WORKERS in the pediatric field have recognized that undernutrition is of major importance in developing countries around the world and have expressed interest in the extent to which efforts have been made in the United States to deal with this problem. This report attempts to bring together information from a wide variety of sources and to summarize the considerable efforts that have been made in dealing with these problems of undernutrition. It may provide a basis for future planning and involvement on the part of those concerned with solutions for the food problems abroad as well as the application of experience with them to situations in this country.

The vital importance of nutrition was forcefully described by the President’s Science Advisory Committee in its 1968 report on the “World Food Problem.”

The principal findings and conclusions reached were stated as follows:

1. the scale, severity, and duration of the world food problem are so great that a massive, long-range, innovative effort unprecedented in human history will be required to master it;

2. the solution of the problem that will exist after about 1985 demands that programs of family planning and population control be initiated now. The food supply is critical for the immediate future;

3. food supply is directly related to agricultural development and, in turn, agricultural development and overall economic development are critically interdependent in the hungry countries; and

4. a strategy for attacking the world food problem will, of necessity, encompass the entire foreign economic assistance effort of the United States in concert with other developed countries, voluntary institutions, and international organizations.

There is ready evidence in the less developed countries of food shortages, of maldistribution of food in communities and families, and, in the absence of outright hunger, of specific nutrient insufficiencies. It is well documented that protein is the nutrient most likely to be inadequate, and protein-calorie malnutrition is the most serious disease. The population at risk is the age group with the most critical requirement of protein in the diet—the rapidly growing fetus, the infant, and the preschool child.

A deep concern for the ill health of the children of the world and for the serious occurrence of malnutrition in many countries stems from the reports of the United Nations agencies concerned with health, from the voluntary agencies that have been so effective in distributing food to needy countries, from the United States Government agencies involved in foreign aid programs, and from detailed evidence of specific forms of malnutrition observed in the nutrition surveys by nutrition specialists from the United States government. During the past 15 years the Nutrition Program of the United States Public Health Service (formerly the Interdepartmental Committee for Nutrition in National Defense) has conducted surveys in 35 different countries showing that the most serious manifestation of malnutrition is in the younger segment of the population—more specifically among children of preschool age.

Protein-calorie deficiency disease predominates, but the pattern of malnutrition varies somewhat from country to country. Marasmus and kwashiorkor were a common occurrence throughout the developing countries studied. When populations subsisting on marginal protein supplies have a disruption in their food supply, kwashiorkor or marasmus may occur in epidemic proportions. This was seen in the Congo in 1961 and in Nigeria/Biafra in 1968 and 1969.

Thousands of children are blinded each year, primarily as a result of vitamin A deficiency, in some of the Asian and Middle
Eastern countries. Beri beri, resulting from a lack of dietary thiamine, is common in Southeast Asia and the Philippine Islands. The effects of a deficiency of zinc and chromium are being studied in Egypt and Iran. A lack of iodine in countries in all parts of the world affects millions of people. Thus it is clear that, although protein-calorie malnutrition during the weaning and post-weaning periods is one of the most prevalent nutritional disorders in these countries, nutritional anemias, xerophthalmia, and endemic goiter are also serious problems in many parts of the world.

International assistance programs in the area of food production and use and related health services are many and varied. The United States Government has been continuously active in its support of the United Nations specialized agencies concerned with nutrition on a worldwide basis; and, the United States has contributed approximately 33% of the United Nations annual budgets. These United Nations organizations include Food and Agriculture Organization (FAO), which is concerned with nutrition from the point of view of food production and distribution, World Health Organization (WHO), which is concerned with nutrition from the point of view of health, and United Nations Children's Fund (UNICEF), which is concerned with the needs of children and mothers and cooperates with FAO and WHO in the implementation of its programs. These United Nations agencies operate on a worldwide basis, whereas the United States in its program, Agency for International Development (AID), operates in a limited number of countries. The three United Nations agencies joined together to sponsor the Protein Advisory Group. Recently this advisory group, with encouragement from the United Nations administration, has been enlarged and is broadening its scope of activities. Other United Nations agencies such as the U.N. Development Program, the International Bank for Reconstruction and Development, and the U.N. Industrial Development Organization are expected to play an increasingly important role in assistance related to foods, nutrition, and health.

International voluntary agencies, such as the Red Cross, Cooperative for American Remittances to Europe, Incorporated (CARE), Church World Service, and Catholic Relief Services, are expanding their programs beyond emergency action and food distribution to include nutrition education and family food production as a means of combating malnutrition.

Foreign assistance programs in the United States are large and complex. Most of the efforts for these programs are coordinated under AID of the State Department. The participation of other government agencies is primarily through the AID organization and financing. Since AID does not have the variety of competent technical nutrition personnel required for the implementation of its program, it uses the expertise of such United States government agencies as the Department of Agriculture, the Department of Health, Education and Welfare, and so forth for the execution of its program. The programs are administered within the recipient countries by the AID Mission, a part of the U.S. Embassy.

It may be helpful to review subject areas that relate to nutrition. AID is cooperating with the developing countries in three major types of activities in the area of nutrition: (1) child feeding; (2) the initiation and demonstration of new concepts and techniques for the improvement of nutrition; and (3) the support and strengthening of applied nutrition programs through manpower training, grassroots education, exchange of information, and technical assistance.

ASSISTANCE PROGRAMS

Food Production

In fiscal year 1969, AID proposed to commit nearly half of all its development assistance to direct aid to agriculture, including loans to finance imports of fertilizer from the United States; loans to support credit to farmers investing in fertilizer, seeds, pesticides, and storage facilities; loans for im-
proving irrigation and transportation; and support for agricultural training. This support is usually through local development banks and rural credit banks. During the past years, cooperatives in the United States, credit unions, and savings and loan associations have been working under AID contract to establish thrift institutions in 53 countries.

In India, the AID Mission found that better science education at the secondary school level was needed to strengthen the technical base for agricultural progress. Experts provided by AID primarily through contracts with universities in the United States have also helped establish an Indian system of state agricultural universities. Patterned on the American land grant system, the universities instruct farmers in triple cropping, use of fertilizer, and new high-yield seeds. Similarly, secondary school courses in agriculture—over 30 schools recently added classes—are an innovation in Kenya.

AID is the principal source of funds to support cooperative international agricultural programs in which universities in the United States are involved. At present, more than 1,200 agricultural experts provide assistance and advice in more than 50 countries. This assistance included demonstration projects, training of foreign nationals, research on new agricultural techniques, and adaptation of cereal varieties and methods of improving storage and transportation facilities for food grains. University administrators interested in broader educational programs and in a new institutional image have accepted international assignments as a legitimate and desirable component of the educational process. To provide a more effective assistance program, the universities are looking toward a consortium type of coordination to provide the multidisciplinary approach necessary for developing a strongly based agricultural economy in a developing country. This can lead to a more stable form of foreign assistance if longer term funds can be provided, a philosophy which is not yet accepted by the Congress.

Food Distribution

Since 1954 food has been provided to needy countries from the United States under the Agricultural Trade Development and Assistance Act of 1954. This act was developed to promote international trade in agricultural commodities to combat hunger and malnutrition, to further economic development, and for other purposes. It was amended in 1966 to include the Food for Peace Program, which places emphasis on assistance to those countries that are determined to improve their own agricultural production. This law, also known as Public Law 480, no longer requires that agricultural commodities offered under the Food for Peace Program be "surplus" foods in the United States. Also, the "self-help" requirement has been enforced as rapidly as possible; this provides that funds resulting from purchase of foods within the developing country be used for research and development, including research in food technology, nutrition, and nutrition training.

In 1967 food sales under this program amounted to approximately $1.4 billion. During 1967 agreements were concluded with 22 countries. In recent years India has received roughly one half of all food aid given to foreign countries by the United States. In response to the self-help provision, India’s food production is improving. This is the result of increased use of fertilizers, pesticides, new high-yielding varieties of rice, wheat, and millet; and improved water use. Similar improvements are being made in a number of other countries.

Food donation programs under Public Law 480 have been unified to make commodities available to nonprofit voluntary agencies in the United States, international agencies (United Nations), and foreign governments. These donation programs meet specific needs of famine, malnutrition in children, community development, or school lunch programs. Much of the donated food has been distributed within the recipient countries by voluntary agencies, such as CARE, Red Cross, religious organi-
In the area of child feeding, the United States Government, through AID, is authorized under Title II of Public Law 480 in the Food for Freedom Program to provide food for feeding programs in the developing countries. In 1968 more than 50,000,000 individuals were reached in maternal and child health and school lunch programs in more than 100 countries. These donated foods are intended to help developing countries combat protein-calorie malnutrition, to gain ground in the food population race, and to help speed up social and economic progress. The foods donated include cereals, bulgur, non-fat dried milk, blended food products such as Corn Soya Milk and Wheat Soya Blend, vegetable oils, and butter products. Top priority in these programs is given to children and pregnant and nursing mothers through the maternal and child health and school feeding programs. In these feeding programs emphasis is being put on the importance of education of mothers in child nutrition.

**High Protein Foods**

AID is helping to finance private firms in the United States which are engaged in foreign development and test marketing of high-protein foods, prepared largely from indigenous foods and marketed to meet the needs of children. An important difficulty, of course, is the inability of a large segment of the population of the country to purchase such foods. Plans are being made to help fortify staple foods in India with protein and other nutrients. Fortification of foods, such as wheat and rice, with the amino acid lysine to improve their protein quality is currently promoted in several countries. Private investment is being encouraged in the production and marketing of low cost protein products, including Fish Protein Concentrate. Working with the Department of the Interior, AID will launch a 5-year program to tap the food sources of the oceans to provide large amounts of food of excellent protein value.

In the programs directed toward the initiation and demonstration of new concepts and techniques, emphasis is placed on fortification and enrichment, the development of new formulated foods with stress on the use of local foods, and the testing and evaluation of the nutritional efficacy and acceptability of high-protein foods. These programs cover a wide range of activities but are generally related to the protein problem and the nutritional needs of children. In these programs, AID cooperates closely with the Department of Agriculture, Department of Health, Education and Welfare, and other institutions in the United States. A few examples of projects carried on are: evaluation of high protein supplements in child feeding programs in the Philippines; clinical evaluation of new protein sources for the prevention of malnutrition; effects of extrusion processing of inexpensive high-protein food mixtures; lysine enrichment of wheat flour; and nutritional improvement of rice by fortification.

**Family Planning**

Three major food deficit countries—India, Pakistan, and Turkey—are now conducting ambitious family planning programs. AID committed approximately $35 million to family planning in 1968 and hopes to do even more in 1969. In 1967, AID announced it would entertain requests to finance distribution of contraceptives and factories in which to manufacture them. Many of AID's efforts in the population field are channeled through voluntary, nongovernmental agencies in the United States such as the International Planned Parenthood Foundation and the Population Council. In addition, AID finances population research in a number of U.S. colleges and universities.

**Research and Training**

Public Law 480 funds have been used by several government agencies for research and educational programs in the countries purchasing food.

The United States Department of Agriculture has conducted research in food science, crops improvement, animal diseases,
soil and water conservation, and agricultural engineering, all of which were directed toward increase of food production. Studies were also made in forestry, marketing, nutrition, and economics.

Since 1962 the Department of Agriculture has conducted a broad research program that encompasses many phases of food use and production and of nutrition. Studies being made with human subjects include the development and biological evaluation of a vegetable protein mixture for infants, evaluation of cereal and cereal-legume diets for preschool children, availability of amino acids from vegetable sources, ascorbic acid metabolism during pregnancy and lactation, determination of energy requirement, and nutritional response of children to wheat bread enriched in various ways.

The Bureau of Commercial Fisheries directed studies to improve varieties of fish, increased domestic production of fish, and methods of processing.

The Department of Health, Education and Welfare conducts an extensive education program in language training and development of primary and secondary schools in various countries. AID carries on a number of activities aimed at the support and strengthening of applied programs through training programs, conferences, seminars, and exchange of ideas. A special 4½-month, AID-sponsored nutrition course has been developed at Columbia University for mid-level workers from the developing countries. It is of particular interest that the approach to nutrition in this course is from the point of view of both health and agriculture. The Department of Health, Education and Welfare cooperated with AID in a Seminar on Family Planning and Nutrition, held for physicians working in maternal and child health programs in the developing countries, and a Seminar on Community Programs for Children, held for workers concerned with the various community aspects of children’s needs.

AID is carrying on a number of activities in nutrition education. A handbook by D. B. Jelliffe, *Child Nutrition in Developing Countries*,¹ has been printed and distributed to governments and workers concerned with nutrition, to the Peace Corps, and to the voluntary agencies in the United States who are using foods donated by the United States in their feeding programs in the developing countries. This publication has met an important need for workers concerned with child nutrition. A French version is being printed, and consideration is being given to a Spanish version.

With the assistance of a nutrition specialist from the Department of Health, Education and Welfare’s Social and Rehabilitation Service, AID is preparing a list of basic nutrition materials for use in the developing countries, with the objective of providing workers concerned with nutrition education of mothers and children with the tools which make such educational programs more effective.

To give greater emphasis to nutrition education, AID has established incentive grants to the voluntary agencies in the United States which are carrying on feeding programs in the developing countries with Public Law 480 donated foods; the grants are intended to assist these agencies to expand, strengthen, and make more effective their activities in the broad field of nutrition. The Office of International Health, of the Public Health Service, provides opportunities for teachers and students of medicine from the United States to study diseases in foreign countries which are not seen in this country. The National Institutes of Health (NIH) supports research in a variety of nutritional and human development areas, with particular emphasis on child health.

The National Science Foundation coordinates programs in science information, including translation activities and the publication of English editions of foreign scientific journals.

The Smithsonian Institution awards grants for studies in natural science, cultural history, and systematic and environmental biology to be carried out abroad.
Encouragement of Private Ventures

AID lends local (foreign) currency to hundreds of private firms in the developing nations, most of them owned by or affiliated with firms in the United States. Since 1961 the dollar equivalent of $258 million has helped to finance private ventures in the manufacture of such things as farm equipment, cement, pharmaceuticals, sewing machines, rubber products, and animal feeds.

PRIVATE FOUNDATIONS

The private foundations have also had an important share in the support of foreign assistance. The Ford and Rockefeller Foundations have broad programs in agricultural development in a number of developing countries. They have had a particular interest in the genetic improvement of cereal grains. With their assistance, the International Rice Research Institute in the Philippines has developed a variety of rice with a yield two to four times greater than the traditional variety. Through similar activities in other countries, the objective is to improve the productive capacity and quality of food crops in the tropical zone and to encourage animal production through more effective conversion of low quality food stuffs supplemented with urea as a source of nitrogen to provide for an increased protein supply. A project on genetic improvement of legumes is planned for Latin America. The Rockefeller Foundation supports an international center for research and training in international science at the University of Chiang Mai in Thailand. Also, efforts in Taiwan and Chile are directed to research on protein malnutrition in preschool children.

In one aspect of its nutrition research effort, the Kellogg Foundation provides a significant contribution to the Institute of Nutrition of Central America and Panama, Guatemala City. This institute's programs are also supported by the Nutrition Foundation, the Inter-American Institute of Agricultural Sciences, and the National Institutes of Health.

These are but a few examples of the extensive effort of the private foundations directed to improvement of the world food problem.

REGIONAL MEDICAL PROGRAMS, HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION OF THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

A significant program in public health nutrition supported by the United States during the past several years has been the activities of the Interdepartmental Committee for Nutrition in National Defense (ICNND). This interdepartmental committee became the Nutrition Section, Office of International Research (NIH) in 1965 and is presently the Nutrition Program, Regional Medical Programs, Health Services and Mental Health Administration (HSMHA) of the Department of Health, Education and Welfare. This group has conducted nutrition surveys in collaboration with nutrition groups in the following 34 countries: Alaska, Bolivia, Brazil, Burma, Chile, Columbia, Costa Rica, East Pakistan, Ecuador, El Salvador, Ethiopia, Guatemala, Honduras, Iran, Jordan, Korea, Lebanon, Libya, Malaya, Nicaragua, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippine Islands, Spain, Taiwan, Thailand, Turkey, Uruguay, Venezuela, Vietnam, and West Indies.

These nutrition surveys have included studies of nutritional status by clinical and biochemical parameters and studies of food consumption, nutrient intake data, food production, and food processing and marketing.

Provision of laboratory equipment and specific training of a nutrition group within each country, prior to and during the survey, served as a nucleus for continuing nutrition activities. As a result, each of the countries surveyed has developed active nutrition-health groups which are organized as national nutrition institutes, nutrition committees, or nutrition divisions within the ministry of health.
Continued support has been given to most of the nutrition groups through active counsel, assistance with research support, providing of significant nutrition journals and books, assistance with travel to regional and international meetings, and other collaborative activities. It is felt that continued development of such national institutions is critical to the future recognition of nutrition, a factor which affects health and human resources development and economic development of the country.

Among the research activities in which the Nutrition Program was engaged in 1968 are the following: (1) completion of the research project in Peru involving an assessment of the benefit from supplemental protein and other nutrients in school lunch feeding in cooperation with the National Institute of Nutrition; (2) research on the development of appropriate child food supplements from indigenous resources in Chile under contract with the University of California; (3) assistance in the development of a national nutrition program in the Philippines in conjunction with the National Institute of Science and Technology and with the Virginia Polytechnic Institute; (4) support of research in Iran, which is cooperative with the National Nutrition Institute concerning the role of zinc in human nutrition; (5) assistance in the iodine injection studies carried out with the National Institute of Nutrition in Ecuador, the Pan American Health Organization, St. Louis University, and the Massachusetts Institute of Technology; (6) assistance to the recently formed National Nutrition Institute in Jordan with problems of the nutrient enrichment of wheat flour; (7) arrangement for several regional conferences and provision of expenses of foreign nationals to attend these conferences.

DEPARTMENT OF DEFENSE

United States military research centers which have contributed to nutrition research include Navy Medical Research Units (NAMRU) in Cairo, Egypt and Taipei, Taiwan and the South East Asia Treaty Organization (SEATO) lab in Bangkok, Thailand. These groups have conducted important nutrition research dealing with such problems as anemias, urolithiasis, iodine supplementation and goiter, and studies on nitrogen metabolism and growth.

NUTRITION RESEARCH PROGRAMS OF THE NATIONAL INSTITUTES OF HEALTH

The National Institutes of Health supports a wide variety of research and training programs throughout the world by use of contract, grant, and Public Law 480 mechanisms. The research includes such problems as protein-calorie malnutrition, the causes and treatment of childhood diseases, family planning, and the behavioral correlates of child development. Epidemiological, metabolic, and clinical studies are included. A coordinated approach to disease problems, particularly those of an infectious nature, is provided through the five international centers for medical research and training which are located in South America, Asia, and Africa. Recently, the Fogarty Center for International Studies (located in Bethesda, Maryland) was established to provide mechanisms for exchange of scientists and scientific information through conferences, congresses, visiting scientist programs, and other internationally oriented advanced training programs.

Of particular interest to the pediatric community is the United States-Japan Cooperative Medical Science Program. Six disease areas have been identified for primary attention by this program: parasitic diseases, cholera, malnutrition, tuberculosis, leprosy, and virus diseases. Malnutrition studies constitute a major portion of the research interest and support. Research projects are under way in the following fields: (1) the determination of the effects of early malnutrition in children on mental development, learning, and behavior; (2) the effect of the results of malnutrition on resistance to infection; (3) investigations on nutritional anemias; (4) studies of requirements of essential nutrients; (5) improvement in
the methods of evaluation of nutritional status; (6) the evaluation of protein-rich foods (including amino acid fortification); (7) research on the importance and control of naturally occurring toxins in foods; and (8) the genetic improvement of cereal grain.

Need for Comprehensive Programs

While the assistance programs of the United States have aided in several areas of activity that have a bearing on improvement of nutrition, it is hoped that future "applied nutrition" projects will deal more directly with rural families who must grow most of their own food (including demonstration, production, and consumption of protective foods that can balance high-carbohydrate, low-protein diets) and urban ghetto families who must have better nutrition education and child care. Supplementary comprehensive programs may also be included. Assistance programs of this type, with promising prospects, are being developed in the Philippines. Increased use of this type of program is desirable.

International Biological Programs

The opportunity for studying nutritional deficiency diseases, human requirement for specific nutrients, interrelations and imbalances of nutrients, and interferences in absorption and metabolism of nutrients is most frequently found in populations of developing countries where caloric insufficiency is common. Many studies supported by NIH, National Science Foundation (NSF), defense agencies, and counterpart funds resulting from the food donation program are in progress. The recently established International Biological Programs (IBP) provide support for coordinating these efforts in relation to the purposes of the worldwide research effort. The IBP was established in 1964 by the International Council of Scientific Unions (ICSU) as a program to define the biological basis of productivity and human welfare. This is a 5-year study (1967 to 1972) in which more than 50 countries are participating through their national academy of science or similar institution. Worldwide problems concerned with genetic selection and evolutionary changes, biologic production, management of biologic resources (including concern for the balance of pollution and production as these relate to man's capacity to adapt and perform in a dynamic ecologic community) are among the most serious scientific problems faced today. Nutrition research is an important component in the determination of human adaptability and in the concern for world management of biologic resources for the maximum production. Coordination of nutrition studies at the international level has been assigned to the International Union for Nutritional Sciences. The United States has a well organized program of participation in all phases of the IBP.

This report was prepared to provide information to pediatricians on a nutritional problem, the magnitude of which is great throughout the world. A description is given of existing enterprises initiating from the United States to alleviate malnutrition of the world's children. Although there is considerable activity in this direction, the impact is not really as great as desired. If this report engenders concern among its readers and initiates greater desire for effective action in finding solutions to the world's malnutrition problems, it will have fulfilled its purpose.

L. J. Filer, Jr., M.D., Chairman
Lewis A. Barness, M.D.
Richard B. Goldbloom, M.D.
Malcolm A. Holliday, M.D.
Robert W. Miller, M.D.
Donough O'Brien, M.D.
Howard A. Pearson, M.D.
Charles R. Scriver, M.D.
William B. Weil, Jr., M.D.
O. L. Kline, Ph.D., Consultant
Charles Whitten, M.D., Consultant
Joaquin Cravioto, M.D., MPH, Consultant

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