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**JOINT FAO/WHO
EXPERT COMMITTEE ON
NUTRITION**

Report on the Second Session

Rome, 10–17 April 1951

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WORLD HEALTH ORGANIZATION

PALAIS DES NATIONS

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JOINT FAO/WHO EXPERT COMMITTEE ON NUTRITION

Second Session

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JOINT FAO/WHO EXPERT COMMITTEE ON NUTRITION

Report on the Second Session¹

The Joint FAO/WHO Expert Committee on Nutrition held its second session at FAO Headquarters in Rome from 10 to 17 April 1951. Professor Ancel Keys was unanimously elected Chairman of the committee, which consisted as before of 10 members, 5 of whom were invited by FAO and 5 by WHO. The committee was also attended by observers from the United Nations and a number of specialized agencies, by a co-opted member, by an observer from the Central Committee of the Italian Red Cross, and by an observer from the Office of the High Commissioner for Food, Rome.

1. INTRODUCTION

In accordance with directives of the World Health Assembly and the Annual Conference of FAO, the committee undertook the responsibility of acting as an advisory body to FAO and WHO. In this capacity it considered the past and future activities of the Nutrition Division of FAO and the Nutrition Section of WHO and made a number of recommendations.

¹ The WHO Executive Board, at its eighth session, adopted the following resolution:
The Executive Board

1. NOTES the report of the Joint FAO/WHO Expert Committee on Nutrition on its second session;
2. THANKS the members of the committee for their work;
3. THANKS the Food and Agriculture Organization for the excellent collaboration and co-operation established and maintained in the conduct of nutrition programmes;
4. AUTHORIZES the publication of the report and its distribution to governments, scientific institutions, etc.;
5. REQUESTS the Director-General to take into account the recommendations of the committee when considering future activities of the World Health Organization, and to transmit the recommendations to the regional committees for inclusion when possible in the future programmes;
6. SUGGESTS that the following be the terms of reference of the committee:
 - (1) to advise the Director-General on the types of programmes that should be undertaken by WHO;
 - (2) to recommend the ways in which most satisfactory collaboration and co-operation can be maintained with FAO in the field of nutrition;
 - (3) to provide expert advice on the technical problems submitted to it by the Director-General.

(Resolution EB8.R38, *Off. Rec. World Hlth Org.* 36, 11)

It also dealt with a number of specific nutrition problems of practical importance, including the following : the assessment of nutritional status ; training in nutrition in underdeveloped areas ; kwashiorkor ; demonstration areas ; nutritional aspects of the welfare of the aged ; the prevention and treatment of severe malnutrition of civilian populations during war periods.

With regard to collaboration, the general approach to be adopted and the spheres of the responsibilities of the two Organizations were carefully considered in the report on the first session, and it did not appear necessary to the committee to discuss these questions in the present report. The report itself indicates that FAO and WHO are working together in the execution of various projects to which each contributes in accordance with the principle that :

“ In FAO the emphasis is on nutrition in relation to the production, distribution, and consumption of food ; in WHO it is on nutrition in relation to the maintenance of health and the prevention of disease.” ²

Throughout its deliberations the committee was impressed with the need for making suggestions of immediate practical significance in the fight against malnutrition. It is nevertheless of the opinion that in attempting to solve nutrition problems consideration must be given not only to the necessity of obtaining practical results within a short period of time, but also to maintaining a balance between immediate measures which can produce temporary improvement in nutrition and long-range measures which yield permanent and lasting effects. The committee has tried to achieve such a balance in its general approach and in making recommendations on the various subjects included in its agenda.

2. PROGRAMMES OF FAO AND WHO

The committee received a brief statement on the activities of FAO and WHO in the field of nutrition during 1949 and 1950 and on those planned for 1951 and 1952. These statements and the ensuing discussions were helpful to the committee in examining other subjects on the agenda and in putting forward suggestions regarding future work.

2.1 FAO Activities, 1949-50

The activities described below are designed to assist governments in establishing and carrying out satisfactory food policies and programmes, to provide tools and techniques for this purpose, and to develop awareness

² *World Hlth Org. techn. Rep. Ser.* 1950, 16, 4

of the importance of nutrition problems. They include direct practical aid to individual governments. The programme is based on the recommendations of the FAO Standing Advisory Committee on Nutrition, which met in 1946, 1947, and 1948.

2.1.1 Food balance-sheets

The work of preparing and revising national food balance-sheets, which show the food supplies available in the different countries and the consumption levels per head, continued in co-operation with the Economics and Statistics Division. The FAO *Food composition tables for international use*,³ published in 1949, were used in the preparation of food balance-sheets issued in April 1950.

2.1.2 World food appraisals

The Nutrition Division is responsible for the food consumption and nutritional aspects of the periodic reviews of the world food and agricultural situation prepared by FAO. Preparatory work has been done on the second *World food survey*, which FAO plans to publish in 1951; this has included determination of the calorie requirement levels to be adopted in assessing the adequacy of food supplies and reviewing the world food situation generally, the establishment of the guiding principles to be followed in setting up food consumption targets, and detailed work on appropriate targets for 1960 country by country.

2.1.3 Analysis of food consumption targets and forward estimates of food production and supplies

Regional meetings at which consideration was given to such analysis and review were held in 1949 in Latin America, the Near East, Asia, and Europe, and in Latin America in 1950. In the background papers prepared for these meetings, the nutritional aspects of targets and estimates were considered and officers from the Nutrition Division attended the meetings to take part in the discussions.

2.1.4 Food composition

Tables providing data on the calorie, protein, and fat content of foods were published in English, French, and Spanish and used in a number of countries. Work on the mineral and vitamin content of foods, the object of which is to prepare extended food composition tables, progressed in 1949 and 1950.

³ Food and Agriculture Organization of the United Nations (1949) *Food composition tables for international use*, Washington, D.C. (FAO Nutritional Studies, No. 3)

2.1.5 Requirements of calories and nutrients

The report of the Committee on Calorie Requirements, convened by FAO in 1949, was published in 1950.⁴ The Joint FAO/WHO Expert Committee on Nutrition at its first session recommended the extension of the study to include nutrient requirements.⁵ Consideration was in the first place given to protein requirements. Preparatory work was done in this field in consultation with various experts and the Division participated in a protein conference at Rutgers University, New Jersey, USA, in January 1951.

2.1.6 Food technology

Requests for information on various aspects of food technology were met as a day-to-day activity. A working paper on the utilization of molasses, with particular reference to food yeast, was prepared for the information of a number of governments interested in this subject. Material for the publication of reports on maize and maize diets and soy-bean products was collected and reports drafted. Technological problems associated with the preservation of fish and fish products in underdeveloped countries and in tropical areas were studied in collaboration with the Fisheries Division and a joint paper on this subject is being published.

2.1.7 Supplementary feeding

The preparation of an international report on school feeding proceeded during the period under review. Its main purpose will be to increase interest in supplementary feeding and to provide technical guidance to governments initiating and developing school feeding programmes. A nutrition officer visited Europe in order to collect information on this subject, discuss relevant problems with appropriate experts, and observe the organization of existing programmes.

Direct assistance in the organization of school feeding was given by FAO nutrition officers in Greece, the Philippines, and Central America. Much of the work of the Division in this field was done in association with the United Nations Children's Emergency Fund (UNICEF).

2.1.8 Nutrition education

A great deal of material on this subject was collected and analysed and was embodied in a handbook, *Teaching better nutrition: A study of*

⁴ Food and Agriculture Organization of the United Nations, Committee on Calorie Requirements (1950) *Calorie requirements. Report of the Committee...*, Washington, D.C. (FAO Nutritional Studies, No. 5)

⁵ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 20

approaches and techniques,⁶ published at the end of 1950. Among the questions considered in this book are the organization of national programmes of nutrition education, the training of nutrition workers, teaching methods, the preparation and handling of teaching materials, and the evaluation of materials and methods.

Information about education in nutrition and educational materials were supplied on request to a number of countries.

On the suggestion of FAO, the Caribbean Commission arranged that a number of workers in social welfare and home economics from British and Netherlands territories in the Caribbean attending a workshop held in June-July 1950 at the University of Puerto Rico should receive training in nutrition. Fellowships to cover expenses were provided by the United Nations Department of Social Affairs and tuition was given free by the University. An FAO nutrition officer participated in the workshop.

At the request of the Government of Thailand, an officer from the Division was assigned to Thailand to work and assist in developing nutrition education projects in that country. She began work in September 1950 and will remain in Thailand throughout 1951.

2.1.9 Dietary surveys

A handbook, *Dietary surveys: Their technique and interpretation*,⁷ was published in English, French, and Spanish at the end of 1949. In this, special attention was given to techniques appropriate for underdeveloped areas, where little is known about consumption levels.

2.1.10 Nutrition Committee for South and East Asia

The first meeting of the Nutrition Committee for South and East Asia was convened by FAO in Baguio, Philippines, in February 1948.⁸ It surveyed the problem of nutrition in the region with special reference to the improvement of rice and rice diets. A second meeting of the Nutrition Committee, held in Rangoon, Burma, early in 1950,⁹ was concerned with

⁶ Food and Agriculture Organization of the United Nations (1950) *Teaching better nutrition: A study of approaches and techniques*, Washington, D.C. (FAO Nutritional Studies, No. 6)

⁷ Food and Agriculture Organization of the United Nations (1949) *Dietary surveys: Their technique and interpretation*, Washington, D.C. (FAO Nutritional Studies, No. 4)

⁸ See Food and Agriculture Organization of the United Nations (1948) *Nutrition problems of rice-eating countries in Asia: Report of the Nutrition Committee, Baguio, Philippines, 23-28 February 1948*, Washington, D.C.

⁹ See Food and Agriculture Organization of the United Nations (1950) *Report of the Nutrition Committee for South and East Asia, second meeting, Rangoon, Burma, 30 January - 4 February 1950*, Washington, D.C.

the steps taken in the different countries to follow up the recommendations of the Baguio meeting, as well as with further action, including the following :

FAO should continue to encourage work on developing simple methods of estimating thiamine in rice milled to different degrees ; it should provide assistance in developing and popularizing food preparations that can be regarded as partial substitutes for milk ; FAO and WHO, in collaboration with the Philippine Government, should arrange for the rice-enrichment experiment in the Philippines to be surveyed by an international team of experts, which would report on enrichment in all its aspects.

2.1.11 Conference on Nutrition Problems in Latin America

In sequence with the Conference on Nutrition Problems in Latin America, held in Montevideo, Uruguay, in 1948,¹⁰ a second conference was convened in Rio de Janeiro, Brazil, in June 1950.¹¹ At this conference a number of countries reported progress in following up recommendations which had been given emphasis at the Montevideo conference, especially in regard to the development of school feeding programmes, the analysis of local foods on which data are urgently needed, and the training of nutrition workers.

The Rio de Janeiro conference emphasized the need for suitable organizations and well-trained expert personnel to carry out research and supervise activities in nutrition, for research on the composition of foods by analytical methods which will ensure comparability of results, and for the development of training programmes and demonstration areas on a regional basis. It also stressed the importance of relating government policies concerned with food production, imports, subsidies, and food prices to the nutrition requirements of the populations concerned.

2.1.12 Regional activities

(a) *Europe.* The nutrition representative in Europe visited Austria, Finland, Ireland, Portugal, the Scandinavian countries, and Yugoslavia, to discuss food and nutrition problems, and appropriate practical measures, with nutrition workers and government officials. At the request of the Government of Finland, the nutrition representative paid a second visit to that country to assist in planning government nutrition services.

¹⁰ See Food and Agriculture Organization of the United Nations (1950) *Nutrition Conference, Montevideo, July 1948*, Montevideo.

¹¹ See Food and Agriculture Organization of the United Nations (1950) *Report of the Second Conference on Nutrition Problems in Latin America, Rio de Janeiro, Brazil, 5-13 June 1950*, Washington, D.C.

The FAO nutrition officer who had been attached to the Ministry of Co-ordination in Greece for the past three years completed her assignment there in the autumn of 1950. The primary purpose of her assignment was to develop and co-ordinate nutrition activities and to establish a government nutrition service. The programme included the planning of food production and import programmes based on the nutritional needs of the population, assisting in the development of specific nutrition measures, such as school feeding and education in nutrition programmes, and the training of workers to carry on such activities.

After a preliminary survey of the food and nutritional situation in Turkey, made by FAO in 1949, the Turkish Government requested assistance in establishing nutrition services in that country. The nutrition officer who had previously worked in Greece was assigned to Turkey in October 1950.

(b) *Asia and the Far East.* At the request of the Philippine Government, a nutrition officer was attached to the Institute of Nutrition for a six-month period, beginning 1 November 1950, to assist the Director "in the planning and co-ordinating and the correlation of nutrition services in the Philippines". In drawing up the immediate as well as the long-range programmes for the Institute, it was possible to incorporate a number of FAO recommendations for work in the Far East and to promote co-ordination among the various government agencies undertaking work related to food and nutrition.

(c) *Near East and Africa.* At the invitation of the Government of Egypt, the Director of the Nutrition Division, together with the Chief of the Nutrition Section of WHO, visited Egypt in February 1950, to advise the Government on nutrition policy. A report containing the joint recommendations of WHO and FAO was furnished to the Ministry of Public Health in Egypt. Among these were : that a survey be made of the relation between existing food supplies and the nutritional requirements of the population, followed by the initiation of a food production programme designed to provide the people with a more nutritious diet ; that nutritionists be employed by the Department of Labour, the Ministry of Education, and the Department of Social Welfare to develop nutrition programmes in their respective fields ; and that the Division of Nutrition and Food in the Ministry of Public Health be expanded into a National Institute of Nutrition, with a director of high professional standing. Recommendations were also made as to the programme of such an institute.

The nutrition training course for the Near East, which was to have been held early in 1950, was postponed until the latter part of the year. The course was given in Cairo and extended over a period of three months. It included lectures on nutrition and allied subjects, laboratory and field demonstrations, and practical work in the field.

An FAO officer took part in the kwashiorkor survey that was made in Africa, October-December 1950.

(d) *Latin America*. At the request of the Governments of El Salvador and Guatemala, a nutrition officer was seconded throughout 1950 to the Institute of Nutrition of Central America and Panama (INCAP), the headquarters of which are in Guatemala City. The nutrition officer conducted diet surveys to provide data on which to base plans and programmes concerned with school feeding, nutrition education, and agricultural production. She also helped to train local nutrition workers.

A nutrition officer visited Mexico in May 1950 to examine proposed technical assistance projects in nutrition submitted by the Mexican National FAO Committee. After the Rio de Janeiro Nutrition Conference, a nutrition officer visited Colombia, Ecuador, and Peru, to consult with officials about nutrition projects under the Technical Assistance Programme (TAP).

2.2 WHO Activities, 1949-50

2.2.1 Endemic goitre

Work proceeded in two directions: assistance to governments in conducting surveys to determine the incidence of endemic goitre in their countries, and stimulation of research to develop means of iodizing crude salt.

WHO supplied a consultant to the Government of Ceylon who, after making a survey of the island, confirmed that there is a high incidence of endemic goitre among the population living in the wet part of the island.

A WHO consultant visited Brazil, Colombia, Ecuador, Guatemala, and Mexico where, in association with local experts, he made sample surveys of the population. This visit stimulated a wide interest in these countries in endemic goitre. The work has been continued by the local experts.

Under stimulus from WHO, research work has been proceeding in laboratories on the iodization of crude salt. The methods in use for the iodization of free-flowing salt are not applicable to crude salt, and until a satisfactory method for the latter is obtained it will not be possible to use iodized salt as a prophylactic in large parts of the world where free-flowing salt is not available.

2.2.2 Pellagra

Headquarters continued to collect information on the incidence of pellagra, and from reports received it would seem that the only country where pellagra is a serious problem is Portugal.

2.2.3 Kwashiorkor

Following the recommendation made during the first session of the committee,¹² FAO and WHO collaborated in a study on kwashiorkor in Africa. The report of Professor J. F. Brock and Dr. M. Autret¹³ was available to the committee and was the subject of a special discussion (see section 3, page 22).

2.2.4 Development and extension of nutrition services in national administrations

2.2.4.1 Egypt

At the invitation of the Government of Egypt, WHO collaborated with FAO in furnishing a report on the steps that should be taken by the Government to extend and develop nutrition services in keeping with the requirements of the country.

2.2.4.2 Yugoslavia

At the request of the Government of Yugoslavia, WHO agreed to assist in developing a nutrition institute at Zagreb. A WHO consultant has already visited Yugoslavia, studied the existing facilities, and assessed the requirements. Following his recommendations, WHO has supplied a considerable amount of laboratory equipment to Yugoslavia. The consultant will make a return visit in the summer of 1951.

2.2.4.3 India

At the request of the Government of India, WHO supplied an experienced hospital dietitian to assist the dietitian at the Medical College Hospital, Calcutta, in framing and organizing a training course for hospital dietitians.

2.2.5 Training programmes

In association with FAO, WHO assisted the Government of Egypt to conduct a three months' training course for students from countries of the Middle East.

WHO has provided two short-term lecturers to INCAP. The lecturers gave a series of lectures in the countries affiliated with the Institute.

The Nutrition Section of WHO participated in a working conference for public-health nurses in the Netherlands, and in infant metabolism seminars in Leyden, Netherlands, and Stockholm, Sweden.

¹² *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 15

¹³ Brock, J. F. & Autret, M. (1951) *Bull. World Hlth Org.* **5** (in press) ; to be published also, in English and in French, in the *World Health Organization : Monograph Series*, as No. 8.

During 1950 eight fellowships were awarded in nutrition or allied subjects.

2.2.6 Nutrition survey

At the request of the Chief Medical Officer of the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWAPRNE), visits were made by the Chief of the Nutrition Section to Arab Palestine and the Lebanon to study the nutritional status of refugees.

2.3 FAO Programme, 1951 and 1952

2.3.1 Work to be undertaken under the ordinary FAO budget

The programme in general represents a further development of activities which have already been in progress for some years.

The work of the Nutrition Division under the FAO budget will be interlocked with activities undertaken under the Technical Assistance Programme. The arrangement and supervision of TAP projects will be among the responsibilities of the staff both at headquarters and in the field.

2.3.1.1 Work at headquarters

2.3.1.1.1 Food balance-sheets. Work on food balance-sheets will be extended in collaboration with the Economics and Statistics Division. The Nutrition Division has assumed special responsibility for the application of food balance-sheets, e.g., in planning national food policies, in the appraisal of consumption levels in countries and regions, and in the establishment of appropriate food production and consumption targets. Special attention will also be given to the study of the distribution of consumption within countries, since data on this subject supplement and extend the national consumption figures presented in food balance-sheets.

2.3.1.1.2 World food appraisals. Work will be continued along the lines followed in 1950 in collaboration with the Economics and Statistics Division.

2.3.1.1.3 Analysis of food consumption targets and forward estimates of food production and supplies. Regional Conferences on Food and Agriculture Programmes and Outlook will be held in Asia and the Far East and in the Near East in 1951. The Nutrition Division will be responsible for the nutritional aspects of the work of these conferences.

2.3.1.1.4 Food composition. The collection and analysis of data needed for the preparation of food composition tables covering vitamins and minerals will be continued. It is unlikely that satisfactory tables can be prepared for publication before the end of 1952.

2.3.1.1.5 *Requirements of nutrients.* Preparatory work for a meeting of experts to consider protein requirements is in progress. This meeting will take place late in 1951 or in 1952. Subsequently attention will be given to requirements of other nutrients.

2.3.1.1.6 *Food technology.* The Nutrition Division has assumed special responsibility for all work of FAO in the field of food technology. It will continue to make background studies of important aspects of the subject, e.g., cereal technology (including enrichment), soy-bean preparations, fish preparations, milk "substitutes", etc. Such studies will be of value in developing the Technical Assistance Programme, which will include many projects concerned with various aspects of food technology. Suitable publications will be issued as opportunity occurs.

2.3.1.1.7 *Supplementary feeding.* The study of supplementary feeding in its various aspects (with special emphasis on school feeding) will be continued and it is hoped to issue a publication on this subject at an early date. Practical application is being and will be given to this study through communications and contacts with governments and administrators, and in particular with UNICEF.

2.3.1.1.8 *Nutrition education.* The application of methods described in the publication already issued (*Teaching better nutrition : A study of approaches and techniques*¹⁴) will be furthered by all possible means.

2.3.1.1.9 *Dietary surveys.* The detailed study of dietary-survey methods already made by the Division will be given practical application through the provision of guidance to governments both through headquarters and in the field.

2.3.1.1.10 *Home economics.* Responsibility for home economics education and extension has been given to the Division. Work in this sphere will include visits to various regions, and the collection and dissemination of information on home economics with special reference to the evaluation of home economics teaching curricula and to home economics programmes and their planning in different countries. Special attention will be given to the role which voluntary rural organizations can play in improving conditions in the home ; liaison with various United Nations specialized agencies, non-official international bodies, women's organizations, etc., is of particular importance since such bodies have a close interest in the betterment of home conditions and provide channels through which ideas and information can be disseminated. It is hoped that in 1952 there will be considerable extension of work in home economics on the part of FAO.

¹⁴ Food and Agriculture Organization of the United Nations (1950) *Teaching better nutrition : A study of approaches and techniques*, Washington, D.C. (FAO Nutritional Studies, No. 6)

2.3.1.2 *Regional activities and field work*

2.3.1.2.1 *Europe.* The move of FAO to Rome will permit the establishment of closer contact with workers in European countries. It is planned to convene a Conference of European Nutrition Workers in 1951 or 1952.

Direct advisory assistance will be given to Austria and Greece. The work of the FAO nutrition officer in Greece, which extended over three years, will be followed up by periodic visits with the object of ensuring that the programme already initiated in that country be developed along satisfactory lines.

2.3.1.2.2 *Near East.* The nutrition officer stationed in the region will be concerned with following up the Near East nutrition training course (held October-December 1950) at which a number of workers from different parts of the region received preliminary training in nutrition.

A nutrition officer is now in Turkey assisting the Government to develop a satisfactory nutrition programme and will remain there for some time.

Assistance will be given to the Government of Israel in dealing with problems of nutrition among immigrants, special attention being given to the improvement, through educational techniques, of the diets of groups of diverse background and origin.

2.3.1.2.3 *Far East.* FAO will collaborate with the Government of India and WHO in arranging a nutrition training course in Calcutta during the last three months of 1951.

A regional nutrition officer will be assigned to the Far East to develop suitable programmes in that region.

A further meeting of the Nutrition Committee for South and East Asia will be held in 1952.

A nutrition officer will continue in 1951 to assist the Government of Thailand to initiate practical work in the field of nutrition, with special reference to education.

2.3.1.2.4 *Latin America*

(a) *Central America and the Caribbean*

Collaboration with INCAP will be continued and a member of the staff will be attached to INCAP during part of 1951. She will be concerned with dietary surveys and the training of workers from various parts of Latin America.

A Caribbean Conference on Home Economics and Nutrition Education will be held in 1952 ; this was planned for March 1951 but had to be postponed.

(b) South America

A regional nutrition officer, stationed in Santiago, Chile, will be mainly concerned with the implementation of the recommendations of the Montevideo and Rio de Janeiro Nutrition Conferences.

A symposium covering selected subjects of importance will be arranged at a convenient centre in South America in 1952.

2.4 FAO Technical Assistance Programme, 1951 and 1952

Requests from governments for technical assistance in the field of nutrition can be divided into four main categories : general advisory and consultative services ; assistance in specific nutrition projects ; training and education ; food technology. In addition, the Division will be responsible for projects related to home economics.

In many instances, the proposals for assistance put forward by Member Governments have not been entirely satisfactory or do not fall legitimately within the sphere of technical assistance. In such circumstances, it is often necessary to make a preliminary survey of the situation and undertake detailed discussions with the government concerned. As a result, projects which are feasible, satisfactory from a nutritional point of view, and suited for inclusion in the Technical Assistance Programme in respect of cost, etc., can usually be designed.

The development of TAP will increase very considerably the work of FAO in the nutritional field. At the beginning of 1951, the number of field officers and fellowships asked for amounted to about 15 and 25 respectively. Requests for the provision of some equipment had also been received.

The projects referred to below are either already in operation, have reached the stage of formal agreement with the countries concerned but have not yet been initiated, or are expected to be embodied in formal agreements during the first quarter of 1951.

2.4.1 General advisory and consultative services

The countries making requests under this head include Finland, Indonesia, Portugal, and Thailand. The projects cover periods varying from four months to one year.

2.4.2 Assistance in specific nutritional projects

Requests under this head are concerned with specific aspects of nutritional programmes, such as dietary surveys, supplementary feeding, and education in nutrition. Countries presenting such requests include : Brazil, Colombia, Costa Rica, Ecuador, Haiti, Mexico, Peru, and Thailand.

2.4.3 Training and education

(a) *Fellowships.* Requests for fellowships have been made by : Colombia, Ecuador, Finland, Indonesia, Mexico, Peru, Portugal, and Thailand. The various fellowships are concerned with training in the technique of dietary surveys, educational methods, research techniques, and certain aspects of food technology. Some of the fellowships will be granted for work in specific institutions, mostly in the developed countries ; others are to enable workers to attend regional training courses.

(b) *Training courses.* A project is under consideration whereby assistance will be given to INCAP to extend facilities for training suitable personnel from Latin American countries, particularly in the technique of surveys of diet and state of nutrition. This project will be carried out in collaboration with WHO.

FAO will participate in the nutrition training course in Calcutta, which will be a collaborative effort on the part of the Government of India, FAO, and WHO, and will be arranged largely through TAP.

2.4.4 Food technology

Requests for assistance in this field have been received from : Brazil, Ecuador, India, Indonesia, Mexico, and Thailand.

2.4.5 Home economics

Home economics experts are working on projects in Mexico and Syria. Consideration is being given to the organization of a home economics "workshop" in Syria during the summer of 1951.

2.5 WHO Programme, 1951

The WHO field programme is developed by the Regional Directors in response to specific requests from governments. In 1951 the only specific request to be financed from the regular budget is from Yugoslavia for a return visit of the consultant to provide further assistance in developing the nutrition training centre in Zagreb.

In order that the Regional Director may be able to study further the needs of countries in respect of assistance and if necessary carry out surveys, provision has been made in each of the regions in the 1951 budget for a number of short-term consultants. These consultants can be used as circumstances warrant.

Provision has been made in the headquarters programme for a short-term consultant to assist in the development of leadership activities in

association with the United Nations and with the other specialized agencies (that is, the exploratory phase of new activities or new phases of existing activities).

Requests for activities to be financed by the United Nations Technical Assistance Programme for Economic Development include a request from the Government of India for assistance in association with FAO to conduct a nutrition training centre in Calcutta, and a request from Iran for a nutrition consultant to develop a nutrition programme for that country.

2.6 WHO Programme, 1952

Specific requests have been received from Afghanistan for a consultant for six months to conduct a nutrition survey of infants and children. Burma has requested a consultant for three months to conduct a nutrition survey and advise on the future programme. Yugoslavia has requested three lecturers for a period of approximately eight weeks to participate in the nutrition training centre to be established at the Zagreb institute.

As in 1951, provision has been made for a number of short-term consultants to operate in each of the regions to assist the Regional Director to extend existing nutrition activities and develop new projects.

2.7 Comments on the FAO Programme

(a) The committee notes that the FAO nutrition programme is in general accord with recommendations made by the FAO Standing Advisory Committee on Nutrition and by the Joint FAO/WHO Expert Committee on Nutrition at its first session.

(b) In 1949-50 publications have been issued on the composition of foods, calorie requirements, methods of making dietary surveys, and techniques of education in nutrition. These studies will be of value both to governments and individual technical workers and are already being put into use in connexion with advisory services to governments, the training of personnel, and the technical work of the headquarters' staff.

(c) The committee commends the increasing attention which has been given to the application of nutritional principles in the analysis and review of food situations in member countries, production and consumption targets, and programmes of food distribution and utilization. It believes that such work will make more profitable the discussions on food consumption targets and forward estimates of food production and supply at FAO Annual Conferences and regional meetings. The study of calorie

requirements referred to above is of importance to this aspect of the broad programme of FAO. The assessment of requirements of other nutrients, for example protein, will also be closely relevant, and the committee considers that work on this subject should be continued.

(d) The decision of the Director-General of FAO to associate the work of the organization on home economics with nutrition can lead to fruitful results. Since problems of food and nutrition are closely interlocked with other problems of the home and family, education in general home economics will supplement and reinforce education in nutrition.

(e) In the programme as a whole greater emphasis should be laid on providing direct assistance to governments in applying nutritional knowledge and appropriate techniques. Such assistance should be particularly concerned with problems of food production, distribution, and consumption. It is hoped that this development will be facilitated through the resources available under TAP.

2.8 Comments on the WHO Programme

(a) The committee recognizes that in the field of nutrition, as in other activities of the Organization, one of the primary functions of WHO is to assist governments in the development of national services to promote health through better nutrition. Reports presented to the committee indicate that, in response to requests from governments, WHO has rendered assistance in this direction to Egypt, India, and Yugoslavia.

(b) In its leadership role in the field of nutrition in relation to health and disease, WHO has initiated studies, either alone or in association with FAO, on kwashiorkor, the assessment of nutritional status, endemic goitre, and infant feeding. In the opinion of the committee, these studies are in themselves important contributions to human welfare, but their most important aspect—the practical application of this knowledge—remains to be developed and should form a basis of future programmes. In respect of kwashiorkor and the problems of infant feeding, the committee hopes that there may be opportunities for expansion in this direction in the areas where these problems occur, and that it may be possible for some of the short-term consultants listed in the programmes for 1951 and 1952 to be used to this end.

(c) The committee has prepared an interim *Guide to nutrition workers on the assessment of nutritional status* (see section 10, page 45). The committee at its present session endorses the recommendations made at the first session relating to studies on the methodology of the assessment of nutritional status, in particular,

" that WHO seek the co-operation of one or more governments in each region in applying methods of assessment, in order both to further investigations into nutritional status in these countries and to ascertain the most suitable methods of assessment for application in the region under consideration ; " ¹⁵

In the opinion of the committee this kind of work should receive high priority in the field programmes of WHO in the immediate future.

(d) The committee notes that investigations have already been made into the iodization of crude salt and endorses the proposal for field trials on the iodization of crude salt when a satisfactory method has been developed in the laboratory.

(e) The committee notes that at its first session recommendations were made for studies on the following problems :

- (i) nutritional disorders of the eye (in parts of Africa and Asia preventable blindness due to nutritional deficiency is common) ;
- (ii) relation of the state of nutrition to resistance to parasitic diseases ;
- (iii) blood dyscrasias believed to be due to malnutrition ;
- (iv) fluorosis and lathyrism.¹⁶

It seems that the opportunity has not yet occurred for these recommendations to be put into effect. The committee suggests that, should funds become available for studies in 1951 and 1952, first priority should be given to the continuation of work already undertaken, e.g., on kwashiorkor, the problems of the assessment of nutritional status, endemic goitre, and infant feeding. The problem of vegetable protein diets of suitable biological value is of great importance to vast areas of the world as it is closely related to the prevention of kwashiorkor (see section 3, page 22). The standardization of anthropometric techniques in the appraisal of nutritional status would also be of great value in all countries.

The committee recommends the following order of priority for the initiation of additional projects should resources become available :

- (1) the development, in close collaboration with FAO, of vegetable protein diets of high biological value for the attainment of permanent nutritional improvement in underdeveloped areas especially in relation to diets for infants and children ;
- (2) the study of the relationship of parasitic infections to the nutritional state ;
- (3) a survey of the problem of nutritional disorders of the eye in Africa and Asia ;

¹⁵ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 21

¹⁶ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 8, 9

(4) other projects mentioned above. (These should receive attention as rapidly as circumstances permit.)

The committee envisaged several stages in handling problems of this nature. They are :

- (a) collection of sufficient information to be able to define the problem ;
- (b) dissemination of information obtained ;
- (c) framing of practical measures which might be immediately applicable in the solution of the problem ;
- (d) exploration of ways and means by which help may be obtained in applying such measures ;
- (e) definition of the unsolved aspects of the problem ;
- (f) devising and putting into effect the means by which appropriate research might be initiated.

2.9 Training Programmes

The following applies to both Organizations :

Considerable attention is being given by FAO and WHO to the training of workers in nutrition both through the ordinary programme and through TAP. In this connexion reference may be made to the regional training courses organized jointly by the two Organizations in collaboration with Member Governments. The committee considers activities concerned with the training of workers in nutrition to be of great importance (see section 7, page 35). It stresses, however, the necessity, in developing this part of the programme, for a critical evaluation of the training methods and subject-matter of training courses, and of the practical results obtained through giving fellowships to trainees for study in other countries.

2.10 Co-ordination and Continuity

The committee devoted considerable time and thought to the responsibilities arising out of recommendations (1) and (2) in section 8.7 of the report on the first session of the committee relating to :

- (1) co-ordination of effort in nutrition maintained :
 - (a) at the headquarters level, by continued close liaison including the interchange of information on all plans and activities ;
 - (b) at the regional level, by regular conferences of regional officers of the United Nations organizations, a form of co-operation already initiated as between FAO, WHO, and the United Nations Economic Commissions ; and

(2) periodic meetings of a joint nutrition committee convened in order to survey afresh the whole question of co-operation, to review work done, and to consider future plans.¹⁷

The committee believes that some clarification of its responsibilities and specific terms of reference, in relation to the above recommendations, will be of value at future sessions. This is particularly desirable in view of the different administrative arrangements of FAO and WHO with respect to expert advisory committees and the possibility of future change in these arrangements.

Recommendation (1) refers to the co-ordination of effort in nutrition. A combined approach such as is implied in the existence of the joint committee is essential for the avoidance of overlapping and the full and satisfactory development of the activities of the two Organizations. With regard to (2), the committee wishes particularly to stress the necessity for ensuring continuity and for appropriate preparation for its sessions.

It is desirable that there should be continuity of policy and action between one session and the next. The committee is not in a position to advise on the administrative arrangements needed to secure this end but reiterates its belief in the importance of such continuity.

2.11 Preparation for Joint Committee Meetings

It is of the greatest value in the consideration of complicated technical subjects that their preliminary exploration should be initiated and relevant documentation be prepared well in advance of the meeting. A valuable function of the committee at any given meeting would be to suggest subjects which could appropriately be placed on the agenda of the next meeting. Study of these should be initiated as soon as possible in the interval between sessions by the two Organizations in consultation with technical experts, e.g., in the case of WHO, with its Expert Advisory Panel on Nutrition. As an example of such a procedure, the committee suggests that its present interim report on nutritional assessment (see section 10, page 44) be referred by correspondence to qualified experts for opinion and comment, with a view to possible revision at the next session.

2.12 Collaboration with Non-Governmental Organizations and Scientific Bodies and Workers

Various nutrition problems of worldwide importance are referred to in this report, and there are many others which need to be studied and attacked. While FAO and WHO are in a position to examine such problems on a wide

¹⁷ *World Hlth Org. techn. Rep. Ser.* 1950, 16, 12

geographical scale and to assess their relative importance, much of the basic work needed for their satisfactory clarification and solution is beyond the resources of FAO and WHO alone.

At its first session, the committee emphasized the need for enlisting the interest of non-governmental organizations in the work of FAO and WHO in the field of nutrition and for maintaining "close association with international scientific organizations, funds, and foundations so that there is a mutual exchange of technical information".¹⁸ The present committee reaffirms this recommendation and expresses the view that the two Organizations can make a valuable contribution by (a) bringing together active workers concerned with specific problems for discussion and exchange of information, and (b) attempting to stimulate and secure the interest of research bodies and foundations in nutrition problems of practical importance.

3. KWASHIORKOR

At its first session, in October 1949, the committee briefly considered the subject of kwashiorkor. The evidence then available led the committee to state: "One of the most widespread nutritional disorders in tropical and subtropical areas is a syndrome at present ill-defined known by various names such as 'kwashiorkor'."¹⁹ The committee recommended that WHO should conduct an inquiry into the various features of kwashiorkor with the object of collecting information on the epidemiological and sociological aspects of the syndrome including the possible relationship of the diet of infants during the weaning and post-weaning periods to its etiology.

FAO collaborated with WHO in carrying out the first phase of such an investigation, and arrangements were made for Dr. J. F. Brock, Professor of the Practice of Medicine, University of Cape Town, Union of South Africa, and Dr. M. Autret, Chief, Area and Field Branch, Nutrition Division, FAO, to make a survey in Africa.

At this second session, the committee had before it the report on kwashiorkor in Africa by Brock & Autret.²⁰ In this survey the investigators visited the following territories or countries: Belgian Congo, French Equatorial Africa (Middle Congo), French West Africa (Senegal), Gambia, Gold Coast, Kenya, Liberia, Nigeria, Ruanda-Urundi, and Uganda. By direct observation, and through interviews and discussions with the health and agricultural authorities and other people in contact with

¹⁸ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 23

¹⁹ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 15

²⁰ Brock, J. F. & Autret, M. (1951) *Bull. World Hlth Org.* **5** (in press); to be published also, in English and in French, in the *World Health Organization: Monograph Series*, as No. 8.

the problem, information on the following phases of the subject was collected :

- (1) the clinical features, with the object of establishing a definition of the syndrome ;
- (2) the incidence of the syndrome ;
- (3) the food habits of the populations among which the syndrome occurs with varying degrees of severity or does not occur, with particular reference to diet during pregnancy, lactation, infancy, and early childhood, and the relation between food habits and its incidence ;
- (4) the part played in causation by other factors, such as tropical parasitism ;
- (5) the most effective treatment ;
- (6) preventive measures.

The committee desires to express its gratification at the success of this mission and to compliment the authors on the excellence of their report. In the opinion of the committee it should be given the widest possible circulation.

The following is a summary of the findings of the investigators :

“ If a wide interpretation is put on the term kwashiorkor, then it was encountered in every part of Africa surveyed, i.e., the whole tropical belt between Zanzibar and Dakar ; it is also found in the Union of South Africa and in Egypt. There are, however, great differences in its incidence in different areas and in different tribes, which can be correlated with differences in diet. Carnivorous races, such as the Masai in Kenya, and races which produce large quantities of cows' milk, such as the Batussi of Ruanda-Urundi, appear to be wholly exempt. In races which subsist largely upon staple foods which are deficient as regards the quantity or quality of the proteins they contain, such as cassava, plantains, yams, and maize, a variable high incidence is found. The consumption of animal protein, such as meat, fish, and milk, in reasonable quantities is protective. There is some evidence that supplementation with vegetable protein, such as beans, peas, and ground-nuts, is also protective.

“ The syndrome cannot at present be precisely defined but the fundamental group of signs is constituted by (a) retarded growth in the late breast-feeding, weaning, and post-weaning phases with (b) alterations in skin and hair pigmentation, (c) oedema, (d) fatty infiltration, cellular necrosis, or fibrosis of the liver, (e) heavy mortality if better protein is not supplied in the diet, and (f) a variety of dermatoses commonly but not invariably associated. There is a gradual transition of clinical features from kwashiorkor to marasmus and it is impossible at present to define clearly the borderline between these two syndromes.

“ Kwashiorkor is not obviously different from ‘ Mehl Nährschaden ’ and post-weaning protein-deficiency syndromes in colder climates except in the pigmentary disturbances in skin and hair. Although this report is confined to the features of a syndrome occurring in Africa, it is recognized that the name may justifiably be applied to closely similar syndromes occurring in other parts of the world. It is felt, however, that the use of this term for syndromes in which dyspigmentation is not a feature is etymologically incorrect.

"The particular age distribution of kwashiorkor is best explained on the basis that the period 1-4 years is a period of high protein requirement whereas under African conditions it is the period of life at which protein intake is likely to be the lowest. The relation between the protein requirements of children and the supply of protein actually available is considered in some detail in the report. Attention is drawn to the possibility that deficiency of certain amino-acids, particularly methionine, may be a basic causative factor.

"The syndrome still causes a high mortality in many areas. Mortality can be greatly reduced by treatment with skim-milk powder. This fact is still incompletely appreciated in many parts of Africa with the result that mortality is unnecessarily high.

"World maps of the distribution of kwashiorkor, and of the high incidence of adult cirrhosis and primary carcinoma of the liver, overlap to a very large extent but not completely. Parasitic disease may play a part in the production of adult cirrhosis, but the overlap with kwashiorkor and the evidence of the effects of protein deficiency in producing experimental cirrhosis suggest the possibility that all three conditions may be produced in the main by protein-deficient diets. This assumption is for further research. On the other hand, there is evidence that the relationship of adult cirrhosis and primary carcinoma of the liver to kwashiorkor is not one of direct sequence.

"The precise frequency and importance of kwashiorkor and its sequelae are difficult to estimate until the relationship of dyspigmentation and adult cirrhosis to the syndrome are more completely understood. A wide and general appraisal of its nature and relationships suggests that it is the most serious and widespread nutritional disorder known to medical and nutritional science."

During the discussion of the report on *Kwashiorkor in Africa*, members of the committee from Egypt, India, and South America each reported that the same or a closely related syndrome was common in their countries. However, it is apparent that the dominant clinical features of the syndrome vary from place to place; this may in part be due to the differences in the nutritive value of the diet of infants and young children in the different areas.

It is evident that many of the doctors and medical assistants in some of the areas where the syndrome appears to exist are acquainted neither with the clinical features of the condition nor with its relationship to diet. It is also possible that many cases are, at present, diagnosed incorrectly and, as a consequence, are not properly treated.

The evidence available shows that the most satisfactory form of treatment, at present known, for several forms of the condition is dried skim milk. It is possible that related syndromes may require in addition other specific medicaments, such as vitamin concentrates. Where dried skim milk has been used the mortality-rates have fallen in a most dramatic way. Unfortunately, this fact does not appear to be as widely known as it should be.

In the opinion of the committee steps should be taken to spread knowledge of both the clinical features of the syndrome and the use of skim milk for its treatment in those regions where the disease is known to occur,

or where the general conditions of life suggest it does occur although up to the present it has not been recognized.

The prevention of the syndrome calls for a general improvement in the diet of the whole population and especially the diets of pregnant and nursing women, of infants, and of children. In most places this calls for an increase in the supply of foods rich in protein and the incorporation of the latter in adequate amounts in the diet of pregnant and lactating women, and infants and children. These aspects of the problem are discussed at length by Brock & Autret, and the committee has based its recommendations relating to prevention on those contained in their report.

3.1 Dissemination of Information

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS

1. that the attention of governments should be drawn to the need for dissemination of knowledge of kwashiorkor among their physicians and medical assistants with particular emphasis on the ease with which the syndrome can be treated by the administration of dried skim milk ;
2. that the Brock-Autret report in English, French, and Spanish should be widely distributed as one of the means of disseminating knowledge.

3.2 General Preventive Measures

The following measures for the prevention of kwashiorkor are largely based on the material contained in the Brock-Autret report and relate specifically to Africa. Many of them are, however, probably applicable to the problem of kwashiorkor in other parts of the world.

It is necessary that food production should be developed so that the foods which prevent kwashiorkor are made available in greater quantities. Among animal foods, fish is of primary importance, since its production can be rapidly increased, while to increase the production of milk and meat would be a lengthy and difficult process. With regard to vegetable foods, attention should be given to the yield of protein per unit area as well as to the yield of calories. Cereals, particularly millets, sorghums, and rice, should be grown wherever possible in preference to manioc. The production of pulse and vegetables, especially green leafy vegetables, should be expanded on village lands and in village kitchen-gardens, and steps taken to encourage the local consumption of ground-nuts.

Steps should be taken to relieve shortages of food in the "hungry months", e.g., through suitable stored reserve stocks of food, both on the family and the community scale.

The foods needed to prevent kwashiorkor must be made available to mothers and children through increased production and appropriate supplementary feeding programmes. In conjunction with these measures, educational campaigns to improve methods of feeding children, especially during the weaning period, should be developed. In particular, sustained efforts to educate mothers are needed.

An important method of attacking kwashiorkor is by means of the "demonstration area" technique. This involves the selection of a suitable area in which kwashiorkor is prevalent, and the development within this area of an appropriate combination of preventive measures. The information and experience obtained in the demonstration area can subsequently be applied elsewhere in the world. While the organization of a suitable demonstration project must be the responsibility of the government of the territory in which it is located, FAO and WHO should be ready to render any assistance possible, at the request of the government concerned.

In most hospitals, outpatient departments, and medical centres skim milk is not now available for the treatment of kwashiorkor. Immediate steps should be taken to provide skim milk for this purpose. The most important use of this milk will be in the treatment of fully established cases of kwashiorkor, but it may also be given to patients in the early stages and thus help to prevent the occurrence of the disease in severe form. Consideration should also be given to methods of distributing skim milk as a preventive measure to potential and incipient patients through medical centres attended by expectant and nursing mothers, and infants and young children, large numbers of whom come under medical supervision in the various territories.

While the provision of skim milk should essentially be the responsibility of governments, the committee understands that UNICEF may co-operate with governments in making it available for the important purposes referred to above.

Apart from treatment, the use of skim milk should be regarded as a temporary and immediate measure, and the main emphasis in prevention must lie on the provision of locally produced foods which will fulfil the protein requirement of mothers and children.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS

1. that FAO and WHO draw the attention of governments to the measures outlined above ;
2. that FAO and WHO convey to UNICEF the importance of skim milk in the treatment and prevention of kwashiorkor.

3.3 Further Investigations

Although much has been learned about the syndrome in recent years through investigation by workers in various parts of the world, many problems remain unsolved. Much further knowledge is needed for the effective prevention and control of the disease. The committee draws special attention to the following :

3.3.1 Problems relating to kwashiorkor and dietary patterns

(i) Extended investigations of the incidence of kwashiorkor and dietary habits in different areas and groups should be made in order to throw more light on the relation of the disease to diet. More quantitative dietary studies are particularly needed.

(ii) Further knowledge is needed on the food intake of children during the weaning period in different areas. Quantitative data on the intake of foods and nutrients should be obtained. Study of the quantities of breast milk obtained by infants is an important part of such investigations.

(iii) Further study is called for on the combination of foods and the kinds of diet needed by mothers and children to prevent kwashiorkor. In approaching this problem, work in the field of animal husbandry concerned with supplying young animals with vegetable foods rich in protein as a substitute for milk may provide suggestive analogies.

(iv) More information is needed on the suggestion that the consumption of pulse and vegetables in satisfactory amounts has a kwashiorkor-preventive effect. This should include the kinds of pulse and vegetables which are most valuable in prevention and the quantities of these required. It may also be possible to develop new varieties which have a greater preventive effect than varieties already in use. Field trials on an experimental basis would help to throw light on these problems.

(v) Data should be collected on the best methods of cooking and serving pulse (including ground-nuts) and other foods. In devising and introducing improved mixtures and preparations, full account must be taken of local customs respecting the preparation of foods.

(vi) The customs followed in different areas in the weaning of children and in feeding children between weaning and puberty should be studied in relation to the incidence of kwashiorkor.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS

1. that FAO and WHO take the above facts into consideration in planning further work on kwashiorkor ;

2. that FAO and WHO call the attention of governments and scientific workers to the need for investigation designed to throw light on the above problems.

3.3.2 Problems relating to the character and recognition of the syndrome

(i) It is essential to study further the natural history of the disease, including mortality, and the question of recurrence and residues in later life. Information is needed on the possible relationship between kwashiorkor in infancy or childhood and the development in adults of cirrhosis and of primary carcinoma of the liver.

(ii) There are particularly important problems with a bearing on diagnosis and prognosis. These include the cause of unexpected deaths during treatment. Information is needed on clinical and biochemical measurements which would be of practical value in this connexion.

(iii) While metabolic defects appear to be basic to the syndrome, these have as yet been insufficiently investigated. In particular, further research is needed on nitrogen metabolism in untreated patients and in patients under treatment, and on the reasons for fatty infiltration of the liver and its disappearance under treatment. The specific metabolic fault which causes dyspigmentation, and the effect of over-consumption of carbohydrates on metabolism and the clinical pictures, require further systematic study.

(iv) Studies should be made of the quantity and quality of the breast milk of the mothers of infants suffering from kwashiorkor with special reference to the observation that the syndrome may occur before weaning. In these studies attention should be given to the B vitamins and the proteins of the whey.

(v) Many observers believe that parasitic infestation has an important influence on the incidence and, possibly, the character of the syndrome. Since parasitic infestation is widespread in most areas in which the syndrome occurs, its relationship to kwashiorkor should be investigated.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS that institutions and workers planning investigation in this field should give consideration to the above observations.

3.4 Future Work on Kwashiorkor by FAO and WHO

Further surveys are needed to supplement the survey already made in Africa. Among the objectives of these will be the creation of wider interest in the problem, information on whether the syndromes occurring in other regions correspond in detail with those observed in Africa, and the stimu-

lation of regional studies by local experts on the nature of the syndrome and the practical measures needed for prevention.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS

1. that early consideration be given to the prevalence of kwashiorkor and associated conditions in Latin America, by measures along the following lines :

(1) the attention of governments in this region, and of workers in medicine, public health, agriculture, and other spheres, should be drawn to the importance of the problem by the circulation of the Brock-Autret report ;

(2) FAO and WHO should draw the attention of governments in the region to the need for collection of information in the territories along the lines of the Brock-Autret report ;

(3) on request by governments, FAO and WHO should send one or more experts to collaborate with local experts, to collect additional information, and to organize areal seminars. These seminars would give local clinicians and nutrition workers the opportunity to exchange information, to plan further investigations, and to consider the control of the condition in their area through public-health and other preventive measures ;

(4) FAO and WHO should consider the possibility of making available fellowships for the advanced training of scientific workers to study problems related to kwashiorkor and allied conditions, should this appear to be of value in preventive campaigns ;

2. that FAO and WHO should, if requested by the governments concerned, assist in organizing a meeting of agencies and individuals in Africa to consider problems of infant and child nutrition, particularly problems to which attention is drawn in this report ;

3. that FAO and WHO should give consideration to the organization of a survey on kwashiorkor and other nutritional problems of infants and children in South-East Asia and in the Western Pacific region.

4. PLACE OF APPLIED NUTRITION IN PROGRAMMES FOR PROMOTING ECONOMIC AND SOCIAL PROGRESS

In many parts of the world various methods are being employed for promoting economic and social progress in urban and rural areas ; these may be " demonstration areas ", community welfare centres, development units, or programmes for mass education.

The FAO Standing Advisory Committee on Nutrition recommended the following in its second report :

" e) The improvement of nutrition in selected ' demonstration areas ' by programs calling for the co-operation of experts in nutrition, agriculture, animal husbandry, fisheries, sociology, cultural anthropology and home management.

These ' demonstration areas ' can serve as training grounds for field nutrition workers. Essential data can be collected which may be applied more widely at a later stage." ²¹

The first FAO Conference on Nutrition Problems in Latin America also recommended :

- " 1. That Governments should, if they have not already done so, select suitable demonstration areas in which experts in agriculture, public health, home management, etc., can cooperate with experts in nutrition in a program of general development, and that the technical advice and assistance of FAO should be sought in selecting suitable areas and in carrying out the program.
2. That there should be continual exchange of ideas and information between countries with regard to existing or projected demonstration areas and the experience derived from their operation." ²²

A similar recommendation was made by the second Conference on Nutrition Problems in Latin America.²³

The FAO Standing Advisory Committee on Nutrition, at its third meeting in 1948, discussed demonstration projects to be undertaken jointly by FAO and WHO with particular reference to malaria and food production.²⁴

Since there was evidence of encouraging results obtained in demonstration areas in Africa, the Inter-African Conference on Food and Nutrition recommended :

- " (i) that such experiments should continue, or new ones be initiated, within clearly defined areas ;
- (ii) that in these areas thorough studies of the state of health and the conditions of local food production should first be carried out ; " ²⁵

²¹ Food and Agriculture Organization of the United Nations, Standing Advisory Committee on Nutrition (1947) *Second report to the Director-General*, Washington, D.C., p. 3 (Document N/N2/18)

²² Food and Agriculture Organization of the United Nations (1950) *Nutrition Conference, Montevideo, July 1948*, Montevideo, p. 182

²³ See Food and Agriculture Organization of the United Nations (1950) *Report of the Second Conference on Nutrition Problems in Latin America, Rio de Janeiro, Brazil, 5-13 June 1950*, Washington, D.C.

²⁴ See Food and Agriculture Organization of the United Nations, Standing Advisory Committee on Nutrition (1948) *[Third] report to the Director-General*, Washington, D.C., p. 5 (Document N/N3/10).

²⁵ *Conférence interafricaine sur l'Alimentation et la Nutrition, Dschang, Cameroun, 3-9 octobre 1949 [1950]* Paris, p. 472

Poverty and ignorance are regarded as the two main causes of widespread malnutrition in underdeveloped countries. Measures designed to eliminate poverty require an effort on the part of the people which, because of their poor state of health due to malnutrition and associated diseases, they may not be able to make. Moreover, in rural areas and especially among primitive communities, the time available to the people, and the efforts of which they are capable, may already be expended in the production, procurement, and preparation of food; work on new activities must, therefore, inevitably interfere with food supplies. In some parts of the world where women play a key role in food management, special consideration must be given to the impact on the food economy of changes in occupation resulting from economic development.

Notwithstanding the advantages gained by improvements in economic and social conditions, the sustained health and well-being of the community will remain dependent on the care given to mothers, infants, and children; the need for such care is clearly shown in the section on kwashiorkor in this report. It is also important to remember that increase in the size of a population may follow, for a time at least, the eradication of diseases including malnutrition, and that the amount of food required for a community may increase in the course of economic progress. Not infrequently "progress" in the past has been accompanied by deterioration in health, partly owing to replacement in the dietary of traditional nutritious foods by sophisticated foods of inferior value. It follows that, if instruments and measures designed to produce economic development, to promote social welfare, and to extend education are to be successful, they must, therefore, include provision for securing and maintaining an adequate food-supply and a good state of nutrition.

In various parts of the world, demonstration-area techniques have been successfully employed in the improvement of health and nutrition. The nutrition work needed in such areas would in the first stage include surveys of the nature and amounts of foodstuffs produced and consumed, methods of preparation and nutritive values, food habits and customs and attitudes, and the assessment of the stage of nutrition of the members of the community. It would be associated with work in the sphere of home economics.

Techniques would then have to be evolved for effecting improvements in nutrition. In designing these account must be taken of the food production possibilities in the area and of the attitude of the people towards foods as well as of their habits, customs, and social organization. The people of the community should understand as fully as possible the nature of the work and their co-operation must be secured. Their own leaders should be fully convinced of the value of the programme so that they will in turn encourage the people to continue with the work initiated in the demonstration. One main criterion of success must be a permanent improvement

in the health, nutrition, and well-being of the people ; the states of nutrition would, therefore, need to be reviewed periodically. Demonstration areas of small size are suitable for preliminary work on nutrition and allied subjects in places in which conditions are unfamiliar and in which it is necessary to work out techniques appropriate to the community concerned. New problems, especially problems concerned with the training of personnel, would emerge as expansion or extension of the demonstration project was justified by success on a small scale.

It is imperative that the staff taking part in demonstration projects should be suitable for field work, and have a knowledge of the special technical problems arising in this type of work, ability to understand and sympathize with the attitude of the members of the community in which they work, and ability to co-operate with their colleagues in associated fields. (The training of personnel for applied nutrition work in under-developed communities is considered elsewhere in this report—see section 7, page 35.) Participation in, or association with, work in projects of the kind envisaged is the most effective way of training workers.

It is implicit in this statement that there should be mutual understanding and the closest collaboration between the nutrition workers and the agricultural experts, public-health workers, economists, sociologists, and others engaged in the project.

The committee considers that the comments made above are relevant to the Resolution adopted by the Social Commission of the United Nations in March 1951 on the use of community welfare centres throughout the world. The Social Commission recommended that the Economic and Social Council should request the Secretary-General of the United Nations :

“ 1. To compile, in co-operation as appropriate with the specialized agencies and non-governmental organizations and with the assistance of the governments of Member States on whose territory such experience has been gained, full documentation on

- (a) the varying objectives and scope of such centres ;
- (b) the varying methods used in establishing and operating the centres ;
- (c) the success achieved and difficulties met ; ” ²⁶

The committee expresses the hope that, in the general approach to this task, adequate consideration will be given to the place of nutrition in the activities of community welfare centres both in urban and rural areas.

²⁶ United Nations, Economic and Social Council (1951) *Economic and Social Council. Official Records : thirteenth session. Supplement No. 12—Social Commission : Report of the seventh session*, New York, p. 8 (Document E/1982 : E/CN.5/254)

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS

1. that FAO and WHO take steps to ensure that improvement in nutrition is included in the objectives of the various projects being planned or in operation in the countries of Member Governments to secure economic and social progress ;
2. that FAO and WHO give all possible assistance, including provision of key personnel, in evolving, developing, and applying these projects ;
3. that FAO and WHO give special consideration to the establishment of small pilot demonstration schemes for community welfare and development in which special emphasis is placed on the solution of the nutrition problems of underdeveloped countries.

5. PREVENTION AND TREATMENT OF SEVERE MALNUTRITION OF CIVILIAN POPULATIONS DURING WAR PERIODS

The committee was asked by the Director-General of WHO to consider the following resolution of the Third World Health Assembly :

“ The Third World Health Assembly . . .

3. REQUESTS the Director-General to refer to the Joint FAO/WHO Expert Committee on Nutrition at its next meeting, for further study, the various aspects of prevention and treatment of severe malnutrition, particularly

- (1) recommendations concerning the storage of food by governments as well as by private persons, in order to diminish the risk of severe malnutrition and starvation ;
- (2) the overall measures to be taken in planning the conservation and distribution of available stocks of food so as to prevent starvation and severe malnutrition in populations living under conditions of severe lack of food ;
- (3) the proper treatment of patients suffering from starvation ;
- (4) measures to be taken during relief activities to prevent the deterioration of the physical and mental state of persons suffering from varying degrees of under-nutrition in the different types of famine ;
- (5) the organization of general relief activities in relation to nutrition when famine conditions prevail, and
- (6) any other measures that might be deemed recommendable for the prevention of disease and death caused by severe malnutrition and starvation.”²⁷

The Director-General had already arranged for the various aspects of this problem to be considered by groups of specialists. It was considered that, for the purposes of study, the whole problem could be divided into

²⁷ Resolution WHA3.40, *Off. Rec. World Hlth Org.* 28, 29

three parts: part I, relating to items (1) and (2); part II, covering items (3), (4), and (6), relating to the physiological, clinical, and therapeutic aspects of the problem; and part III, limited to item (5), concerning the organizational aspects of relief programmes. The Director-General had submitted parts I and III to a group of consultants,²⁸ and had asked Professor Ancel Keys to prepare a preliminary statement on those aspects of the problem included in part II.

The reports of the working party and of Professor Keys, amalgamated into a comprehensive report,²⁹ were considered by the committee, endorsed, and transmitted to the Director-General.

6. NUTRITION AS A SUBJECT IN MEDICAL CURRICULA

The application of the principles of nutrition has lagged far behind the present state of knowledge. In part this is due to the tardiness in many countries of universities, licensing authorities, and others concerned with the education of medical students and public-health officers, in introducing systematic teaching of nutrition in medical schools and in public-health courses. The committee recalled the statement made in the first report of the FAO Standing Advisory Committee on Nutrition, which reads:

“The position of the doctor is unique; his opportunities of teaching and applying the principles of nutrition are unequalled by those of any other member of the community. For this reason, it is of great importance that his training in nutrition should be thorough. It is unlikely that any progress will be made in this matter until nutrition

²⁸ The group was composed of the following members:

Professor M. J. L. Dols, State Adviser on Nutrition, Ministry of Agriculture, Fisheries and Food, The Hague; Professor of Nutritional Science, University of Amsterdam, Netherlands (*Chairman*)

Professor W. Halden, Chairman, Food and Nutrition Division, Austrian Public Health Association, Graz-Kroisbach, Austria

A. Heilbronner, Maître des Requêtes au Conseil d'Etat; ancien Directeur au Ministère du Ravitaillement, Paris, France

Miss D. F. Hollingsworth, Ministry of Food, London, England

G. Mathieu, Secrétaire général de l'ex-Ministère du Ravitaillement et des Importations, Brussels, Belgium

A. K. Muggli, ancien Chef de la Section du Rationnement de l'Office fédéral de guerre pour l'Alimentation, Berne, Switzerland

Dr. F. W. Clements, Chief, Nutrition Section, WHO, and Miss T. Norris, Nutrition Division, FAO, acted as secretaries.

The Fourth World Health Assembly requested the Director-General of WHO, when arranging for the publication of this report, to change the title to read “Prevention and treatment of severe malnutrition in times of disaster”.

²⁹ See *World Hlth Org. techn. Rep. Ser.* 1951, 45.

holds a conspicuous place in the medical curriculum as approved by the statutory bodies which have this under their control.”³⁰

A recommendation was made at the first meeting of the FAO Standing Advisory Committee on Nutrition that

“ Pending the establishment of a nutrition division by WHO ... FAO should study the place given to the teaching of nutrition in the medical curricula in various countries.”³¹

The committee considered this matter was of such importance that ways of attaining more substantial results should be explored.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS that WHO draw the attention of Member Governments to the need for including adequate instruction on the principles and practice of nutrition in the teaching of medical students and in the training of public-health officers.

7. TRAINING IN NUTRITION IN UNDERDEVELOPED AREAS

7.1 Introduction

In many underdeveloped countries there is a lack of personnel trained in nutrition who can contribute to the improvement of the nutritional status of the population. In such circumstances the training of the necessary personnel of different kinds is of primary importance.

The object of the report presented below is to give indications of the various kinds of personnel who may receive training, of the activities which these can undertake when they have been trained, and the kind of knowledge and instruction they require for this purpose. Clearly, these indications must be general and cannot take the form of precise and final recommendations. It is the responsibility of each country to adapt them to local conditions and to the special needs of their peoples and to relate them both to practical possibilities and to local administrative arrangements. These reservations apply both to the composition of the various groups of personnel suggested below and to the application of the training programmes outlined for these groups.

It must be emphasized that the existence of a central nutrition service, or a national institute of nutrition, greatly facilitates the task of raising

³⁰ Food and Agriculture Organization of the United Nations, Standing Advisory Committee on Nutrition (1946) *First report to the Director-General*, Copenhagen, p. 7 (Document Con 2/Nu 1)

³¹ Food and Agriculture Organization of the United Nations, Standing Advisory Committee on Nutrition (1946) *First report to the Director-General*, Copenhagen, p. 7 (Document Con 2/Nu 1)

nutritional levels. This can indeed be undertaken even in the absence of such organizations. It must, however, be pointed out that since practical nutrition programmes must be put into effect by personnel belonging to various government departments—agriculture, public health, education, etc.—the existence of a co-ordinating unit is necessary.

One point cannot be too strongly stressed: the creation of a body of competent personnel calls in the first place for workers who are highly qualified in the field of nutrition. These must undertake the task of establishing and directing national programmes concerned with national nutrition problems in their various aspects. They must also enlist the services of the different groups needed for the practical execution of these programmes, and be responsible for their technical training. Through their activities a group of such “executive agents” can be organized, step by step, and these agents can in turn influence and instruct groups who are in direct contact with the people.

7.2 Types of Trained Personnel Required

In general, there are four categories of people who can receive training, ranging from a central directing group to a group at the local-community level.

7.3 Group I

This group includes trained nutrition workers who would direct a central nutrition service; their activities include the organization and conduct of essential laboratory and field research, and co-operation with officials responsible for the food and agriculture, and health and welfare programmes of the country.

7.3.1 Training

The training that should be given to people in this group will not be discussed in any detail here. There are many institutes of higher learning which provide adequate training of the kind needed. The majority of these are located in the more developed countries, and this presents some difficulties since, with few exceptions, the training given is not orientated towards the problems found in underdeveloped regions. For this reason it is important that people from underdeveloped areas should not be sent overseas for extensive study until they have worked for a number of years in their own country on nutrition problems in the field. They should then be aware of the nature of these problems and of the kind of training that they need to fit them more adequately to undertake further work in their own country. They should, if possible, also receive some short-term advanced training in an institution within the region in which problems of nutrition characteristic of the region are being investigated.

The training of specialized workers, e.g., biochemists, in research techniques is not considered here. It must be emphasized, however, that such specialized workers are needed to develop a satisfactory practical nutrition programme in any country or region.

7.4 Group II

This group consists of people who can play an important part in developing programmes in the field of nutrition and who form the working basis of a permanent nutrition service. They include officers attached to central medical and health departments, and to departments of welfare, agriculture, and education. Home-economics workers with standing and experience who have already had some training in nutrition and undertake nutrition work as part of their duties will also fall into this category. For the purposes of training, the group may also include people from group III who have a special interest in, and therefore aptitude for, nutrition work.

When trained, workers in group II can undertake the following:

(a) The organization of the kinds of inquiries needed to provide a basis for local programmes. They can help to determine the type of information required, the most appropriate techniques to be used in obtaining it, and the kind of training needed for the personnel in groups III and IV.

(b) The collection and interpretation of data on the existing situation in the country. In the light of these, combined with knowledge of local conditions in general, they can assist workers in group I to draw up an appropriate programme for the country as a whole.

(c) Participation in the training of groups III and IV.

7.4.1 Training

The training of this group is most effectively carried out in their own country or region. It must be related to the previous experience and background of the workers concerned and to the actual work which the trainees will undertake on completion of their training. It is important that any group of workers within this category receiving specific training should not be too large and should be as homogeneous as possible.

The training given may include the subjects listed below. The choice and range of subjects must, however, depend on local circumstances:

(a) *Common to all groups*

- (1) Principles of nutrition
- (2) Dietetics
- (3) Biostatistics
- (4) Principles of dietary and nutrition surveys

- (5) Psychology in relation to food and nutrition
 - (6) Nutrition education
 - (7) Economics and planning of family diets
 - (8) Food and population
 - (9) Composition of foodstuffs
 - (10) Effects of processing, preservation, and preparation on the nutritive value of foods
 - (11) Elements of food sanitation and control, including food laws and regulations
 - (12) Production, storage, and distribution of food
- (b) *Special for medical workers*
- (1) Nutrition and public health
 - (2) Nutrition surveys—advanced
 - (3) Clinical (hospital) studies
 - (4) Therapeutic dietetics
- (c) *Special for non-medical workers*
- (1) Dietary surveys (advanced training in methodology)
 - (2) Food economics and statistics (including food balance-sheets)
 - (3) Food management, planning, and policy
 - (4) Supplementary feeding schemes (school feeding, feeding of workers, etc.)

With regard to (c), highly specialized workers such as biochemists and statisticians may be given training which helps to orient them for work in the field of nutrition.

It is emphasized that the training programme must demonstrate the existing food situation in the country or countries to which the trainees belong, the local dietary patterns and habits, the intake of nutrients by various groups if this information is available, and the nutritional status of the total population or of special groups within the population. It must be orientated towards teaching the students ways and means of improving the nutrition of the population, using local sources and materials. Formalized lectures should be used as little as possible. A considerable amount of teaching should be given through seminars and discussion groups. There must be ample opportunity for the trainees to present for consideration and discussion the local problems of which they have knowledge and experience, and to obtain constructive suggestions as to how these may be solved. They should be taught by demonstration how to teach the people in groups III and IV and the general public. Methods of education in nutrition should, in fact, be one of the most important aspects of the training.

7.5 Group III

This group includes people whose work brings them into contact with the general population on a local basis and who should have some knowledge of nutrition in order to make the services they render to the population more valuable and effective. Among the important functions that they can fulfil is that of acting as teachers of the members of group IV. Included in group III would be local public-health and medical officers, public-health nurses, social welfare workers, home demonstration agents, home economists, and teachers and workers in agricultural advisory services.

It sometimes happens that workers in this category have, during the course of their basic training, received training which would enable them to undertake nutrition work without further specialized training. This is, however, likely to be the exception.

With adequate training the members of this group may appropriately undertake the following types of work :

(a) collection of information on which local programmes would be based, e.g., the dietary habits and patterns of the population, food consumption levels, food production potentialities, nutritional status, etc. ;

(b) general education of people in food selection and the preparation of food for the family, family food budgets, food selection in buying for household use, infant feeding, and the feeding of other vulnerable groups ;

(c) nutrition instruction in schools ;

(d) supervision of special feeding programmes, e.g., school meals, industrial canteens, etc. ;

(e) training of people in group IV.

7.5.1 Training

The necessary instruction can be given to people in this group either by training courses or workshops, or by in-service training. In each case it must be specifically related to local conditions prevailing in the areas where they work. It should be largely confined to demonstrations of methods of improving the nutritional status of the population and of imparting this information to the members of group IV so that they can effectively pass it on to the general population. For the training of this group to be effective, a nutrition programme for the area should be prepared in advance and the trainees should be told what part they are to play in implementing this programme. Since the training should be concentrated on the actual work to be done by the trainees, each group should be homogeneous, that is, there should be separate training courses for local medical officers, social welfare officers, sanitary inspectors, home-economics teachers in schools, public-health nurses, etc.

Medical and health officers may be given instruction on the dietary patterns of the population of the area, the nutritive value of the foods commonly consumed, the nutritional status of the vulnerable groups in that population, the signs and symptoms of undernutrition and malnutrition commonly seen in the area, and the ways in which nutritional status can be improved by changes in diet through the use of locally available foods.

Public-health nurses and sanitary inspectors should receive much the same training, instruction on the clinical detection of malnutrition, however, being omitted. Special emphasis should be placed, in their training, on measures for improving the diet of the vulnerable groups.

Social welfare officers can be given teaching concerned with the following :

- (1) The dietary patterns and food consumption levels in their area ; their good points and where they are lacking.
- (2) The nutrient value of the different foodstuffs available in the area, and how families can build better diets by proper selection at the lowest cost possible ; the place of food in the family budget.
- (3) The planning and preparation of meals to give the greatest nutritional value from the foods available.
- (4) The methods to be used in teaching housewives and the general public, and the types of materials to use in this work.
- (5) Methods of collecting information on dietary patterns and habits and on local methods of food preparation.
- (6) Nutritional needs in relation to age and activity.

Home-economics schoolteachers can be taught :

- (1) General nutrition—the principal elements in a balanced diet.
- (2) The ways by which information on these subjects can be introduced into the school syllabus.
- (3) Methods and materials for use in school nutrition programmes.
- (4) Planning and preparation of meals appropriate for schoolchildren, using local foods.
- (5) Planning and supervising school feeding programmes.
- (6) The part they can play in community nutrition programmes ; the general dietary patterns of the community, and ways and means of improving them.

The instruction for all these groups should be of a strictly practical nature. For example, in teaching appropriate methods of convincing home-makers of the importance of the proper preparation of foods, actual techniques should be demonstrated, not merely a description given.

Similarly, when being instructed in the planning of diets and meals to meet particular requirements, the trainees should be given the chance of actually preparing such meals.

The conditions and needs within a country may be such that it is desirable to train some people in this group in only one aspect of a nutrition programme, e.g., in making dietary surveys or in organizing nutrition instruction in schools.

An appropriate way of providing the necessary training is by giving preliminary instruction in the general principles of nutrition and the part that dietary surveys and other field activities play in a nutrition programme, and then associating the trainees for a few months with a centre that is carrying out field surveys.

Once a programme has started in a country, "in-service" training can be given. In this case people with an appropriate background are recruited to carry out the programme and, after preliminary instruction from the officer or officers responsible for organizing and carrying it out, learn the work by actually doing it, under the guidance of the responsible officer. For this type of training it is essential that the supervising officer should devote a considerable amount of time to discussing the work with the trainees, helping them to overcome the difficulties they face, and taking every opportunity of teaching them through practical experience.

7.6 Group IV

This group may include local schoolteachers, subordinate local officials of various kinds, natural village-leaders, and others who, in their everyday tasks, bring help and guidance to the people. If these people are given an elementary instruction in nutrition, they can play an important part in demonstrating to people in their locality ways of securing a better diet and better health for themselves and their children.

7.6.1 Training

Instruction to this group should be mainly through the demonstration of the following:

- (a) the selection of well-balanced low-cost diets composed of locally available foods;
- (b) methods for the preparation of food based upon good hygiene and sound nutritional principles;
- (c) the possibilities of increasing the local production of food and the use of appropriate methods of preserving foods;
- (d) the preparation of correct diets for infants and young children.

7.7 General Emphasis in Training

In the training of the various groups described above, and particularly groups II, III, and IV, one aim of essential importance must be kept in mind. This is that knowledge of the principles of good nutrition should be widespread among the general population. Those trained must therefore be taught the most appropriate ways of passing on their knowledge either directly to the population or through people working among the population.

Experience has already shown that certain points are of great significance in organizing training courses. The size of the group being trained at any one time should not be large. It should be small enough to allow for the direct discussion of specific problems between the individuals included in the group and between these trainees and the instructors. It must be appreciated that trainees have often had a wide experience of various community activities and problems and can bring this knowledge to a class, thus enhancing the value of the technical information supplied. The more homogeneous the group as regards previous training and experience, the more specific and effective the training can be. The orientation and emphasis of the training course should always be on local problems and the best ways these can be solved by the use of local resources.

The committee, at its first session in October 1949, recommended that training programmes in nutrition should form part of the activities of both FAO and WHO.³² The committee notes that during 1950 a start was made in this direction and that further activities in this field are planned. The general principles and procedures outlined above may be of value both to governments and to FAO and WHO in developing work in this field.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS that active steps should be taken by governments to further the training of workers in nutrition and that FAO and WHO should continue to provide all the assistance they can to their Member Governments in initiating and conducting educational programmes.

8. NUTRITIONAL ASPECTS OF THE WELFARE OF THE AGED

The committee had before it Resolution 309 (XI) of the Economic and Social Council in which the Secretary-General of the United Nations is requested to initiate, in consultation with governments and specialized agencies, "an integrated work programme of research studies and action

³² *World Hlth Org. techn. Rep. Ser.* 1950, 16, 6

for promoting the welfare of aged persons".³³ In accordance with this resolution, the Secretary-General consulted the Directors-General of FAO and WHO with regard to an integrated programme and the contribution which the specialized agencies in question might be able to make. The Director-General of FAO in his reply indicated that FAO was interested in the question mainly from the standpoint of nutrition and suggested that the matter might be considered by the Joint FAO/WHO Expert Committee on Nutrition.

The committee recognizes the importance of this subject. In certain countries considerable attention is now being given to the welfare of the aged, including its nutritional aspects. The committee recommends that FAO and WHO should assist the United Nations by the collection of information relating to nutrition and the aged which appears to be of value and importance. A start may be made by requesting national nutrition organizations or committees to make available to FAO and WHO relevant information at their disposal. A number of individuals who have given special attention to the subject may also be asked to provide information. The material so obtained should be transmitted to the United Nations accompanied by appropriate analysis and commentary.

9. NUTRITION AND DEGENERATIVE DISEASES

The term malnutrition is applied customarily to conditions associated with insufficiency of one or more nutrients which may be corrected or treated by the provision of suitable quantities of the nutrients in question. In order to prevent confusion, it seems desirable at present to retain this meaning of the term. Malnutrition may, however, also result from excessive food intake. This is particularly evident in the case of excessive consumption of calories, but there is also reason to suppose that excessive consumption of carbohydrates and fats, quite apart from calories, may produce serious forms of malnutrition. While these are rare in many parts of the world, they may be of outstanding importance in regions in which food supplies are abundant and economic levels high. The association of obesity with a high incidence of "degenerative" diseases, e.g., certain cardiovascular and metabolic disorders, suggests that in these regions malnutrition from the over-consumption of food is a problem of major significance.

The committee draws attention to the importance of the subject of over-nutrition in relation to health and disease, and suggests that it merits systematic study.

³³ Resolution 309 (XI) D, 13 July 1950, of the Economic and Social Council of the United Nations. *Economic and Social Council. Official Records: fifth year, eleventh session. Supplement No. 1—Resolutions*, Geneva, p. 39 (Document E/1849)

10. ASSESSMENT OF NUTRITIONAL STATUS

This subject was considered by the first session of the committee in October 1949 when a number of recommendations were made for further action.³⁴ Included in these was the suggestion that WHO should collect information on the various studies that have been made by national institutions on the several aspects of this problem. The committee understands that the working paper submitted to the committee by the Director-General of WHO was based on this information.

In the opinion of the committee there is a need for a document which would attempt to indicate the kinds of survey that might be undertaken for the assessment of nutritional status. Surveys are usually made for one of two purposes, namely :

- (1) to provide a basis for programmes to improve nutrition ;
- (2) as part of research activities.

As regards the former, the object of the surveys is to ascertain whether existing diets are satisfactory. Assessments need to be made before programmes are planned and at intervals after they have started so that their effectiveness in improving nutrition may be determined. The direction given to the programme will depend upon the relationship between the existing diet and nutritional status. For this reason, a study of food intake should be a part of every investigation of nutritional status.

Historically, the medical study of nutritional status has been almost entirely concerned with the more-florid recognizable signs of dietary-deficiency disease. Naturally this approach must continue, but the committee hopes that further study of the criteria of health and well-being will lead to reorientation of the criteria used in appraising nutritional status. Such a study would include the relationship of better feeding to improved physical and mental efficiency, stamina, and resistance to disease.

The committee has prepared a statement as a guide to nutrition workers concerned with assessing nutritional status for the purposes referred to above. The committee believes that this document represents a summary of the present status of knowledge on the several aspects of this problem. It should, however, be emphasized that the document is in the nature of an interim paper and should be reviewed at subsequent sessions of the committee to bring it up to date in accordance with advances in knowledge and thought on this subject.

³⁴ *World Hlth Org. techn. Rep. Ser.* 1950, **16**, 20

GUIDE TO NUTRITION WORKERS ON THE ASSESSMENT OF NUTRITIONAL STATUS

10.1 Introduction

The methods used to assess nutritional status will depend upon the level of social and economic development of the country and on the general nutrition of its people. Where these are low and unsatisfactory, few and relatively simple methods will provide the information needed to initiate a nutrition programme designed to secure a substantial improvement in the nutritional status of a high percentage of the population. In well-developed countries with a high standard of health and nutrition, relatively complex studies may be required to reveal minor departures from normal health and desirable nutrition, and in many instances their existence can only be demonstrated by feeding fully satisfactory diets over a relatively long period.

Some of the information which can contribute to the assessment of nutritional status is often already available in various government departments and institutions in the country, and merely awaits collation and interpretation. In this category are mortality-rates and information on the principal causes of death.

Special studies have to be arranged for the collection of other types of information, in particular information on dietary patterns and food consumption levels, the incidence of signs and symptoms associated with deficiency states, and the growth patterns of infants and children.

Every type of nutritional survey requires specially trained staff. However, highly specialized training is not required for some forms of inquiry. When workers with the requisite training for special investigations are not available, steps can be taken to train suitable persons. Whether this is a desirable measure will depend upon the extent of the programme and the contribution that will be made to the whole study by the particular type of investigation for which the staff is to be trained.

The committee felt that there was a need to set down various ways in which the nutritional status could be assessed, indicating as far as possible the limitations associated with each. It had in mind the fact that interest in the assessment of nutritional status extends from countries or localities where scarcely any health or social services exist to countries with well-organized services, staffed with highly trained personnel and equipped with all modern apparatus.

10.2 Types of Data that can be Used to Assess Nutritional Status

10.2.1 Mortality- and morbidity-rates

10.2.1.1 *Techniques*

Most countries have statistics of mortality-rates but the information on morbidity is usually limited to a number of notifiable diseases of which tuberculosis is the most significant after diseases specially due to food deficiency. Infantile mortality-rates and death-rates of children in the 1-4 age-group provide most useful information. As a rule these figures are already available in ministries of health.

10.2.1.2 *Interpretation*

It is now generally recognized that the health and nutritional status of a woman during pregnancy have a significant influence on the health and nutritional status of the infant. In countries where the infant mortality-rates are high, an appreciable number of infants die during the first week of life from "congenital debility", while in circumstances where the health and nutritional status of pregnant women approach the optimal, the number of deaths from this cause becomes insignificant. Diarrhoea is often the principal cause of death of up to 80% of the remaining deaths that occur during the first year of life. Although the immediate cause of the diarrhoea is infection, the standard of nutrition of the infant plays an important part in both the development of the disease and its subsequent course.

The causes of death reported in official records may not always be a true indication of the actual causes of death, owing to incorrect diagnosis through inadequate diagnostic criteria or undue interest in a condition on the part of the doctor.

In some underdeveloped countries, death-rates in the 1-4 age-group are up to ten times greater than they are in well-developed countries, indicating that many infants who survive the first year of life die in the next one or two. Diarrhoea and respiratory infections are usually the principal causes of death, but malnutrition is an important contributory factor.

10.2.1.3 *Application*

The infantile and child mortality-rates can be used in all communities as a measure of the nutritional status of at least a section of the population. High mortality in these age-groups has stimulated preventive work in nutrition in many countries. In other countries, in some of which the rates are high, the significance of adequate nutrition of pregnant women, and of infants and children, as an important factor in the reduction of these rates, has not yet been appreciated.

It is necessary to know the dietary patterns and the food consumption levels of these groups before active measures to improve their nutrition can be applied. A programme can then be prepared to correct defects in food consumption and to improve nutrition.

10.2.2 Study of the growth of infants and children

10.2.2.1 *Techniques*

Birth-weights are usually recorded for the infants born in hospitals. However, unless special precautions are taken to standardize the technique and apparatus, they cannot always be accepted with full confidence. If it is proposed to use this type of data in a study of nutritional status, it is essential to be sure that the methods of weighing the infant, recording gestation time, etc., are accurate.

In some communities steps have been taken to register premature births and stillbirths. Where confidence can be placed in these figures they are also of value.

In countries where regular records are made of the weight and height of schoolchildren, the technique has already been established. Where such records are not available it should be possible to arrange for school-teachers or public-health nurses to collect them. However, it is important that plans include provision for the analysis of the figures. Too frequently little or no practical use is made of records of this nature.

In many underdeveloped countries there are no accurate records of children's ages. In these circumstances, as in fact in all circumstances, it is desirable to record the height so that comparisons can be made on a weight-for-height basis.

10.2.2.2 *Interpretation*

Birth-weights, premature-birth-rates, and stillbirth-rates can sometimes be used to assess the nutritional status of women during pregnancy. Some standard of comparison is obviously necessary when they are used for this purpose. The most satisfactory standard will often be one based on the same population as that from which the sample under investigation is drawn. Comparison can be drawn between different groups within that population, each group being itself homogeneous as regards economic status or area. Again, it may in certain circumstances be possible to compare birth-weights, premature births, and stillbirths during periods of food shortage and periods of abundance, and to observe changes occurring as a result of the supplementary feeding of pregnant women on an experimental basis.

The isolated record of weight for age or height of an individual is of limited value and must be taken along with signs and symptoms in the

assessment of nutritional status. More useful is a long-term record of the child's weight, which then becomes a study of the rate of growth.

Weight records must be compared with some standard; this applies both to an individual observation and to the means of group observations. The comparison of an individual observation with the norm of the community is of little specific value because of the many factors that can affect the individual's weight at a moment of time. However, useful information can be obtained by comparison of the means of a group within a community either with the norms for the whole community or with the means of other groups. Such comparisons might be made on socio-economic, geographical, or regional bases.

10.2.2.3 *Application*

These types of investigation have been used in many countries as part of the routine appraisal of nutritional status. They can also be employed in preliminary surveys in communities where few, if any, previous attempts to assess nutritional status have been made. They can also be used to follow the effects of feeding programmes designed to improve nutrition.

Where medical officers are not available for clinical surveys on a country-wide basis, weight-for-height studies may be used as one indication of the areas where the nutritional status is apparently the least satisfactory and where further steps to investigate it should be taken. These would include detailed clinical appraisals by medical officers and a study of the food consumption levels of the children.

10.2.3 **Clinical assessment**

10.2.3.1 *Techniques*

A physical examination is essential for the proper assessment of nutritional status, since the effects of disease on nutrition are not easily separable from those of dietary deficiency. Such physical examination is preferably carried out by a medical practitioner with special training in nutrition.

The use of non-medical personnel to make a preliminary screening can greatly accelerate group surveys. There are many signs that non-medical personnel can be taught to recognize. The selection of the symptoms and signs to be recorded by the non-medical and medical personnel respectively can be made at the time the plan of operations is prepared. The way in which the work is partitioned will be determined by the training and experience of the non-medical workers.

The physical examination can cover all age-groups but is most frequently applied to infants, children, and pregnant or nursing mothers. The examination should include both general inspection and detailed examination, and should be applied both to structure and function.

General inspection includes the appearance of health, intelligence, and vitality, or their opposites, conveyed to the mind of the examiner. In the case of infants and children especially, the best impression is usually obtained by observing behaviour at play. Such details as complexion, brightness of eye and expression, and texture of skin and hair are included in general inspection but are amplified through subsequent detailed examination.

Attention should next be given to bulk of muscle, thickness of subcutaneous tissue, and stature. These points are usually checked by measurements of weight and height. Oedema of the face and dependent parts must be detected and, if it is present, allowance must be made for it in the general appraisal of nutrition.

When the nutritional status is assessed by inspection, the examiner actually compares the subject with a standard in his mind, the nature of which is determined by a number of factors. These include the nutritional status of the majority of the group being studied; where this is good, there is a tendency to place in the undernourished group children who would be considered borderline or even satisfactory in a community the majority of whom are malnourished. Attention has also been drawn to the fact that if the examining medical officer is himself lean he is less likely to place these children in the unsatisfactory group than if he is obese. It has been observed that, with this subjective method, the examining medical officer may change his standard during the course of a day, especially if there is a large sequence of one particular type.

The skeleton must be examined by inspection and palpation with special reference to such points as epiphysial enlargement, pigeon breast, and winging of the scapulae.

Detailed examination should cover all systems of the body but, especially in rapid surveys, a great deal of information can be obtained from inspection of the superficial tissues, including the epithelium, skin, hair, mucocutaneous junctions, eyes, and the buccal mucosa. This inspection has been systematized by some workers into schedules.

The committee unanimously decided that it would be undesirable to recommend the use of a standard schedule. It considered that the most satisfactory procedure would be, before undertaking extensive surveys, to make clinical examinations of representatives of the community to be studied, and to draw up a schedule based on the results obtained.

The committee considered that it would be useful to comment on signs and symptoms indicating:

- (a) those known to be of value in the assessment of nutritional status;
- (b) those which need to be investigated more fully before their value can be determined; and

(c) those which the committee considers to be unrelated to nutrition, the use of which in assessment may be misleading.

The examiner should know what he is recording and should satisfy himself, as far as is possible at present, that he is using correct terms. He should try to see well-developed examples of the lesions in their various forms and when possible to determine their nutritional basis by observing the effects of proper feeding.

In general, it is unnecessary to evaluate the grade of intensity of signs; all that is required is to be able to state that a sign is or is not present. It will be found useful, in deciding on the value of recording various items, if, at an early stage in the inquiry, a trial tabulation of results is attempted in order to discover what signs are most common in the community.

With the guidance so available, the investigator should decide on the scope of the schedule, taking into account the purpose of the investigation, the time available, the numbers to be examined, and the co-operation of the subjects who may not permit anything more than a most superficial inspection. The schedule finally devised may be little more than the record of an attempt to make a rapid appraisal of nutritional status in such terms as satisfactory, good, poor, etc. It may be specialized, as for example in the case of a survey of the prevalence of dental disease or goitre.

10.2.3.2 *Interpretation*

Comprehensive discussion of the interpretation of the results of clinical examination would be out of place here and is to be found in textbooks of medicine. The committee feels, however, that a few comments would be of value to those undertaking nutritional surveys, especially in areas where dietary customs are quite different from those in the area in which medical training was obtained.

History taking. Information of value in helping to assess the state of nutrition may be obtained by inquiry. The age and sex of individuals examined are obviously of importance. Religious and social customs affect the diet and way of life of the individual. Occupation and the size of the family when considered with the clinical findings may show a relationship to the nutritive state. Again, the history of the individual family—e.g., the number of deaths that have occurred in the family, the age and cause of death, and the season of the year at which they occurred—may all be of importance. Fertility and the occurrence of stillbirths are influenced by inadequate diets.

Where deficiency disease is found, the nature of the onset and the duration of the disease, and whether or not it is or was associated with diseases such as malaria or dysentery, are matters of importance. The disease may be confined to the members of a few families, and if so this

should be recorded. It may occur seasonally and be associated with the high consumption of particular foodstuffs at certain seasons. Such information will indicate the need for further surveys at different times during the year.

General inspection. The interpretation of the results of general inspection will usually be tentative until the more detailed examination has been made. But if it is omitted, valuable information may be missed.

Complexion is more easy to interpret in light-skinned than in pigmented people. The colour of the mucous membranes will give a guide to the presence of anaemia. Since conjunctivitis may mask the appearance of anaemia in the conjunctivae, the buccal mucosa and tongue should also be inspected.

Inspection of general posture is often helpful in interpreting nutritional status, especially in children, although fatigue, which itself may not be of nutritional origin, may be responsible for poor posture. Winged scapulae, forward slump of the head, and kyphosis usually indicate poor posture.

Behaviour and psychological characteristics. Observations of behaviour and of psychological characteristics may often be of great value, particularly where severe degrees of malnutrition are suspected. Considerable experience, as well as an understanding of local customs and habits, is needed to make valid observations on this point and to interpret them. It is necessary to have clearly in mind suitable norms against which possible abnormalities are to be judged. The facial expression, frequency, speed and extent of voluntary movements, manner of speech, and apparent mood and intelligence seldom admit of precise gradation in description but may be roughly appraised. Observation of the spontaneous behaviour of children is often valuable both in evaluating the nutritional status of the children and as a possible index of the status of the community. Marked depression and apathy are particularly characteristic of severe degrees of starvation and of deficiencies of thiamine and protein.

Skeleton

Bones. Definitely palpable or visible enlargement of the lower ends of the ulna, radius, tibia, and fibula, frontal bosses in infants, beading of the ribs, and marked delayed closure of the fontanelle, generally indicate active or recently active rickets. Marked bow legs in children suggest a history of rickets in infancy.

On the other hand it is doubtful if the following signs, namely, pigeon breast, Harrison's groove, knock-knees, and spinal deformity, are related to specific nutritional deficiency. Stiffness of the spine in adults may indicate spondylitis of fluorotic origin.

Peculiarity of gait, a history of spontaneous fractures, pain in the bones, notably the pelvic region and spine in adult women, suggest osteomalacia.

Teeth

Teeth are considered under gastro-intestinal tract.

Muscle and subcutaneous tissue

The assessment of muscle bulk and thickness of subcutaneous tissue can be aided by a variety of measurements, but must be interpreted with allowance for genetic influences. The use of this method may be facilitated by recent work on somatotyping. The nutritional significance of observed differences is not easy to establish except through the effects of a period of better feeding.

"Pot belly" accentuates the signs of poor posture to suggest more severe degrees than actually may exist. "Pot belly", when present, is an expression of the relative strength of the muscles of the abdominal wall in relation to the force exerted either by the abdominal viscera or by marked lordosis. Enlargement of the intestines, due either to chronic disease or to the consumption over long periods of time of large quantities of bulky fibrous carbohydrate-rich foods, is one of the main causes of "pot belly" in children. Marked enlargement of the liver and spleen can also cause "pot belly". In view of these facts it is doubtful if the diagnosis of "pot belly", without an indication of the possible cause, has any specific significance in the assessment of nutritional status.

Oedema

Oedema is a frequent and important result of severe degrees of malnutrition with respect to calories, to proteins, and to thiamine. In the case of thiamine deficiency, the mechanism is that of heart failure ("beriberi heart") and a similar form of oedema may result from overtaxing the heart by the excessive feeding of starved patients. The differentiation between simple starvation oedema and the oedema of protein deficiency is difficult to make without recourse to laboratory tests.

Simple calorie deficiency is not productive of extreme degrees of oedema. It should be recognized that the absence of clinically visible oedema is no guarantee that the body may not be over-hydrated; excessive fluid representing some 10% or more of the body-weight is required before the oedema becomes visible. Allowance must be made for this in the interpretation of height-weight relations and in the assessment of the thickness of subcutaneous tissue.

Epithelia and associated structures (skin; hair; nails; cornea; conjunctiva; sebaceous, ceruminous, and meibomian glands)

Changes in the skin and other superficial tissues occur in many dietary-deficiency diseases. Many of those tissues are relatively rapidly replaced

in the living subject, and shortage of nutrients essential for growth will lead to the formation of an abnormal structure. As well as changes in structure and texture, there may be alterations in the amount of pigmentation on the epithelia. Skin colour may also alter with disturbances in the cardiovascular system and the blood, as in pallor and cyanosis, and as a result of capillary damage. There may be evidence of an altered fluid and fat content of the skin and subcutaneous tissues, e.g., an increase, as in oedema and obesity, or a decrease, as in dehydration or after oedema and in marasmus. There may also be signs or subjective evidence of affections of the cutaneous nerves. The study of the signs of nutrition ill-health in the superficial tissues of the body has been of great value. The ease with which these signs can be observed has, however, led to undue reliance being placed on them for assessment purposes. Various abnormalities of the superficial tissues have also been attributed to nutritional disturbances without much, if any, justification.

The following signs are accepted as being due to malnutrition, though even they may not invariably be due to dietary deficiencies. They are: symmetrical dermatosis of the pellagroid type; follicular keratosis such as may be associated with vitamin-A deficiency and sometimes with vitamin-C deficiency; perifollicular congestion followed by swelling and hypertrophy of the follicles in vitamin-C deficiency; dyssebacia, which may take various forms, has been described in experimental ariboflavinosis, and responds to treatment with concentrates rich in members of the vitamin-B complex; Bitot's spots, which have been reported in undisputed cases of vitamin-A deficiency.

There is a group of signs which occur frequently in malnourished subjects; these signs need further study before their value in nutritional assessments can be determined. The group includes dry, staring hair; hypo- and dys-chromotrichia; spoon nails (koilonychia); thickened lustreless nails; atrophic skin; skins with atrophic scars; xerosis of the skin; dry conjunctivae; reduction of secretion of wax in the external auditory meatus; all conditions in which there appears to be hyposecretion of the associated glandular tissues; ichthyosis-like lesions; mosaic skin; crazy-pavement skin and crackled skin, a condition resembling but not necessarily identical with follicular keratosis, i.e., permanent goose-flesh; scrotal dermatitis; various conjunctival and corneal dystrophies.

The relationship to diet of a number of other skin conditions, e.g., acne, eczema, scleroderma, naevi, spider telangiectasia, pterygia, is vague and ill-defined. Acne rosacea is clearly not related to nutritional status. These conditions should therefore not be included in records used as a basis for assessment.

Since the tissues concerned are all more or less exposed to light and air, the effects of irradiation by the sun, of coal dust and filth, traumata

such as insect bites and scratches, friction of clothes, pressure of girdles, etc., must be appraised. Some of these agents undoubtedly contribute to artefacts which must be disregarded; others, as in pellagra, may even determine the site of the lesion. The appearance of a lesion primarily the result of malnutrition may also be altered and its persistence determined by secondary infection, as in some forms of mucocutaneous-junction signs and in some types of ophthalmitis. Finally, the age of the lesion may vary and it is possible that scars of old lesions may persist after the general nutrition and food intake have become satisfactory. Much may be done to clarify interpretation by relating the occurrence of these signs to the results of the rest of the clinical examination, to information about food consumption, and to the effects of changes in the dietary.

Gastro-intestinal tract

Lips. Changes in the lips occur in riboflavin deficiency, the most frequent sign being cheilosis; this has, however, been found to respond to therapy with the vitamin-B complex and to the administration of riboflavin or pyridoxine separately. Other changes in the lips, including fissuring at the angles of the mouth, chapping, and vertical fissuring, are also found in a number of other conditions, including iron deficiency, and chronic diseases, and may be contributed to by harsh climates and ill-fitting dentures.

Tongue. Changes in the tongue, including hypertrophy of the papillae, atrophy of the papillae, oedema, changes in colour including changes to scarlet or magenta, occur in deficiencies of the members of the vitamin-B complex and iron, but may result also from diarrhoea, mouth breathing, and wasting diseases.

Gums. Changes in the gums, especially swelling, redness, sponginess, and bleeding, occur in vitamin-C deficiency. However, the pathological tissue is rapidly invaded by micro-organisms, and secondary changes are superimposed, which seldom respond to vitamin-C therapy alone, i.e., without vigorous local treatment as well. So-called scorbutic gums do not occur in edentulous cases of scurvy.

Teeth. The part played by faulty diet in the production of teeth which are either deformed or unduly susceptible to caries is still controversial in detail, but in general the importance of nutrition is widely accepted, particularly in regard to the formative period of the first and second dentitions during intra-uterine life and the first five years after birth. After the teeth have erupted, the development of caries is undoubtedly related to the diet, including water and other beverages. There is abundant evidence that change in the diet of a community from primitive and raw types of diet to sophisticated and cooked foods will rapidly raise the caries-

rate. This primitive type of diet could be one factor in the so-called racial resistance to caries. It is clear that the fluorine content of the water is of great importance in protecting against the development of caries. Changes from the relatively luxurious diet of western Europe in times of food plenty to the simpler, coarser diets of wartime food shortages was associated with a sharp reduction in dental caries.

At the present stage of knowledge there is no justification for assuming that the existence of caries in a population bears a relationship to the intake of any particular nutrient or groups of nutrients. Caries-rates should be recorded as a separate item and discussed as such and not taken as a criterion of "malnutrition".

The appearance of the mucous membrane of the mouth and tongue probably often reflects the state of the mucous membrane in other parts of the gastro-intestinal tract. In ordinary clinical examination the functional state of the non-visible part of this tract must be inferred from the state of the mouth and tongue, perhaps supplemented by the frequency and appearance of the stools. Steatorrhoea may be visible or occult. Diarrhoea may be basically due to dietary deficiency, as in pellagra and severe undernutrition, but is far more often due to parasitic infestation or bacterial infection. In some areas it is due to the over-use of aperients and enemata, dictated by social custom. Of fundamental importance is the relation between diarrhoea and nutrition, which is often that of a "vicious circle".

In certain areas the para-intestinal glands, such as the liver and pancreas, are severely affected by dietary deficiency, notably protein deficiency. Visible enlargement of the parotid glands may be a convenient indication of protein deficiency. Enlargement of the liver may be another, but the distinction between hepatomegalia due to parasitism and that due to nutritional deficiency cannot be made without laboratory tests. In tropical areas the two causes are often operative together. Splenomegaly points usually to parasitism.

Cardiovascular system

Affection of the cardiovascular system occurs specially in vitamin-B₁ deficiency when it is suspected clinically from such signs as tachycardia, oedema, and cardiac enlargement not due to causes commonly operating in well-nourished communities.

It appears that cardiomegaly and cardiac failure may result from protein deficiency, and this cause should be borne in mind, especially when the neurological signs characteristic of vitamin-B₁ deficiency are absent. In severe undernutrition, bradycardia, hypotension, and slight cyanosis may be evident. Phlebothrombosis occurs in extreme degrees of undernutrition.

Petechiae, ecchymoses, and subperiosteal haematomata from capillary damage occur in vitamin-C deficiency.

Neurological characteristics

Important neurological changes occur in several varieties of malnutrition. For most survey work the more salient and informative neurological changes and peculiarities may be recognized adequately from observations of gait, stance, the manner in which simple co-ordination movements are performed, and some elementary neurological tests. The latter may include knee and/or ankle jerks and the digital test of calf tenderness. Detailed testing for vibration sense and for paraesthesias by pin and cotton wisp, as well as other more elaborate kinds of neurological examination, are seldom useful in survey work and, in fact, frequently raise difficult questions of interpretation from the nutritional standpoint. Well-marked paraesthesias, particularly those which are the occasion of complaints, must be noted. Nutritional amblyopia, photophobia, optic atrophy, and eighth-nerve deafness of nutritional origin are conditions which may be recorded under certain circumstances.

Endocrine and genital systems

Thyroid. In endemic-goitre areas inspection of the neck with the head thrown back, followed by direct palpation of the thyroid gland, should be included in routine examinations. When definite enlargement is present the consistency of thyroid tissue and the existence of nodules should be recorded. Satisfactory classification schemes are available.

Endemic goitre may be considered a public-health problem when definitely palpable or visible enlargement is present in more than 5% of adolescent girls in a population group.

Other observations. The examiner should always be alert for recognized signs of specific endocrine disorders. In certain areas gynecomastia has been associated with nutritional deficiency. In specific cases the effects of endocrine disorders can be easily confused with the signs or symptoms of dietary deficiencies.

Observation of the above type, together with information obtained from the patient, may also reveal conditions such as delayed puberty, menstrual disturbances, lowered fertility, decreased libido, and impotence which, in addition to the usual causes, may result from severe under-nutrition or malnutrition. In general, little is known of the relation of nutrition to endocrine disorders.

Special aspects of infancy

Growth-rate is the most sensitive index of infant nutrition. Failure to gain weight at the normal rate may indicate inadequate calorie intake or

loss of nutrients and fluid by diarrhoea, or it can be the first sign of deficiency of a specific nutrient, e.g., protein, thiamine, or ascorbic acid.

The recording of regular weighings is the most satisfactory method of determining the growth-rate, but this method is not always applicable. Much information can be gained by the experienced medical officer or nurse from the appearance of the child. Attention should be directed to general vigour, the expression of the eyes, the texture and elasticity of the skin, and the muscle tone.

As a rule it is not possible to determine from the clinical appearances of the infant the cause of the failure to gain weight at a satisfactory rate. The best way to do this is to study the effect of improved food intake.

General comments

In general, physical signs of disease may be encountered which are similar in many respects to those associated with dietary deficiencies but not necessarily attributable to faults in the diet; these must be differentiated. Factors such as environmental stress and infection contribute to the clinical expression of nutritional deficiencies. It may be difficult to determine readily whether a particular sign is due to insufficiency of one or two or more nutrients. Again, the appearance of the lesion due to a dietary defect varies according to its age or rate of development, to the degree of the deficiency, or to a combination of degree and duration.

10.2.3.3 Application

A physical examination of the individual must be an essential part of every comprehensive nutrition survey. All other methods supply presumptive evidence which is of limited value unless subsequently verified by such examination. Many of the signs widely used to judge nutritional status have clearly only limited value for this purpose. There is need for a change in attitude towards the value of these signs. It is unjustifiable to record the number of cases exhibiting a certain sign and assume immediately that this corresponds to the number of persons suffering from the specific nutrient deficiency commonly associated with the sign.

The approach must rather be that adopted in any other branch of clinical medicine. A careful medical and dietary history of each subject must be taken, each must be thoroughly examined, and the results of any laboratory tests must be included. From the evidence available those responsible for the survey make a diagnosis of the state of nutrition of the individual person. Even with the disadvantages listed above, it must be appreciated that the clinical examination of a population by experienced observers frequently yields as much information about the state of nutrition of an individual or community as do complicated laboratory tests.

10.2.4 Dietary patterns and food consumption levels

An FAO publication outlines the techniques that can be used in collecting information on diets and discusses the interpretation of data on food consumption levels.³⁵

10.2.4.1 Techniques

Personal dietary history. This is the simplest form of dietary investigation. By this means information can be collected as to the kinds of foods eaten, attention being paid to both staple and supplementary foods. This information can frequently be obtained at the same time as the physical examination is being made, either by the medical officer or by a dietitian or nutritionist.

Records of foods eaten made by the individual. This is often difficult, since families usually share common meals. It can be applied only when the population is literate. In general, it is a qualitative method and is therefore of approximately the same value as a personal dietary history.

Family dietary surveys. Descriptions of the techniques which may be followed are given in the following publications:

Australia, National Health and Medical Research Council, Nutrition Committee (1945) *The food consumption and dietary levels in 2,730 Australian family households in 1944*, Canberra (Special Report Series, No. 1)

Leitch, I. & Aitken, F. C. (1950) *Nutr. Abstr. Rev.* **19**, 507

Trémolières, J. & Péquignot, G. (1948) *Bull. Inst. nat. Hyg.* **3**, 225

US National Research Council, Committee on Survey of Food and Nutrition Research (1949) *Nutrition surveys: their techniques and value*, Washington, D.C. (*Bull. nat. Res. Coun., Wash.* No. 117)

10.2.4.2 Interpretation

In many instances the information collected from a series of personal dietary histories provides a sufficient basis for practical nutrition work, particularly when the diet is grossly inadequate in quantity or markedly unbalanced. However, it frequently happens that a knowledge of the dietary pattern, and even quantitative data on food consumption and nutrient intake levels, do not alone provide sufficient information on which to decide the extent to which the diet is unsatisfactory. Nutrient intake levels have to be compared with some standard or yard-stick of requirements. This will give an indication of the deficiencies which are likely to exist, with reference either to the groups in the population in which the deficiencies occur or to the particular nutrients concerned, and will help to show what further investigations are needed.

³⁵ Food and Agriculture Organization of the United Nations (1949) *Dietary surveys: Their technique and interpretation*, Washington, D.C. (*FAO Nutritional Studies*, No. 4)

The selection of "standards" against which the nutritive value of diets may be compared often presents difficulties. The use of the term "standards" may lead to confusion. Another concept which has been introduced is that of "recommended daily dietary allowances", which have been defined as "objectives towards which to aim in planning practical dietaries", or as "a numerical expression of the quantities of certain nutrients believed to be needed by an individual representative of one of the various categories" (e.g., age and sex categories). Tables of "recommended dietary allowances" have been produced by authorities in various countries.

Standards or allowances based on observation and experience in one environment may require adaptation before use in other circumstances. Various factors, e.g., body size, external temperature and activity, affect requirements of calories and nutrients. Again, the digestibility of food and the availability of nutrients for absorption may be influenced by the dietary pattern and methods of food processing, preparation, and cooking. For these reasons the results of dietary surveys should be reported in terms of foods as well as of calories, and when comparisons are made with reference to standards or allowances, the latter should be fully described. The fact that the level of intake of one or more nutrients falls below standards or allowances regarded as appropriate for another community should not of itself be accepted as evidence of inferior nutritional status. The effect on health of such an intake level can be determined with certainty only when supporting evidence from laboratory and clinical examinations is obtained and when it can be demonstrated that improvement in nutrition results from higher levels of intake. With regard to such improvement, it should be realized that the full effect of increased intake may not be apparent in observations extending over a short period of time.

10.2.4.3 *Application*

An important use of the information obtained from studies of dietary patterns and trends in food consumption levels is to ascertain the dietary causes for differences in the actual nutritional status of population groups. These differences may be revealed by differences in mortality- or morbidity-rates, in the rate of growth of children, or in clinical appearances. Studies of this kind are of particular value in making comparisons between different socio-economic and geographical groups in the same racial or national community.

Where the food consumption levels and the associated nutritional status of the people have been previously investigated, studies of food consumption alone can be sufficient to indicate trends in nutritional status.

10.2.5 Laboratory tests

Laboratory tests, either chemical, roentgenological, or physiological, have been designed to study the state of body tissues that cannot as a rule be studied by clinical examination. Some of these tests were introduced to confirm clinical observations, others as part of the search for methods that will reveal minor departures from normal before the onset of signs of deficiency that can be detected by clinical examination, others again in order to have objective measurements of nutritional status. It is often important to have objective data if plans for the improvement of nutrition have to be submitted to a lay body. To these tests should be added those necessary to diagnose the presence of parasitic infection, e.g., malaria, filaria, and the urinary and intestinal parasites. Many surveys have shown the important relationship which exists between parasitic infestation and nutritional status.

10.2.5.1 Techniques

In general, the necessary skills to conduct most of the tests can be acquired with relative ease. For some tests the limiting factor will frequently be the extensive, and sometimes expensive, laboratory equipment required. It is necessary to determine whether the inclusion in a survey of a particular laboratory test requiring the purchase of equipment is justified in terms of the nature of the results the test will contribute.

Details of the techniques will be found in many publications, including the following :

Children's Fund of Michigan (194—) *Proceedings of conference on methods of evaluating nutritional status of mothers, infants and children held in the Horace H. Rackham Mem. Building, Detroit, February 21-22, 1947*, Michigan (Abstract in *Nutr. Abstr. Rev.* 1949, **18**, 859)

Cornell University Agricultural Station (1951) *Co-operative nutritional status studies in the Northeast Region. I. Techniques*, Ithaca, N.Y. (Northeast Regional Publication 5, Memoir 307)

Details of the dietary, microchemical, clinical, and statistical procedures used in the Northeast Regional Nutrition Project NE-4.

Goldsmith, G. A. (1949) *Fed. Proc.* **8**, 553

A review of chemical measurements in relation to physical evidence of malnutrition, giving an excellent discussion of the interpretation and evaluation of the results of the biochemical tests.

György, P., ed. (1950) *Vitamin methods*, New York, vol. 1

The chapter on microchemical methods, pages 287-326, by Otto A. Bessey, describes in detail the microchemical blood-methods of Bessey, Lowry, and Burch formerly reported in a series of articles in *J. biol. Chem.* (1945-8), and gives a complete bibliography.

Harris, L. J., Mapson, L. W., Kodicek, E., Moore, T. & Booth, V. H. (1948) *Food Manuf.* **23**, 316

- Mack, P. B., Brown, W. N., jr. & Trapp, H. D. (1949) *Amer. J. Roentgenol.* **61**, 808
X-rays of ankle and wrist bones have been used as a measure of calcification. The paper describes the experimental technique—used in the North Central and Western regions—and also gives the theoretical background and applications of the method.
- Marrack, J. R. (1948) *Brit. J. Nutrit.* **2**, 147
- Pittaluga, G. (1948) *Vitaminas y sangre*, Habana, Cuba
- Reeve, E. B. (1948) *Nutr. Abstr. Rev.* **17**, 811
- Sinclair, H. M. (1948) *Vitamins and Hormones*, **6**, 101
- US National Research Council, Committee on Survey of Food and Nutrition Research (1949) *Nutrition surveys: their techniques and value*, Washington, D.C. (*Bull. nat. Res. Coun., Wash.* No. 117)
- Villela, G. G. (1948) *Vitaminas, métodos de dosificación*, Buenos Aires

10.2.5.2 Interpretation and application

10.2.5.2.1 Chemical tests

Protein. Serum protein levels are usually used to measure the level of protein nutrition. However, metabolism is adjusted to maintain the serum protein at optimal levels. Recent investigations by a number of workers in widely separated localities have shown that serum protein levels do not reflect the level of protein nutrition or the level of recent protein intake, except under conditions of extreme malnutrition.

Iron. Haemoglobin estimations have been used for a considerable time to record the level of iron metabolism. If the collection of blood is standardized as to time of day, relation to meals, exercise, etc., haemoglobin values have a useful place in the assessment of nutritional status. Low haemoglobin levels do not necessarily indicate nutritional anaemia due to iron deficiency, for the intake of protein can also affect the level. Other important factors are the presence of infection and blood loss due to parasitic infestation. Thus the findings have to be correlated with clinical signs and other laboratory tests.

Estimations of mean corpuscular haemoglobin should be combined with estimations of haemoglobin, as the combined figures are of considerably greater value than figures for haemoglobin alone.

Serum iron values are useful in determining the nature of the anaemia and whether it will respond to iron therapy. It has been found that in anaemic subjects the anaemia does not respond to iron therapy when the serum iron is above 60 µg per cent. An analysis of serum iron, however, should not be a routine procedure in an exploratory nutrition survey.

Vitamins. The procedures that have been adopted to assess nutritional status in regard to the vitamins include measurements of the level in the blood, either plasma or cells, and determination of urinary excretion of

the water-soluble vitamins during fasting or after giving a test dose. The interpretation of these findings presents difficulties because of the absence of clearly defined normal values. The position has, unfortunately, not been clarified by the results of surveys combining clinical, dietary, and biochemical investigations, for the majority of these investigations have failed to demonstrate the value of these tests for survey purposes.

Microchemical methods have been developed for the determination of a number of vitamins, and with these it is possible to make up to 10 or 12 observations on an individual sample of capillary blood. These methods can be applied to properly selected samples from different population groups and the findings from each group compared, revealing the relation of the groups to each other. However, without parallel clinical studies it is difficult to assess the significance of the comparisons.

Enzymes, phosphatase. Alkaline serum phosphatase is elevated in any condition that results in arrest of the calcification of bone, most notably in rickets. As a rule a rise in alkaline serum phosphatase precedes roentgenological signs. The determination of serum phosphatase is a reasonably reliable and accurate method of diagnosing early rickets. The method has much the same use as an x-ray examination of the wrist or ankle, and the choice of the method to be used in a survey will depend on whether other biochemical tests are being made and on whether an x-ray apparatus with suitable source of electric current is available. Other enzymes may be included for the purpose of special studies.

10.2.5.2.2 *Physiological tests*

The dark-adaptation test has been used in a number of surveys to study the state of vitamin-A nutrition. There is no doubt that in vitamin-A deficiency states there is delay in adaptation to the dark. However, a number of other factors contribute to individual variations; of these not the least important are genetic. For these reasons it is difficult to interpret the significance of a single test revealing delayed dark adaptation. It has been found necessary to apply vitamin-A therapy and make another test in order to discover whether the original result was due to vitamin-A deficiency or not.

Capillary fragility. This test has been used in some surveys to measure the degree of tissue saturation with ascorbic acid. A number of investigators, however, have shown that no correlation exists between capillary fragility and the amount of ascorbic acid in the serum or blood cells, or the amount of a test dose excreted in the urine. It is now generally held that the test is of no value as a measure of the state of ascorbic-acid nutrition.

10.2.5.2.3 *Roentgenological examination.* This has been applied to three systems: the skeleton (for signs of scurvy or rickets), the heart (for signs

of beriberi), and the gastro-intestinal tract (for signs of thiamine deficiency and general malnutrition). The last two are, as a rule, reserved for special investigations in which an intense study is being made of selected cases, and are not usually included in surveys to assess nutritional status. The x-ray examination of the wrist or ankle can, however, be applied in such surveys. The inclusion of the test is indicated when there is reason to suspect that subclinical rickets or scurvy are present in the community concerned. The examination for rickets should be limited to infants and children under the age of two, and for scurvy to infants and children under six years of age.

10.2.5.2.4 *Performance tests.* These tests have no place in surveys of this nature. However, in every survey an attempt should be made to study the productivity and working habits of the adults and the play habits of the children, as observations of this nature can help to assess the adequacy of the food supply.

10.3 General Considerations

In general, for large-scale surveys of the state of nutrition, the basic method is careful clinical appraisal combined with dietary surveys. Simple laboratory tests may, under certain circumstances, usefully supplement these basic methods. In the last resort, however, the assessment of nutritional status depends upon the demonstration that bodily structure and function are improved by better feeding.

11. ANTHROPOMETRY APPLIED TO NUTRITION

The physical dimensions of the body are, to a considerable degree, dependent on its nutrition. Anthropometric measurements are therefore of importance in assessing existing nutritional status and in obtaining information about past nutritional history. Measurements of body-weight in relation to height are widely used in assessing nutritional status in relation to health, and many anthropometric measurements and indices are applied and advocated for this purpose. There are, however, no generally accepted norms for the evaluation of such measurements, nor, indeed, generally accepted standard methods of making the measurements themselves.

It is universally held that some adjustment or classification should be made for body or constitutional type, but there is no agreement as to how individuals may be classed into type, nor as to the numerical adjustments to be applied. For example, the appropriate adjustment of standards for age, particularly during the adult period, is a debatable question and there is confusion as to the meaning and validity of "averages", "norms", "standards", "desirable weights", and "ideal weights". Differences

in norms corresponding to differences in race and climatic environment have been suggested, but adequate data to establish these on a firm basis are either lacking or have not been analysed systematically.

In the opinion of the committee anthropometric measurements, including relative body-weight, would be of greater practical value in the assessment of nutritional status if properly characterized norms and agreed methods were available for general application. Other kinds of measurements, particularly of thickness of the skin folds, deserve greater attention as a criterion of relative fatness and "calorie status". It would appear desirable for FAO and WHO to provide, as far as possible, advice, leadership, and aid in the solution of these problems.

The committee adopted the following resolution :

The Joint FAO/WHO Expert Committee on Nutrition

RECOMMENDS that FAO and WHO should study the problems involved in the development of anthropometric norms and standardized techniques of anthropometric measurements, and prepare a report for review at the next session of the committee.
