village, one hundred thirty-six subjects or 85% were below NRC allowances.

Thiamine added to enriched flour helps to increase the intake of thiamine. White milled rice is one of the most popular foods but is low in thiamine. Converted rice has a higher thiamine value than milled white rice. Enriched rice is now on the market and the effectiveness of improving the diet is still in the experimental stages.

Thiamine is found in the following foods: Animal: milk, liver, kidney, heart, egg yolk and especially pork. Seeds: whole grains, wheat and corn. All nuts. Legumes: beans, peas, and lentils. Bananas (kābran), breadfruit (mā), fresh and preserved (bwiro, jankwin and manakajin); breadfruit seeds (colé); sweet potatoes; iaraj (Cyrtosperma chamissonis); coconut embryo (iu); pandanus (bop, mokan), fresh and paste.

7. Riboflavin

Riboflavin along with thiamine and niacin is involved in the oxidation and reduction processes which are concerned with energy metabolism of the tissues. Lack of this vitamin affects growth, the skin, eyes and nerves. Dimness of vision, and invasion of the cornea by the capillaries is caused by a lack.

Of one hundred sixty-one subjects of Majuro village, one hundred sixty or 99% were below NRC allowances.

Of all the nutrients studied, riboflavin showed the greatest number of subjects failing to meet NRC allowances. This nutrient intake was helped by riboflavin in enriched flour. Riboflavin is found in liver, muscles of animals and fish, milk and eggs. Among the plant sources the actively growing leaves; legumes, including peanuts are good. Bananas (kābran); breadfruit (mā), fresh and preserved (bwiro, jankwin and manakajen); breadfruit seeds (colé); iaraj (Cyrtosperma chamissonis); coconut embryo (iu); pandanus fruit (bop), fresh and paste (mokan) are other sources.

8. Niacin

Niacin is essential in the enzyme system of the body. A lack affects the skin, gastro-intestinal tract, and the nervous system. In severe cases, pellagra is the result.

Of one hundred sixty-one subjects of Majuro village, seventy-nine subjects or 49% were below NRC allowances.

High values for niacin are found in liver, kidney, lean muscle of meat, fish, poultry, brain, salmon, peanuts, peanut butter, yeast, milk, plants: leaf type vegetables. Coconut syrup (jekamāi); coconut embryo (iu); mature coconut (waini); breadfruit (mā), fresh and preserved (bwiro, jankwin and manakajen); breadfruit seeds (colé); iaraj (Cyrtosperma chamissonis); pandanus (bop) fresh and paste (mokan); and sweet

potatoes are sources.

9. Ascorbic acid

Ascorbic acid is involved in the metabolism of intercellular tissue and plays an important part in the structure and functioning of bones and teeth, capillaries, muscle and glandular organs.

Lack of ascorbic acid results in hemorrhage, soft swollen gums, teeth with resorbed porotic dentine, malformed and weak bones, and degeneration of muscle fibers.

Out of one hundred sixty-one subjects of Majuro village, one hundred fifty-one subjects or 94% were below NRC allowances.

Citrus fruits, such as lime, orange, grapefruits, lemons, are the best sources, others are tomatoes, cantaloupes, cabbage, papayas and peppers. Bananas (kabran); coconut sap (jekaro); pandanus (bop), fresh and paste (mokan); breadfruit (ma), fresh and preserved (bwiro, jankwin and manakajen); and coconut embryo (iu) are sources.

For future planning, the target for good nutrition is a well balanced meal. Foods from each group should be eaten daily: the fat and sugars; bread, flour and cereals; green and yellow vegetables; limes, papayas and other fruits; vegetables and fruits; milk and milk products; fish, eggs, meat and poultry.

Special attention should be paid to the growing children, pregnant and lactating women.

The first years of a child's life is a period of very rapid growth and good nutrition is important. The Recommended Daily Dietary Allowances for a child under 1 year are as follows: calories, 100 calories/2.2 lbs. or 1 kilogram; protein, 3.5/2.2 lbs.; calcium 1 gm.; iron 6 mgs.; vitamin A 1500 I. U.; thiamine 0.4 mgs.; riboflavin 0.6 mgs.; niacin 4 mgs.; ascorbic acid 30 mgs.; vitamin D 400 I. U. These allowances can be met by including the easily digested foods of the various groups mentioned previously.

The few instances in which data were collected, the child was breast fed until about 8 months. Usually a child is weaned at 12 months. In many instances, canned evaporated milk diluted with equal amounts of boiled water, was given as supplementary food to breast feeding. Drinking fluid of the immature nut was taken as early as three months. At about six months, cooked breadfruit mixed with boiled water and boiled coconut sap was given. At about 11 to 12 months, foods found in an adult diet were given as fast as tolerated.

For growing children all food nutrients including calories must cover requirements for growth as well as maintenance and activity. Liberal calcium intake is needed by the body of infants and children as they must retain a large amount of calcium than of any other building material. A low intake of calcium and phosphorus during growth will prevent normal development and calcification of the bones and teeth. All other nutrients must be carefully considered for optimum health.

Pregnancy is also a period of growth. There is an extra demand for body building materials and body regulating materials needed for maintenance requirements for the woman, for fetal tissue, and for a reserve for lactation. All nutrient intakes should be liberal.

Lactation requires energy to carry on work of women and energy to manufacture milk. Liberal feeding is not only important for conservation of energy of the mother but may prolong the period of lactation.

DIETARY STUDIES OF THREE MARSHALLESE SCHOOLS

DIETARY STUDY OF FEMALE STUDENTS OF THE MARSHALL CHRISTIAN TRAINING SCHOOL, RONRON, MARSHALL ISLANDS

PURPOSE

1. To determine the nutritional adequacy of the diet for calories and nutrients; 2. To study food consumption of studnets in a school supervised and financed by Marshallese in order to make a comparative study of diets of students of a Marshallese school and students of the Marshall Island Intermediate School and Teacher Training School in Uliga, which was supervised by the U. S. Navy; 3. To gather more data about female students as most of the subjects at the Marshall Island Intermediate School were males.

SCHOOL

The students came from all the atolls in the Marshall Islands except Ujelang. The school is owned and financed by the Association of Marshall Island Churches. Financial support is obtained from a fund created by Marshallese Congregational church members paying a dollar a year. School teachers' salaries and food for faculty and students are paid from this fund.

FOOD SUPPLIES

The Council of Majuro village had given the school certain lands and trees, such as breadfruit, coconuts, and pandanus, which are used for food. Bananas, limes, and taro are usually given to the school as gifts from the Council of Majuro village. Church members and churches of the other atolls in the Marshall Islands send arrowroot flour, preserved pandanus and salted fish as gifts.

Supplies such as rice, sugar, shoyu, and flour are bought from the Majuro Wholesale Company at retail prices.

MEALS

Two meals are served to the students daily. Breakfast at about 9:30 a.m. and the evening meal at 5:30 p.m. One food was usually served at each meal such as soft rice cooked with coconut milk and coconut sap; jaibo, a mixture of flour, coconut milk, and boiled coconut sap; jekara bread made with coconut sap; or rice. Other food that students ate were bought individually at a store that the school maintained for students, where canned fish, crackers, and other food were sold.

Schedule of activities for the day

6:00 a.m. Rising bell

6:30 a.m. Hymn and prayer at girls' dormitory

7:00 a.m. Cleaning of dormitory

8:00 a.m. Bible reading

9:15-10:00 a.m. Breakfast

10:00 a.m. to 12:30 p.m. English, arithmetic, geography, music

12:30-2:00 p.m. Study, rest, and play

2:00-4:30 p.m. Work period

Girls - Embroidery, handicraft, or washing and ironing

Boys - Feeding pigs, morning, noon and night

Feeding hens, morning, noon and night

Carpentry

Cleaning grounds

Planting

Fishing

Building

Kitchen duties -

Cooking - boys only - one week at a time

Married students act as supervisors

Girls do the washing of kitchen utensils

FOOD PREPARATION

Food was prepared at the cookhouse. The cookhouse had facilities for cooking food by baking (umum) or boiling (ainbat). Dried pandanus husks, wood or coconut husks were used for fuel. After the food was prepared, the boys took the food to the girls' dormitory where monitors for the day divided the food equally for each girl. Food was then eaten from enamelware plates or coconut husks. Since there were no dining rooms, the students ate in groups around the school grounds. After eating, each student washed her own dish in the lagoon. In case of rain, the students ate in the dormitory.

SUPPLEMENTARY FOODS

Pigs and chickens raised on the premises were used for food only on special occasions, such as chicken for Easter and roast pig on New Year's day.

FISHING

The school owned three fish traps; two were always left in the lagoon. The students went fishing with nets on Saturday. Since there

were no storage facilities;the fish was eaten the day of the catch. Crabs and lobsters were caught at certain times of the year. At low tide, girls gathered clams and shellfish on the coral reefs.

STUDY

Food record method was followed. Food was weighed at each meal on a Chatillon gram scale. Left over food was weighed and subtracted from the amount originally served. Between meal feedings with quantities eaten were listed.

Forms used were the same as those used in the study at the Marshall Island Intermediate School at Uliga. Food consumption for a period of one week for each subject was recorded. Medical information was also noted.

Example

Student B Age: 19 Sex: F Marital status: S

Address: Marshall Christian Training School

District: Ebon

Weight: 143 lbs. Height: 62 1/2 inches

Medical record:

Physical complaints: none

Defects noted on general inspection

Ecthyma, legs

Hypertrophic tonsils

Chest X-ray

Negative

Tuberculin skin

T negative

C negative

H negative

Kahn

222

Stools

negative

Food intake record for Student B from April 2 through April 8, 1951

April 2, 1951

Soft rice	760 gms.
Taro	340 gms.
Between meals	
Bananas, Marshallese	2
Coconut, mature	200 gms.

April 3, 1951

Soft rice	704 gms.
Rice, white, boiled	640 gms.
Between meals	
Bananas, Marshallese	4
Pandanus, fresh	300 gms.
Candies, hard	50 gms.
Bread, white	224 gms.

April 4, 1951

Jaibo	650 gms.
Soft rice	620 gms.
Between meals	
Bananas, Jibuki	2
Coconuts	600 gms.
Bread, white	224 gms.

April 5, 1951

Soft rice	566 gms.
Jaibo	504 gms.

Between meals	
Pandanus, fresh	300 gms.
Shellfish, Lukerr	100 gms.
April 6, 1951	
Jaibo	440 gms.
Rice, boiled white	560 gms.
Between meals	
Bread, white	224 gms.
Coconut, embryo, iu	500 gms.
Bread, white	224 gms.
April 7, 1951	
Jaibo	600 gms.
Soft rice	620 gms.
Between meals	
Coconut, mature	300 gms.
Bread, white	224 gms.
Fish, Kuban	200 gms.
April 8, 1951	
Rice, white, boiled	686 gms.
Between meals	
Bread, white	448 gms.
Pandanus, fresh	375

Typical Menus Served by School

April 2, 1951	April 5, 1951
Breakfast	Breakfast
Soft rice	Soft rice
Supper	Supper
Taro	Jaibo
April 3, 1951	April 6, 1951
Breakfast	Breakfast
Soft rice	Jaibo
Supper	Supper
Rice	Rice, boiled, white
April 4, 1951	April 7, 1951
Breakfast	Breakfast
Jaibo	Jaibo
Supper	Supper
Soft rice	Soft rice

RESULTS

The results of the dietary study of female students at the Marshall Christian Training School, Ronron, Marshall Islands are given in Table 10.

The daily quantities of various nutrients per person and comparison with National Research Council Allowances for fifty-two female students from the ages of 10 through 20 years of age are noted.

The subjects are divided into different age groups, giving the number of subjects in each group, sex, range of each nutrient, number of subjects in each group, sex, range of each nutrient, number of subjects in each group, average, NRC allowances and number below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin and ascorbic acid.

Table 10.

Dietary Study of Students at Marshall Christian Training School, Roñroñ, Marshall Islands

by Mary Murai

Daily Quantities of Various Nutrients per Person and Comparison with National Research Council Allowances

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Calories									
10-12	4	F	1413-2947	1400-2399	1	2300	2500	3	75
				2400-3399	3				
13-15	14	F	1646-2391	1600-2599	14	2070	2600	14	100
16-20	34	F	1578-2927	1500-2499	25	2178	2400	25	73
				2500-3499	9				
Protein (gm.)									
10-12	4	F	59-77	50-69	3	66	70	3	75
				70-89	1				
13-15	14	F	42-73	40-59	7	58	80	14	100
				60-79	7				
16-20	34	F	38-76	30-49	5	59	75	31	91
				50-69	23				
				70-89	6				
Fat (gm.)									
10-12	4	F	30-57	30-89	4	42	69	4	100
13-15	14	F	8-70	< 10	2	39	72	14	100
				10-39	6				
				40-69	5				
				70-99	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects iin group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
16-20	34	F	7-88	< 10	3	42	67	29	85
				10-39	16				
				40-69	11				
				70-99	4				
Calcium (mg.)									
10-12	4	F	334-541	300-499	3	440	1200	4	100
				500-699	1				
13-15	14	F	205-738	200-399	3	496	1300	14	100
				400-599	8				
				600-799	3				
16-20	34	F	208-731	200-399	11	445	1000	34	100
				400-599	18				
				600-799	5				
Phosphorus (mg.)									
10-12	4	F	1014-1208	1000-1199	3	1132	1200	3	75
				1200-1399	1				
13-15	14	F	904-1230	900-1099	9	1054	1200	13	93
				1100-1299	5				
16-20	34	F	853-1728	800-999	10	1102	1200	28	82
				1000-1199	18				
				1200-1399	5				
				1600-1799	1				
Iron (mg.)									
10-12	4	F	7-11	5-9	2	9	12	4	100
				10-14	2				
13-15	14	F	5-18	5-9	12	9	15	13	93
				10-14	1				
				15-19	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	34	F	5-14	5-9	27	9	15	34	100
				10-14	7				
Vitamin A (I.U.)									
10-12	4	F	219-3492	< 499	1	1796	4500	4	100
				1000-1999	1				
				2000-2999	1				
				3000-3999	1				
13-15	14	F	649-5156	500-999	2	2845	5000	13	93
				1000-1999	1				
				2000-2999	3				
				3000-3999	6				
				4000-4999	1				
				5000	1				
16-20	34	F	144-9550	< 499	3	2885	5000	32	94
				500-999	1				
				1000-1999	5				
				2000-2999	12				
				3000-3999	7				
				4000-4999	4				
				>5000	2				
Thiamine (mcg.)									
10-12	4	F	625-1592	600-899	2	1056	1200	3	75
				900-1199	1				
				1500-1799	1				
13-15	14	F	366-1188	300-599	2	690	1300	14	100
				600-899	11				
				900-1199	1				
16-20	34	F	348-1367	300-599	8	756	1200	32	94
				600-899	19				
				900-1199	5				
				1200-1499	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Riboflavin (mcg.)									
10-12	4	F	417-979	400-699	3	672	1800	4	100
				700-999	1				
13-15	14	F	241-799	200-499	8	498	2000	14	100
				500-799	6				
16-20	34	F	311-922	300-599	23	552	1800	34	100
				600-899	10				
				900-1199	1				
Niacin (mg.)									
10-12	4	F	9-15	< 10	1	13	12	1	25
				10-19	3				
13-15	14	F	7-16	< 10	6	10	13	10	71
				10-19	8				
16-20	34	F	7-20	< 10	10	12	12	19	56
				10-19	23				
				20-29	1				
Ascorbic Acid (mg.)									
10-12	4	F	11-23	10-19	3	16	75	4	100
				20-29	1				
13-15	14	F	7-25	< 10	1	17	80	14	100
				10-19	8				
				20-29	5				
16-20	34	F	8-61	< 10	1	22	80	34	100
				10-19	18				
				20-29	7				
				30-39	4				
				40-49	2				
				50-59	1				
				60-69	1				

1. CALORIES

For four female subjects, 10 to 12 years of age, the range was from 1413 to 2947 calories, and the average per person was 2300 calories. The average figure was 92% of the NRC allowances of 2500 calories. Three subjects or 75% were below allowances and one or 25% was above the allowance.

For fourteen female subjects, 13 to 15 years of age, the range was from 1646 to 2391 calories, and the average per person was 2070 calories. The average figure was 80% of the NRC allowances of 2600 calories. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 1578 to 2927 calories, and the average per person was 2178 calories. The average figure was 91% of the NRC allowances of 2400 calories. Twenty-five subjects or 73% were below allowances and nine or 27% were above allowances.

For the total group of fifty-two subjects, forty-two or 81% were below allowances and ten or 19% were above allowances.

2. PROTEIN

For four female subjects, 10 to 12 years of age, the range was from 59 to 77 gms., and the average per person was 66 gms. The average figure was 94% of the NRC allowances of 70 gms. Three subjects or 75% were below allowances and one or 25% was above the allowance.

For fourteen female subjects, 13 to 15 years of age, the range was from 42 to 73 gms., and the average per person was 58 gms. The average figure was 72% of the NRC allowances of 80 gms. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 38 to 76 gms., and the average per person was 59 gms. The average figure was 79% of the NRC allowances of 75 gms. Thirty-one or 91% were below allowances and three or 9% were above allowances.

For the total group of fifty-two subjects, forty-eight or 92% were below allowances and four or 8% were above allowances.

3. FAT

For four female subjects, 10 to 12 years of age, the range was from 30 to 57 gms., and the average per person was 42 gms. The average figure was 61% of the NRC allowances of 69 gms. Four subjects or 100% were below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 8 to 70 gms., and the average per person was 39 gms. The average figure was 54% of the NRC allowances of 72 gms. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 7 to 88 gms., and the average per person was 42 gms. The average figure was 63% of the NRC allowances of 67 gms. Twenty-nine subjects or 85% were below allowances and five or 15% were above allowances.

For the total group of fifty-two subjects, forty-seven or 90% were below allowances, and five or 10% were above allowances.

4. CALCIUM

For four female subjects, 10 to 12 years of age, the range was from 334 to 541 mgs., and the average per person was 440 mgs. The average figure was 37% of the NRC allowances of 1200 mgs. Four subjects or 100% were below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 205 to 738 mgs., and the average per person was 496 mgs. The average figure was 38% of the NRC allowances of 1300 mgs. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 208 to 731 mgs., and the average per person was 445 mgs. The average figure was 44% of the NRC allowances of 1000 mgs. Thirty-four subjects or 100% were below allowances.

For the total group of fifty-two subjects, fifty-two subjects or 100% were below allowances.

5. PHOSPHORUS

For four female subjects, 10 to 12 years of age, the range was from 1014 to 1208 mgs., and the average per person was 1132 mgs. The average figure was 94% of the NRC allowances of 1200 mgs. Three subjects or 75% were below allowances and one or 25% was above the allowance.

For fourteen female subjects, 13 to 15 years of age, the range was from 904 to 1230 mgs., and the average per person was 1054 mgs. The average figure was 88% of the NRC allowances of 1200 mgs. Thirteen or 93% were below allowances and one subject or 7% was above the allowance.

For thirty-four female subjects, 16 to 20 years of age, the range was from 853 to 1728 mgs., and the average per person was 1102 mgs. The average figure was 92% of the NRC allowances of 1200 mgs. Twenty-eight subjects or 82% were below allowances and six subjects or 18% were above allowances.

For the total group of fifty-two subjects, forty-four subjects or 85% were below allowances and eight subjects or 15% were above allowances.

6. IRON

For four female subjects, 10 to 12 years of age, the range was from 7 to 11 mgs., and the average per person was 9 mgs. The average figure was 75% of the NRC allowances of 12 mgs. Four subjects or 100% were below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 5 to 18 mgs., and the average per person was 9 mgs. The average figure was 60% of the NRC allowances of 15 mgs. Thirteen subjects or 93% were below allowances and one subject or 7% was above the allowance.

For thirty-four female subjects, 16 to 20 years of age, the range was from 5 to 14 mgs., and the average per person was 9 mgs. The average figure was 60% of the NRC allowances of 15 mgs. Thirty-four subjects or 100% were below allowances.

For the total group of fifty-two subjects, fifty-one subjects or 98% were below allowances and one subject or 2% was above the allowance.

7. VITAMIN A

For four female subjects, 10 to 12 years of age, the range was from 219 to 3492 I. U., and the average per person was 1796 I. U. The average figure was 40% of the NRC allowances of 4500 I. U. Four subjects or 100% were below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 649 to 5156 I. U., and the average per person was 2845 I. U. The average figure was 57% of the NRC allowances of 5000 I. U. Thirteen subjects or 93% were below allowances and one subject or 7% was above the allowance.

For thirty-four female subjects, 16 to 20 years of age, the range was from 144 to 9550 I. U., and the average per person was 2885 I. U. The average figure was 58% of the NRC allowances of 5000 I. U. Thirty-two subjects or 94% were below allowances and two subjects or 6% were above allowances.

For the total group of fifty-two subjects, forty-nine subjects or 94% were below allowances and three subjects or 6% were above allowances.

8. THIAMINE

For four female subjects, 10 to 12 years of age, the range was from 625 to 1592 mcgs., and the average per person was 1056 mcgs. The average figure was 88% of the NRC allowances of 1200 mcgs. Three subjects or 75% were below allowances and one subject or 25% was above the allowance.

For fourteen female subjects, 13 to 15 years of age, the range was from 366 to 1188 mcgs., and the average per person was 690 mcgs. The average figure was 53% of the NRC allowances of 1300 mcgs. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 348 to 1367 mcgs., and the average per person was 756 mcgs. The average figure was 63% of the NRC allowances of 1200 mcgs. Thirty-two subjects or 94% were below allowances and two or 6% were above allowances.

For the total group of fifty-two subjects, forty-nine subjects or 94% were below allowances and three subjects or 6% were above allowances.

9. RIBOFLAVIN

For four female subjects, 10 to 12 years of age, the range was from 417 to 979 mcgs., and the average per person was 672 mcgs. The average figure was 37% of the NRC allowances of 1800 mcgs. Four subjects or 100% were below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 241 to 799 mcgs., and the average per person was 498 mcgs. The average figure was 25% of the NRC allowances of 2000 mcgs. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 311 to 922 mcgs., and the average per person was 552 mcgs. The average figure was 31% of the NRC allowances of 1800 mcgs. Thirty-four subjects or 100% were below allowances.

For the total group of fifty-two subjects, fifty-two subjects or 100% were below allowances.

10. NIACIN

For four female subjects, 10 to 12 years of age, the range was from 9 to 15 mgs., and the average per person was 13 mgs. The average figure was 108% of the NRC allowances of 12 mgs. One subject or 25% was below the allowance and three subjects or 75% were above allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 7 to 16 mgs., and the average per person was 10 mgs. The average figure was 77% of the NRC allowances of 13 mgs. Ten or 71% were below allowances and four subjects or 29% were above allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 7 to 20 mgs., and the average per person was 12 mgs. The average figure was 100% of the NRC allowances of 12 mgs. Nineteen subjects or 56% were below allowances and fifteen subjects or 44% were above allowances.

For the total group of fifty-two subjects, thirty subjects or 58% were below allowances and twenty-two subjects or 42% were above allowances.

11. ASCORBIC ACID

For four female subjects, 10 to 12 years of age, the range was from 11 to 23 mgs., and the average per person was 16 mgs. The average figure was 21% of the NRC allowances of 75 mgs. Four subjects or 100% were

below allowances.

For fourteen female subjects, 13 to 15 years of age, the range was from 7 to 25 mgs., and the average per person was 80 mgs. The average figure was 21% of the NRC allowances of 80 mgs. Fourteen subjects or 100% were below allowances.

For thirty-four female subjects, 16 to 20 years of age, the range was from 8 to 61 mgs., and the average per person was 22 mgs. The average figure was 27% of the NRC allowances of 80 mgs. Thirty-four subjects or 100% were below allowances.

For the total group of fifty-two subjects, fifty-two subjects or 100% were above allowances.

SUMMARY

Weekly dietary records of fifty-two female students of the Marshall Christian Training School at Roñroñ, Marshall Islands, from the ages of 10 through 20 years of age, were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid. These figures were then compared with National Research Council Allowances.

Taking the total group of fifty-two students, the following results were obtained when daily intakes were compared with National Research Council allowances:

1. Calories: Forty-two or 81% were below allowances, ten or 19% were above allowances.

2. Protein: Forty-eight or 92% were below allowances, four subjects or 8% were above allowances.

3. Fat: Forty-seven subjects or 90% were below allowances, five subjects or 10% were above allowances.

4. Calcium: Fifty-two subjects or 100% were below allowances.

5. Phosphorus: Forty-four subjects or 85% were below allowances, eight subjects or 15% were above allowances.

6. Iron: Fifty-one subjects or 98% were below allowances, one subject or 2% was above the allowance.

7. Vitamin A: Forty-nine subjects or 94% were below allowances, three subjects or 6% were above allowances.

8. Thiamine: Forty-nine subjects or 94% were below allowances, three subjects or 6% were above allowances.

9. Riboflavin: Fifty-two subjects or 100% were below allowances.

10. Niacin: Thirty subjects or 58% were below allowances, twenty-two subjects or 42% were above allowances.

11. Ascorbic acid: Fifty-two subjects or 100% were above allowances.

All subjects or 100% did not meet NRC allowances for calcium, riboflavin, and ascorbic acid. Ninety-eight percent of the subjects were below allowances for iron, 94% of the subjects were below allowances for thiamine and vitamin A.

Ninety-two percent of the subjects were below allowances for protein; 90% of the subjects were below allowances for fat; 85% of the subjects were below allowances for phosphorus; 81% of the subjects were below allowances for calories; and 58% of the subjects were below allowances for niacin.

DIETARY STUDY OF STUDENTS AT THE MISSION SCHOOL, MAJURO VILLAGE, MAJURO ISLAND, MARSHALL ISLANDS

PURPOSE

1. To determine the nutritional adequacy of the diet for calories and nutrients.

2. To study food consumption of students in a school administered and financed by Marshallese.

3. To complete the survey of subjects of Majuro Village.

SUBJECTS

The students were all residents of Majuro Village except for three students who were from Arno atoll. This study included twenty-four students--one male subject, 13 to 15 years of age; ten male subjects, 16 to 20 years of age; ten female subjects, 13 to 15 years of age; and three female subjects, 16 to 20 years of age. These students lived at the school.

SCHOOL

The school was built by the Council of Majuro Village. The maintenance of the school and the teachers' salaries are financed by the Marshallese Christian Association.

The students do not pay tuition and were all recommended by church members and the pastor.

Students are responsible for bringing their own bedding and for buying their own school supplies such as pencils and tablets. The better students go to the Elementary school at Roñroñ.

Classes are in session from January to the end of May, and from September through December.

The classes are held in the church building from 8 to 11:30 a.m. Subjects taught are: Bible studies, English, arithmetic, and singing. After a year and a half, they continue their education at the Marshall Christian Training School at Roñroñ.

FOOD

Supplying food to the students is the responsibility of the Majuro Village Council. Students cook their own food at the cookhouse, which is outdoors where an open fire is used. Two meals are served daily. One in the morning and the other in the evening. Two male students and two female students were cooks on rotation. On Saturdays, male students went fishing for the school.

The school owned two pigs and some chickens, which were eaten only on special occasions. The school did not maintain a store where

students could buy food for between feedings or to supplement their diets.

STUDY

The interview method was used and food records were kept. Between meal feedings and quantities eaten were listed. Method used was the same as that followed for other subjects of Majuro Village. Food consumption records were kept for a period of one week, for each subject.

FOOD INTAKE RECORD

An example of one of the intake records of a student is given.

TYPICAL MENUS

This is the same as the intake record. There were no supplementary feedings.

EXAMPLE
FOOD INTAKE RECORD FOR J

Name: J Sex: M Age: 15

April 18, 1951
Wednesday

Jaibo	500 gms.
Jekara	1 cup

April 19, 1951
Thursday

Jaibo	600 gms.
Rice	300 gms.

April 20, 1951
Friday

Jaibo	500 gms.
Rice	300 gms.
Sardines, fresh	60 gms.

April 21, 1951
Saturday

Jaibo	750 gms.
Breadfruit, baked	350 gms.
Sardines, canned	100 gms.

April 22, 1951
Sunday

Breadfruit, baked	400 gms.
Sardines, canned	100 gms.
Bread	4 ozs.

April 23, 1951
Monday

Jaibo	600 gms.
Soft rice	800 gms.
Jekara	1 cup

April 24, 1951
Tuesday

Rice	700 gms.
Breadfruit, baked	300 gms.

RESULTS

The results of the dietary study of students at the Mission School, Majuro Village, Majuro Island, Marshall Islands are given in Table 11.

The daily quantities of various nutrients per person and comparison with National Research Council Allowances for twenty-four students from the ages of 13 through 20 years of age are noted.

The subjects are divided into different age groups, giving the number of subjects in each group, sex, range of each nutrient, number of subjects in each group, averages, NRC allowances, number below allowances and percent of subjects below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin, and ascorbic acid.

1. Calories

For one male subject, 13 to 15 years of age, the daily intake was 1098 calories, which was 34% of the NRC allowances of 3200 calories. This subject was below allowances.

For ten male subjects, 16 to 20 years of age, the range was from 932 to 1912 calories, and the average per person was 1332 calories. The average figure was 35% of the NRC allowances of 3800 calories. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 930 to 1340 calories, and the average per person was 1217 calories.

Table 11.

Dietary Study of Students at Mission School,
Majuro Island, Marshall Islands by Mary Murai

Daily Quantities of Various Nutrients per Person
and Comparison with National Research Council Allowances

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Calories									
13-15	1	M	1098	1000-1999	1	1098	3200	1	100
16-20	10	M	932-1912	<1000	1	1332	3800	10	100
				1000-1999	9				
13-15	10	F	930-1340	<1000	1	1217	2600	10	100
				1000-1999	9				
16-20	3	F	1172-1420	1000-1999	3	1277	2400	3	100
Protein (gm.)									
13-15	1	M	23	20-39	1	23	85	1	100
16-20	10	M	20-38	20-39	10	28	100	10	100
13-15	10	F	25-38	20-39	10	29	80	10	100
16-20	3	F	29-33	20-39	3	31	75	3	100
Fat (gm.)									
13-15	1	M	7	< 20	1	7	89	1	100
16-20	10	M	3-66	< 20	6	19	105	10	100
				20-39	3				
				> 50	1				
13-15	10	F	5-16	< 20	10	8	72	10	100
16-20	3	F	6-16	< 20	3	10	67	3	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
Calcium (mg.)									
13-15	1	M	228	200-399	1	228	1400	1	100
16-20	10	M	116-195	< 200	11	148	1400	10	100
13-15	10	F	122-419	< 200	6	209	1300	10	100
				200-399	3				
				419	1				
16-20	3	F	136-170	< 200	3	157	1000	3	100
Phosphorus (mg.)									
13-15	1	M	493	400-599	1	493	1320	1	100
16-20	10	M	324-699	300-499	8	453	1320	10	100
				500-699	2				
13-15	10	F	402-612	400-599	9	484	1200	10	100
				600-799	1				
16-20	3	F	455-524	400-599	3	484	1200	3	100
Iron (mg.)									
13-15	1	M	7	5-9	1	7	15	1	100
16-20	10	M	5-12	5-9	8	7	15	10	100
				10-14	2				
13-15	10	F	4-8	5-9	10	6	15	10	100
16-20	3	F	7	5-9	3	7	15	3	100
Vitamin A (I.U.)									
13-15	1	M	50	< 100	1	50	5000	1	100
16-20	10	M	10-66	< 100	10	29	6000	10	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
13-15	10	F	19-51	< 100	10	40	5000	10	100
16-20	3	F	40-73	< 100	3	54	5000	3	100
Thiamine (mcg.)									
13-15	1	M	565	500-799	1	565	1500	1	100
16-20	10	M	393-993	< 500	3	650	1700	10	100
				500-799	4				
				800-1099	3				
13-15	10	F	366-820	< 500	1	633	1300	10	100
				500-799	7				
				800-1099	2				
16-20	3	F	652-1064	500-799	1	840	1200	3	100
				800-1099	2				
Riboflavin (mcg.)									
13-15	1	M	449	400-699	1	449	2000	1	100
16-20	10	M	263-584	< 500	6	432	2500	10	100
				500-799	4				
13-15	10	F	233-557	< 500	8	450	2000	10	100
				500-799	2				
16-20	3	F	465-586	< 500	1	530	1800	3	100
				500-799	2				
Niacin (mg.)									
13-15	1	M	11	10-19	1	11	15	1	100
16-20	10	M	8-13	< 10	3	10	17	10	100
				10-19	7				
13-15	10	F	9-12	< 10	2	11	13	10	100
				10-19	8				
16-20	3	F	10-11	10-19	3	10	12	3	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Ascorbic Acid (mg.)									
13-15	1	M	29-	10-29	1	29	30	1	100
16-20	10	M	3-21	< 10	3	12	100	10	100
				10-29	7				
13-15	10	F	4-20	< 10	3	15	80	10	100
				10-29	7				
16-20	3	F	7-20	< 10	2	12	80	3	100
				10-29	1				

The average figure was 47% of the NRC allowances of 2600 calories. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 1172 to 1420 calories, and the average per person was 1277 calories. The average figure was 53% of the NRC allowances of 2400 calories. Three subjects or 100% were below allowances.

Of the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

2. Protein

For one male subject, 13 to 15 years of age, the daily intake was 23 gms., which was 27% of the NRC allowances of 85 gms. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 20 to 38 gms., and the average per person was 28 gms. The average figure was 28% of the NRC allowances of 100 gms. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 25 to 38 gms., and the average per person was 29 gms. The average figure was 36% of the NRC allowances of 80 gms. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 29 to 33 gms., and the average per person was 31 gms. The average figure was 41% of the NRC allowances of 75 gms. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

3. Fat

For one male subject, 13 to 15 years of age, the daily intake was 7 gms., which was 8% of the NRC allowances of 89 gms. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 3 to 66 gms., and the average per person was 19 gms. The average figure was 18% of the NRC allowances of 105 gms. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 5 to 16 gms., and the average per person was 8 gms. The average figure was 11% of the NRC allowances of 72 gms. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 6 to 16 gms., and the average per person was 10 gms. The average figure was 15% of the NRC allowances of 67 gms. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four or 100% were below allowances.

4. Calcium

For one male subject, 13 to 15 years of age, the daily intake was 228 mgs., which was 16% of the NRC allowances of 1400 mgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 116 to 195 mgs., and the average per person was 148 mgs. The average figure was 11% of the NRC allowances of 1400 mgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 122 to 419 mgs., and the average per person was 209 mgs. The average figure was 16% of the NRC allowances of 1300 mgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 136 to 170 mgs., and the average per person was 157 mgs. The average figure was 16% of the NRC allowances of 1000 mgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

5. Phosphorus

For one male subject, 13 to 15 years of age, the daily intake was 493 mgs., which was 37% of the NRC allowances of 1320 mgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 324 to 699 mgs., and the average per person was 453 mgs. The average figure was 34% of the NRC allowances of 1320 mgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 402 to 612 mgs., and the average per person was 484 mgs. The average figure was 40% of the NRC allowances of 1200 mgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 455 to 524 mgs., and the average per person was 484 mgs. The average figure was 40% of the NRC allowances of 1200 mgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four or 100% were below allowances.

6. Iron

For one male subject, 13 to 15 years of age, the daily intake was 7 mgs., which was 47% of the NRC allowances of 15 mgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 5 to 12 mgs., and the average per person was 7 mgs. The average figure was 47% of the NRC allowances of 15 mgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 4 to 8 mgs., and the average per person was 6 mgs. The average figure was 40% of the NRC allowances of 15 mgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, there is no range of nutrient value given. The average per person was 7 mgs. The average figure was 47% of the NRC allowances of 15 mgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

7. Vitamin A

For one male subject, 13 to 15 years of age, the daily intake was 50 I. U., which was 1% of the NRC allowances of 5000 I. U. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 10 to 66 I. U., and the average per person was 29 I. U. The average figure was 0.5% of the NRC allowances of 6000 I. U. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 19 to 51 I. U., and the average per person was 40 I. U. The average figure was 0.8% of the NRC allowances of 5000 I. U. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 40 to 73 I. U., and the average per person was 54 I. U. The average figure was 1% of the NRC allowances of 5000 I. U. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four or 100% were below allowances.

8. Thiamine

For one male subject, 13 to 15 years of age, the daily intake was 565 mcgs., which was 38% of the NRC allowances of 1500 mcgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 393 to 993 mcgs., and the average per person was 650 mcgs. The average figure was 38% of the NRC allowances of 1700 mcgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 336 to 820 mcgs., and the average per person was 633 mcgs. The average figure was 49% of the NRC allowances of 1300 mcgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 652 to 1064 mcgs., and the average per person was 840 mcgs. The average figure was 70% of the NRC allowances of 1200 mcgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

9. Riboflavin

For one male subject, 13 to 15 years of age, the daily intake was 449 mcgs., which was 22% of the NRC allowances of 2000 mcgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 263 to 584 mcgs., and the average per person was 432 mcgs. The average figure was 17% of the NRC allowances of 2500 mcgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 233 to 557 mcgs., and the average per person was 450 mcgs. The average figure was 22% of the NRC allowances of 2000 mcgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 465 to 586 mcgs., and the average per person was 530 mcgs. The average figure was 24% of the NRC allowances of 1800 mcgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four or 100% were below allowances.

10. Niacin

For one male subject, 13 to 15 years of age, the daily intake was 11 mgs., which was 73% of the NRC allowances of 15 mgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 8 to 13 mgs., and the average per person was 10 mgs. The average figure was 59% of the NRC allowances of 17 mgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 9 to 12 mgs., and the average per person was 11 mgs. The average figure was 85% of the NRC allowances of 13 mgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 10 to 11 mgs., and the average per person was 10 mgs. The average figure was 83% of the NRC allowances of 12 mgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

11. Ascorbic Acid

For one male subject, 13 to 15 years of age, the daily intake was 29 mgs., which was 32% of the NRC allowances of 90 mgs. This subject was below the allowance.

For ten male subjects, 16 to 20 years of age, the range was from 3 to 21 mgs., and the average per person was 12 mgs. The average figure was 12% of the NRC allowances of 100 mgs. Ten subjects or 100% were below allowances.

For ten female subjects, 13 to 15 years of age, the range was from 4 to 20 mgs., and the average per person was 15 mgs. The average figure was 19% of the NRC allowances of 80 mgs. Ten subjects or 100% were below allowances.

For three female subjects, 16 to 20 years of age, the range was from 7 to 20 mgs., and the average per person was 12 mgs. The average figure was 15% of the NRC allowances of 80 mgs. Three subjects or 100% were below allowances.

For the total group of twenty-four subjects, twenty-four subjects or 100% were below allowances.

SUMMARY

Weekly dietary records of twenty-four students of the Mission School, Majuro Village, Majuro Island, from the age of 13 through 20 years of age, were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron, Vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. These figures were then compared with National Research Council Allowances.

Taking the total group of twenty-four students, the following results were obtained when daily intakes were compared with National Research Council Allowances:

1. Calories: Twenty-four subjects or 100% were below allowances.

2. Protein: Twenty-four subjects or 100% were below allowances.

3. Fat: Twenty-four subjects or 100% were below allowances.

4. Calcium: Twenty-four subjects or 100% were below allowances.

5. Phosphorus: Twenty-four subjects or 100% were below allowances.

6. Iron: Twenty-four subjects or 100% were below allowances.

7. Vitamin A: Twenty-four subjects or 100% were below allowances.

8. Thiamine: Twenty-four subjects or 100% were below allowances.

9. Riboflavin: Twenty-four subjects or 100% were below allowances.

10. Niacin: Twenty-four subjects or 100% were below allowances.

11. Ascorbic acid: Twenty-four subjects or 100% were below allowances.

All twenty-four subjects or 100% did not meet NRC allowances for any of the nutrients studied, namely, calories, protein, fat, calcium, phosphorus, iron, Vitamin A, thiamine, riboflavin, niacin, and ascorbic acid.

DIETARY STUDY OF STUDENTS OF THE MARSHALL ISLAND INTERMEDIATE SCHOOL AND THE TEACHER TRAINING SCHOOL

PURPOSE

1. To determine the nutritional adequacy of the diet for calories and nutrients; 2. To compare total calories and nutrients of this school which was supervised by the United States Navy with others supervised by Marshallese; [In this school, the dietary patterns had changed from the use of native foods to the use of imported foods;] 3. To complete the survey on Majuro village since most of the children of ages 13 to 15 were at school.

SUBJECTS

The subjects were students of the Intermediate school who were on scholarships from twenty-four islands and atolls of the Marshall Islands. The teacher trainees were also included. The study included 87 students. There were 72 male students; of these, 11 students were from 13 to 15 years of age, 48 students were 16 to 20 years of age, and 13 students over 20 years of age. There were 15 female students; of these, 6 students were 13 to 15 years of age, 8 students were 16-20 years of age; and 1 over 20 years of age.

SCHOOLS

The school was located at Uliga, which was the naval base. The Intermediate school was composed of the 7th and 8th grades; while the teacher trainees were on rotation, spending one year as teachers in the field and one year as trainee in the Teacher Training school. The school was financed by funds which were included in the Navy budget for the Marshall Islands. The food allowance for each student was about ten dollars per month. An increase to about thirteen dollars per person had been anticipated. Food supplies were secured through the Naval Supply Office. Canned fruits and vegetables, evaporated milk, sugar, rice and shortening were available. Fresh fruits and vegetables could be ordered but since they were sent on logistic flights once a week, it was difficult to supply the whole school with these items. The students were given three dollars per month for their toilet articles and for other personal items. This allowance did not give them enough money to indulge in between meal feedings, so they were dependent on three meals a day at school for their nutritional requirements. The students lived in dormitories at the school.

ACTIVITIES OF STUDENTS

The daily schedule for the students was as follows:

6:30 a. m.	Reveille
6:30-7:30 a. m.	Clean dormitory and yard
7:30-8:00 a. m.	Breakfast
8:45-11:55 a. m.	Academic classes

12 noon-1:30 p. m.	Lunch period
1:30-3:30 p. m.	Work period

Male students (teacher trainees and Intermediate school students)

1. Cleaning
2. Building
3. Painting
4. Repairing fish nets
5. Copra production
6. Working with cement to repair buildings, walks and other places in need of repair
7. New construction of buildings and other necessary places
8. Fishing for school

Women students

1. Classes in sewing and handicrafts

4:45-5:45 p. m.	Supper period
7:00-9:00 p. m.	Study period (when electricity is available)

Once a month three boys or six girls rotate on kitchen duty. A day was spent cooking and cleaning the kitchen.

The kitchen and dining rooms were in a separate building on the school grounds. Kerosene lamps were used for light. A wood stove was used for cooking and an oven for baking. These rooms were dark with cement flooring. Dishes were washed with cold water; soap was used when available. There were no facilities for sterilization. Food was prepared in the kitchen or outdoors. A well outside of the kitchen supplied water for washing rice and for dishwashing, rainwater from a cistern was used for drinking. Adequate storage space for perishables, such as fresh fish, was lacking. Therefore, whenever, fish was caught in large numbers, they had to be eaten at once.

METHOD USED FOR STUDY

Food records were kept for three consecutive days on mimeographed sheets. They were for breakfast, lunch, supper and between meal feeding. Food was weighed at each meal on Chatillon gram scales and uneaten food was reweighed. Between meal feedings were recorded and quantities estimated. For composite food products, the weights of the ingredients in the recipe, and the weight of the resulting food after cooking, were determined in order to calculate from tables of food composition, the nutritive value of each food combination.

Other data collected were name, age, sex, marital status, address, district, weight, height, medical record, and dental record.

RESULTS

FOOD INTAKE RECORDS

An example of one of the student's intake record is given.

Example

Name: E Age: 14 Sex: M Marital status: S

Address: Majuro Intermediate School

District: Rongelap

Weight: 92 pounds Height: 58 inches

Medical record:

Physical complaints: none

Defects noted on general inspection
Chronic tonsilitis
Ecthyma buttocks

Chest X-ray
Negative

Tuberculin skin
T Negative
C Negative
H Negative

Kahn
Negative

Stools
Negative

Summary or defect
Dental - none
Emergency treatment given - dental none
Treatment required - none

February 2, 1951

Breakfast

Pancake	230 gms.
Sugar cane syrup	20 gms.
Rice, boiled	200 gms.

Water	300 gms.
Lunch	
Rice, boiled	290 gms.
Kuban fish, boiled	250 gms.
Water	500 gms.
Supper	
Rice, boiled	280 gms.
Salmon, canned	120 gms.
Water	300 gms.
Between meals	
Drinking coconut, ni (fluid)	340 gms.
mere (meat)	120 gms.
Waini (mature coconut meat)	135 gms.

February 5, 1951

Breakfast	
Rice, boiled	185 gms.
Salmon, canned	65 gms.
Water	400 gms.
Lunch	
Doughnut	160 gms.
Rice, boiled	125 gms.
Water	300 gms.
Supper	
Rice, boiled	420 gms.
Salmon, canned	100 gms.
Water	500 gms.
Between meals	
Drinking coconut, ni (fluid)	300 gms.
mere (meat)	100 gms.
Waini (mature coconut meat)	125 gms.

February 6, 1951

Breakfast

Pancake	140 gms.
Sugar cane syrup	20 gms.

Lunch

Rice, boiled	180 gms.
Salmon, canned	120 gms.
Water	500 gms.

Supper

Rice, boiled	260 gms.
Salmon, canned	140 gms.
Water	500 gms.

Between meals

Waini (mature coconut meat)	135 gms.

TYPICAL MENUS

These menus show the type of meals which were served in the school.

January 30, 1951

Breakfast

Boiled rice Canned red sockeye salmon

Black tea with sugar

Lunch

Doughnut Water

Supper

Boiled rice Canned red sockeye salmon

February 2, 1951

Breakfast

Boiled rice Pancake with syrup

Black tea with sugar

Lunch

Boiled rice Boiled fresh Kuban fish

Black tea with sugar

February 5, 1951

Breakfast

Boiled rice Canned red sockeye salmon

Black tea with sugar

Lunch

Doughnut Canned sardines in cottonseed oil

Canned evaporated milk with water

Supper

Boiled rice Canned red sockeye salmon

Canned milk with water

INGREDIENTS USED IN SOME OF THE FOODS ON THE MENUS

Beverages

For each 300 grams of tea, 17.43 grams of sugar were added.
For each 300 grams of evaporated milk with water, there were 12.64 grams of evaporated milk.

Doughnuts

Yield: 165 doughnuts

Ingredients

Flour	33 pounds
Eggs, powdered (whole)	2 pounds
Yeast	3.1 oz.
Sugar	2 pounds

Method

Ingredients were mixed together by hand and fried in deep fat until brown. They were eaten cold.

Bread

Yield: 18 loaves

Ingredients

Flour	35 pounds
Sugar	3 pounds
Yeast	1/4 pound
Dried milk	1 pound

Method

Regular bread making procedures were followed. Cook was trained in Navy bakery. Baked in wood fire oven.

Ingredients used in cooking

Flour--wheat, hard, enriched bleached
Sugar--fine granulated white
Yeast--active dry yeast
Dried milk--dried whole milk, 26% butter fat
Dried eggs--spray dried whole eggs
Sardines--packed in cottonseed and/or soy bean oil
Rice--converted, 100 pound sacks, Houston Texas brand
Salmon--Red Sockeye Salmon, canned

RESULTS

Table 12 gives the results of the dietary study of students of the Marshall Island Intermediate School and the Teacher Training School, Uliga, Marshall Islands.

The daily quantities of various nutrients per person and comparison with National Research Council Allowances for eighty-seven male and female students from the ages of thirteen to over 20 years of age were noted.

The subjects are divided into different age groups, giving the number of subjects in each group, sex, range of each nutrient, number of subjects in each group, average, NRC allowances, number below allowances, and percent of subjects below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin, and ascorbic acid.

1. Calories

For eleven male subjects, 13 to 15 years of age, the range was from 2608 to 4571 calories, and the average per person was 3858 calories. The average figure was 120% of the NRC allowances of 3200 calories. Three subjects or 27% were below allowances and eight or 73% were above these allowances.

For six female subjects, 13 to 15 years of age, the range was from 1841 to 3733 calories, and the average per person was 3281 calories. The average figure was 125% of the NRC allowances of 2600 calories. One subject or 17% was below allowance and five subjects or 83% were above these allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 1851 to 5655 calories, and the average per person was 3253 calories. The average figure was 86% of the NRC allowances of 3800 calories. Thirty-nine or 81% were below allowances and nine or 19% were above allowances.

For eight female subjects, 16 to 20 years of age, the range was from 2279 to 4161 calories, and the average per person was 3011 calories. The average figure was 125% of the NRC allowances of 2400 calories. Two subjects or 25% were below allowances and six subjects or 75% were above allowances.

For thirteen male subjects, 20 years and over, the range was from 2290 to 3733 calories, and the average per person was 2972 calories. The average figure was 99% of the NRC allowances of 3000 calories. Six subjects or 46% were below allowances, and seven subjects or 54% were above allowances.

For one female subject, 20 years and over, 2236 calories were consumed. This figure was 111% of the NRC allowances of 2000 calories. This subject was above allowances.

For the total group of eighty-seven subjects, fifty-one subjects or 59% were below allowances, thirty-six subjects or 41% were above allowances.

2. Protein

For eleven male subjects, 13 to 15 years of age, the range was from 85 to 142 grams, and the average per person was 115 grams. The average was 135% of the NRC allowances of 85 grams. Eleven subjects or 100% were above allowances.

For six female subjects, 13 to 15 years of age, the range was from 65 to 137 grams, and the average per person was 104 grams. The average was 130% of the NRC allowances of 80 grams. One subject or 17% was below allowances and five subjects or 83% were above these allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 73 to 178 grams, and the average per person was 116 grams. The average was 116% of the NRC allowances of 100 grams. Fourteen subjects or 29% were below allowances and thirty-four or 71% were above the allowances.

For eight female subjects, 16 to 20 years of age, the range was from 48 to 153 grams, and the average per person was 98 grams. Two subjects or 25% were below allowances and 6 subjects or 75% were above these allowances.

For thirteen male subjects, 20 years and over, the range was from 96 to 168 grams, and the average per person was 118 grams. The average was 168% of the NRC allowances of 70 grams. No one was below allowances and thirteen or 100% were above the allowances.

Table 12.

Dietary Study of Students at the Marshall Island Intermediate School and the Teacher Training School, Uliga, Marshall Islands

by Mary Murai

Daily Quantities of Various Nutrients per Person and Comparison with National Research Council Allowances

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Calories									
13-15	11	M	2608-4571	2000-2999	2	3858	3200	3	27
				3000-3999	6				
				4000-4999	3				
13-15	6	F	1841-3733	1800-2799	1	3281	2600	1	17
				3000-3999	5				
16-20	48	M	1851-5655	1800-2799	11	3253	3800	39	81
				3000-3799	38				
				3800-4799	7				
				4800-5799	2				
16-20	8	F	2279-4161	2000-2999	5	3011	2400	2	25
				3000-3999	2				
				4000-4999	1				
20/	13	M	2290-3733	2000-2999	6	2972	3000	6	46
				3000-3999	7				
20/	1	F	2236	2000-2999	1	2236	2000	0	0
Protein (gm.)									
13-15	11	M	85-142	80-99	2	115	85	0	0
				100-119	4				
				>120	5				
13-15	6	F	65-137	60-79	1	104	80	1	17
				100-119	4				
				130-149	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	48	M	73-178	70-89	12	116	100	14	29
				90-109	4				
				>110	32				
16-20	8	F	48-153	40-59	2	98	75	2	25
				80-99	3				
				>100	3				
20/	13	M	96-168	90-109	3	118	70	0	0
				110-129	6				
				130-149	3				
				>150	1				
20/	1	F	83	80-99	1	83	60	0	0
Fat (gm.)									
13-15	11	M	31-141	30-59	2	85	89	6	55
				60-89	4				
				90-119	3				
				>120	2				
13-15	6	F	29-118	20-49	2	81	72	2	33
				80-109	3				
				110-139	1				
16-20	48	M	21-200	20-49	15	70	105	42	88
				50-79	20				
				80-109	7				
				>110	6				
16-20	8	F	27-148	20-49	4	70	67	5	63
				50-79	1				
				>80	3				
20/	13	M	29-87	20-49	3	61	83	11	85
				50-79	8				
				80-109	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
20/	1	F	42	30-59	1	42	56	1	100
Calcium (mg.)									
13-15	11	M	492-1052	400-599	4	784	1400	11	100
				700-899	4				
				900-1099	3				
13-15	6	F	405-1163	400-599	1	725	1300	6	100
				600-799	4				
				>800	1				
16-20	48	M	436-1911	< 700	19	825	1400	46	96
				700-899	14				
				900-1099	8				
				1100-1299	5				
				>1400	2				
16-20	8	F	216-1432	< 500	3	675	1000	7	88
				600-799	2				
				800-999	2				
				>1000	1				
20/	13	M	607-1712	600-799	6	926	1000	9	69
				800	3				
				>1000	4				
20/	1	F	631	600- 799	1	631	1000	1	100
Phosphorus (mg.)									
13-15	11	M	1079-2089	1000-1199	2	1487	1320	4	36
				1200-1399	3				
				> 1400	6				
13-15	6	F	751-1637	700-899	1	1362	1200	1	17
				1200-1399	1				
				>1400	4				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
16-20	48	M	996-2159	900-1099	1	1515	1320	12	25
				1100-1299	11				
				1300-1499	13				
				> 1500	23				
16-20	8	F	597-2064	< 700	1	1230	1200	4	50
				700-899	1				
				900-1099	1				
				1100-1299	2				
				> 1300	3				
20/	13	M	1018-2135	1000-1199	3	1480	1320	3	23
				1200-1399	3				
				> 1400	7				
20/	1	F	1118	1000-1199	1	1118	1320	1	100
Iron (mg.)									
13-15	11	M	7-26	5-9	2	16	15	5	45
				10-14	3				
				> 15	6				
13-15	6	F	5-21	5-9	1	13	15	4	67
				10-14	3				
				> 15	2				
16-20	48	M	5-28	5-9	13	13	15	29	60
				10-14	16				
				> 15	19				
16-20	8	F	6-17	5-9	4	11	15	6	75
				10-14	2				
				> 15	2				
20/	13	M	7-18	5-9	4	11	12	7	54
				10-14	7				
				> 15	2				
20/	1	F	7	7	1	7	12	1	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Vitamin A (I.U.)									
13-15	11	M	320-5844	< 499	2	1666	5000	10	91
				500-999	2				
				1000-1999	5				
				2000-2999	1				
				> 5000	1				
13-15	6	F	286-609	< 499	3	479	5000	6	100
				500-999	3				
16-20	48	M	233-7085	< 499	16	1805	6000	45	94
				500-999	7				
				1000-1999	12				
				2000-2999	4				
				3000-3999	3				
				4000-4999	2				
				> 7500	4				
16-20	8	F	306-10187	< 499	2	2431	5000	7	88
				500-999	1				
				1000-1999	3				
				2000-2999	1				
				> 5000	1				
20/	13	M	482-5530	< 499	1	2062	5000	11	85
				500-999	4				
				1000-1999	4				
				2000-2999	1				
				4000-4999	1				
				> 5000	2				
20/	1	F	1171	1000-1999	1	1171	5000	1	100
Thiamine (mcg.)									
13-15	11	M	934-3049	900-1199	4	1686	1500	5	45
				1200-1499	1				
				> 1500	6				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
13-15	6	F	767-1822	700-999	1	1450	1300	1	17
				1300-1599	3				
				1600-1899	2				
16-20	48	M	572-3188	500-799	3	1410	1700	39	81
				800-1099	8				
				1100-1399	20				
				1400-1699	8				
				>1700	9				
16-20	8	F	831-1600	800-1099	4	1162	1200	5	63
				1100-1399	2				
				1400-1699	2				
20/	13	M	993-2112	800-1099	3	1361	1500	9	69
				1100-1399	5				
				1400-1699	3				
				>1700	2				
20/	1	F	826	826	1	826	1000	1	100
Riboflavin (mcg.)									
13-15	11	M	605-2396	600-899	3	1109	2000	10	91
				900-1199	3				
				1200-1499	2				
				1500-1799	2				
				> 2000	1				
13-15	6	F	496-1255	< 500	1	966	2000	6	100
				600-899	1				
				900-1199	3				
				1200-1499	1				
16-20	48	M	511-2107	500-799	6	1147	2500	48	100
				800-1099	17				
				1100-1399	15				
				1400-1699	9				
				> 2100	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	8	F	464-1495	500	1	912	1800	8	100
				500-799	3				
				800-1099	1				
				1100-1399	2				
				1400-1699	1				
20/	13	M	840-1936	800-1099	7	1179	1800	12	92
				1100-1399	4				
				1400-1699	1				
				1700-1999	1				
20/	1	F	814	800-1099	1	814	1500	1	100
Niacin (mg.)									
13-15	11	M	11-41	10-19	1	27	15	1	9
				20-39	9				
				40-59	1				
13-15	6	F	15-31	10-19	1	26	13	0	0
				20-39	5				
16-20	48	M	13-37	10-19	5	26	17	1	2
				20-39	43				
16-20	8	F	17-35	10-19	5	20	12	0	0
				20-39	3				
20/	13	M	7-31	< 10	1	24	15	1	8
				10-19	1				
				20-39	11				
20/	1	F	15	10-19	1	15	10	0	0
Ascorbic Acid (mg.)									
13-15	11	M	0-120	< 10	4	27	90	10	91
				10-29	4				
				30-49	2				
				> 90	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
13-15	6	F	0-29	<10	2	14	80	6	100
				10-29	4				
16-20	48	M	0-129	<10	30	23	100	43	90
				10-29	9				
				50-69	2				
				70-89	2				
				90-109	1				
				>110	4				
16-20	8	F	0-224	<10	2	40	80	7	88
				10-29	4				
				30-49	1				
				>110	1				
20/	13	M	0-44	<10	10	8	75	13	100
				10-29	1				
				30-49	2				
20/	1	F	9	<10	1	9	70	1	100

For one female subject, 20 years and over, the daily intake was 83 grams. This was 138% of the NRC allowances of 60 grams. This subject was above the allowance.

For the total group of eighty-seven subjects, seventeen subjects or 20% were below allowances and seventy subjects or 80% were above allowances.

3. Fat

For eleven male subjects, 13 to 15 years of age, the range was from 31 to 141 grams, and the average per person was 85 grams. The average was 95% of the NRC allowances of 89 grams. Six subjects or 55% were below allowances and five subjects or 45% were above the allowance.

For six female subjects, 13 to 15 years of age, the range was from 29 to 118 grams, and the average per person was 81 grams. The average was 112% of the NRC allowances of 72 grams. Two subjects or 33% were below allowances and four subjects or 67% were above allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 21 to 200 grams, and the average per person was 70 grams. The average was 67% of the NRC allowances of 105 grams. Forty-two subjects or 88% were below allowances and six subjects or 12% were above allowances.

For eight female subjects, 16 to 20 years of age, the range was from 27 to 148 grams, and the average per person was 70 grams. The average was 104% of the NRC allowances of 67 grams. Five subjects or 63% were below allowances and three subjects or 37% were above these allowances.

For thirteen male subjects, 20 years and over, the range was from 29 to 87 grams, and the average per person was 61 grams. The average was 73% of the NRC allowances of 83 grams. Eleven subjects or 85% were below allowances and two or 15% were above the allowances.

For one female subject, 20 years and over, the total grams of fat was 42 grams. This was 75% of the NRC allowances of 56 grams. This subject was below allowances.

For the total group of eighty-seven subjects, sixty-seven subjects or 77% were below allowances and twenty subjects or 23% were above allowances.

4. Calcium

For eleven male subjects, 13 to 15 years of age, the range was from 492 to 1052 mgs., and the average per person was 784 mgs. The average was 56% of the NRC allowances of 1400. Eleven subjects or 100% were below allowances.

For six female subjects, 13 to 15 years of age, the range was from 405 to 1163 mgs., and the average per person was 725 mgs. The average was 56% of the NRC allowances of 1300 mgs. Six subjects or 100% were below allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 436 to 1911 mgs., and the average per person was 825 mgs. The average was 59% of the NRC allowances of 1400 mgs. Forty-six subjects or 96% were below allowances and two or 4% were above allowances.

For eight female subjects, 16 to 20 years of age, the range was from 216 to 1432 mgs., and the average per person was 675 mgs. The average was 67% of the NRC allowances of 1000 mgs. Seven subjects or 88% were below allowances and one subject or 12% was above the allowance.

For thirteen male subjects, 20 years and over, the range was from 607 to 1712 mgs., and the average per person was 926 mgs. The average was 93% of the NRC allowances of 1000 mgs. Nine subjects or 69% were below allowances and four subjects or 31% were above allowances.

For one female subject, 20 years and over, the total intake of calcium was 631 mgs. This was 63% of the NRC allowances of 1000 mgs. This subject was below allowances.

For the total group of eighty-seven subjects, eighty subjects or 92% were below allowances and seven subjects or 8% were above allowances.

5. Phosphorus

For eleven male subjects, 13 to 15 years of age, the range was from 1079 to 2089 mgs., and the average per person was 1487 mgs. The average was 112% of the NRC allowances of 1320 mgs. Four subjects or 36% were below allowances and seven subjects or 64% were above allowances.

For six female subjects, 13 to 15 years of age, the range was from 751 to 1637 mgs., and the average per person was 1362 mgs. The average was 113% of the NRC allowances of 1200 mgs. One subject or 17% was below the allowance and five subjects or 83% were above allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 996 to 2159 mgs., and the average per person was 1515 mgs. The average was 115% of the NRC allowances of 1320 mgs. Twelve subjects or 25% were below allowances and thirty-six subjects or 75% were above allowances.

For eight female subjects, 16 to 20 years of age, the range was from 597 to 2064 mgs., and the average per person was 1230 mgs. The average was 102% of the NRC allowances of 1200 mgs. Four subjects or 50% were below allowances and four subjects or 50% were above allowances.

For thirteen male subjects, 20 years and over, the range was from 1018 to 2135 mgs., and the average per person was 1480 mgs. The average was 111% of the NRC allowances of 1320 mgs. Three subjects or 23% were below allowances and ten subjects or 77% were above allowances.

For one female subject, 20 years and over, the total mgs. of phosphorus was 1118 mgs. This was 85% of the NRC allowances of 1320 mgs. This subject was below the allowance.

For the total group of eighty-seven subjects, twenty-five subjects or 29% were below allowances and sixty-two subjects or 71% were above allowances.

6. Iron

For eleven male subjects, 13 to 15 years of age, the range was from 7 to 26 mgs., and the average per person was 16 mgs. The average was 107% of the NRC allowances of 15 mgs. Five subjects or 45% were below allowances and six subjects or 55% were above allowances.

For six female subjects, 13 to 15 years of age, the range was from 5 to 21 mgs. and the average per person was 13 mgs. The average was 87% of the NRC allowances of 15 mgs. Four subjects or 67% were below allowances and two subjects or 33% were above allowances.

For forty-eight male subjects, 15 to 20 years of age, the range was from 5 to 28 mgs., and the average per person was 13 mgs. The average was 87% of the NRC allowances of 15 mgs. Twenty-nine subjects or 60% were below allowances and nineteen subjects or 40% were above allowances.

For eight female subjects, 16 to 20 years of age, the range was from 6 to 17 mgs., and the average per person was 11 mgs. The average was 73% of the NRC allowances of 15 mgs. Six subjects or 75% were below allowances and two subjects or 25% were above allowances.

For thirteen male subjects, 20 years and over, the range was from 7 to 18 mgs., and the average per person was 11 mgs. The average was 92% of the NRC allowances of 12 mgs. Seven subjects or 54% were below allowances and six subjects or 46% were above allowances.

For one female subject, 20 years and over, the iron content was 7 mgs. This was 58% of the NRC allowances of 12 mgs. This subject was below the allowance.

For the total group of eighty-seven students, fifty-two subjects or 60% were below allowances and thirty-five subjects or 40% were above allowances.

7. Vitamin A

For eleven male subjects, 13 to 15 years of age, the range was from 320 to 5844 I. U. and the average per person was 1666 I. U. The average was 33% of the NRC allowances of 5000 I. U. Ten subjects or 91% were below allowances and one subject or 9% was above the allowance.

For six female subjects, 13 to 15 years of age, the range was from 286 to 609 I. U. and the average per person was 479 I. U. The average was 10% of the NRC allowances of 5000 I. U. Six subjects or 100% were below allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 233 to 7085 I. U. and the average per person was 1805 I. U. The average was 30% of the NRC allowances of 6000 I. U. Forty-five subjects

or 94% were below allowances and three subjects or 6% were above allowances.

For eight female subjects, 16 to 20 years, the range was from 306 to 10,187 I. U. and the average per person was 2431 I. U. The average was 49% of the NRC allowances of 5000 I. U. Seven subjects or 88% were below allowances and one subject or 12% was above the allowance.

For thirteen male subjects, 20 years and over, the range was from 482 to 5530 I. U. and the average per person was 2062 I. U. The average was 41% of the NRC allowances of 5000 I. U. Eleven subjects or 85% were below allowances and two subjects or 15% were above allowances.

For one female subject, 20 years and over, the vitamin A content was 1171 I. U. This was 23% of the NRC allowances of 5000 I. U. This subject was below the allowance.

For the total group of eighty-seven students, eighty subjects or 92% were below allowances and seven subjects or 8% were above allowances.

8. Thiamine

For eleven male subjects, 13 to 15 years of age, the range was from 934 to 3049 mcgs., and the average per person was 1686 mcgs. The average was 112% of the NRC allowances of 1500 mcgs. Five subjects or 45% were below allowances and six subjects or 55% were above allowances.

For six female subjects, 13 to 15 years of age, the range was from 767 to 1822 mcgs. and the average per person was 1450 mcgs. The average was 111% of the NRC allowances of 1300 mcgs. One subject or 17% was below the allowance and five subjects or 83% were above allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 572 to 3188 mcgs., and the average per person was 1410 mcgs. The average was 83% of the NRC allowances of 1700 mcgs. Thirty-nine subjects or 81% were below allowances and nine subjects or 19% were above allowances.

For eight female subjects, 16 to 20 years, the range was from 831 to 1600 mcgs., and the average per person was 1162 mcgs. The average was 97% of the NRC allowances of 1200 mcgs. Five subjects or 63% were below allowances and three subjects or 37% were above allowances.

For thirteen male subjects, 20 years and over, the range was from 993 to 2112 mcgs., and the average per person was 1361 mcgs. The average was 91% of the NRC allowances of 1500 mcgs. Nine subjects or 69% were below allowances and four subjects or 31% were above allowances.

For one female subject, 20 years and over, the thiamine content was 826 mcgs. This was 83% of the NRC allowances of 1000 mcgs. This subject was below the allowance.

For the total group of eighty-seven students, sixty subjects or 69% were below allowances and twenty-seven subjects or 31% were above allowances.

9. Riboflavin

For eleven male subjects, 13 to 15 years of age, the range was from 605 to 2396 mcgs., and the average per person was 1109 mcgs. The average was 55% of the NRC allowances of 2000 mcgs. Ten subjects or 91% were below allowances and one subject or 9% was above the allowance.

For six female subjects, 13 to 15 years of age, the range was from 496 to 1255 mcgs., and the average per person was 966 mcgs. The average was 48% of the NRC allowances of 2000 mcgs. Six subjects or 100% were below allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 511 to 2107 mcgs., and the average per person was 1147. The average was 46% of the NRC allowances of 2500 mcgs. Forty-eight subjects or 100% were below allowances.

For eight female subjects, 16 to 20 years, the range was from 464 to 1495 mcgs., and the average per person was 912 mcgs. The average was 51% of the NRC allowances of 1800 mcgs. Eight subjects or 100% were below allowances.

For thirteen male subjects, 20 years and over, the range was from 840 to 1936 mcgs., and the average per person was 1179 mcgs. The average was 65% of the NRC allowances of 1800 mcgs. Twelve subjects or 92% were below allowances and one subject or 8% was above the allowance.

For one female subject, 20 years and over, the riboflavin content was 814 mcgs. This was 54% of the NRC allowances of 1500 mcgs. This subject was below the allowance.

For the total group of eighty-seven students, eighty-five subjects or 98% were below allowances and two subjects or 2% were above allowances.

10. Niacin

For eleven male subjects, 13 to 15 years of age, the range was from 11 to 41 mgs., and the average per person was 27 mgs. The average was 180% of the NRC allowances of 15 mgs. One subject or 9% was below the allowance and ten subjects or 91% were above allowances.

For six female subjects, 13 to 15 years of age, the range was from 15 to 31 mgs., and the average per person was 26 mgs. The average was 200% of the NRC allowances of 13 mgs. Six subjects or 100% were above allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 13 to 37 mgs., and the average per person was 26 mgs. The average was 153% of the NRC allowances of 17 mgs. One subject or 2% was below allowances and forty-seven subjects or 98% were above allowances.

For eight female subjects, 16 to 20 years, the range was from 17 to 35 mgs., the average per person was 20 mgs. The average was 166% of the NRC allowances of 12 mgs. Eight subjects or 100% were above allowances.

For thirteen male subjects, 20 years and over, the range was from 17 to 31 mgs., and the average per person was 24 mgs. The average was 160% of the NRC allowances of 15 mgs. One subject or 8% was below the allowance and twelve subjects or 92% were above allowances.

For one female subject, 20 years and over, the niacin content was 15 mgs. This was 150% of the NRC allowances of 10 mgs. This subject was above the allowance.

For the total group of eighty-seven students, three subjects or 4% were below allowances and eighty-four subjects or 96% were above allowances.

11. Ascorbic Acid

For eleven male subjects, 13 to 15 years of age, the range was from 0 to 120 mgs., and the average per person was 27 mgs. The average was 30% of the NRC allowances of 90 mgs. Ten subjects or 91% were below allowances and one subject or 9% was below the allowance.

For six female subjects, 13 to 15 years of age, the range was from 0 to 29 mgs., and the average per person was 14 mgs. The average was 17% of the NRC allowances of 80 mgs. Six subjects or 100% were below allowances.

For forty-eight male subjects, 16 to 20 years of age, the range was from 0 to 129 mgs., and the average per person was 23 mgs. The average was 23% of the NRC allowances of 23 mgs. Forty-three subjects or 90% were below allowances and five subjects or 10% were above allowances.

For eight female subjects, 16 to 20 years, the range was from 0 to 224 mgs., and the average per person was 40 mgs. The average was 50% of the NRC allowances of 80 mgs. Seven subjects or 88% were below allowances and one subject or 12% was above the allowance.

For thirteen male subjects, 20 years and over, the range was from 0 to 44 mgs., and the average per person was 8 mgs. The average was 11% of the NRC allowances of 75 mgs. Thirteen subjects or 100% were below allowances.

For one female subject, 20 years and over, the total niacin content was 9 mgs. This was 13% of the NRC allowances of 70 mgs. This subject was below the allowance.

For the total group of eighty-seven students, eighty subjects or 92% were below allowances and seven subjects or 8% were above allowances.

SUMMARY

Three day dietary records of eighty-seven students at the Marshall Island Intermediate School and Teacher Training School at Uliga, Marshall Islands, from the ages of 13 to 20 years and over, were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron vitamin A, thiamine, riboflavin, niacin and ascorbic acid. These figures were then compared with National Research Council Allowances.

Taking the total group of eighty-seven students, the following results were obtained when daily intakes were compared with NRC allowances.

1. Calories: Fifty-one subjects or 59% were below allowances, thirty-six subjects or 41% were above allowances.

2. Protein: Seventeen subjects or 20% were below allowances, seventy subjects or 80% were above allowances.

3. Fat: Sixty-seven subjects or 77% were below allowances, twenty subjects or 23% were above allowances.

4. Calcium: Eighty subjects or 92% were below allowances, seven subjects or 8% were above allowances.

5. Phosphorus: Twenty-five subjects or 29% were below allowances, sixty-two subjects or 71% were above allowances.

6. Iron: Fifty-two subjects or 60% were below allowances, thirty-five subjects or 40% were above allowances.

7. Vitamin A: Eighty subjects or 92% were below allowances, seven subjects or 8% were above allowances.

8. Thiamine: Sixty subjects or 69% were below allowances, twenty-seven subjects or 31% were above allowances.

9. Riboflavin: Eighty-five subjects or 98% were below allowances, two subjects or 2% were above allowances.

10. Niacin: Three subjects or 4% were below allowances, eighty-four subjects or 96% were above allowances.

11. Ascorbic acid: Eighty subjects or 92% were below allowances, seven subjects or 8% were above allowances.

Ninety-six percent of the subjects met the NRC allowances for niacin; 80% of the subjects met the NRC allowances for protein; and 71% of the subjects met the NRC allowances for phosphorus.

Ninety-eight percent of the subjects were below allowances for riboflavin. Ninety-two percent of the subjects were below allowances for calcium, vitamin A, and ascorbic acid. Seventy-seven percent of the subjects failed to meet NRC allowances for fat; 69% of the subjects failed to meet NRC allowances for thiamine; 60% of the subjects failed to meet NRC allowances for iron; and 59% of the subjects failed to meet NRC allowances for calories.

SUMMARY OF DAILY QUANTITIES OF VARIOUS NUTRIENTS PER PERSON IN THE THREE MARSHALLESE SCHOOLS AND COMPARISON WITH NATIONAL RESEARCH COUNCIL ALLOWANCES.

PURPOSE

To compare the daily quantities of various nutrients per person and comparison with National Research Council Allowances between three Marshallese Schools. The Marshall Island Intermediate School and Teacher Training School (an example of a school for Marshallese students administered and financed by the U. S. Navy); the other two, the Marshall Christian Training School and the Mission School, were examples of schools for Marshallese students administered and financed by Marshallese.

PROCEDURE AND METHODS USED

Given under section for each individual school.

RESULTS

Table 13 summarizes the daily quantities of various nutrients per person and compares them with National Research Council Allowances for female subjects from three schools in the Marshall Islands: The Marshall Island Intermediate School and the Teacher Training School at Uliga, the Marshall Christian Training School at Ronron, and the Mission School at Majuro Village, Majuro Island.

There were 163 male and female subjects, of which 80 were female students.

There were four subjects, ages 10 to 12 years from the Marshall Christian Training School.

Thirty subjects, ages 13 to 15 years; of these, fourteen were from the Marshall Christian Training School, ten subjects from the Mission School, and six subjects from the Marshall Island Intermediate School.

There were 45 subjects ages 16 to 20 years: 34 subjects from the Marshall Christian Training School; three subjects from the Mission School; and eight subjects from the Marshall Island Intermediate School. There was one subject over 20 years of age from the Marshall Island Intermediate School.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given.

I. FEMALES

a. <u>10 to 12 years of age</u>

1. For four female subjects, 10 to 12 years of age from the Marshall Christian Training School, the daily quantities of various nutrients

Table 13.

Summary of Daily Quantities of Various Nutrients per Person in the Three Marshallese Schools and Comparisons with National Research Council Allowances

by Mary Murai

Females

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Ages 10 to 12 years											
Marshall Christian Training School (4)*											
Average intake	2300	66	42	440	1132	9	1796	1056	672	13	16
NRC allowances	2500	70	69	1200	1200	12	4500	1200	1800	12	75
% of allowances	92	94	61	37	94	75	40	88	37	108	21
% of subjects below allowances	75	75	100	100	75	100	100	75	100	25	100
Ages 13 to 15 years											
Marshall Christian Training School (14)											
Average intake	2070	58	39	496	1054	9	2845	690	498	10	17
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	80	72	54	38	88	60	57	53	25	77	21
% of subjects below allowances	100	100	100	100	93	93	93	100	100	71	100
Mission School (10)											
Average intake	1217	29	8	209	484	6	40	633	450	11	15
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	47	36	11	16	40	40	0.8	49	22	85	19
% of subjects below allowances	100	100	100	100	100	100	100	100	100	100	100
Marshall Island Intermediate School (6)											
Average intake	3281	104	81	725	1362	13	479	1450	966	26	14
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	125	130	112	56	113	87	10	111	48	200	17
% of subjects below allowances	17	17	33	100	17	67	100	17	100	0	100

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
Ages 16 to 20 years											
Marshall Christian Training School (34)											
Average intake	2178	59	42	445	1102	9	2885	756	552	12	22
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	91	79	63	44	92	60	58	63	31	100	27
% of subjects below allowances	73	91	85	100	82	100	94	94	100	56	100
Mission School (3)											
Average intake	1277	31	10	157	484	7	54	840	530	10	12
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	53	41	15	16	40	47	1	70	24	83	15
% of subjects below allowances	100	100	100	100	100	100	100	100	100	100	100
Marshall Island Intermediate School (8)											
Average intake	3011	98	70	675	1230	11	2431	1162	912	20	40
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	125	131	104	67	102	73	49	97	51	166	50
% of subjects below allowances	25	25	63	88	50	75	88	63	100	0	88
Ages 20 years and over											
Marshall Island Intermediate School (1)											
Average intake	2236	83	42	631	1118	7	1171	826	814	15	9
NRC allowances	2000	60	56	1000	1320	12	5000	1000	1500	10	70
% of allowances	111	138	75	63	85	58	23	83	54	150	13
% of subjects below allowances	0	0	100	100	100	100	100	100	100	0	100

* Figure in ( ) indicate number of subjects studied.

per person and comparison with NRC allowances are summarized here:

1. Calories: average intake was 2300 calories, which was 92% of the NRC allowances of 2500 calories. 75% of the subjects were below allowances.

2. Protein: average intake was 66 gms., which was 94% of the NRC allowances of 70 gms. 75% of the subjects were below allowances.

3. Fat: average intake was 42 gms., which was 61% of the NRC allowances of 69 gms. 100% of the subjects were below allowances.

4. Calcium: average intake was 440 gms., which was 37% of the NRC allowances of 1200 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 1132 mgs., which was 94% of the NRC allowances of 1200 mgs. 75% of the subjects were below allowances.

6. Iron: average intake was 9 mgs., which was 75% of the NRC allowances of 12 mgs. 100% of the subjects were below allowances.

7. Vitamin A: average intake was 1796 I. U., which was 40% of the NRC allowances of 4500 I. U. 100% of the subjects were below allowances.

8. Thiamine: average intake was 1056 mcgs., which was 88% of the NRC allowances of 1200 mcgs. 75% of the subjects were below allowances.

9. Riboflavin: average intake was 672 mcgs., which was 37% of the NRC allowances of 1800 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 13 mgs., which was 108% of the NRC allowances of 12 mgs. 25% of the subjects were below allowances.

11. Ascorbic acid: average intake was 16 mgs., which was 21% of the NRC allowances of 75 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for fat, calcium, iron, vitamin A, riboflavin, and ascorbic acid; 75% of the subjects were below allowances for calories, protein, phosphorus, and thiamine. 25% of the subjects were below allowances for niacin and 75% were above allowances.

b. <u>13 to 15 years of age</u>

1. For fourteen female subjects, 13 to 15 years of age from the Marshall Christian Training School, the daily quantities of various nutrients per person and comparison with NRC allowances are summarized here:

1. Calories: average intake was 2070 calories which was 80% of the NRC allowances of 2600 calories. 100% of the subjects were below allowances.

2. Protein: average intake was 58 gms., which was 72% of the NRC allowances of 80 gms. 100% of the subjects were below allowances.

3. Fat: average intake was 39 gms., which was 54% of the NRC allowances of 72 gms. 100% of the subjects were below allowances.

4. Calcium: average intake was 496 mgs., which was 38% of the NRC allowances of 1300 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 1054 mgs., which was 88% of the NRC allowances of 1200 mgs. 93% of the subjects were below allowances.

6. Iron: average intake was 9 mgs., which was 60% of the NRC allowances of 15 mgs. 93% of the subjects were below allowances.

7. Vitamin A: average intake was 2845 I. U., which was 57% of the NRC allowances of 5000 I. U. 93% of the subjects were below allowances.

8. Thiamine: average intake was 690 mcgs., which was 53% of the NRC allowances of 1300 mcgs. 100% of the subjects were below allowances.

9. Riboflavin: average intake was 498 mcgs., which was 25% of the NRC allowances of 2000 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 10 mgs., which was 77% of the NRC allowances of 13 mgs. 71% of the subjects were below allowances.

11. Ascorbic acid: average intake was 17 mgs., which was 21% of the NRC allowances of 80 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for calories, protein, fat, calcium, thiamine, riboflavin, and ascorbic acid; 93% of the subjects were below allowances for phosphorus, iron and vitamin A; 71% of the subjects were below allowances for niacin.

2. For ten female subjects, 13 to 15 years of age, from the Mission School, the daily quantities of various nutrients per person and comparison with NRC allowances are summarized here:

1. Calories: average intake was 1217 calories which was 47% of the NRC allowances of 2600 calories. 100% of the subjects were below allowances.

2. Protein: average intake was 29 gms., which was 36% of the NRC allowances of 80 gms. 100% of the subjects were below allowances.

3. Fat: average intake was 8 gms., which was 11% of the NRC allowances of 72 gms. 100% of the subjects were below allowances.

4. Calcium: average intake was 209 mgs., which was 16% of the NRC allowances of 1300 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 484 mgs., which was 40% of the NRC allowances of 1200 mgs. 100% of the subjects were below allowances.

6. Iron: average intake was 6 mgs., which was 40% of the NRC allowances of 15 mgs. 100% of the subjects were below allowances.

7. Vitamin A: average intake was 40 I. U., which was 0.8% of the NRC allowances of 5000 I. U. 100% of the subjects were below allowances.

8. Thiamine: average intake was 633 mcgs., which was 49% of the NRC allowances of 1300 mcgs. 100% of the subjects were below allowances.

9. Riboflavin: average intake was 450 mcgs., which was 22% of the NRC allowances of 2000 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 11 mgs., which was 85% of the NRC allowances of 13 mgs. 100% of the subjects were below allowances.

11. Ascorbic acid: average intake was 15 mgs., which was 19% of the NRC allowances of 80 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for all the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid.

3. For six female subjects, 13 to 15 years of age, from the Marshall Island Intermediate School, the daily quantities of various nutrients per person and comparison with NRC allowances are summarized here:

1. Calories: average intake was 3281 calories, which was 125% of the NRC allowances of 2600 calories. 17% of the subjects were below allowances.

2. Protein: average intake was 104 gms., which was 130% of the NRC allowances of 80 gms. 17% of the subjects were below allowances.

3. Fat: average intake was 81 gms., which was 112% of the NRC allowances of 72 gms. 33% of the subjects were below allowances.

4. Calcium: average intake was 725 mgs., which was 56% of the NRC allowances of 1300 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 1362 mgs., which was 113% of the NRC allowances of 1200 mgs. 17% of the subjects were below allowances.

6. Iron: average intake was 13 mgs., which was 87% of the NRC allowances of 15 mgs. 67% of the subjects were below allowances.

7. Vitamin A: average intake was 479 I. U., which was 10% of the NRC allowances of 5000 I. U. 100% of the subjects were below allowances.

8. Thiamine: average intake was 1450 mcgs., which was 111% of the NRC allowances of 1300 mcgs. 17% of the subjects were below allowances.

9. Riboflavin: average intake was 966 mcgs., which was 48% of the NRC allowances of 2000 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 26 mgs., which was 200% of the NRC allowances of 13 mgs. None of the subjects were below allowances.

11. Ascorbic acid: average intake was 14 mgs., which was 17% of the NRC allowances of 80 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for calcium, vitamin A, riboflavin, and ascorbic acid; and 67% of the subjects were below allowances for iron. 33% of the subjects were below allowances for fat. For calories, protein, phosphorus, and thiamine only 17% of the subjects were below allowances and 83% of the subjects were above allowances. All subjects or 100% were above allowances for niacin.

c. 16 to 20 years of age

1. For thirty-four female subjects, 16 to 20 years of age, from the Marshall Christian Training School, the daily quantities of various nutrients per person and comparison with NRC allowances are summarized here:

1. Calories: average intake was 2178 calories, which was 91% of the NRC allowances of 2400 calories. 73% of the subjects were below allowances.

2. Protein: average intake was 59 gms., which was 79% of the NRC allowances of 75 gms. 91% of the subjects were below allowances.

3. Fat: average intake was 42 gms., which was 63% of the NRC allowances of 67 gms. 85% of the subjects were below allowances.

4. Calcium: average intake was 445 mgs., which was 44% of the NRC allowances of 1000 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 1102 mgs., which was 92% of the NRC allowances of 1200 mgs. 82% of the subjects were below allowances.

6. Iron: average intake was 9 mgs., which was 60% of the NRC allowances of 15 mgs. 100% of the subjects were below allowances.

7. Vitamin A: average intake was 2885 I. U., which was 58% of the NRC allowances of 5000 I. U. 94% of the subjects were below allowances.

8. Calcium: average intake was 756 mgs., which was 63% of the NRC allowances of 1200 mgs. 94% of the subjects were below allowances.

9. Phosphorus: average intake was 552 mgs., which was 31% of the NRC allowances of 1800 mgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 12 mgs., which was 100% of the NRC allowances of 12 mgs. 56% of the subjects were below allowances.

11. Ascorbic acid: average intake was 22 mgs., which was 27% of the NRC allowances of 80 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for calcium, iron, riboflavin, and ascorbic acid; 94% of the subjects were below allowances for vitamin A and thiamine; 91% of the subjects were below allowances for protein; 85% of the subjects were below allowances for fat; 82% of the subjects were below allowances for phosphorus; 73% of the subjects were below allowances for calories; and 56% of the subjects were below allowances for niacin.

2. For three female subjects, 16 to 20 years of age, from the Mission School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1277 calories, which was 53% of the NRC allowances of 2400 calories. 100% of the subjects were below allowances.

2. Protein: average intake was 31 gms., which was 41% of the NRC allowances of 75 gms. 100% of the subjects were below allowances.

3. Fat: average intake was 10 gms., which was 15% of the NRC allowances of 67 gms. 100% of the subjects were below allowances.

4. Calcium: average intake was 157 mgs., which was 16% of the NRC allowances of 1000 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 484 mgs., which was 40% of the NRC allowances of 1200 mgs. 100% of the subjects were below allowances.

6. Iron: average intake was 7 mgs., which was 47% of the NRC allowances of 15 mgs. 100% of the subjects were below allowances.

7. Vitamin A: average intake was 54 I. U., which was 1% of the NRC allowances of 5000 I. U. 100% of the subjects were below allowances.

8. Thiamine: average intake was 840 mcgs., which was 70% of the NRC allowances of 1200 mcgs. 100% of the subjects were below allowances.

9. Riboflavin: average intake was 530 mcgs., which was 24% of the NRC allowances of 1800 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 10 mgs., which was 83% of the NRC allowances of 12 mgs. 100% of the subjects were below allowances.

11. Ascorbic acid: average intake was 12 mgs., which was 15% of the NRC allowances of 80 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for all the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid.

3. For eight female subjects, 16 to 20 years of age from the Marshall Island Intermediate School, the daily quantities of various nutrients per person with the NRC allowances are summarized here:

1. Calories: average intake was 3011 calories, which was 125% of the NRC allowances of 2400 calories. 25% of the subjects were below allowances.

2. Protein: average intake was 98 gms., which was 131% of the NRC allowances of 75 gms. 25% of the subjects were below allowances.

3. Fat: average intake was 70 gms., which was 104% of the NRC allowances of 67 gms. 63% of the subjects were below allowances.

4. Calcium: average intake was 675 mgs., which was 67% of the NRC allowances of 1000 mgs. 88% of the subjects were below allowances.

5. Phosphorus: average intake was 1230 mgs., which was 102% of the NRC allowances of 1200 mgs. 50% of the subjects were below allowances.

6. Iron: average intake was 11 mgs., which was 73% of the NRC allowances of 15 mgs. 75% of the subjects were below allowances.

7. Vitamin A: average intake was 2431 I. U., which was 49% of the NRC allowances of 5000 I. U. 88% of the subjects were below allowances.

8. Thiamine: average intake was 1162 mcgs., which was 97% of the NRC allowances of 1200 mcgs. 63% of the subjects were below allowances.

9. Riboflavin: average intake was 912 mcgs., which was 51% of the NRC allowances of 1800 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 20 mgs., which was 166% of the NRC allowances of 12 mgs. None of the subjects were below allowances.

11. Ascorbic acid: average intake was 40 mgs., which was 50% of the NRC allowances of 80 mgs. 88% of the subjects were below allowances.

100% of the subjects were below allowances for riboflavin; 88% of the subjects were below allowances for calcium, vitamin A, and ascorbic acid; 75% of the subjects were below allowances for iron; 63% of the subjects were below allowances for fat and thiamine; and 50% of the subjects were below allowances for phosphorus. 25% of the subjects were below allowances for calories and protein and 75% of the subjects were above allowances. All of the subjects or 100% were above allowances for niacin.

d. 20 years of age and over

1. For one female subject over 20 years of age, from the Marshall Island Intermediate School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 2236 calories, which was 111% of the NRC allowances of 2000 calories. The subject was above allowances.

2. Protein: average intake was 83 gms., which was 138% of the NRC allowances of 60 gms. This subject was above allowances.

3. Fat: average intake was 42 gms., which was 75% of the NRC allowances of 56 gms. This subject was below allowances.

4. Calcium: average intake was 631 mgs., which was 63% of the NRC allowances of 1000 mgs. This subject was below allowances.

5. Phosphorus: average intake was 1118 mgs., which was 85% of the NRC allowances of 1320 mgs. This subject was below allowances.

6. Iron: average intake was 7 mgs., which was 58% of the NRC allowances of 12 mgs. This subject was below allowances.

7. Vitamin A: average intake was 1171 I. U., which was 23% of the NRC allowances of 5000 I. U. This subject was below allowances.

8. Thiamine: average intake was 826 mcgs., which was 83% of the NRC allowances of 1000 mcgs. This subject was below allowances.

9. Riboflavin: average intake was 814 mcgs., which was 54% of the NRC allowances of 1500 mcgs. This subject was below allowances.

10. Niacin: average intake was 15 mgs., which was 150% of the NRC allowances of 10 mgs. This subject was above allowances.

11. Ascorbic acid: average intake was 9 mgs., which was 13% of the NRC allowances of 70 mgs. This subject was below allowances.

This subject was below allowances for fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, and ascorbic acid; and above allowances for calories, protein, and niacin.

Table 14 summarized the quantities of various nutrients per person and comparison with National Research Council Allowances for male subjects from three schools in the Marshall Islands: the Marshall Island Intermediate School and the Teacher Training School, at Uliga; the Marshall Christian Training School at Roñroñ; and the Mission School at Majuro Village, Majuro Island.

There were one hundred and sixty-three male and female subjects. There were eighty-three male subjects.

There were twelve subjects, ages 13 to 15 years; one subject from the Mission School, and eleven subjects from the Marshall Island Intermediate School.

There was a total of fifty-eight subjects, ages 16 to 20 years. Of these, ten subjects were from the Mission School; forty-eight subjects from the Marshall Island Intermediate School.

For the thirteen students who were over 20 years of age, there were thirteen subjects from the Marshall Island Intermediate School.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given.

II. MALES

a. 13 to 15 years of age

1. For one male subject, 13 to 15 years of age, from the Mission School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1098 calories, which was 34% of the NRC allowances of 3200 calories. This subject was below allowances.

2. Protein: average intake was 23 gms., which was 27% of the NRC allowances of 85 gms. This subject was below allowances.

3. Fat: average intake was 7 gms., which was 8% of the NRC allowances of 89 gms. This subject was below allowances.

4. Calcium: average intake was 228 mgs., which was 16% of the NRC allowances of 1400 mgs. This subject was below allowances.

5. Phosphorus: average intake was 493 mgs., which was 37% of the NRC allowances of 1320 mgs. This subject was below allowances.

6. Iron: average intake was 7 mgs., which was 47% of the NRC allowances of 15 mgs. This subject was below allowances.

7. Vitamin A: average intake was 50 I. U., which was 1% of the NRC allowances of 5000 I. U. This subject was below allowances.

8. Thiamine: average intake was 565 mcgs., which was 38% of the NRC allowances of 1500 mcgs. This subject was below allowances.

9. Riboflavin: average intake was 449 mcgs., which was 22% of the NRC allowances of 2000 mcgs. This subject was below allowances.

10. Niacin: average intake was 11 mgs., which was 73% of the NRC allowances of 15 mgs. This subject was below allowances.

11. Ascorbic acid: average intake was 29 mgs., which was 32% of the NRC allowances of 90 mgs. This subject was below allowances.

This subject was below allowances for all of the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, riboflavin, niacin, and ascorbic acid.

Table 14.

Summary of Daily Quantities of Various Nutrients per Person in the Three Marshallese Schools and Comparisons with National Research Council Allowances.

by Mary Murai

Males

	Calories	Protein gm.	Fat gm.	Calcium mg.	Phosphorus mg.	Iron mg.	Vitamin A I.U.	Thiamine mcg.	Riboflavin mcg.	Niacin mg.	Ascorbic Acid mg.
Ages 13 to 15 years											
Mission School (1)*											
Average intake	1098	23	7	228	493	7	50	565	449	11	29
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	34	27	8	16	37	47	1	38	22	73	32
% of subjects below allowances	100	100	100	100	100	100	100	100	100	100	100
Marshall Island Intermediate School (11)											
Average intake	3858	115	85	784	1487	16	1666	1686	1109	27	27
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	120	135	95	56	112	107	33	1121	55	180	30
% of subjects below allowances	27	0	55	100	36	45	91	45	91	9	91
Ages 16 to 20 years											
Mission School (10)											
Average intake	1332	28	19	148	453	7	29	650	432	10	12
NRC allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	35	28	18	11	34	47	0.5	38	17	59	12
% of subjects below allowances	100	100	100	100	100	100	100	100	100	100	100
Marshall Island Intermediate School (48)											
Average intake	3253	116	70	825	1515	13	1805	1410	1147	26	23
NRC Allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	86	116	67	59	115	87	30	83	46	153	23
% of subjects below allowances	81	29	42	96	25	60	94	81	100	2	90

	Calo-ries	Pro-tein	Fat	Cal-cium	Phos-phorus	Iron	Vita-min A	Thia-mine	Ribo-flavin	Nia-cin	Ascor-bic Acid
Ages 20 years and over											
Marshall Island Intermediate School (13)											
Average intake	2972	118	61	926	1480	11	2062	1361	1179	24	8
NRC allowances	3000	70	83	1000	1320	12	5000	1500	1800	15	75
% of allowances	99	168	73	93	111	92	41	91	65	160	11
% of subjects below allowances	46	0	85	69	23	54	85	69	92	8	100

* Figure in ( ) indicate number of subjects studied.

2. For eleven male subjects, 13 to 15 years of age, from the Marshall Island Intermediate School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 3858 calories, which was 120% of the NRC allowances of 3200 calories. 27% of the subjects were below allowances.

2. Protein: average intake was 115 gms., which was 135% of the NRC allowances of 85% gms. None were below allowances.

3. Fat: average intake was 85 gms., which was 95% of the NRC allowances of 89 gms. 55% were below allowances.

4. Calcium: average intake was 784 mgs., which was 56% of the NRC allowances of 1400 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 1487 mgs., which was 112% of the NRC allowances of 1320 mgs. 36% of the subjects were below allowances.

6. Iron: average intake was 16 mgs., which was 107% of the NRC allowances of 15 mgs. 45% of the subjects were below allowances.

7. Vitamin A: average intake was 1666 I. U., which was 33% of the NRC allowances of 5000 I. U. 91% of the subjects were below allowances.

8. Thiamine: average intake was 1686 mcgs., which was 112% of the NRC allowances of 1500 mcgs. 45% of the subjects were below allowances.

9. Riboflavin: average intake was 1109 mcgs., which was 55% of the NRC allowances of 2000 mcgs. 91% of the subjects were below allowances.

10. Niacin: average intake was 27 mgs., which was 180% of the NRC allowances of 15 mgs. 9% of the subjects were below allowances.

11. Ascorbic acid: average intake was 27 mgs., which was 30% of the NRC allowances of 90 mgs. 91% of the subjects were below allowances.

100% of the subjects were below allowances for calcium; 91% of the subjects were below allowances for vitamin A, riboflavin, and ascorbic acid; and 55% of the subjects were below allowances for fat. 36% of the subjects were below allowances for phosphorus and 64% of the subjects were above allowances. 45% of the subjects were below allowances for iron and thiamine, while 55% of the subjects were above allowances. 27% of the subjects were below allowances for calories and 73% of the subjects were above allowances. All subjects or 100% were above allowances for protein. 9% of the subjects were below allowances for niacin and 91% of the subjects were above allowances.

b. 16 to 20 years of age

1. For ten male subjects, 16 to 20 years of age, from the Mission School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 1332 calories, which was 35% of the NRC allowances of 3800 calories. 100% of the subjects were below allowances.

2. Protein: average intake was 28 gms., which was 28% of the NRC allowances of 100 gms. 100% of the subjects were below allowances.

3. Fat: average intake was 19 gms., which was 18% of the NRC allowances of 105 gms. 100% of the subjects were below allowances.

4. Calcium: average intake was 148 gms., which was 11% of the NRC allowances of 1400 mgs. 100% of the subjects were below allowances.

5. Phosphorus: average intake was 453 mgs., which was 34% of the NRC allowances of 1320 mgs. 100% of the subjects were below allowances.

6. Iron: average intake was 7 mgs., which was 47% of the NRC allowances of 15 mgs. 100% of the subjects were below allowances.

7. Vitamin A: average intake was 29 I. U., which was 0.5% of the NRC allowances of 6000 I. U. 100% of the subjects were below allowances.

8. Thiamine: average intake was 650 mcgs., which was 38% of the NRC allowances of 1700 mcgs. 100% of the subjects were below allowances.

9. Riboflavin: average intake was 432 mcgs., which was 17% of the NRC allowances of 2500 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 10 mgs., which was 59% of the NRC allowances of 17 mgs. 100% of the subjects were below allowances.

11. Ascorbic acid: average intake was 12 mgs., which was 12% of the NRC allowances of 100 mgs. 100% of the subjects were below allowances.

2. For forty-eight male subjects, 16 to 20 years of age, from the Marshall Island Intermediate School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 3253 calories, which was 86% of the NRC allowances of 3800 calories. 81% of the subjects were below allowances.

2. Protein: average intake was 116 gms., which was 116% of the NRC allowances of 100 gms. 29% of the subjects were below allowances.

3. Fat: average intake was 70 gms., which was 67% of the NRC allowances of 105 gms. 42% of the subjects were below allowances.

4. Calcium: average intake was 825 mgs., which was 59% of the NRC allowances of 1400 mgs. 96% of the subjects were below allowances.

5. Phosphorus: average intake was 1515 mgs., which was 115% of the NRC allowances of 1320 mgs. 25% of the subjects were below allowances.

6. Iron: average intake was 13 mgs., which was 87% of the NRC allowances of 15 mgs. 60% of the subjects were below allowances.

7. Vitamin A: average intake was 1805 I. U., which was 30% of the NRC allowances of 6000 I. U. 94% of the subjects were below allowances.

8. Thiamine: average intake was 1410 mcgs., which was 83% of the NRC allowances of 1700 mcgs. 81% of the subjects were below allowances.

9. Riboflavin: average intake was 1147 mcgs., which was 46% of the NRC allowances of 2500 mcgs. 100% of the subjects were below allowances.

10. Niacin: average intake was 26 mgs., which was 153% of the NRC allowances of 17 mgs. 2% of the subjects were below allowances.

11. Ascorbic acid: average intake was 23 mgs., which was 23% of the NRC allowances of 100 mgs. 90% of the subjects were below allowances.

100% of the subjects were below allowances for riboflavin; 96% of the subjects were below allowances for calcium; 94% of the subjects were below allowances for vitamin A; 90% of the subjects were below allowances for ascorbic acid; 81% of the subjects were below allowances for calories and thiamine; and 60% of the subjects were below allowances for iron. 42% of the subjects were below allowances for fat and 58% were above allowances. 29% of the subjects were below allowances for protein and 71% were above. 25% of the subjects were below allowances and 75% of the subjects were above allowances for phosphorus. 2% of the subjects were below allowances and 98% of the subjects were above allowances for niacin.

c. 20 years of age and over

1. For thirteen male subjects, 20 years and over, from the Marshall Island Intermediate School, the daily quantities of various nutrients per person and comparison with the NRC allowances are summarized here:

1. Calories: average intake was 2972 calories, which was 99% of the NRC allowances of 3000 calories. 46% of the subjects were below allowances.

2. Protein: average intake was 118 gms., which was 168% of the NRC allowances of 70 gms. None of the subjects were below allowances.

3. Fat: average intake was 61 gms., which was 73% of the NRC allowances of 83 gms. 85% of the subjects were below allowances.

4. Calcium: average intake was 926 mgs., which was 93% of the NRC allowances of 1000 mgs. 69% of the subjects were below allowances.

5. Phosphorus: average intake was 1480 mgs., which was 111% of the NRC allowances of 1320 mgs. 23% of the subjects were below allowances.

6. Iron: average intake was 11 mgs., which was 92% of the NRC allowances of 12 mgs. 54% of the subjects were below allowances.

7. Vitamin A: average intake was 2062 I. U., which was 41% of the NRC allowances of 5000 I. U. 85% of the subjects were below allowances.

8. Thiamine: average intake was 1361 mcgs., which was 91% of the NRC allowances of 1500 mcgs. 69% of the subjects were below allowances.

9. Riboflavin: average intake was 1179 mcgs., which was 65% of the NRC allowances of 1800 mcgs. 92% of the subjects were below allowances.

10. Niacin: average intake was 24 mgs., which was 160% of the NRC allowances of 15 mgs. 8% of the subjects were below allowances.

11. Ascorbic acid: average intake was 8 mgs., which was 11% of the NRC allowances of 75 mgs. 100% of the subjects were below allowances.

100% of the subjects were below allowances for ascorbic acid; 92% of the subjects were below allowances for riboflavin; 85% of the subjects were below allowances for both fat and vitamin A; 69% of the subjects were below allowances for calcium and thiamine; and 54% of the subjects were below allowances for iron. 46% of the subjects were below allowances for calories and 54% were above allowances. 23% of the subjects were below allowances and 77% were above allowances for phosphorus. 8% of the subjects were below allowances and 92% of the subjects were above allowances for niacin. 100% of the subjects were above allowances for protein.

SUMMARY

The dietary records of 163 subjects who were students of three schools in the Marshall Islands, namely, the Marshall Island Intermediate School and the Teacher Training School, at Uliga; the Marshall Christian School at Roñroñ; and the Mission School at Majuro Village, Majuro, were studied for daily consumption of calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. These figures were then compared with National Research Council Allowances.

There were eighty female students.

a. Ages 10 to 12 years - Total, four subjects

   1. Marshall Christian Training School - four subjects

b. Ages 13 to 15 years - Total, thirty subjects

   1. Marshall Christian Training School - fourteen subjects

   2. Mission School - ten subjects

   3. Marshall Intermediate School - six subjects

c. Ages 16 to 20 years - Total - forty-five subjects

   1. Marshall Christian Training School - thirty-four subjects.

   2. Mission School - three subjects

   3. Marshall Island Intermediate School -eight subjects

d. Ages 20 years and over - Total, one subject

1. Marshall Island Intermediate School - one subject.

There were eighty-three male subjects.

a. Ages 13 to 15 years - Total, twelve subjects

1. Mission School - one subject

2. Marshall Island Intermediate School - eleven subjects

b. Ages 16 to 20 years - Total, fifty-eight subjects

1. Mission School - ten subjects

2. Marshall Island Intermediate School - forty-eight subjects

c. Ages 20 years and over - Total, thirteen subjects

1. Marshall Island Intermediate School - thirteen subjects.

Taking the total group of 163 subjects and grouping them as above, the following results were obtained when daily intakes were compared with National Research Council allowances.

I. FEMALES

a. 10 to 12 years of age

1. Marshall Christian Training School

All of the subjects, or 100% were below allowances for fat, calcium, iron, vitamin A, riboflavin, and ascorbic acid. 75% of the subjects were below allowances for calories, protein, phosphorus, and thiamine. 25% of the subjects were below allowances for niacin.

b. 13 to 15 years of age

1. Marshall Christian Training School

100% of the subjects were below allowances for calories, protein, fat, calcium, thiamine, riboflavin, and ascorbic acid. 93% of the subjects were below allowances for phosphorus, iron, and vitamin A; and 71% of the subjects were below allowances for niacin.

2. Mission School

100% of the subjects were below allowances for all of the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid.

3. Marshall Island Intermediate School

100% of the subjects were below allowances for calcium, vitamin A, riboflavin, and ascorbic acid; and 67% of the subjects were below

allowances for iron. 33% of the subjects were below allowances and 67% were above allowances for fat. For calories, protein, phosphorus, and thiamine only 17% of the subjects were below allowances and 83% of the subjects were above allowances. All subjects or 100% were above allowances for niacin.

c. 16 to 20 years of age

1. Marshall Christian Training School

100% of the subjects were below allowances for calcium, iron, riboflavin, and ascorbic acid; 94% of the subjects were below allowances for vitamin A and thiamine; 91% of the subjects were below allowances for protein; 85% of the subjects were below allowances for fat; 82% of the subjects were below allowances for phosphorus; 73% of the subjects were below allowances for calories; 56% of the subjects were below allowances for niacin.

2. Mission School

100% of the subjects were below allowances for all the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid.

3. Marshall Island Intermediate School

100% of the subjects were below allowances for riboflavin; 88% of the subjects were below allowances for calcium, vitamin A, and ascorbic acid; 75% of the subjects were below allowances for iron; 63% of the subjects were below allowances for fat and thiamine; and 50% of the subjects were below allowances for phosphorus. For calories and protein, 25% of the subjects were below allowances and 75% of the subjects were above allowances. All of the subjects, or 100% were above allowances for niacin.

d. 20 years of age and over

1. Marshall Island Intermediate School

The subject was below allowances for fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, and ascorbic acid; and above allowances for calories, protein and niacin.

II. MALES

a. 13 to 15 years of age

1. Mission School

The subject was below allowances for all of the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, riboflavin, niacin, and ascorbic acid.

2. Marshall Island Intermediate School

100% of the subjects were below allowances for calcium;

91% of the subjects were below allowances for vitamin A, riboflavin, and ascorbic acid; and 55% of the subjects were below allowances for fat. 36% of the subjects were below allowances for phosphorus and 64% of the subjects were above allowances. 45% of the subjects were below allowances for iron and thiamine, while 55% of the subjects were above allowances. 27% of the subjects were below allowances for calories and 73% were above allowances. All subjects or 100% were above allowances for protein. 9% were below allowances for niacin and 91% were above allowances.

b. 16 to 20 years of age

1. Mission School

100% of the subjects were below allowances for all the nutrients, namely, calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid.

2. Marshall Island Intermediate School

100% of the subjects were below allowances for riboflavin; 96% of the subjects were below allowances for calcium; 94% of the subjects were below allowances for vitamin A; 90% of the subjects were below allowances for ascorbic acid; 81% of the subjects were below allowances for calories and thiamine; and 60% of the subjects were below allowances for iron. 42% of the subjects were below allowances for fat and 58% were above allowances. 29% of the subjects were below allowances for protein and 71% were above allowances. 25% of the subjects were below and 75% above allowances for phosphorus. 2% of the subjects were below allowances and 98% were above allowances for niacin.

c. 20 years of age and over

1. Marshall Island Intermediate School

100% of the subjects were below allowances for ascorbic acid; 92% of the subjects were below allowances for riboflavin; 85% of the subjects were below allowances for both fat and vitamin A; 69% of the subjects were below allowances for calcium and thiamine; and 54% of the subjects were below allowances for iron. 46% of the subjects were below allowances for calories and 54% were above allowances. 23% of the subjects were below allowances and 77% were above allowances for phosphorus. 8% of the subjects were below and 92% were above allowances for niacin. 100% of the subjects were above allowances for protein.

In comparing the three schools, the Marshall Island Intermediate School students had the best dietary; the Marshall Christian Training School, second; and the Misssion School, third. However, all of the NRC allowances were not met by the meals served in any of the schools; so there is much to be done for the improvement of the nutrient content of the diets.

DISCUSSION

In all the schools, the diets can be improved by including some of the protective foods, such as the green leafy vegetables and milk. The other foods which are good sources of the various nutrients as noted in the previous section should be included for a well balanced diet. Marshallese diets in most instances are low in the protective foods.

The students of the Navy operated school, Marshall Island Intermediate School and the Teacher Training School had the best diet. The diet was known to be insufficient in the nutrients and an effort had been made to include beans, dried eggs, meat, milk, fruits and vegetables in the diet. In the other schools, there was little knowledge of the nutritional aspects of foods. Meals were served to fill empty stomachs. The Marshall Christian Training School was second in quality and the Mission School at Majuro Village had the poorest diet.

In the study by Faine and Hereus (24), of the nutritional status of Cook Islanders, 1951, stated that milk ration was introduced in all the schools in Rarotonga and had been in operation for 18 months and the teachers were enthusiastic.

Such steps are encouraging and indicate that better nutrition for the students is possible and practical. A target for future planning should be well balanced diets for the school children of the Marshall Islands for through better health they will become better citizens in the world of tomorrow.

The average of nutrient intake of 163 students from the three Marshallese schools are classified in relation to NRC Recommended Dietary Allowances. The average intakes are given as percentages of NRC Recommended Dietary Allowances. The results are given in Table 15.

The intakes of fat, calcium, iron, vitamin A, thiamine, riboflavin and ascorbic acid were much below recommended allowances. Ascorbic acid intakes were lowest for the greatest number of individuals; riboflavin was next, followed by vitamin A, calcium, fat, iron and thiamine.

For the nutrients with average intake of 90 to 100% or more of NRC recommended allowances, niacin intakes were met by the greatest number of subjects; phosphorus was next, followed by protein and calories.

Table 15.

Classification of Averages of Nutrient Intake of One Hundred Sixty-Three Students of Three Marshallese Schools in Relation to NRC Recommended Dietary Allowances.

Nutrient	Classification of Average Intake As Percentage of NRC Recommended Dietary Allowances		
	90 to 100% and over	70 to 89%	Under 70%
	(Number of Individuals)		
Calories	69	54	40
Protein	93	30	40
Fat	36	24	103
Calcium	11	16	136
Phosphorus	96	39	28
Iron	44	31	88
Vitamin A	13	10	140
Thiamine	38	47	78
Riboflavin	2	12	149
Niacin	113	24	26
Ascorbic Acid	8	3	152

FOOD HABITS AND DIETARY PATTERNS IN OUTLYING SECTIONS OF THE MARSHALL ISLANDS.

PURPOSE

1. To observe food patterns of the outlying islands as the Marshall Islands consisting of twenty-nine coral atolls and five small coral islands which are scattered over an ocean area of nearly 200,000 square miles.

2. To observe the Marshallese in their own environment with the minimum of foreign influence.

3. To gather information to help in understanding their food problems.

PROCEDURE

A field trip was taken on an LST for the period of February 16 to March 2, 1951. The following places were visited:

1. Mejit Atoll, Mejit Island
2. Utirik Atoll, Utirik Island
3. Ailuk Atoll, Ailuk Island
4. Likiep Atoll, Likiep Island
5. Wotje Atoll, Ormej Island
6. Maloelap Atoll, Kaben Island
7. Aur Atoll, Tabal Island
8. Arno Atoll, Ine Island
9. Kili Atoll, Kili Island
10. Mili Atoll, Nallu Island

RESULTS

As the time spent at each island was of short duration it was not possible to do any detailed study, but some information was acquired which is recorded in summarized form.

MEJIT

Mejit Atoll, Mejit Island. Arrived on February 17, 1951 at 7:40 a. m. and departed on the same day at 5:00 p. m. Location: Latitude 10 degrees 15'N., Longitude 170 degrees 52'E.

Pandanus fruit was plentiful. Adults and children were eating raw pandanus fruit. They were constantly eating these "keys" for meals and also for between meal snacks. Pandanus fruit was also boiled and eaten. In many homes, the women took the boiled pandanus and used an instrument called the "beka" to scrape the edible portion from the fibrous material to make a puree which had a consistency of mashed sweet potatoes. This mixture also tasted very much like sweet potatoes. Pandanus was eaten as a puree, or in many instances, mokmok (arrowroot flour) and grated coconuts were added and the mixture made into a large patty. This was wrapped in dried pandanus leaves.

Walking along the main road, a family invited us to lunch. The family group was seated around the cooking pit and they were eating their noon meal. They were baking fish in the pit where coconut husks and pandanus husks were used for firewood. By removing skins and bones, only the flesh of the fish was eaten. Bones were thrown to the dogs and cats. A large tuna was caught that day so chunks of fish about an inch square were sliced and eaten raw with chunks of mature coconut meat. Drinking coconuts were used in place of water. Hands were used in eating, and at the end of the meal, a bucket of water was brought to the guests so that their hands may be washed. Iu (embryo of the sprouting coconut) was tasted. Several children ate with us. They were eating mere (spoon meat) and jekaro (coconut sap). There were many pandanus, breadfruit, and coconut trees on the island. Most of the homes had for cooking facilities a pit for baking and roasting and a separate place for boiling food. These cooking areas were near the lagoon under the shade of the coconut trees.

UTIRIK

Utirik Atoll, Utirik Island. Arrived February 18, 1951 at 7 a. m. departed same day at 6:00 p. m. Location: Latitude 11 degrees 15'N., Longitude 169 degrees 45'E.

Arrived on a Sunday. On the island were coconut palms, pandanus trees, and arrowroot; but no taro. A delicacy made of cooked pureed pandanus fruit and grated coconuts wrapped in dried pandanus leaf was tasted. It was sweet and tasted like a sweet potato pudding. They were unable to catch fresh fish at this time of the year.

AILUK

Ailuk Atoll, Ailuk Island. Arrived on February 19, 1951 at 6:00 a. m. departed on February 21, 1951 at 9:00 a. m. Location: Latitude 10 degrees 20' N., Longitude 169 degrees 55'E.

Bananas, pandanus, coconuts, arrowroot and breadfruit were available on this island, although breadfruit was not yet in season.

Observed the making of mokmok (arrowroot flour). Raw arrowroot resembles a small potato.

Steps taken in the making of mokmok:

1. Peel arrowroot

2. Take raw arrowroot and grind in pan with a stone

3. Put ground raw arrowroot in a cloth such as cheesecloth.

4. Put the mixture in the cheesecloth on a sieve placed over a large tub half filled with salt water.

5. Take a dipper of salt water from this pan of salt water, pour over mixture on the sieve, while stirring

6. Continue process until all starch is washed out. Throw away waste product

7. The product in tub usually is milky white in the beginning and becomes yellowish brown as starch settles to bottom

8. After starch settles at bottom, decant salt water

9. Starch stays on the bottom of the tub

10. Fill tub half full of salt water and stir all over again

11. Let starch settle and decant salt water to get rid of bitter taste

12. Put in cloth, tie at top and let hang from ceiling until it hardens

13. Dry outside in sun until powdery

14. Scrape mokmok from cloth

15. Put in woven basket and use as needed

Mokmok is boiled in water and jekaro is added to this mixture. It is then boiled until it becomes a translucent starchy mixture. While hot, it is made into large patties and rolled in grated coconuts. Jekaro is collected in bottles. These bottles of jekaro are kept hanging under the beams in their homes. Jekaro is used for drinking purposes and also in cooking. As it was pandanus season both raw and boiled pandanus fruit was tasted.

Chickens and pigs and sea fowls called "nana," which are used for food was observed.

In going through the cook houses, observed that the standard equipment were as follows:

a beka--grater used for pandanus fruit

a ranke--grater for coconuts

um--pit for baking and roasting

large pot--to boil food

knife

They did not seem to observe regular hours for meals but ate whenever they felt like eating. Food was distributed to everyone. Drinking coconuts were used extensively.

LIKIEP

Likiep Atoll, Likiep Island. Arrived on February 21, 1951 at 3:00 p. m. and departed on February 23, 1951 at 7:00 a. m. Location: Latitude 09 degrees 45'N., Longitude 159 degrees 10'E.

Visited the native village and observed people cooking. "Iu" (coconut embryo) was the predominant food used at this time. Many bottles were seen hanging on coconut trees for collecting jekaro.

At one cookhouse, iu was pounded with a wooden mallet and mixed with jekaro to make lukor. At another place, they were making ainbat iu with mokmok and jekaro (boiled coconut embryo with arrowroot flour and coconut sap).

Yellow pumpkin was popular. Rice was used in their diet as a staple food. A family was seated in their home where they were eating rice with canned salmon and tea. A small child was eating pancakes and pandanus fruit.

Chickens and pigs were seen. Very little fresh fish was found in and around cookhouses.

WOTJE

Wotje Atoll, Ormoj Island. Arrived on February 23, 1951 at 5:30 p. m., departed on February 24, 1951 at 4:00 p. m. Location: Latitude 09 degrees 25' N., Longitude 170 degrees E.

On arrival, went with interpreter and visited all the cookhouses in the island. Chief Lanimoj, their Chief, was to attend the council meeting so much of the food preparation for the day was for food offerings which were brought to pay homage to him. Many of the dishes were made of mokmok or arrowroot flour.

Chief Lanimoj had baked turtle, baked fish, drinking coconuts and jekaro for lunch. Food was carried in small baskets made of coconut leaves. Coconuts, mokmok, pandanus fruit, chicken, breadfruit and other gift items were presented to Chief Lanimoj.

MALOELAP

Maloelap Atoll, Kaben Island. Arrived on February 25, 1951 at 7:00 a. m. departed same day at 11:00 a. m. Location: Latitude 08 degrees 42'N., longitude 171 degrees E. This is a low, flat coral island located at the northwestern end of the atoll. It is 1 1/2 miles long and 1/4 mile wide.

Coconuts, pandanus, arrowroot, papayas, bananas, pumpkins, chicken, pork and sweet potatoes were seen. Breadfruit will be added to their diet when the breadfruit season begins. Fish is added to the diet when fresh fish or canned fish is available.

AUR

Aur Atoll, Tabal Island. Arrived on February 25, 1951 at 2:00 p. m. and departed same day at 6:30 p. m. Location: Latitude 8 degrees 10'N., longitude 171 degrees 10'E. Tabal is the largest island of Aur Atoll and lies in the center of the atoll. It is a low flat coral island about 1 1/2 miles long and about 1/2 mile wide.

There were coconut trees, breadfruit, pandanus, papayas, sweet potatoes, few bananas, pumpkin, pork and chicken. Rice, flour, sugar, tea and coffe were bought in from the outside.

ARNO

Arno Atoll, Ine Island. Arrived on February 26, 1951 at 7:00 a. m. and departed same day at 11:00 a. m. Location: Latitude 7 degrees 5'N., longitude 171 degrees 40'E.

Ine Island, is a low, flat coral island, located on the southern rim of the atoll. It is about 15 miles long and about 1/4 mile wide. The island has coconut trees, breadfruit and pandanus trees.

Coconuts, pandanus, breadfruit, bananas, papayas, limes, fish, pork and chicken were available. Rice, sugar, flour and live ducks were left by the field party.

They were preparing boiled breadfruit and chicken but did not stay long enough to taste the finished product.

KILI

Kili Atoll, Kili Island. Arrived on March 1, 1951 at 6:00 a. m. departed same day at 7:00 p. m. Location: Latitude, 5 degrees 30'N., longitude 169 degrees 00'E.

MILI

Mili Atoll, Nallu Island. Arrived on March 2, 1951 at 7:00 a. m. and departed same day at 12:00 m. Location: Latitude, 6 degrees 15'N., longitude 172 degrees 00'E.

Kili and Mili were not visited as it was not possible to go ashore.

Returned to Majuro Atoll at Uliga on March 2, 1951 at 7:00 p. m.

On many islands, rice, flour, sugar, biscuit, coffee and tea were left in exchange for copra. Rice was imported from Siam, flour and biscuits from Japan. Tea, soy sauce, sugar, and coffee from the U. S. A., and corned beef from Argentina. Such items were sent in from either Kwajalein or Majuro. Utirik and Ailuk were the poorer islands and not owning boats to bring in supplies and take out copra, they are dependent on the field trip ship for supplies. In Mejit, native boats were available, so there is regular transportation between Mejit and the other atolls. Kwajalein supplied Kili with food.

The transportation of food to the outlying atolls is a difficult task. Often a sailing craft gets close to an island or atoll but is not able to go ashore because of coral reefs and the tide. For atolls such as Mejit or Kili, a small boat is necessary in order to go over the reefs, which means that getting food ashore is dangerous and supplies often get so wet before they get to shore that they have to be left in the sun to dry.

Often the larger vessels will anchor outside of the lagoon and all supplies including food have to be taken over by a smaller boat. In many places there were three transfers, one from the LST to an LCVP, second, to an outrigger canoe which carried food to a place near shore, and third, to a man who had to carry food on his back and wade to shore. For instance, at Arno a box of ducks were to be left but since it was impossible to carry the large box on an outrigger it was necessary to have the ducks swim ashore.

DISCUSSION AND CONCLUSION

The extensive use of arrowroot flour, mokmok (Tacca leontopetaloides (L) Ktze. was noted. In the Northern islands, arrowroot flour was used much more extensively than on Majuro island during the same period.

Pandanus was in season and many prepared dishes of pandanus fruit were observed. More time was spent in food preparation than on Majuro and more local foods were used. However, they were still dependent on imported foods as some of the vegetable and fruit crops are not grown on the islands; for example, Utirik, did not have a taro crop. In Ailuk, the breadfruit season had not started and imported foods were a necessity until the breadfruit season began.

It was extremely difficult to get food to some of the outlying districts, due in part to an inadequate transportation system. Coral reefs made the approach to Kili hazardous.

PART II

NUTRITION STUDY ON UDOT ISLAND, TRUK DISTRICT, EASTERN CAROLINE ISLANDS

Udot Island lies 7°23' North, 151°43' East and about 3 miles westward of Fefan Island. It is about 2 1/4 miles long, east and west, and the highest point is 791 feet at its northwestern part. There are six villages on the island.

I. Planning and organizing the survey.

Much of the planning and organizing of the survey was done on Udot Island. Unlike the study in the Marshall Islands, it was not possible to learn about the Trukese foods, native terminology for common foods, and preparation of foods as done previously at the base before going to the island to be studied, as most of the administrative staff members were new and were not familiar with the Trukese way of life and transportation was difficult to obtain.

By observing the native village on Moen, Truk, where the base was located, it was noted that many of the foods consumed were similar to those of the Marshall Islands, although the language was different, and new food terms would have to be learned. The knowledge gained from the research in the Marshall Islands helped the investigator gather information quickly as compared to the first study.

The chief of Truk atoll was visited with a gift and the survey was explained through an interpreter. The discussions with the anthropologist about the manner of life, religion, and politics of the Trukese gave background material for the study.

1. Unit of survey

A household was used. A group who lived and ate together, usually consisting of blood relatives and relatives by adoption, was considered a household group.

2. Sampling

Statistics were not available and since there were six villages relatively close together, in order to get a representative sample all the inhabitants of the island, who were residing on the island at that time, were included in the study. The six villages included were Wonip, Tunnuk, Fonomo, Monowe, Ilitu and Pinine.

3. Time Period

A seven-day period was chosen. The diet on Udot Island goes through seasonal changes, and there was monotony of diet and very little day to day variation during the period observed.

4. Interpreter

The interpreter hired lived in the village and knew local foods and sources from which they were obtained.

5. Record forms

Formal record forms were not used. Informal records of diary type were kept in bound notebooks in a uniform manner.

6. Publicity

Personal visits with gifts were made to the leaders of their different villages who passed the information on to their subjects. Most of the villagers had read an article in a Honolulu Japanese paper about the study in the Marshall Islands, so they knew about the study.

II. Nutrition Survey

1. Preparation for survey on Udot Island.

After making arrangements with Ayster Irons for housing on Udot Island, and taking the necessary provisions, mattress, kerosene lamps, mosquito netting, pots and pans, his boat was taken to Udot Island. He took the investigator over to the island and introduced her to his family but returned the same day to Moen, as he made his headquarters on Moen, Truk.

The housekeeping and cooking units were set up in the house. Little pilot work was done on Moen as the time spent was of short duration. It was, therefore, necessary that observations of the local situation be made and contacts made before actual field work could get underway.

Each survey is unique and has its own problems. The villages were separate units and as Udot was a "high" volcanic island, to get from one village to another was difficult as trails went up and down hills and over rough terrain. Many of the paths were overgrown with grass and foliage and were difficult to follow. Homes were scattered in the hills. After rainfall, roads were washed out or they were so slippery that it was dangerous to try and climb the hill paths so the lagoon paths along the boulders were used in most cases. Instead of taking the inland trails, taking the shoreline and going up the rocky roads was time saving and safer.

With the help of the interpreter, formal visits were made with gifts to the headman of each village. At this time, the survey was outlined with each one and their permission was obtained to proceed with the survey.

This island was predominantly Catholic but they had one church for Protestants.

Before any home visits could be started, the Trukese terms for common, native foods, the preparation of foods, the ingredients and methods of preparation all had to be learned.

A LIST OF TRUKESE FOODS WITH A BRIEF DESCRIPTION IN ENGLISH OF EACH FOOD

TRUKESE	ENGLISH
Mei	Breadfruit.
Varieties of breadfruit	
Achapar	Second largest variety.
Enim	
Faine	
Faiton	
Faiyor	
Fanpuasuk	
Kisengei	
Meikoch	
Meiyon	Make into kon only.
Meichon	Can be eaten any way.
Napar	
Neisoso	Largest variety.
Newota	
Pono	
Sawan	
Unikko	
Uwanau	
Oneas	Seeded variety, flesh can be eaten raw.
Mei um	Breadfruit, baked in earth oven
Mei ainbat	Breadfruit, boiled
Notsupost	Breadfruit, roasted. After roasting, put in water, scrape off skin, and eat.

TRUKESE	ENGLISH
Kon	A breadfruit preparation. Breadfruit is first steamed then pounded until consistency is like dough. Made into loaves about 10 pounds each. Most popular staple food during breadfruit season.
Ror or opou	Breadfruit is first roasted and charred. Skin is removed. Remaining edible portion is pounded or sliced and coconut milk added.
Ammach	A very ripe meichon breadfruit which had been kept 10 days until soft is used. It is then baked and coconut milk added.
Emesefich	Steamed breadfruit is pounded and coconut oil added.
Arung or appuch	Breadfruit is roasted and skin removed. Edible portion is pounded. Faster pounding movements are used than for kon. This is necessary to keep breadfruit sticky. Small pieces are taken and made into dumplings and coconut milk is added. "Arung" means coconut milk. This preparation is called arung or appuch.
Apot	Breadfruit preserved by fermentation. Left to ferment in holes dug in earth for about two to three months. Can be kept for a year or more in these holes. After a year, the food is called autam.
Apot mei mon	A preserved breadfruit preparation. After removing apot from earth, it is then cleaned and kneaded. Water is added and apot is made into a soft dough. This is either baked or steamed.
Apot mei pupu	A preserved breadfruit preparation. After removing from earth, apot is cleaned and kneaded. Coconut milk is added and mixture is steamed or baked.
Nu	Coconuts.
Kinds of coconuts	
Nu yon	
Nu won	Yellow
Nu cha	Reddish tinge to ripening nuts
Nu arau	Green

TRUKESE	ENGLISH
Nu setsusen	Sweet but small, ripen all at the same time.
Nu min	Large nuts
Taka	Meat of mature coconut. A grater called a pweiker is often used to grate coconuts. After grating, coconut milk or oil is extracted which is used for flavoring food.
Nu	Drinking fluid of the immature nut.
Appun	Soft spoon meat of the immature drinking nut.
Trofal	Embryo of the sprouting coconut.
Utsu	Banana.
Varieties of bananas	
Utsupun	
Amesebok	Large bananas.
Samawa	
Ujirek	
Ujitopu	
Pannu	
Puupu	
Nukisa	
Peressin	Brazilian variety.
Ponapei	Ponape.
Tanan	
Utsu Feiru	Large bananas baked with grated coconuts.
Annira	Trukese chestnuts.
Mangko	Mangoes.
Peinaper	Pineapple.
Sassaf	Soursop.
Naimis	Lime.

ENGLISH	TRUKESE
Kurukur	Orange.
Sennia	Watermelon.
Kitppau	Papaya.
Oni	Dry and wetland taro. Colocasia esculenta.
Ka	Dry land. Alocasia macrorrhiza.
Puna	Wetland. Cyrtosperma chamissonis.
Simiden	Swamp taro, imported from the Marshalls or Nukuoro.
Nopur	Morinda citrifolia, eaten only during famines.
Ep	Dioscorea alata, yam.
Apuereka	Dioscorea bulbifera, poor quality yam eaten in famines, very bitter.
Emechimech	Ipomoea digitata, like burdock root, eaten raw also.
Mon	Spondias dulcis Forst. f. Fruit with thorny center.
Apuch	Crataeva speciosa, a fruit, common on Nomwin.
Kap	Yam
Asas	Terminalia catappa, Singapore almond. Nuts used for food, eaten after drying.
Kamuti	Sweet potato.
Wo	Sugar cane.
Fats	Pandanus.
Fatsira	Edible pandanus.
Fatessis	Edible pandanus.
Moniok	Tapioca.
Mokmok	Arrowroot.
Kunger	Cucumber.
Sim	Clams.

TRUKESE	ENGLISH
To	Clams.
Nippach	Octopus.
Pik	Pig.
Pik, um	Baked pig.
Pik, sol	Salted pig.
Pik, ainbat	Boiled pig.
Iik	Fish.
Ku	Porpoise.
Poko	Shark.
Rau	Whale.
Tikit	Eel, fresh water.
Penichon	Species of black trepang, commonly known as sea slug, sea cucumber, or beche-de-mer.
Win or Puapua	Turtle.
Kutsu	Goat.
Kou	Cow.
Chuko	Chicken.
Chek	Duck.
Arar	Tern, white with black lines on head.
Esies	White or "fairy" tern, common bird.
Ponik	Tern, black with white on top of head.
Ekiek	White tern.
Nipauane	Whitish brown sea bird.
Sop	White heron.
Kunnu	Small unidentified land bird.
Amo	Large unidentified sea bird.

Next to a house where the investigator lived, was a household where they did all the cooking in their cookhouse. By observing and asking questions, all this information was collected. By walking through the village and visiting with the villagers it was possible to learn more about their food and food patterns.

At the same time, enough knowledge of the language was gained to converse in Trukese to understand the interviews between the interpreter and the subjects of the survey.

The type and extent of waste were investigated in detail. Data were acquired on how much the average loaf of "kon" weighed, the amount of drinking fluid from one immature nut, how much edible portion could be obtained from one sweet potato and other similar facts.

Foods such as boiled rice and breadfruit were weighed to determine in grams the amounts in household measurements.

Most household utensils were alike as the source of supply was the same.

Several types of fish were weighed after cooking, to determine edible portions by removing wastage and refuse such as bones, head, and entrails. Others which were eaten whole, such as Musum, small fish, were weighed per serving.

Recipes were made up for mixed cooked dishes. Many samples of these dishes were brought back to Honolulu for chemical food analyses.

2. Routine procedure of the interview

The number interviewed averaged about six households daily. The visits were fewer in number as compared to the Marshall Island survey as distances were greater from one village to another and roads were poorer. In order to avoid the hot sun, traveling was done during the cooler time of the day, the walk to another village started about 6 in the morning and the return trip was about 7 at night.

Daily visits were made to the households. The first visit was an orientation period with discussions about the survey, procedure and data to be collected. Various utensils for eating were shown so that accurate recordings could be made such as cupfuls, spoonfuls, and other household measurements. Information about the household was recorded at this time.

A day's record was to be kept in Trukese and they were to be collected the following day. It was difficult to have them give individual food intakes as they spoke in terms of how much the household unit consumed, therefore, records were kept of total consumption per household with information about special cases, such as food intake of a smaller child, who had special foods, but in most instances individual intakes were taken. Number of meals consumed daily and the time of meals varied considerably. Having more households to cover with greater distances in between and a shorter time for the survey, two interpreters were hired to help collect data. Investigator went with the interpreters on initial visits, to explain the survey, and take down the necessary information about the household. Investigator went with each one on alternate days, when they made daily visits, as they were covering villages on both ends of the island.

Data were brought back daily at the end of the day and they were recorded in notebooks. Any doubtful data or mistakes were discovered and the next time the investigator visited the households, which was each second day, they were clarified by questioning the subjects.

3. Data collected.

a. Basic data.

1. Kinds of foods eaten.

2. Distribution of foods among meals and between meal feedings.

3. Amounts eaten in terms of numbers of foods, servings, or household measurements.

4. Time period of seven days.

b. Information about household.

1. Composition of the family.

a. Number.

b. Sex.

c. Age to nearest year.

d. Other members of the household.

e. Names -- all names used in the past.

f. Other relevant information.

1. Pregnancy.

2. Lactation.

g. Occupation.

h. Illness.

c. Data of a household for one week.

Trukese Household

1. Information about the household.

Members of the household.

1. Male, 45 years old, husband, copra maker.

2. Female, 41 years old, wife, lactating.

3. Male, 16 years old, son.

4. Female, 5 years old, daughter.

5. Male, 2 years old, son.

2. Food data.

Tuesday

Rice, boiled, white	1500 gms. (3.3 lbs.)
Octopus, boiled	400 gms. (0.9 lb.)
Kon, steamed, pounded breadfruit	10 lbs.
Coconut, drinking, fluid only	8
Bananas, cooking	16

2 year old son

Sugar cane juice (extracted)	2 stalks
Rice, boiled, white	2 tablespoons
Milk, breast	ad libitum

Wednesday

Kon, steamed, pounded breadfruit	10 lbs.
Salmon, red, canned	1 lb.
Fish, Motsu, baked	500 gms. (1.1 lbs.)

2 year old son

Breadfruit, roasted	400 gms. (0.9 lb.)
Coconut, drinking, fluid only	1
Milk, breast	ad libitum

Thursday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, Motsu, baked	500 gms. (1.1 lbs.)

2 year old son

Breadfruit, roasted	400 gms. (0.9 lb.)
Coconut, drinking, fluid only	1
Milk, breast	ad libitum

Friday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, Musum, boiled	4500 gms. (9.9 lbs.)
Coconut, drinking, fluid only	1
2 year old son	
Breadfruit, roasted	400 gms. (0.9 lb.)
Milk, breast	ad libitum

Saturday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, ekeful, baked	1000 gms. (2.2 lbs.)
Coconut, drinking, fluid only	2
2 year old son	
Breadfruit, roasted	400 gms. (0.9 lbs.)
Coconut, drinking, fluid only	1
Milk, breast	ad libitum

Sunday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, Motsu, baked	300 gms. (0.6 lb.)
2 year old son	
Breadfruit, roasted	300 gms. (0.6 lb.)
Milk, breast	ad libitum

Monday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, Ikeson, baked	300 gms. (0.6 lb.)
2 year old son	
Cracker	20 gms. (1 cracker)
Coconut, drinking, fluid only	1
Milk, breast	ad libitum

Tuesday

Kon, steamed, pounded breadfruit	10 lbs.
Fish, Motsu, baked	400 gms. (0.9 lb.)
2 year old son	
Cracker	20 gms. (1 cracker)
Coconut, drinking, fluid only	1
Milk, breast	ad libitum

Treatment of Dietary Survey Data and Assessment of the Adequacy Diets

The same procedures were followed for the treatment of the dietary survey data and the assessment of the adequacy of diets as found in the nutrition study of the Marshall Islands.

RESULTS

Table 16 gives the results of the dietary study of Trukese of Udot, Truk District, Caroline Islands.

The daily quantities of various nutrients per person and comparison with National Research Council Allowances for 290 Trukese were noted.

The subjects are divided into different age groups, giving the number of subjects in each group, sex, range of each nutrient, number of subjects in each group, average, NRC allowances, number below allowances, and percent of subjects below allowances for calories, protein, fat, calcium, phosphorus, iron, thiamine, riboflavin, and ascorbic acid.

1. Calories

In each age group, some of the subjects were above allowances and others were below allowances except the males of the 16 to 20 years age group. In this instance, all seven subjects or 100% were below allowances. Among the lactating women and males of the 13 to 15 age group, the percentage below allowances were high, 89% and 86% respectively. 1 to 3 years of age group and females 21 to 60 years age group had lower percentages of subjects below allowances with 42% and 46%, respectively. Deviations of the other groups were between these two figures.

For the total group of 290 Trukese, 186 subjects or 64% were below NRC allowances, and 104 subjects or 36% were above NRC allowances.

Table 16.

Dietary Studies of the Trukese of Udot, Truk, Caroline Islands

by Mary Murai

Daily Quantities of Various Nutrients per Person
and Comparison with National Research Council Allowances

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Calories									
1-3	12	M/F	733-2178	500-1499 1500-2499	10 2	1303	1200	5	42
4-6	21	M/F	758-2232	500-1499 1500-2499	9 12	1451	1600	12	57
7-9	18	M/F	1042-2669	1000-1999 2100-2499 2500-2599 2600-2699	11 3 2 2	1913	2000	11	61
10-12	21	M/F	1051-3307	1000-1999 2100-2499 2500-2899 3100-3399	14 2 3 2	1948	2500	16	76
13-15	7	M	1389-2524	1000-1999 2200-2299 2500-2599	5 1 1	1793	3200	6	86
13-15	12	F	762-3509	500-1499 1500-2499 2500-2999 3000-3599	2 6 2 2	2141	2600	8	67
16-20	7	M	1332-2573	1300-1399 1500-1599 1500-1999 2100-2599	1 1 2 2	1833	3800	7	100

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	12	F	1104-3520	1100-1599	3	2125	2400	7	58
				1600-1999	2				
				2000-2699	6				
				3000-3599	1				
21-60	75	M	1189-4878	1100-1599	18	2471	3000	53	70
				1600-1999	8				
				2000-2699	21				
				2700-2999	6				
				3000-3599	11				
				3600-4099	7				
				4100-4899	4				
61 and over	12	M	1583-4446	1100-1599	2	2545	2400	6	50
				1600-1999	3				
				2000-2699	3				
				3000-3599	2				
				3600-4099	1				
				4100-4446	1				
21-60	56	F	757-4877	700-899	1	2531	2400	26	46
				900-1099	1				
				1100-1599	12				
				1600-1999	8				
				2000-2999	13				
				3000-3599	11				
				3600-4099	7				
				4100-4899	3				
61 and over	10	F	1398-4420	1300-1499	1	2466	2000	5	50
				1700-1999	4				
				2000-2499	1				
				2500-2999	1				
				3000-3999	2				
				4000-4999	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
Lactating women	27	F	1189-4186	1100-1599	7	2200	3000	24	89
				1600-1999	6				
				2000-2499	6				
				2500-2999	5				
				3000-3999	1				
				4000-4999	2				
Protein (gm.)									
1-3	12	M/F	19-71	< 20	3	38	40	7	58
				20-39	4				
				40-59	3				
				60-79	2				
4-6	21	M/F	27-93	20-39	7	49	50	14	67
				40-59	10				
				60-89	2				
				90-99	2				
7-9	18	M/F	35-116	30-49	9	60	60	11	61
				50-59	2				
				60-69	3				
				70-79	1				
				90-119	3				
10-12	21	M/F	37-115	30-49	8	61	70	14	67
				50-59	5				
				60-69	1				
				70-79	4				
				80-89	1				
				90-119	2				
13-15	7	M	32-114	30-49	4	56	85	6	86
				60-69	1				
				70-79	1				
				100-119	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	N.C allowances	Number below allowances	Percent below allowances
13-15	12	F	35-124	30-49	4	78	80	6	50
				70-79	2				
				80-89	2				
				90-99	1				
				100-199	3				
16-20	7	M	34-88	30-49	2	63	100	7	100
				40-59	1				
				60-69	1				
				70-79	1				
				80-89	2				
16-20	12	F	40-167	40-59	5	76	75	8	67
				60-69	3				
				70-89	1				
				100-167	3				
21-60	75	M	32-196	30-49	21	76	70	34	45
				50-69	13				
				70-89	22				
				90-109	7				
				110-129	8				
				130-169	2				
				190-210	2				
21-60	56	F	32-186	30-49	14	76	60	20	36
				50-69	12				
				70-89	14				
				90-109	5				
				110-129	9				
				130-169	1				
				170-189	1				
61 and over	12	M	34-174	30-49	3	67	70	7	58
				50-69	4				
				70-89	4				
				110-129	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC allow-ances	Number below allowances	Percent below allowances
61 and over	10	F	32-110	30-49	4	66	60	5	50
				50-69	2				
				70-89	2				
				90-109	1				
				110-119	1				
Lactating women	27	F	35-196	30-49	10	74	100	23	85
				50-69	4				
				70-89	8				
				90-119	2				
				120-196	3				
Fat (gm.)									
1-3	12	M/F	1-27	< 20	11	8	33	12	100
				20-30	1				
4-6	21	M/F	2-33	< 20	15	13	44	21	100
				20-30	5				
				30-40	1				
7-9	18	M/F	5-72	< 20	13	21	56	16	89
				20-30	2				
				40-72	3				
10-12	21	M/F	5-45	< 20	13	17	69	21	100
				20-30	3				
				30-40	4				
				41-45	1				
13-15	7	M	5-27	< 20	6	12	89	7	100
				20-30	1				
13-15	12	F	1-49	< 20	7	20	72	12	100
				20-30	2				
				40-50	3				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	7	M	5-22	< 20	5	13	105	7	100
				20-30	2				
16-20	12	F	6-26	< 20	9	13	67	12	100
				20-30	3				
21-60	75	M	5-72	< 20	50	17	83	75	100
				20-30	18				
				31-40	1				
				41-50	4				
				51-72	2				
61 and over	12	M	3-25	< 20	8	14	67	12	100
				20-30	4				
21-60	56	F	3-63	< 20	39	16	67	56	100
				20-30	13				
				31-40	1				
				41-50	2				
				60-70	1				
61 and over	10	F	5-49	< 20	6	19	56	10	100
				20-30	2				
				40-50	2				
Lactating women	27	F	3-72	< 20	19	16	83	27	100
				20-30	6				
				31-40	1				
				70-79	1				
Calcium (mg.)									
1-3	12	M/F	203-7365	200-399	1	1892	1000	6	50
				400-599	1				
				600-799	4				
				1000-7365	6				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	N.C allowances	Number below allowances	Percent below allowances
4-6	21	M/F	137-13711	< 200	2	1810	1000	9	43
				200-399	5				
				400-799	2				
				1000-1199	3				
				1300-1899	3				
				2000-2199	2				
				2600-3499	3				
				13711	1				
7-9	18	M/F	229-8538	200-399	1	2256	1000	6	33
				400-799	5				
				1000-1199	2				
				1300-1999	2				
				2000-2199	1				
				2600-3499	4				
				3500-3999	2				
				4000-8538	1				
10-12	21	M/F	173-3954	< 200	1	1463	1200	11	52
				200-399	4				
				400-799	4				
				1000-1199	2				
				1500-2199	4				
				2200-2599	2				
				2600-3499	3				
				3500-3999	1				
13-15	7	M	195-3954	< 200	1	1748	1400	4	56
				300-999	3				
				2722-3399	2				
				3900-3954	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NAC allow-ances	Number below allowances	Percent below al-lowances
13-15	12	F	95-5693	< 200	1	2487	1300	4	33
				300-999	2				
				1000-2099	3				
				2600-2799	1				
				3000-3299	2				
				4000-4499	1				
				5300-5693	2				
16-20	7	M	239-13710	200-300	1	3964	1400	2	28
				1000-1999	3				
				2000-2999	1				
				7248	1				
				13710	1				
16-20	12	F	173-4529	< 200	1	2157	1000	3	25
				300-999	2				
				1000-1999	4				
				2500-4599	5				
21-60	75	M	173-14730	< 200	2	2431	1000	22	29
				200-999	20				
				1000-1999	17				
				2000-2999	20				
				3000-4999	8				
				5000-8999	6				
				13000-14999	2				
61 and over	12	M	308-9229	300-499	1	4491	1000	1	8
				1600-1699	1				
				2000-2999	3				
				3000-3999	2				
				5000-5999	1				
				7000-8999	3				
				9000-9999	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
21-60	56	F	205-14729	200-999	14	2690	1000	14	25
				1000-1999	14				
				2000-2999	15				
				3000-8999	12				
				14000-14999	1				
61 and over	10	F	829-9229	800-999	2	2886	1000	2	20
				1400-1499	3				
				2000-2199	1				
				2200-2399	1				
				4000-4999	2				
				9000-9999	1				
Lactating women	27	F	173-13711	< 200	1	2686	2000	13	48
				200-999	5				
				1000-1999	7				
				2000-2999	5				
				3000-3999	6				
				5000-5999	1				
				13711	1				
Phosphorus (mg.,									
1-3	12	M/F	394-1775	300-499	3	741	1000	11	91
				500-699	3				
				700-899	5				
				1700-1899	1				
4-6	21	M/F	283-2698	200-499	7	740	1000	18	86
				500-699	5				
				700-899	6				
				1100-1299	2				
				2500-2699	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Aver-age	NRC-allow-ances	Number below al-lowances	Percent below al-lowances
7-9	18	M/F	281-2199	200-499	2	938	1200	15	85
				500-699	4				
				700-999	4				
				1000-1999	7				
				2100-2199	1				
10-12	21	M/F	281-2282	200-499	2	914	1200	17	80
				500-699	5				
				700-999	9				
				1000-1999	4				
				2000-2999	1				
13-15	7	M	448-1366	400-599	3	755	1320	6	85
				600-799	2				
				800-999	1				
				1200-1399	1				
13-15	12	F	558-1740	500-699	3	1167	1200	7	58
				900-1099	3				
				1100-1299	1				
				1300-1499	3				
				1700-1899	2				
16-20	7	M	574-2698	500-999	4	1235	1320	5	71
				1000-1999	2				
				2698	1				
16-20	12	F	483-2118	400-599	2	1035	1200	9	75
				600-799	1				
				800-999	4				
				1000-1399	4				
				2100-2199	1				
21-60	75	M	281-3550	200-999	29	1237	1320	51	68
				1000-1999	36				
				2000-2999	9				
				3000-3999	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
61 and over	12	M	488-2254	400-999	2	1419	1320	7	58
				1000-1999	8				
				2000-2999	2				
21-60	56	F	281-3550	200-999	23	1254	1320	37	66
				1000-1999	24				
				2000-2999	8				
				3000-3999	1				
61 and over	10	F	506-2282	500-999	5	1284	1320	7	70
				1000-1999	2				
				2000-2999	3				
Lactating women	27	F	281-10941	200-999	13	1206	1800	22	81
				1000-1999	10				
				2000-2999	3				
				10941	1				
Iron (mg.)									
1-3	12	M/F	2-5	< 5	11	3	7	12	100
				5-10	1				
4-6	21	M/F	2-6	< 5	13	4	8	21	100
				5-10	8				
7-9	18	M/F	2-12	< 5	8	6	10	16	88
				5-10	9				
				11-15	1				
10-12	21	M/F	2-7	< 5	8	5	12	21	100
				5-10	13				
13-15	7	M	2-21	< 5	4	6	15	6	85
				5-21	3				
13-15	12	F	2-9	< 5	3	6	15	12	100
				5-9	9				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
16-20	7	M	3-7	< 5	5	4	15	7	100
				5-9	2				
16-20	12	F	2-8	< 5	5	5	15	12	100
				5-8	7				
21-60	75	M	3-13	< 5	21	6	12	73	97
				5-9	47				
				10-15	7				
61 and over	12	M	4-13	< 5	2	7	12	11	88
				5-9	7				
				10-15	3				
21-60	56	F	3-12	< 5	16	6	12	55	94
				5-9	34				
				10-15	6				
61 and over	10	F	3-13	< 5	2	7	12	9	90
				5-9	7				
				10-15	1				
Lactating women	27	F	2-13	< 5	9	6	15	27	100
				5-9	15				
				10-15	3				
Vitamin A (i.u.)									
1-3	12	M/F	75-1941	< 499	5	660	2000	12	100
				500-999	4				
				1000-1999	3				
4-6	21	M/F	160-5646	< 499	10	794	2500	20	95
				500-999	7				
				1000-1999	3				
				5000-5999	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
7-9	18	M,F	157-2728	< 499	1	978	3500	18	100
				500-999	12				
				1000-1999	3				
				2000-2999	2				
10-12	21	M/F	357-2720	< 499	3	972	4500	21	100
				500-999	14				
				1000-1999	1				
				2000-2999	3				
13-15	7	M	430-691	< 499	4	518	5000	7	100
				500-999	3				
13-15	12	F	516-3836	500-999	7	1303	5000	12	100
				1000-1999	3				
				2000-2999	1				
				3000-3999	1				
16-20	7	M	357-2638	< 499	2	1006	6000	7	100
				500-999	2				
				1000-1999	2				
				2000-2999	1				
16-20	12	F	567-4052	500-999	8	1442	5000	12	100
				1000-2999	2				
				3000-4999	2				
21-60	75	M	157-5925	< 499	10	1318	5000	73	97
				500-999	31				
				1000-1999	21				
				2000-2999	8				
				3000-3999	1				
				4000-4999	2				
				5000-5999	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	N.A.C. allowances	Number below allowances	Percent below allowances
61 and over	12	M	474-4052	< 499	1	1351	5000	12	100
				500-999	6				
				1000-1999	3				
				2000-2999	1				
				4052	1				
21-60	56	F	320-4050	< 499	6	1296	5000	56	100
				500-999	21				
				1000-1999	20				
				2000-2999	8				
				4000-4999	1				
61 and over	10	F	43-1395	< 499	2	732	5000	10	100
				500-999	7				
				1000-1999	1				
Lactating women	27	F	157-2464	< 499	2	986	8000	27	100
				500-999	17				
				1000-1999	4				
				2000-2999	4				
Thiamine (mcg.)									
1-3	12	M/F	224-1211	200-499	4	595	600	4	34
				500-799	6				
				800-1399	2				
4-6	21	M/F	276-1306	200-499	5	809	800	9	43
				500-799	5				
				800-1099	6				
				1100-1399	5				
7-9	18	M/F	193-1456	< 200	1	924	1000	11	66
				200-499	1				
				500-799	4				
				800-1099	6				
				1100-1399	5				
				1400	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
10-12	21	M/F	135-1826	< 200	1	952	1200	17	80
				200-499	2				
				500-799	5				
				800-1099	7				
				1100-1399	2				
				1400-1699	2				
				1700-2099	2				
13-15	7	M	251-1420	200-499	2	806	1500	7	100
				800-1099	4				
				1400-1699	1				
13-15	12	F	401-2074	200-499	1	1297	1300	5	41
				800-1099	3				
				1100-1399	2				
				1400-1699	5				
				2000-2299	1				
16-20	7	M	695-1456	500-799	2	972	1700	7	100
				800-1099	3				
				1100-1399	1				
				1400-1699	1				
16-20	12	F	135-1855	< 200	1	889	1200	9	75
				200-499	3				
				500-799	1				
				800-1099	4				
				1400-1699	2				
				1700-1999	1				
21-60	75	M	135-2423	< 200	2	1310	1500	45	60
				500-799	12				
				800-1099	18				
				1100-1399	10				
				1400-1699	14				
				1700-2099	12				
				2100-2399	6				
				2423	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
61 and over	12	M	869-2105	800-1099	4	1429	1200	6	50
				1100-1399	3				
				1400-1699	1				
				1700-2099	3				
				2100-2399	1				
21-60	56	F	415-2423	< 400	1	1505	1200	24	42
				400-699	6				
				700-999	16				
				1000-1299	6				
				1300-1599	9				
				1600-1899	7				
				1900-2199	6				
				2200-2499	5				
61 and over	10	F	109-2663	< 200	3	1151	1000	5	50
				800-1099	2				
				1400-1699	3				
				2000-2299	1				
				2600-2999	1				
Lactating women	27	F	135-2171	< 200	1	1089	1500	21	77
				200-499	1				
				500-799	5				
				800-1099	10				
				1100-1399	4				
				1400-1699	3				
				1700-1999	1				
				2000-2299	2				
Riboflavin (mcg.)									
1-3	12	M/F	239-953	< 500	9	444	900	11	92
				500-799	2				
				800-1099	1				
4-6	21	M/F	187-871	< 500	10	501	1200	21	100
				500-799	10				
				800-1099	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
7-9	18	M/F	109-900	< 500	6	575	1500	18	100
				500-799	9				
				800-1099	3				
10-12	21	M/F	117-1246	< 500	7	611	1800	21	100
				500-799	10				
				800-1099	2				
				1100-1399	2				
13-15	7	M	238-730	< 500	5	462	2000	7	100
				500-799	2				
13-15	12	F	398-1302	< 500	2	801	2000	12	100
				500-799	5				
				800-1099	3				
				1100-1399	2				
16-20	7	M	463-888	< 500	3	599	2500	7	100
				500-799	3				
				800-1099	1				
16-20	12	F	158-1247	< 500	4	604	1800	12	100
				500-799	5				
				800-1099	2				
				1100-1399	1				
21-60	75	M	359-1607	< 500	16	825	1800	75	100
				500-799	23				
				800-1099	16				
				1100-1399	16				
				1400-1699	4				
61 and over	12	M	495-1254	500-799	6	847	1800	12	100
				800-1099	2				
				1100-1399	4				
21-60	56	F	331-1607	< 500	15	803	1500	55	94
				500-799	14				
				800-1099	12				
				1100-1399	13				
				1400-1699	2				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
61 and over	10	F	462-1482	< 500	1	797	1500	10	100
				500-799	6				
				800-1099	1				
				1100-1399	1				
				1400-1699	1				
Lactating women	27	F	290-1562	< 500	7	707	3000	27	100
				500-799	13				
				800-1099	3				
				1100-1399	2				
				1400-1699	2				
Niacin (mg.)									
1-3	12	M/F	4-11	< 10	10	6	6	7	58
				10-19	2				
4-6	21	M/F	3-10	< 10	21	7	8	11	52
7-9	18	M/F	3-17	< 10	10	10	10	10	55
				10-19	8				
10-12	21	M/F	0-21	< 10	15	8	10	15	71
				10-19	6				
13-15	7	M	3-11	< 10	6	7	15	7	100
				10-19	1				
13-15	12	F	1-19	< 10	4	11	13	9	75
				10-19	8				
16-20	7	M	0-12	< 10	6	7	17	7	100
				10-19	1				
16-20	12	F	4-15	< 10	9	8	12	10	83
				10-19	3				
21-60	75	M	1-41	< 10	33	12	15	54	72
				10-19	38				
				20-29	2				
				40-49	2				
61 and over	12	m	7-19	< 10	6	12	12	7	58
				10-19	6				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
21-60	56	F	0-22	<10	27	11	12	30	53
				10-19	26				
				20-29	3				
61 and over	10	F	0-22	<10	6	11	10	6	60
				10-19	3				
				20-29	1				
Lactating women	27	F	1-31	<10	18	10	15	24	88
				10-19	7				
				30-39	2				
Ascorbic acid (mg.)									
1-3	12	M/F	1-16	<10	10	5	35	12	100
				10-29	2				
4-6	21	M/F	0-26	<10	16	7	50	21	100
				10-29	5				
7-9	18	M/F	0-62	<10	8	18	60	17	93
				10-29	7				
				40-49	1				
				50-59	1				
				60-69	1				
10-12	21	M/F	0-61	<10	16	15	75	21	100
				40-49	3				
				50-59	1				
				60-69	1				
13-15	7	M	3-11	<10	6	6	90	7	100
				10-29	1				
13-15	12	F	0-27	<10	8	9	80	12	100
				10-29	4				
16-20	7	M	3-16	<10	5	7	100	7	100
				10-29	2				
16-20	12	F	3-63	<10	9	15	80	12	100
				10-29	1				
				30-39	1				
				60-69	1				

Age	Number of subjects	Sex	Range	Groups	Number of subjects in group	Average	NRC allowances	Number below allowances	Percent below allowances
21-60	75	M	0-58	< 10	52	10	70	75	100
				10-29	15				
				30-39	2				
				40-49	4				
				50-59	2				
61 and over	12	M	1-38	< 10	7	12	75	12	100
				10-29	4				
				30-39	1				
21-60	56	F	0-58	< 10	37	11	70	56	100
				10-29	12				
				30-39	1				
				40-49	4				
				50-59	2				
61 and over	10	F	0-43	< 10	5	20	70	10	100
				10-29	1				
				30-39	3				
				40-49	1				
Lactating women	27	F	0-42	< 10	16	12	150	27	100
				10-29	7				
				30-39	2				
				40-49	2				

2. Protein

All seven male subjects of the 16 to 20 years age group or 100% were below allowances. Lactating women and male subjects, 13 to 15 years of age, had a high percentage of subjects below allowances with 85% and 86%, respectively. Male subjects of the 21 to 60 years age group and female subjects of 21 to 60 years age group had a low percentage of subjects below allowances, 45% and 36%, respectively. Deviations of the other groupswere between these two figures.

For the total group of 290 Trukese, 162 subjects or 56% were below allowances and 128 or 44% were above allowances.

3. Fat

In all age groups, 100% or all subjects were below allowances, except the 7 to 9 years age group where 89% were below allowances.

For the total group of 290 Trukese, 288 subjects or 99% were below allowances and two subjects or 1% were above allowances.

4. Calcium

Of all age groups, males 13 to 15 years of age had the highest percentage of subjects below NRC allowances with 56% below allowances. This group was followed by the 10 to 12 years age group, 1 to 3 years age group, and lactating women with 52%, 50%, and 48% of the subjects below NRC allowances, respectively. Males 61 and over group had a low percentage of subjects below NRC allowances with 8% below allowances. Females of the 61 years and over group, and females of the 21 to 60 years group had 20% and 25% of the subjects below allowances.

For the total group of 290 Trukese, 97 subjects or 33% were below allowances and 193 subjects or 67% were above allowances.

5. Phosphorus

91% of the 1 to 3 years age group were below NRC allowances. All other groups had 80% or more of the subjects below NRC allowances with the exception of females 16 to 20 years of age; males 16 to 20 years of age; and females, 61 years and over group; with 75%, 71% and 70%, respectively.

For the total group of 290 Trukese, 212 subjects or 73% were below allowances and 78 subjects or 27% were above allowances.

6. Iron

100% or all of the subjects of the following groups were below NRC allowances: 1 to 3 years old; 4 to 6 years; 10 to 12 years; 13 to 15 years; males, 16 to 20 years; females, 16 to 20 years; and lactating

women. 85% of the subjects were below NRC allowances for males of the 13 to 15 years old group.

For the total group of 290 Trukese, 282 subjects or 97% were below NRC allowances and 8 subjects or 3% were above NRC allowances.

7. Vitamin A

100% of the subjects were below NRC allowances for all groups with the exception of the 4 to 6 years old group and males of the 21 to 60 years old group where 95% and 97% of the subjects were below NRC allowances, respectively.

For the total group of 290 Trukese, 287 subjects or 99% were below NRC allowances and 3 subjects or 1% were above NRC allowances.

8. Thiamine

100% of the subjects were below NRC allowances for males of the 13 to 15 years old group and males of the 16 to 20 years old group. The 1 to 3 years old group had 34% of the subjects below NRC allowances. The other groups varied from 41% to 80% of the subjects being below NRC allowances.

For the total group of 290 Trukese, 170 subjects or 58% were below allowances and 120 subjects or 42% were above allowances.

9. Riboflavin

100% of the subjects of every group were below NRC allowances, except the 1 to 3 years old group and females, 21 to 60 years with 92% and 94% of the subjects below NRC allowances, respectively.

For the total group of 290 Trukese, 288 subjects or 99% were below NRC allowances and 2 subjects or 1% were above NRC allowances.

10. Niacin

100% of the males of the 13 to 15 years age group and 16 to 20 years group were below NRC allowances. 52% of the subjects of the 4 to 6 years old group were below NRC allowances. Other groups ranged from 53% to 88% of the subjects being below NRC allowances.

For the total group of 290 Trukese, 197 subjects or 68% were below NRC allowances and 93 subjects or 32% were above allowances.

11. Ascorbic Acid

100% of the subjects of each group were below NRC allowances except for the 7 to 9 years old group, where 93% of the subjects were below NRC allowances.

For the total group of 290 Trukese, 289 subjects or 99% were below NRC allowances and one subject or 1% was above NRC allowances.

Children 1 to 3 years of age

Intake records for children one to three years of age were collected for thirty-two subjects. Out of thirty-two subjects, twelve were weaned and twenty subjects were still breast fed although other foods were included in their dietary. Diets of non-breast fed subjects were calculated and tabulated in Table 16. For breast fed subjects, calories and nutrient values were calculated, however, intakes of breast feeding were not recorded. Therefore, all calculations exclude breast milk intakes.

Fischer (25) reported the following in her study: "Mothers of 33 children under six years of age were consulted as to the types of food eaten by their children. Only children under the age of eight months were reported as limited in their diets. In addition to the breast, these younger children were observed to eat sugar cane, sugar and coconut water. For the one bottle baby in this group, sugar was added to the baby's milk ..... Babies of eight months and older were eating the regular adult diet, pounded breadfruit, roasted fish, etc., in addition to the milk obtained from the mother. Only two babies as old as two years were found who had not been weaned and were not being fed entirely on adult foods. In regard to the unweaned baby, mothers were asked when they expected to wean them. These estimates ran from one to three years."

A few records are given as examples of quantities and kinds of food given to breast fed children of this age group.

One female child of one year had boiled white rice and drinking fluid of the immature coconuts in her diet. The daily intake was estimated at 220 gms. of coconut fluid, and 100 gms. of boiled white rice. Calculated daily caloric and nutrient values were as follows: calories, 390; protein, 8 gms.; fat, 0.43 gms.; carbohydrate, 88 gms.; calcium, 50 mgs.; phosphorus, 99mgs.; iron, 0.20 mgs.; vitamin A, none; thiamine, 39 mcgs.; riboflavin, 21 mcgs.; niacin, 1.6 mgs.; and ascorbic acid, 2 mgs.

One female child of one year had the following foods in her diet: soda crackers, drinking fluid of immature coconuts, and boiled white rice. The daily intake was estimated at 60 gms. of soda crackers, 342 gms. of coconut fluid, and 50 gms. of boiled white rice. Calculated daily caloric and nutrient values were as follows: calories, 736; protein, 7 gms.; fat, 3 gms.; carbohydrate, 72 gms.; calcium, 82 mgs.; phosphorus, 74 mgs.; iron, 0.8 mgs.; vitamin A, none; thiamine, 37 mcgs.; riboflavin, 34 mcgs.; niacin, 0.9 mgs.; and ascorbic acid, 3 mgs.

One female child of one year had the following foods in her diet: boiled white rice and white bread. The daily intake was estimated at 58 gms. of boiled white rice and 96 gms. of white bread. Calculated daily caloric and nutrient values were as follows: calories, 548; protein, 15 gms.; fat, 2 gms.; carbohydrate, 116 gms.; calcium, 40 mgs.; phosphorus, 145 mgs.; iron, 3 mgs.; vitamin A, 35 I. U.; thiamine, 535 mcgs.; riboflavin, 306 mcgs.; niacin, 4 mgs.; and ascorbic acid, none.

One female child of two years had the following foods in her diet; boiled white rice, boiled mackerel, baked breadfruit and drinking fluid of immature coconuts. The daily intake was estimated at 58 gms. of boiled white rice, 128 gms. of boiled mackerel, 107 gms. of baked breadfruit, and 223 gms. of coconut fluid. Calculated daily caloric and nutrient values were as follows: calories, 553; protein, 34 gms.; fat, 10 gms.; carbohydrate, 90 gms.; calcium, 74 mgs.; phosphorus, 451 mgs.; iron, 3 mgs.; vitamin A, 197 I. U.; thiamine, 105 mcgs.; riboflavin, 65 mcgs.; niacin, 2 mgs.; and ascorbic acid, 4 mgs.

One male child of two years had the following foods in his diet; sugar cane (pounded and juice extracted), boiled white rice, roasted breadfruit, soda crackers, and fluid of immature coconuts. The daily intake was estimated at 389 gms. of sugar cane, 10 gms. of boiled white rice, 270 gms. of roasted breadfruit, 137 gms. of coconut fluid, and 3 gms. of soda crackers. Calculated daily caloric and nutrient values were as follows: calories, 566; protein, 4 gms.; fat, 1 gm.; carbohydrate, 187 gms.; calcium, 146 mgs.; phosphorus, 158 mgs.; iron, 5 mgs.; vitamin A, 186 I. U.; thiamine, 376 mcgs.; riboflavin, 200 mcgs.; niacin, 3 mgs.; and ascorbic acid, 3 mgs.

One male child of three years had the following foods in his diet: roasted breadfruit, bananas, and drinking fluid of immature coconuts. The daily intake was estimated at 240 gms. of coconut fluid, 300 gms. of roasted breadfruit, and 100 gms. of bananas. Calculated daily caloric and nutrient values were as follows: calories, 556; protein, 5 gms.; fat, 1 gm.; carbohydrate, 131 gms.; calcium, 126 mgs.; phosphorus, 166 mgs.; iron, 2 mgs.; vitamin A, 1046 I. U.; thiamine, 281 mcgs.; riboflavin, 205 mcgs.; niacin, 3 mgs.; and ascorbic acid, 30 mgs.

Children and adult male subjects

Table 17 summarizes the daily quantities of various nutrients per person and comparison with National Research Council Allowances of children and adult male subjects of Udot, Truk District, Caroline Islands.

There were 173 subjects as follows: 12 males and females between the ages of 1 through 3 years of age; 21 males and females between the ages of 4 through 6 years of age; 18 males and females between the ages of 7 through 9 years of age; and 21 males and females between the ages of 10 through 12 years of age; 7 males between the ages of 13 through 15 years of age; 7 males between the ages of 16 through 20 years of age; 75 males between the ages of 21 to 60 years of age; and 12 males, 61 years of age and over.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given in Table 17.

Table 17.

Dietary Study - Udot, Truk District, Caroline Islands.

Summary of Daily Quantities of Various Nutrients
per Person and Comparison with National Research Council Allowances

by Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
Children (Male and Female)		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
1 to 3 years (12)*											
Average intake	1303	38	8	1892	741	3	660	595	444	6	5
NRC Allowances	1200	40	33	1000	1000	7	2000	600	900	6	35
% of allowances	109	95	24	189	74	43	33	99	49	100	14
% of subjects below allowances	42	58	100	50	91	100	100	34	92	58	100
4 to 6 years (21)											
Average intake	1451	49	13	1810	740	4	794	809	501	7	7
NRC allowances	1600	50	44	1000	1000	8	2500	800	1200	8	50
% of allowances	91	98	29	181	74	50	32	101	42	87	14
% of subjects below allowances	57	67	100	43	86	100	95	43	100	52	100
7 to 9 years (18)											
Average intake	1913	60	21	2256	938	6	978	924	575	10	18
NRC allowances	2000	60	56	1000	1200	10	3500	1000	1500	10	60
% of allowances	96	100	37	226	78	60	28	92	38	100	30
% of subjects below allowances	61	61	89	33	85	88	100	66	100	55	93
10 to 12 years (21)											
Average intake	1948	61	17	1463	914	5	972	952	611	8	15
NRC allowances	2500	70	69	1200	1200	12	4500	1200	1800	10	75
% of allowances	77	87	25	121	76	42	22	79	34	80	20
% of subjects below allowances	76	67	100	52	80	100	100	80	100	71	100

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
Males		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
13 to 15 years (7)											
Average intake	1793	56	12	1748	755	6	518	806	462	7	6
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	56	66	13	124	57	40	10	54	23	47	7
% of subjects below allowances	86	86	100	56	85	85	100	100	100	100	100
16 to 20 years (7)											
Average intake	1833	63	13	3964	1235	4	1006	972	599	7	7
NRC allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	48	63	12	283	94	27	17	56	24	41	7
% of subjects below allowances	100	100	100	28	71	100	100	100	100	100	100
21 to 60 years (75)											
Average intake	2471	76	17	2431	1237	6	1318	1310	825	12	10
NRC allowances	3000	70	83	1000	1320	12	5000	1500	1800	15	70
% of allowances	82	108	20	243	94	50	26	87	46	80	14
% of subjects below allowances	70	45	100	29	68	97	97	60	100	72	100
61 to 70 years (12)											
Average intake	2545	67	14	4491	1419	7	1351	1429	847	12	12
NRC allowances	2400	70	67	1000	1320	12	5000	1200	1800	12	75
% of allowances	106	96	21	449	107	58	27	119	47	100	16
% of subjects below allowances	50	58	100	8	58	88	100	50	100	58	100

* Figure in ( ) indicate number of subjects studied.

I. CHILDREN

1 to 3 years of age There were 12 male and female subjects. All of the subjects or 100% were below NRC allowances for fat, iron, vitamin A and ascorbic acid. 92% of the subjects were below allowances for riboflavin and 91% were below allowances for phosphorus. 34% of the subjects were below allowances for thiamine, and 42% were below allowances for calories. 58% of the subjects were below allowances for protein and niacin, and 50% were below allowances for calories.

4 to 6 years of age There were 21 males and female subjects. All of the subjects or 100% were below NRC allowances for fat, iron, riboflavin, and ascorbic acid. 95% of the subjects were below allowances for vitamin A. 86% of the subjects were below allowances for phosphorus. 57% of the subjects were below allowances for calories and 52% for niacin. 67% of the subjects were below allowances for protein. 43% of the subjects were below allowances for calcium and thiamine.

7 to 9 years of age There were 18 male and female subjects. All of the subjects or 100% were below allowances for vitamin A and riboflavin. 93% of the subjects were below allowances for ascorbic acid. 89% of the subjects were below allowances for fat; 88% were below allowances for iron and 85% were below allowances for phosphorus. 66% of the subjects were below allowances for thiamine and 61% for calories and protein. 55% were below allowances for niacin and 33% were below allowances for calcium.

10 to 12 years of age There were 21 male and female subjects. All of the subjects or 100% were below allowances for fat, iron, vitamin A, riboflavin, and ascorbic acid. 80% of the subjects were below allowances for phosphorus and riboflavin. 76% of the subjects were below allowances for calories and 71% were below allowances for niacin. 67% of the subjects were below allowances for protein and 52% of the subjects were below allowances for calcium.

III. MALES

13 to 15 years of age There were 7 subjects. 100% or all of the subjects were below allowances for fat, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. 86% of the subjects were below allowances for calories and protein; 85% were below allowances for phosphorus and iron. 56% were below allowances for calcium.

16 to 20 years of age There were 7 subjects. 100% or all of the subjects were below allowances for calories, protein, fat, iron, vitamin A, thiamine, riboflavin, niacin and ascorbic acid. 71% of the subjects were below allowances for phosphorus and 28% of the subjects were above allowances.

21 to 60 years of age There were 75 subjects. 100% or all of the subjects were below allowances for fat, riboflavin, and ascorbic acid. 97% of the subjects were below allowances for iron and vitamin A. 72% of the subjects were below allowances for niacin, and 70% for calories. 68% of the subjects were below allowances for phosphorus and 60% were below allowances for thiamine. 45% were below allowances for protein and 29% were below allowances for calcium.

61 to 70 years of age There were 12 subjects. 100% or all of the subjects were below NRC allowances for fat, vitamin A, riboflavin, and ascorbic acid. 88% of the subjects were below allowances for iron. 58% of the subjects were below NRC allowances for protein, phosphorus, and niacin. 50% of the subjects were below allowances for calories and thiamine. 8% of the subjects were below allowances for calcium.

Female subjects

Table 18 summarizes the daily quantities of various nutrients per person and comparison with National Research Council Allowances for female subjects of Udot, Truk District, Caroline Islands.

There were 117 female subjects as follows: 12 females between 13 and 15 years of age; 12 females between 16 through 20 years of age; 56 females between the ages of 21 through 60 years of age; 10 females, 61 years and over; and 27 lactating women.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given in Table 18.

III. FEMALES

13 to 15 years of age There were 12 subjects. 100% or all of the subjects were below allowances for fat, iron, vitamin A, riboflavin, and ascorbic acid. 75% of the subjects were below allowances for niacin. 67% of the subjects were below allowances for calories. 58% of the subjects were below allowances for phosphorus and 50% were below allowances for protein. 41% of the subjects were below allowances for thiamine and 33% were below allowances for calcium.

16 to 20 years of age There were 12 subjects. 100% or all of the subjects were below allowances for fat, iron, vitamin A, riboflavin and ascorbic acid. 83% of the subjects were below allowances for niacin. 75% of the subjects were below allowances for thiamine and phosphorus. 67% of the subjects were below allowances for protein. 58% of the subjects were below allowances for calories and 25% of the subjects were below allowances for calcium.

21 to 60 years of age There were six subjects. 100% or all of the subjects were below NRC allowances for fat, vitamin A, and ascorbic acid. 94% were below allowances for iron and riboflavin. 66% were below allowances for phosphorus, and 53% were below allowances for niacin. 46% were below allowances for niacin. 46% were below allowances for calories and 42% were below allowances for thiamine. 36% were below allowances for protein and 25% were below allowances for calcium.

61 to 70 years of age There were ten subjects. 100% or all of the subjects were below allowances for fat, vitamin A, riboflavin and ascorbic acid. 90% of the subjects were below allowances for iron. 70% of the subjects were below allowances for phosphorus and 60% were below allowances

Table 18.

Dietary Study - Udot, Truk District, Caroline Islands.

Summary of Daily Quantities of Various Nutrients
per Person and Comparison with National Research Council Allowances

by Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Females											
13 to 15 years (12)*											
Average intake	2141	78	20	2487	1167	6	1303	1297	801	11	9
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	82	97	28	191	97	40	26	99	40	85	11
% of subjects below allowances	67	50	100	33	58	100	100	41	100	75	100
16 to 20 years (12)											
Average intake	2125	76	13	2157	1035	5	1442	889	604	8	15
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	88	101	19	216	86	33	29	74	33	67	19
% of subjects below allowances	58	67	100	25	75	100	100	75	100	83	100
21 to 60 years (56)											
Average intake	2531	76	16	2690	1254	6	1296	1505	803	11	11
NRC allowances	2400	60	67	1000	1320	12	5000	1200	1500	12	70
% of allowances	105	126	24	269	95	50	26	125	54	92	16
% of subjects below allowances	46	36	100	25	66	94	100	42	94	53	100
61 to 70 years (10)	2466										
Average intake	2466	66	19	2886	1284	7	732	1151	797	11	20
NRC allowances	2000	60	56	1000	1320	12	5000	1000	1500	10	70
% of allowances	123	110	34	289	97	58	15	115	53	110	28
% of subjects below allowances	50	50	100	20	70	90	100	50	100	60	100
Lactating women (27)											
Average intake	2200	74	16	2686	1206	6	986	1089	707	10	12
NRC allowances	3000	100	83	2000	1800	15	8000	1500	3000	15	150
% of allowances	73	74	19	134	67	40	12	73	24	67	8
% of subjects below allowances	89	85	100	48	81	100	100	77	100	88	100

* Figure in ( ) indicate number of subjects studied.

for niacin. 50% of the subjects were below allowances for calories, protein and thiamine. 20% were below allowances for calcium.

Lactating women There were 27 subjects. 100% or all of the subjects were below NRC allowances for fat, iron, vitamin A, riboflavin and ascorbic acid. 89% of the subjects were below allowances for calories and 88% were below allowances for niacin. 85% of the subjects were below allowances for protein and 81% were below allowances for phosphorus. 77% of the subjects were below allowances for thiamine and 48% were below allowances for calcium.

Classification of averages of nutrient intake in relation to NRC Recommended Dietary Allowances

Table 19 gives the classification of averages of nutrient intake of 290 Trukese of Udot, Caroline Islands, in relation to NRC Recommended Dietary Allowances. Classification of average intake is given as percentage of NRC Recommended Dietary Allowances.

For calories, protein, calcium, and thiamine the greatest number of average intakes were in the group which was 90 to 100% of the NRC Recommended Dietary Allowances.

Table 19.

Classification of Averages of Nutrient Intake of 290 Trukese of Udot, Caroline Islands in Relation to NRC Recommended Dietary Allowances.

Classification of Average Intake as Percentage of NRC Recommended Dietary Allowances

by Mary Murai

	90-100 Percent	70-89 Percent	Under 70 Percent
Calories	123	56	111
Protein	150	56	84
Fat	6	7	277
Calcium	198	21	71
Phosphorus	105	59	126
Iron	13	31	246
Vitamin A	3	11	276
Thiamine	133	50	107
Riboflavin	7	36	247
Niacin	100	60	130
Ascorbic Acid	2	9	279

For fat, phosphorus, iron, vitamin A, riboflavin, niacin, and ascorbic acid the greatest number of average intakes were in the group which was under 70% of NRC Recommended Dietary Allowances.

DISCUSSION

Little is known about the physiological requirements of the Trukese for various nutrients.

In order to have some data on body sizes of Trukese, 282 male and female Trukese, from the ages of 1 through 70 years, participants in this dietary survey, were weighed and measured by the author.

Table 20 shows the weights and heights of 282 male and female subjects from 1 year through 70 years of age. The weights are given in pounds showing the range and average; heights are given in inches showing the range and average.

The average weights of Trukese were compared with average weights of Americans of the same age group to obtain the difference between Trukese and Americans.

Table 21 shows the difference between average body weights of Trukese and American subjects of the same age group.

Trukese subjects had smaller body sizes when compared with American subjects of the same age group, with the exception of females 21 years and over, where the average weight for Trukese females was two pounds heavier than the average weight for American females.

CALORIES

Caloric requirements, using the FAO formula for calculating these requirements, would be similar to the calculated values for Marshallese as the body sizes of the Trukese are very much like the Marshallese and the mean temperature of Truk is the same as that of the Marshall Islands. For details see section under Discussion in the Nutrition Study of the Marshall Islands.

Table 20.

Weights and Heights of Trukese Subjects

Age (yrs.)	Sex	Number of subjects	Weight (pounds) Range	Weight (pounds) Average	Height (inches) Range	Height (inches) Average
1-3	M	17	20-30	25	22-30	27
	F	15	20-30	25	22-30	27
4-6	M	7	30-35	32	36-40	38
	F	14	20-33	28	36-40	38
7-9	M	13	42-60	50	40-55	45
	F	4	40-60	48	40-54	47
10-12	M	12	64-90	78	48-50	50
	F	9	65-88	76	50-58	52
13-15	M	7	70-120	98	55-63	60
	F	12	75-125	100	50-60	58
16-20	M	7	95-165	133	55-68	63
	F	12	80-140	121	55-65	61
21-60	M	75	110-200	138	59-69½	64
	F	56	90-170	125	55-68	61
61-70	M	12	98-160	123	59-69	63
	F	10	90-150	121	56-64	56

Table 21.

Comparison of Average Weights of Trukese with Weights of Americans Given for Each Age Group in the Table of Recommended Daily Allowances, National Research Council.

Age group	Weights of Americans Weight in Pounds	Weights of Trukese Weight in Pounds	Difference in Pounds
1 to 3	27	25	-2
4 to 6	42	30	-12
7 to 9	58	49	-9
10 to 12	78	77	-1
13 to 15 (girls)	108	100	-8
16 to 20 (girls)	122	121	-1
13 to 15 (boys)	108	100	-8
16 to 20 (boys)	141	133	-8
21 and over (females)	123	125	+2
21 and over (males)	154	138	-16

FOOD ITEMS COMMONLY CONSUMED BY TRUKESE STUDIED IN THIS DIETARY SURVEY

	TRUKESE	ENGLISH
1. BREADS	Pinauwa	Bread, white
2. CEREAL AND CEREAL DISHES	Rais	Rice, boiled, white
3. CRACKERS		Crackers, soda

4. FISH, CRUSTACEA, AND SIMILAR FOODS

TRUKESE	ENGLISH	SCIENTIFIC
Ar	Parrot fish	Scarus
Boro	Wrasse	Family Labridae
Bula	Surgeon fish (Tang)	Naso Lituratus
Eni	Sea Bass	Cephalopholis Argus (Bloch)
Fide	Snapper	Family Lutjanidae (genus Lutjanus)
Ikechon	Wrasse	Family Labridae
Kinfou	Sea Bass	Epinephelus macrospilos (?)
Kuo		Siganus (punctatus?)
Meigyogyo	Trigger Fish	Family Balistidae or Monacanthidae
Meich		Siganus Rostratus
Musum	Damsel Fish, Sergeant Major, Squirrel Fish or Soldier Fish	Contains several species belonging at least to the familiar Pomacentridae and Holocentridae
Nippach	Octopus	Octopus (Octopus) sp. (probably O. o. cyanea)
Onon	Bivalves found in mangrove swamps	Lucina edentula (Linné)
Petu	Mackerel	
Puna	Surgeon Fish (Tang)	Family Acanthuridae

TRUKESE	ENGLISH	SCIENTIFIC
Senif	Sardines, small	A clupeid fish, probably of the genus Harengula
Sewit	Scorpion Fish	Family Scorpaenidae
Sim	Clam	Hippopus hippopus
To	Clam	Tridacna sp. (probably T. crocea)
Tsufu	Parrot Fish	Family Scaridae

5. FRUITS	TRUKESE	ENGLISH
	Utsu	Bananas, raw and cooked
	Naimis	Limes
	Painaper	Pineapple
	Sasaf	Soursop
	Mangko	Mangoes
	Sennia	Watermelon
	Kurukur	Orange
	Kippwau	Papaya

6. MEATS, FRESH		
	Pik	Pig
	Chuko	Chicken Chicken soup

7. MEAT, SAUSAGE AND SIMILAR PRODUCTS		
		Frankfurters
8. MILK		Evaporated milk for infants
9. NUTS	Nu	Coconut fluid from the immature nut
	Taka	Meat from mature coconut
	Apun	Meat often called spoon meat from immature coconuts

9. NUTS (CONT'D)	TRUKESE	ENGLISH
	Ot or chofar	Embryo of the sprouting coconut
10. SUGAR		
	Wo	Sugar cane
	Suke	Sugar, white, refined
11. VEGETABLES		
	Kon	Breadfruit, steamed and pounded into a loaf
	Ainbat mei	Breadfruit, boiled
	Aponau	Breadfruit, baked
	Matun	Breadfruit, steamed, pounded and coconut milk added
	Ror or opou	Breadfruit, roasted, charred, skin scraped off and baked in coconut milk
	Emesifich	Breadfruit, steamed, pounded and coconut oil added
	Kamuti	Potato, sweet
	Pwoteiton	Potato, white
12. MISCELLANEOUS		
	Kofi	Coffee
	Ti	Tea
		Miso soup

BREADFRUIT AND TARO SEASON

Bulk of the breadfruit crop is obtained during the main harvest season from July to September. During this season, the surplus is stored as fermented breadfruit, "apot".

Meikoch, a variety of breadfruit, is harvested in October. Meikoch, sawan, and Meiyon are in season from the middle of December until the middle of January and in good years until middle of February.

Root crops such as puna (Cyrtosperma chamissonis), taro or oni (Colocasia esculenta) and dryland taro or ka (Colocasia macrorrhiza) and tapioca are cultivated all year round.

RECOMMENDATIONS

See section under Recommendations Based on Dietary Studies in the Nutrition Study of the Marshall Islands.

SUMMARY

Seven-day dietary records of 290 Trukese of Udot, Truk District, Caroline Islands, from the ages of one to 70 years of age were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron, Vitamin A, thiamine, riboflavin, niacin and ascorbic acid. These figures were then compared with National Research Council allowances.

Taking the total group of 290 subjects, the following results were obtained when daily intakes were compared with NRC allowances:

1. Calories: 186 subjects or 64% were below NRC allowances and 104 subjects or 36% were above NRC allowances.

2. Protein: 162 subjects or 56% were below allowances and 128 or 44% were above NRC allowances.

3. Fat: 188 subjects or 99% were below NRC allowances and two subjects or 1% were above allowances.

4. Calcium: 97 subjects or 33% were below allowances and 193 subjects or 67% were above NRC allowances.

5. Phosphorus: 212 subjects or 73% were below NRC allowances and 78 subjects or 27% were above NRC allowances.

6. Iron: 282 subjects or 97% were below NRC allowances and eight subjects or 3% were above NRC allowances.

7. Vitamin A: 287 subjects or 99% were below NRC allowances and three subjects or 1% were above NRC allowances.

8. Thiamine: 170 subjects or 58% were below allowances and 120 subjects or 42% were above NRC allowances.

9. Riboflavin: 288 subjects or 99% were below NRC allowances and two subjects or 1% were above NRC allowances.

10. Niacin: 197 subjects or 68% were below NRC allowances and 93 subjects or 32% were above NRC allowances.

11. Ascorbic Acid: 289 subjects or 99% were below NRC allowances and one subject or 1% was above NRC allowances.

PART III

A COMPARATIVE STUDY OF THE NUTRIENT INTAKES OF THE MARSHALLESE OF MAJURO VILLAGE, MARSHALL ISLANDS, AND THE TRUKESE OF UDOT, TRUK DISTRICT, CAROLINE ISLANDS

PURPOSE: To compare the nutrient intakes of the Marshallese of Majuro Village, Marshall Islands, a "low" island; and the nutrient intakes of the Trukese of Udot, Truk District, Caroline Islands, a "high" island.

PROCEDURE: As given in section for the Marshall Islands and the Caroline Islands.

RESULTS

Table 22 summarizes the daily quantities of various nutrients per person and comparison with National Research Council allowances of the Marshallese children of Majuro Village, Marshall Islands and the Trukese children of Udot, Caroline Islands.

There were 120 children. Ages 1 to 3 years: Marshallese, 24; Trukese, 12. Ages 4 to 6 years: Marshallese, 12; Trukese, 21. Ages 7 to 9 years: Marshallese, 6; Trukese, 18. Ages 10 to 12 years: Marshallese 6; Trukese, 21.

The average intakes, NRC allowances, percent of allowance, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given in Table 22.

I. CHILDREN

1 to 3 years of age In comparing the Marshallese and the Trukese of this age group, for the Marshallese, a greater percentage of subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage were below allowances for fat, phosphorus, iron, vitamin A, riboflavin and ascorbic acid. For protein and niacin almost half of the subjects were above and half below NRC allowances. For calcium, it was evenly divided between those above and those below allowances.

4 to 6 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients except iron and niacin. For the Trukese, a greater percentage of the subjects were below allowances for all nutrients except calcium and thiamine. Caloric and niacin intakes were divided with almost half of the subjects above and half below allowances.

7 to 9 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients except niacin. The percentage for protein and for iron were divided with half of the subjects above and half below allowances. For the Trukese, a greater percentage of the subjects were below allowances for all nutrients except calcium and niacin.

Table 22.

Summary of Daily Quantities of Various Nutrients per Person of the Marshallese, Majuro Village, Marshall Islands and the Trukese, Udot, Caroline Islands and Comparisons with National Research Council Allowances.

by Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		g.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
Children (male and female)											
1 to 3 years											
Marshall Islands (21)*											
Average intake	823	26	13	229	404	6	1404	503	409	11	20
NRC allowances	1200	40	33	1000	1000	7	2000	600	900	6	35
% of allowances	68	65	39	23	40	86	70	84	45	180	57
% of subjects below allowances	92	88	96	100	100	62	83	75	96	33	83
Caroline Islands (12)											
Average intake	1303	38	8	1892	741	3	660	595	444	6	5
NRC allowances	1200	40	33	1000	1000	7	2000	600	900	6	35
% of allowances	109	95	24	189	74	43	33	99	49	100	14
% of subjects below allowances	42	58	100	50	91	100	100	34	92	58	100
4 to 6 years											
Marshall Islands (12)											
Average intake	1096	42	21	303	572	8	2019	642	439	9	30
NRC allowances	1600	50	44	1000	1000	8	2500	800	1200	8	50
% of allowances	68	84	48	30	57	100	81	80	36	112	60
% of subjects below allowances	92	67	92	100	100	33	83	75	100	42	67
Caroline Islands (21)											
Average intake	1451	49	13	1810	740	4	794	809	501	7	7
NRC allowances	1600	50	44	1000	1000	8	2500	800	1200	8	50
% of allowances	91	98	29	181	74	50	32	101	42	87	14
% of subjects below allowances	57	67	100	43	86	100	95	43	100	52	100

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
7 to 9 years		gm.	gm.	mg.	mg.	mg.	I.U.	mcg	mcg.	mg.	mg.
Marshall Islands (6)											
Average intake	1269	52	21	534	732	10	3508	631	563	12	19
NRC allowances	2000	60	56	1000	1200	10	3500	1000	1500	10	60
% of allowances	63	87	37	53	61	100	100	63	37	120	32
% of subjects below allowances	100	50	100	67	100	50	67	83	100	0	100
Caroline Islands (18)											
Average intake	1913	60	21	2256	938	6	978	924	575	10	18
NRC allowances	2000	60	56	1000	1200	10	3500	1000	1500	10	60
% of allowances	96	100	37	226	78	60	28	92	38	100	30
% of subjects below allowances	61	61	89	33	85	88	100	66	100	55	93
10 to 12 years											
Marshall Islands (6)											
Average intake	1577	62	30	486	925	11	2550	801	621	12	26
NRC allowances	2500	70	69	1200	1200	12	4500	1200	1800	10	75
% of allowances	63	88	43	40	77	92	57	67	34	120	35
% of subjects below allowances	100	83	100	100	83	67	83	83	100	33	100
Caroline Islands (21)											
Average intake	1948	61	17	1463	914	5	972	952	611	8	15
NRC allowances	2500	70	69	1200	1200	12	4500	1200	1800	10	75
% of allowances	77	87	25	121	76	42	22	79	34	80	20
% of subjects below allowances	76	67	100	52	80	100	100	80	100	71	100

* Figures in ( ) indicate number of subjects studied.

10 to 12 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage of subjects were below allowances for all nutrients except calcium. For calcium almost half of the subjects were below allowances and half were above allowances.

Table 23 summarizes the daily quantities of various nutrients per person and comparison with National Research Council allowances of the Marshallese males of Majuro Village, Marshall Islands and the Trukese males of Udot, Caroline Islands.

There were 147 males. Ages 13 to 15 years: Marshallese, 3; Trukese, 7. Ages 16 to 20 years: Marshallese, 2; Trukese, 7. Ages 21 to 60 years: Marshallese, 33; Trukese, 75. Ages 61 to 70 years: Marshallese, 8; Trukese, 12.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin and ascorbic acid are given in Table 23.

II. MALES

13 to 15 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients. For the Trukese, a greater percentage of subjects were below allowances for all nutrients except calcium. Almost one half of the subjects were below allowances and one half were above allowances for calcium.

16 to 20 years For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients except protein, phosphorus, iron, vitamin A, thiamine and niacin. For all these nutrients, one half of the subjects were below allowances and one half were above allowances. For the Trukese, a greater percentage of the subjects were below allowances for all nutrients except calcium.

21 to 60 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients. For the Trukese, a greater percentage of the subjects were below allowances for all nutrients except protein and calcium.

61 to 70 years of age For the Marshallese, a greater percentage of the subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage of the subjects were below allowances for fat, iron, vitamin A, riboflavin, and ascorbic acid. Almost one half of the subjects were below allowances and one half were above allowances for protein, phosphorus, thiamine, and niacin. For calories, one half were below and one half above NRC allowances.

Table 24 summarizes the daily quantities of various nutrients per person and comparison with National Research Council allowances of the Marshallese females of Majuro Village, Marshall Islands, and the Trukese females of Udot, Caroline Islands.

Table 23.

Summary of Daily Quantities of Various Nutrients per Person of the Marshallese, Majuro Village, Marshall Islands and the Trukese, Udot, Caroline Islands and Comparisons with National Research Council Allowances.

by Mary Murai

	Calories	Protein gm.	Fat gm.	Calcium mg.	Phosphorus mg.	Iron mg.	Vitamin A I.U.	Thiamine mcg.	Riboflavin mcg.	Niacin mg.	Ascorbic Acid mg.
Males											
13 to 15 years											
Marshall Islands (3)*											
Average intake	1385	49	28	313	552	8	901	939	622	13	33
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	43	58	31	22	42	53	18	63	31	87	37
% of subjects below allowances	100	100	100	100	100	100	100	100	100	67	100
Caroline Islands (7)											
Average intake	1793	56	12	1748	755	6	518	806	462	7	6
NRC allowances	3200	85	89	1400	1320	15	5000	1500	2000	15	90
% of allowances	56	66	13	124	57	40	10	54	23	47	7
% of subjects below allowances	86	86	100	56	85	85	100	100	100	100	100
16 to 20 years											
Marshall Islands (33)											
Average intake	2240	92	32	489	1547	17	1799	1415	1133	17	20
NRC allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	59	92	30	35	117	113	30	83	45	100	20
% of subjects below allowances	100	50	100	100	50	50	50	50	100	50	100
Caroline Islands (7)											
Average intake	1833	63	13	3964	1235	4	1006	972	599	7	7
NRC allowances	3800	100	105	1400	1320	15	6000	1700	2500	17	100
% of allowances	48	63	12	283	94	27	17	56	24	41	7
% of subjects below allowances	100	100	100	28	71	100	100	100	100	100	100

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
21 to 60 years		gm.	gm.	mg.	mg	mg.	I.U.	mcg.	mcg.	mg.	mg.
Marshall Islands (33)											
Average intake	1469	54	24	390	744	10	1307	944	726	13	14
NRC allowances	3000	70	83	1000	1320	12	5000	1500	1800	15	75
% of allowances	49	77	29	39	56	83	26	63	40	87	19
% of subjects below allowances	100	82	97	97	91	64	91	85	100	70	97
Caroline Islands (75)											
Average intake	2471	76	17	2431	1237	6	1318	1310	825	12	10
NRC allowances	3000	70	83	1000	1320	12	5000	1500	1800	15	70
% of allowances	82	108	20	243	94	50	26	87	46	80	14
% of subjects below allowances	70	45	100	29	68	97	97	60	100	72	100
61 to 70 years											
Marshall Islands (8)											
Average intake	1302	42	16	308	601	8	436	839	619	12	11
NRC allowances	2400	70	67	1000	1320	12	5000	1200	1800	12	75
% of allowances	54	60	24	31	45	67	9	70	34	100	15
% of subjects below allowances	100	100	100	100	100	75	100	88	100	38	100
Caroline Islands (12)											
Average intake	2545	67	14	4491	1419	7	1351	1429	847	12	12
NRC allowances	2400	70	67	1000	1320	12	5000	1200	1800	12	75
% of allowances	106	96	21	449	107	58	27	119	47	100	16
% of subjects below allowances	50	58	100	8	58	88	100	50	100	58	100

* Figures in ( ) indicate number of subjects studied.

There were 180 females. Ages 13 to 15 years: Marshallese, 3; Trukese, 12. Ages 16 to 20 years: Marshallese, 4; Trukese, 12. Ages 21 to 60 years: Marshallese, 36; Trukese, 56. Ages 61 to 70 years: Marshallese, 9: Trukese, 10. Lactating women: Marshallese, 11; Trukese, 27.

The average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid are given in Table 24.

III. FEMALES

13 to 15 years of age For the Marshallese, a greater percentage of subjects were below allowances for all nutrients. For the Trukese, a greater percentage of subjects were below allowances for all nutrients except calcium and thiamine. For phosphorus, almost one half of the subjects were above and one half below allowances. For protein, one half were below and one half above NRC allowances.

16 to 20 years of age For the Marshallese, a greater percentage of subjects were below allowances for all nutrients except phosphorus and iron where one half of the subjects were above and one half below allowances. For the Trukese, a greater percentage of subjects were below allowances for all nutrients except calcium. For calories, about one half of the subjects were below allowances and one half were above allowances.

21 to 60 years of age For the Marshallese, a greater percentage of subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage of subjects were below allowances for all nutrients except calories, protein, calcium and thiamine. Almost a half of the subjects were below allowances and one half were above allowances for niacin.

61 to 70 years of age For the Marshallese, a greater percentage of subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage of subjects were below allowances for fat, phosphorus, iron, vitamin A, riboflavin, niacin and ascorbic acid. One half of the subjects were below and one half above allowances for calories, protein, and thiamine.

Lactating women For the Marshallese, a greater percentage of subjects were below allowances for all nutrients except niacin. For the Trukese, a greater percentage of the subjects were below allowances for all nutrients except calcium.

Table 24.

Summary of Daily Quantities of Various Nutrients per Person of the Marshallese, Majuro Village, Marshall Islands and the Trukese, Udot, Caroline Islands and Comparisons with National Research Council Allowances.

By Mary Murai

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
Females		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
13 to 15 years											
Marshall Islands (3)*											
Average intake	1487	59	25	442	655	9	352	745	568	12	6
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	57	74	35	34	54	60	7	57	28	92	7
% of subjects below allowances	100	100	100	100	100	100	100	100	100	67	100
Caroline Islands (12)											
Average intake	2141	78	20	2487	1167	6	1303	1297	801	11	9
NRC allowances	2600	80	72	1300	1200	15	5000	1300	2000	13	80
% of allowances	82	97	28	191	97	40	26	99	40	85	11
% of subjects below allowances	67	50	100	33	58	100	100	41	100	75	100
16 to 20 years											
Marshall Islands (4)											
Average intake	1323	52	15	277	867	6	1119	801	637	10	10
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	55	69	22	28	72	40	22	67	35	83	12
% of subjects below allowances	100	75	100	100	50	50	100	100	100	75	100
Caroline Islands (12)											
Average intake	2125	76	13	2157	1035	5	1442	889	604	8	15
NRC allowances	2400	75	67	1000	1200	15	5000	1200	1800	12	80
% of allowances	88	101	19	216	86	33	29	74	33	67	19
% of subjects below allowances	58	67	100	25	75	100	100	75	100	83	100

	Calories	Protein	Fat	Calcium	Phosphorus	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		gm.	gm.	mg.	mg.	mg.	I.U.	mcg.	mcg.	mg.	mg.
21 to 60 years											
Marshall Islands (36)											
Average intake	1365	47	23	363	661	10	1524	809	648	12	13
NRC allowances	2400	60	67	1000	1320	12	5000	1200	1500	12	70
% of allowances	57	78	34	36	50	83	30	67	43	100	18
% of subj. below allow.	97	72	97	100	97	67	89	86	100	47	97
Caroline Islands (56)											
Average intake	2531	76	16	2690	1254	6	1296	1505	803	11	11
NRC allowances	2400	60	67	1000	1320	12	5000	1200	1500	12	70
% of allowances	105	126	24	269	95	50	26	125	54	92	16
% of subj. below allow.	46	36	100	25	66	94	100	42	94	53	100
61 to 70 years											
Marshall Islands (9)											
Average intake	1197	38	19	375	582	11	1375	683	550	10	13
NRC allowances	2000	60	56	1000	1320	12	5000	1000	1500	10	70
% of allowances	60	63	34	37	44	92	27	68	37	100	18
% of subj. below allow.	100	78	100	100	100	78	89	89	100	44	100
Caroline Islands (10)											
Average intake	2466	66	19	2886	1284	7	732	1151	797	11	20
NRC allowances	2000	60	56	1000	1320	12	5000	1000	1500	10	70
% of allowances	123	110	34	289	97	58	15	115	53	110	28
% of subj. below allow.	50	50	100	20	70	90	100	50	100	60	100
Lactating Women											
Marshall Islands (11)											
Average intake	1695	62	27	466	840	12	2499	876	786	16	17
NRC allowances	3000	100	83	2000	1800	15	8000	1500	3000	15	150
% of allowances	56	62	32	23	47	80	31	58	26	107	11
% of subj. below allow.	100	100	100	100	100	73	91	91	100	45	100
Caroline Islands (27)											
Average intake	2200	74	16	2686	1206	6	986	1089	707	10	12
NRC allowances	3000	100	83	2000	1800	15	8000	1500	3000	15	150
% of allowances	73	74	19	134	67	40	12	73	24	67	8
% of subj. below allow.	89	85	100	48	81	100	100	77	100	88	100

* Figures in ( ) indicate number of subjects studied.

Classification of Averages of Nutrient Intake of Marshallese and Trukese Subjects in Relation to NRC Recommended Dietary Allowances

Table 25 gives the classification of averages of nutrient intake of 161 Marshallese subjects and 290 Trukese subjects in relation to NRC Recommended Dietary Allowances. Classification of average intake is given as percentage of NRC dietary allowances. The number of individuals in each group is given as percentage of subjects studied.

1. Calories: 4% of the Marshallese and 43% of the Trukese were in the 90 to 100% group. 18% of the Marshallese and 19% of the Trukese were in the 70 to 89% group in relation to NRC recommended allowances. 78% of the Marshallese and 38% of the Trukese were in the under 70% group.

2. Protein: 29% of the Marshallese and 52% of the Trukese were in the 90 to 100% group, and 27% of the Marshallese and 19% of the Trukese were in the 70 to 89% group. 44% of the Marshallese and 29% of the Trukese were in the under 70% group.

3. Fat: 3% of the Marshallese and 2% of the Trukese were in the 90 to 100% group; while 2% of the Marshallese and 3% of the Trukese were in the 70 to 89% group. 95% of both Marshallese and Trukese were in the under 70% group in relation to NRC recommended allowances.

4. Calcium: 2% of the Marshallese and 68% of the Trukese were in the 90 to 100% group; while 3% of the Marshallese and 7% of the Trukese were in the 70 to 89% group; and 95% of the Marshallese and 25% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

5. Phosphorus: 8% of the Marshallese and 36% of the Trukese were in the 90 to 100% group; 9% of the Marshallese and 20% of the Trukese were in the 70 to 89% group; while 83% of the Marshallese and 44% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

6. Iron: 42% of the Marshallese and 4% of the Trukese were in the 90 to 100% group; 20% of the Marshallese and 11% of the Trukese were in the 70 to 89% group; while 38% of the Marshallese and 85% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

7. Vitamin A: 13% of the Marshallese and 1% of the Trukese were in the 90 to 100% group; 3% of the Marshallese and 4% of the Trukese were in the 70 to 89% group; while 84% of the Marshallese and 95% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

8. Thiamine: 20% of the Marshallese and 46% of the Trukese were in the 90 to 100% group; 19% of the Marshallese and 17% of the Trukese were in the 70 to 89% group; while 61% of the Marshallese and 37% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

Table 25.

Classification of Averages of Nutrient Intake of Marshallese and Trukese in Relation to NRC Recommended Dietary Allowances.

Classification of Average Intake as Percentage of NRC Recommended Dietary Allowances. Number of Individuals in Each Group Given as Percentage of Subjects Studied.

	90 to 100 Percent		70 to 89 Percent		Under 70 Percent	
	Marshallese Percent	Trukese Percent	Marshallese Percent	Trukese Percent	Marshallese Percent	Trukese Percent
Calories	4	43	18	19	78	38
Protein	29	52	27	19	44	29
Fat	3	2	2	3	95	95
Calcium	2	68	3	7	95	25
Phosphorus	8	36	9	20	83	44
Iron	42	4	20	11	38	85
Vitamin A	13	1	3	4	84	95
Thiamine	20	46	19	17	61	37
Riboflavin	1	3	4	12	95	85
Niacin	58	34	20	21	22	45
Ascorbic Acid	7	1	3	3	90	96

9. Riboflavin: 1% of the Marshallese and 3% of the Trukese were in the 90 to 100% group; 4% of the Marshallese and 12% of the Trukese were in the 70 to 89% group; and 95% of the Marshallese and 85% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

10. Niacin: 58% of the Marshallese and 34% of the Trukese were in the 90 to 100% group; 20% of the Marshallese and 21% of the Trukese were in the 70 to 89% group; and 22% of the Marshallese and 45% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

11. Ascorbic acid: 7% of the Marshallese and 1% of the Trukese were in the 90 to 100% group; 3% of the Marshallese and Trukese were in the 70 to 89% group; and 90% of the Marshallese and 96% of the Trukese were in the under 70% group in relation to NRC recommended allowances.

DISCUSSION

Data for the Marshall Islands dietary study were collected during the period from January 18th through May 29th, 1951, while the data for the Caroline Islands study covered the period from June 27th through October 8th, 1951.

The diets of the people are influenced by the seasonal fruits and vegetables available, so this comparative study does not indicate the differences that exist between the dietaries for the whole twelve months period but shows only the differences or similarities during the seasons when these studies were undertaken. For a true comparison, the studies should be undertaken for a year period.

Marshall Islands is representative of a "low" island and the Caroline Islands, of a "high" island. "Low" islands are coral atolls and "high" islands are of volcanic origin. The supply and variety of vegetables and fruits differ on each of these islands.

The Marshallese of Majuro Village depended more on store goods for their source of food supplies. For example, rice, sugar, flour and canned goods were predominant in their dietary. Trukese of Udot depended on the sea and their vegetable crops for their existence. Fish, octopus, shellfish, breadfruit, bananas and coconuts were used in greater quantities.

Fish heads and fish bones were not as commonly used in the Marshallese diets while the Trukese took small fish (Musum), boiled them and ate the whole fish including heads, bones, and entrails. The bony structure of fish is high in calcium values and this is one of the reasons why the calcium intake was higher among the Trukese than the Marshallese. 68% of the Trukese were in the group which was 90 or 100% of the NRC recommended allowances, while only 2% of the Marshallese were in this group. 95% of the Marshallese were in the under 70% of NRC recommended allowances group.

For other differences in the diets, 43% of the Trukese were in the upper group for calories and only 4% of the Marshallese were in this group. 78% of the Marshallese were in the lowest group for caloric intake. It was breadfruit season in Udot and everyone had large quantities

of "kon" to eat, while in the Marshall Islands the breadfruit season had not started.

For protein intakes, 52% of the Trukese were in the upper group for protein intake, while only 29% of the Marshallese were in this group. On Udot, the women of the village were responsible for fishing while the men of the village were responsible for "kon" making. Each day the women were out in the reef looking for shellfish or octopus. At least once a week, they fished in groups with their hand nets in the lagoon. About once in two weeks, the Chief's wife took all the available women of the village on the Chief's boat and they went out in the ocean to fish leaving their homes very early in the morning and returning very late at night. They came back with large amounts of fish, which they divided among the people of the village. Men did the fishing on Majuro, usually on Saturdays.

For phosphorus intakes, 36% of the Trukese were in the upper group and only 8% of the Marshallese were in this group. Usually foods that have calcium have phosphorus also, so that it often follows that when calcium intakes are low phosphorus intakes are also low.

For thiamine intakes, 46% of the Trukese were in the upper group, and only 20% of the Marshallese were in this group. For the Trukese, the large amounts of breadfruit eaten may account for the thiamine intake.

For iron and niacin intakes, Marshallese were in the upper groups.

Both the Trukese and Marshallese diets were low in fat, riboflavin, Vitamin A, and ascorbic acid.

Trukese did not include coconut sap in their diets as it was unlawful to tap coconut trees. This law was put in effect to curtail the making of fermented coconut sap liquor. Large quantities of coconut sap were used by the Marshallese.

The reasons for the existence of these deficiencies and how they may be remedied is discussed in the section under Recommendations Based on Dietary Studies in the Nutrition Study of the Marshall Islands.

SUMMARY

Seven-day dietary records of 157 Marshallese of Majuro Village, Marshall Islands and 290 Trukese of Udot, Truk District, Caroline Islands, from the age of one to 70 years of age were studied for daily quantities of calories, protein, fat, calcium, phosphorus, iron, Vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. These figures were then compared with National Research Council allowances. Tables are given with figures for average intakes, NRC allowances, percent of allowances, percent of subjects below allowances, for calories, protein, fat, calcium, phosphorus, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. Differences and similarities in the nutrient intakes of the Marshallese and Trukese

BIBLIOGRAPHY

1. Bowes, Anna de Planter and Charles F. Church. Food values of portions commonly used. 7th edition, 1951.

2. United States Department of Agriculture. Composition of foods--raw, processed, prepared. Agriculture Handbook, No. 8.

3. United States Department of Agriculture, Bureau of Human Nutrition and Home Economics. Composition of foods used in Far Eastern countries. Agriculture Handbook, No. 34.

4. Miller, C. D., Marian Weaver, and Stella Okita. Food values of portions commonly used, Hawaii supplement to Bowes and Church. Home Economics Department, University of Hawaii, Honolulu.

5. Miller, C. D. Unpublished data.

6. National Research Council, Food and Nutrition Board. Recommended dietary allowances, revised. Rep. & Circ. Series No. 129, October, 1948.

7. Sherman, Henry C. and Caroline Sherman Lanford. Essentials of nutrition. 2nd edition, 1947. Chapter VIII, p. 133.

8. United States Department of Agriculture, War Food Administration. Food consumption levels in the United States, Canada and the United Kingdom. Report of a special joint committee set up by the Combined Food Board. April, 1944.

9. British Medical Association. Report of the Committee on Nutrition. London, 1950.

10. Canadian Council on Nutrition. A dietary standard for Canada. Approved by the Canadian Council on Nutrition. Bull. Canad. Council on Nutrition, 2: 1, 1950.

11. Goldsmith, Grace A. Human nutritive requirements and recommended dietary allowances. J. Am. Diet. A. 29: 109, 1953.

12. Committee on Calorie Requirements: Calorie Requirements, FAO Nutritional Studies, No. 5, June, 1950.

13. Leitch, I., and J. Duckworth. The determination of protein requirements of man. Nutr. Abs. Rev. 7, 257, 1937.

14. Hegsted, D. M., A. G. Tsongas, D. B. Abbott and F. J. Stare. Protein requirements of adults. J. Lab. Clin. Med. 31, 261, 1946.

15. Leitch, I. The determination of the calcium requirements of man. Nutr. Abs. Rev. 6, 553; 8, 1; 1937, 1938.

16. Sherman, Henry C. Chemistry of food and nutrition. 8th edition, 1952. Chapter XXIII, p. 468.

17. Daum, K., Tuttle, W. W., and Wilson, M. Influence of various levels of thiamine intake on physiologic response. 7. Thiamine requirements and their implications. J. Am. Diet. A. 25: 398, 1949.

18. U. S. Food and Drug Administration, Federal Security Agency. Minimum daily requirements of specific nutrients. Section 403 (j), Federal Regiger, November 22, 1941.

19. Horwitt, M. K., Hills, O. W., Harvey, C. C., Liebert, E., and Steinberg, D. L. Effects of dietary depletion of riboflavin. J. Nutr. 39: 357, 1949.

20. Sherman, Henry C. Chemistry of food and nutrition. 8th ed. 1952. Chapter XX, p. 422.

21. Sherman, Henry C. Chemistry of food and nutrition, 8th ed. 1952. Chapter XVII, p. 348.

22. Sherman, Henry C. Chemistry of Food and nutrition, 8th ed. 1952. Chapter XVII, p. 349.

23. Goldsmith, Grace A., Human nutritive requirements and recommended dietary allowances. J. Am. Diet. A. 29: 109, 1953.

24. Faine, S. and C. E. Hercus. The nutritional status of Cook Islanders. Brit. J. Nutrit. 1951, 5, 327.

25. Fischer, Ann. Role of Trukese mother and its effect on child training. S I M Report No. 8. Scientific Investigation in Micronesia, 1949. Pacific Science Board, National Research Council.