

Chapter III

NUTRITION RESEARCH STRATEGIES



vitamins



fats



minerals



carbohydrates



proteins

NUTRITION RESEARCH STRATEGIES

Accumulating the fragmented research activities of the 14 Federal agencies supporting human nutrition research does not, as a whole, constitute a coherent strategy for the solution of current diet-related health problems. A good understanding of the status quo can be gained by analysis of the Food and Agriculture Act of 1977 which established research goals and priorities for the Department of Agriculture (USDA). The picture of the present situation can be completed by reviewing the research goals and priorities at the National Institutes of Health (NIH). Alternatives to the status quo can be found in the recently published reports of the Office of Science and Technology Policy (OSTP) and the General Accounting Office (GAO). These two alternatives, plus an alternative developed by OTA, are examined here and provide Congress with several alternative strategies that may be pursued. Each of the alternatives are examined from three perspectives: Do the stated goals and priorities adequately address current U.S. health problems? Is nutrition research defined clearly to permit realistic estimation of Federal expenditures? Is consideration given to the personnel requirements to fulfill proposed research priorities?

THE STATUS QUO: NUTRITION RESEARCH IN THE FEDERAL GOVERNMENT

Goals and Priorities

The Food and Agriculture Act of 1977 recognized the relationship between diet and the general health of the population. The legislation states "that there is increasing evidence of a relationship between diet and many of the leading causes of death in the United States; that improved nutrition is an integral component of preventive health care; that there is a serious need for research on the chronic effects of diet on degenerative diseases and related disorders; that nutrition and health considerations are important to U.S. agricultural policy; that there is insufficient knowledge concerning precise human nutritional requirements, the interaction of the various nutritional constituents of food, and differences in nutritional requirements among different population groups such as in-

fants, children, adolescents, elderly men and women, and pregnant women; and that there is a critical need for objective data concerning food safety, the potential of food enrichment, and means to encourage better nutritional practices. "

The legislation declares that the Secretary of Agriculture shall develop and implement a national food and human nutrition research program that shall include, but not be limited to, five areas:

1. Research on human nutritional requirements.
2. Research on nutrient composition of foods and the effects of agricultural

practices, handling, food processing, and cooking on the nutrients they contain.

3. Surveillance of the nutritional benefits provided to participants in the food programs administered by USDA,
4. Research on the factors affecting food preference and habits,
5. The development of techniques and equipment to assist consumers in the home or in institutions in selecting food that supplies a nutritionally adequate diet.

Although the legislation points up the relationship between diet and leading causes of death in the United States, the research priority areas spelled out do not pursue this line of inquiry. Since the legislation pertains almost exclusively to USDA, it lays out what could be considered a partial strategy to solve the problems of diet and chronic degenerative diseases—research on nutrient needs, on the composition of the food supply, on ways to help consumers select a healthful diet, and surveillance of the population. Furthermore, funding proposed in the FY 1979 budget does not match the ambitious wording of the legislation.

The Food and Agriculture Act of 1977 designated the Secretary of Agriculture to “establish jointly with the Secretary of Health, Education, and Welfare procedures for coordination with respect to nutrition research in areas of mutual interest.” Section 1406 amends the National Science and Technology Policy, Organization, and Priorities Act of 1976 (90 Stat. 471; 42 U.S.C. 6651 (h)), by creating a standing subcommittee to be known as the Subcommittee on Food and Renewable Resources.

The legislation also established a National Agricultural Research and Extension Users Advisory Board composed of 21 members representing a wide variety of agricultural producer, consumer, marketing, and environmental interests. Two members must be engaged in human nutrition work. The Advisory Board has the responsibilities for:

- “Reviewing the policies, plans, and goals of programs within USDA involving the food and agricultural sciences, and related programs in other Federal and State departments and agencies and in the colleges and universities developed by the Secretary under this title;
- Reviewing and assessing the extent of agricultural research and extension being conducted by private foundations and businesses, and the relationships of such research and extension to federally supported agricultural research and extension;
- Reviewing and providing consultation to the Secretary on national policies, priorities, and strategies for agricultural research and extension for both the short and long term;
- Assessing the overall adequacy of, and making recommendations to the Secretary with regard to, the distribution of resources and the allocation of funds authorized by this title;
- Preparing and submitting to the Secretary, not later than October 31 of each year, a statement of recommendations as to allocations of responsibilities and levels of funding among federally supported agricultural research and extension programs; and
- Not later than March 1 of each year submitting a report on its appraisal of the President’s proposed budget for the food and agricultural sciences for the fiscal year beginning in such year and the recommendations of the Secretary contained in the annual report.”

As indicated earlier, the Food and Agriculture Act of 1977 does not clearly give USDA the lead responsibility for human nutrition research. Section 1405 declares “the Department of Agriculture is designated as the lead agency of the Federal Government for agricultural research (except with respect to the biomedical aspects of human nutrition concerned with diagnosis or treatment of disease). . . .” Human nutrition is one of the areas included in the definition of “food and

agricultural sciences" (section 1404). But Section 1409 states that "It is the intent of Congress in enacting this title to augment, coordinate, and supplement the planning, initiation, and conduct of agricultural research programs existing prior to the enactment of this title, except that it is not the intent of Congress in enacting this title to limit the authority of the Secretary of Health, Education, and Welfare under any Act which the Secretary of Health, Education, and Welfare administers. Thus a clear mandate is not given to USDA to be the lead agency for human nutrition research.

Section 1423 (b) requires the Secretary of Agriculture to "periodically consult with the administrators of the other Federal departments and agencies." As discussed earlier, this unilateral approach to coordination relies on the goodwill of other agencies to cooperate with USDA in the goal of research coordination.

Research priorities at NIH are summarized in table 3. A wide range of basic and applied research are embodied in these priorities. The major emphasis is on basic and curative-oriented disease research rather than disease prevention. This becomes more clear as allocations of funds to the different areas are studied. The Nutrition Study Section at NIH reviewed a total of 181 grant proposals in FY 1977, and approved 119, totaling \$4.7 million. Only four other study sections recommended for approval grants totaling less than \$4.7 million in this period of time. Two of these sections have been disbanded, their work being referred to other study sections. Since research in nutrition involves many different disciplines and crosses traditional disciplinary lines, NIH maintains that many grant applications with nutrition components are referred to other study sections. It can therefore be assumed that \$4.7 million is what NIH clearly defined as human nutrition research, and the remainder of the \$80.4 million of nutrition research funded by NIH in FY 1977 was basic and disease-oriented research with nutrition components of varying degrees of relevance.

The Agency for International Development (AID) is the Federal agency primarily responsible for international nutrition research.

...the long-range goals of the AID nutrition program are: to have developing countries incorporate nutrition considerations into their social and economic development plans; to create the methodologies for assessing needs, determining causes, and selecting interventions; and to have available the most cost-effective interventions with information on when they are most appropriate to apply, the cost and other requirements for implementing them, the best methods for implementing them, and information on expected results.

The AID nutrition research program is designed to provide new knowledge that will help implement programs to attain these goals. The AID nutrition research program attempts to assess the functional significance of improvements in nutrition; it seeks to establish whether nutritional needs can be satisfied with locally available foods; it evaluates the effectiveness of nutrition intervention; and it seeks to inform governments about the potential impact of policies in food and nutrition.]

It is therefore apparent that the AID nutrition research program is not and should not be designed to address the research needs outlined in this report. The AID program is designed to meet the needs of host countries. Should a research project yield results applicable to problems discussed in this report, it is serendipitous. There is a clear need to encourage international research, much of which would be epidemiological, to identify and explore dietary and lifestyle factors contributing to the major chronic diseases,

In theory, AID's nutrition research activities undergo peer review. Research funds are publicized through the distribution of a brochure, and information on AID's research needs are circulated among professional groups and announced at professional meetings. "Projects that are awarded on the basis of predominant capability are very carefully reviewed before approval. Fewer and fewer projects follow this latter route, "z

In practice, the system seems to have functioned somewhat differently, Human nutr--

¹Irwin Hornstein, Deputy Director, Office of Nutrition, Agency for International Development, June 8, 1978.

²Ibid.

tion research received an estimated \$2.7 million from AID in FY 1977. Most of this research was conceived by agency staff who then had a scientific research group develop study proposals. The proposals were screened by AID staff members before being submitted to the Research Advisory Committee for technical feasibility evaluation. The agency does not widely advertise requests for proposals, and few unsolicited proposals are received. Some panel participants felt that this system reduces the scientific base of expertise on which the agency can draw and leads to an inbreeding of research ideas.

Definition and Funding

The Food and Agriculture Act of 1977 does not explicitly define the term "nutrition" nor the scope of "nutrition research." It implies that "nutrition research" includes research on diet and disease, certain aspects of agricultural policy, nutritional requirements, food composition and nutrient interactions, food safety, food enrichment, and means of encouraging better nutritional practices. There is no reference in the legislation to international nutrition research.

Section 1423 (a) of the Food and Agriculture Act of 1977 states that the Secretary of Agriculture "shall increase support for such research [research into food and human nutrition] to a level that provides resources adequate to meet the policy of this subtitle. No specific authorization for

human nutrition research is made in the Act.

In response to these requirements, USDA requested \$43 million for human nutrition research in its FY 1979 budget proposal. This is a 95-percent increase over its FY 1977 spending of \$22 million.

At NIH, nutrition research support has remained relatively constant over the last several years, constituting less than 3 percent of the total research budget. Estimates of actual dollar outlays for human nutrition research vary from \$20 million to \$80 million for FY 1977.

Personnel Resource Requirements

Both the USDA and HEW support undergraduate, predoctoral, and postdoctoral students through a variety of tuition grants, loans, fellowships, and training grants. The Food and Agriculture Act establishes grants and fellowships for food and agricultural sciences education at the undergraduate through postdoctoral levels. The program is authorized in FY 1978 for \$25 million, expanding to \$50 million by FY 1982. The proportion of this money to be devoted to training nutrition researchers is not specified.

The Department of Health, Education, and Welfare has traditionally supported training of research scientists through training grants and fellowships. In FY 1977 these totaled \$2.8 million for human nutrition research,

NEW DIRECTIONS IN FEDERALLY SUPPORTED HUMAN NUTRITION RESEARCH: THE OSTP REPORT

Goals and Priorities

In December 1977, OSTP published a report on Government nutrition research. The report defined the scope of human nutrition research, described existing Federal programs, identified research areas that need more attention, and suggested means for enhancing the coordination and quality of Fed-

eral nutrition research activities. Although the report focused only on domestic research, it encouraged various Federal agencies involved in such activities to assess the potential international benefits from current and planned projects.

The working groups of the OSTP inter-agency senior nutrition research staff recommended four priority research activities:

1. Effects of nutrition on human health and performance in pregnancy, infancy and early childhood, old age, obesity, iron deficiency, nutrient toxicity, and interactions;
2. Food sciences (methodology for analyzing food composition, nutrient bio-availability in foods, updating national nutrient data bank, expanding food composition measurements);
3. Nutrition education research (factors determining dietary practices, identification of good nutritional practices, ad hoc educational research committee); and
4. Diet and nutritional status surveillance (food composition, survey methodology, measurements of nutritional status, analysis of the Health and Nutrition Examination Survey (HANES) data, epidemiological studies),

The criteria used by the working group in selecting research areas for greater attention were impact, substantial existing knowledge gap, and researchability. The priority areas chosen reflect the narrowness of these criteria. The priorities tend toward short-term projects that lack long-term commitments needed to identify the nutrition elements of major health problems facing adult Americans—the chronic degenerative diseases and obesity.

In the OSTP report several recommendations are made for coordination within and among the departments conducting nutrition research. First of all, the participants in the study requested OSTP “to continue to take a lead role in coordinating and monitoring nutrition research activities.” OSTP could serve as a focal point for interagency planning through the Federal Coordinating Council on Science, Engineering, and Technology (FCCSET), chaired by the Director of OSTP. Secondly, external reviews of the intramural grants process in both NIH and USDA with joint participation of Federal agencies in developing requests for proposals and in reviewing research in progress.

To improve coordination and communication within HEW and USDA, the report recommends:

In HEW, the programs of the Food and Drug Administration (FDA), the National Center for Health Statistics [NCHS], the Center for Disease Control (CDC), and NIH must be coordinated in the high-priority activities identified. . . . At NIH, it is essential for the NIH Director and for the Nutrition Coordinating Committee under his direction to have the authority to prioritize nutrition research needs. The Director of NIH, has a relationship to the several Institutes which permits allocation of funds for nutrition research in the absence of specific statutory authorities for reprogramming between Institute appropriations.

In USDA, it is essential that the nutrition research activities of the Agricultural Research Service (ARS), the Cooperative State Research Service (CSRS), the Food and Nutrition Service (FNS), and the Economic Research Service (ERS) be coordinated through the Secretary of Agriculture. ”

Finally, the establishment of an ad hoc interagency nutrition education research committee is recommended. This committee would: identify and summarize research findings related to nutrition education research and summarize pertinent findings from other areas of education research, establish priorities, and develop a plan for conducting nutrition education research.

It is doubtful that OSTP through FCCSET would be able to adequately oversee coordination of nutrition research activities. The staff of the Office is small, and their responsibilities large. With a budget of \$50 million to \$117 million per year, nutrition research is a very small component of the FY 1977 \$3.6 billion research budget for health and agriculture.

External reviews by teams of nonagency scientists may improve the quality of intramural human nutrition research activities, but they cannot be expected to improve research coordination. This recommendation calls for the external reviews to be conducted within 12 months of the report's publication by an unspecified number of multidisciplinary teams. Scientists from agencies conducting nutrition research would also participate. The report suggests that this would be expected to increase communication and understanding of Federal programs. Since the review would only be conducted once and

no provisions are made for improving bad situations if they are found, it is doubtful that it would be of any lasting use in improving interagency communication or the quality of intramural research.

The proposal that Federal agencies jointly participate in developing requests for research proposals and in reviewing research in progress has merit, as does the proposal for an ad hoc interagency nutrition education research committee. The ideas could be further explored by USDA and HEW and proposals for implementation developed.

Definition and Funding

The scope of human nutrition research, as defined by the OSTP study, included investigation of:

- Basic physiological and biochemical mechanisms for the digestion, absorption, metabolism, and transport of nutrients; the role of food ingredients in human health and performance and in the prevention and treatment of disease;
- Nutrient composition of foods; the effects of storage, processing, and packaging; and the biological availability of nutrients in the foods at the time of consumption;
- Determinants of dietary practices and methods for educating the public about dietary practices; and

- Food consumption patterns and nutritional status of the general population and of special high-risk subgroups within the population; evaluation of the nutritional impacts of various intervention strategies and public policies.

The OSTP report established Federal expenditures for nutrition research for FY 1977 at \$116.6 million. The report stated that no specific funding levels would be recommended, but that the report's objectives could be met "at least in part by reallocation of resources from existing programs to the higher priority areas identified." It is highly unlikely that this could be accomplished without outside intervention. It is also questionable whether such a strategy makes good sense, since the amount of human nutrition research conducted in this country is so small in comparison to our \$3.6 billion in health and agriculture research expenditures and our \$160.6 billion in health costs. Furthermore, at least \$60 million of the \$117 million is basic research on metabolism which underlies many of the biological and health sciences. A cut in this funding would severely constrain progress in basic research.

Personnel Resource Requirements

The OSTP report does not consider the personnel resources needed to fulfill the research priorities contained in the report.

FEDERAL HUMAN NUTRITION RESEARCH NEEDS A COORDINATED APPROACH TO ADVANCE AND A COORDINATED APPROACH TO ADVANCE

Goals and Priorities

The General Accounting Office was asked to identify research gaps and needs in the field of human nutrition. The scope of the report was restricted to the domestic situation. Gaps identified by GAO included:

- Knowledge of dietary nutrients required to promote or maintain growth or well-being at various stages and conditions of life;
- Information on the composition of the current U.S. food supply and the extent that nutrients are biologically available;

- Evaluation of long-term health consequences of the modern diet; and
- Assessment of the Nation's current nutritional status in terms of dietary excesses and imbalances, as well as deficiencies.

GAO recommended research along the following lines to overcome these research gaps:

- Long-term studies of human subjects across the full range of both health and disease;
- Comparative studies of populations of differing geographic, cultural, and genetic backgrounds;
- Basic investigations of the functions and interactions of dietary components;
- Updated and expanded food composition data; and
- Improved techniques for assessing long-term toxicological risks.

The priorities set out in the GAO report involve the types of research that will probably provide the most information on the role of diet in disease. However, work is also needed on how best to convey the research findings to the public so they can be translated into daily life.

The GAO report cites "lack of central focus and coordination" and "shortage of nutrition scientists" as two of the three principal barriers to progress in human nutrition research. To remedy the first of these, the report recommends that the Director of OSTP "work with the Federal agencies to further define the subject areas comprising human nutrition research and make recommendations to the Director of OMB to:

- Assign where practicable, each area to a lead Federal agency.

- Eliminate unnecessary research that may exist among Federal agencies.
- Promote Government-wide human nutrition research planning, coordination, and reporting. "

These recommendations are not sufficiently specific to be considered a strategy for organizing nutrition research. Furthermore, in an early draft of their report, OSTP assigned lead and support agency responsibilities for specific nutrition research areas. This approach was abandoned in the final report because of agency objections. A general goal of improved research planning, coordination, and reporting is commendable, but without specifics probably will not be attained.

Definition and Funding

GAO identifies the third barrier to progress in nutrition research as "instability of federally funded extramural research." The report does not make specific recommendations as to how to improve this situation. However, it endorses the development of federally funded regional research centers in conjunction with universities and colleges.

GAO estimates U.S. Government expenditures for human nutrition research at \$73 million to \$117 million annually. It makes no attempt to define nutrition research or to analyze agency reports on nutrition research expenditures,

Personnel Resource Requirements

The GAO report highlights the concern of the scientific community that there is a shortage of nutrition research scientists. If this situation exists, it holds significant implications for the ability of the research community to absorb research funds should large increases be made in the future. Since no accurate information exists on the numbers and expertise of nutrition research scientists outside Government laboratories, analysis of research capabilities is impossible.

A COMPREHENSIVE NUTRITION RESEARCH STRATEGY

Goals and Priorities

The focus now lacking in Federal nutrition research could be achieved by defining the scope of human nutrition research, defining general goals for Federal agencies that conduct such research, and specifying research priority areas that are in line with the general goals. A reorientation of Federal nutrition research efforts should recognize the changing nature of food supply by placing greater emphasis on the role of diet in preventing chronic diseases. At the same time, Government programs must continue striving to eliminate hunger and malnutrition through intervention programs and research.

Such a reoriented research strategy requires an increased focus on today's complex food supply, especially on the effects of processed food, food additives and contaminants, and similar problems that concern consumers, food producers, and health professionals. Research in the food sciences would enable us to evaluate the adequacy of the food supply and to develop recommendations for needed changes. Such changes might include new processing techniques, fortification, reformulation, or selection of alternative food items by consumers.

Broader information and intervention efforts outside of the health care system are also necessary. The public should know what the scientific community has learned about the relationships among lifestyles, food consumption, and health. Developing improved ways of conveying such knowledge would encourage the public to adopt better eating habits and other health-promoting behavior.

OTA working group participants felt that neither the existing legislation nor the priorities suggested in the OSTP and GAO reports provided the holistic, integrated research strategy needed to meet current and projected diet-related problems in the United States. Seven elements of a comprehensive research strategy to define the role of nutrition in the prevention of chronic disease and to improve management of current nutrition-related problems were discussed. The seven

points are outlined in table 5. The rationale for the selection of each is contained in the appendix.

Several mechanisms for coordinating Federal nutrition research activities have been suggested. These include assigning responsibilities for research areas to various agencies, making one agency the lead agency, placing coordination responsibility under a third party, assigning coordination responsibility to the assistant secretary level, and concentrating all nutrition research activities in either USDA or HEW.

The first alternative (assigning responsibilities for research areas to various agencies) would make USDA and HEW the two lead agencies in human nutrition research. This approach is similar to the one taken in the Food and Agriculture Act of 1977 in which the legitimate roles of both agencies in nutrition research are recognized. Under such a system of joint responsibility, the concerns of each agency would have to be defined to minimize duplication of effort. An effective system of intra-agency cooperation would also be necessary. However, since it may not be possible to clearly separate the concerns of nutrition and disease from those of "normal nutrition," some overlap would probably be inevitable.

The second alternative assigns one agency main responsibility for nutrition research. Since USDA and HEW fund 87 percent of Federal human nutrition research, they are the most likely candidates for the lead agency role. There are arguments both for and against giving such responsibility to one or the other agency.

Currently USDA plays the major role in carrying out food intervention programs in the United States. By giving it primary responsibility for funding and coordinating nutrition research efforts, the Government's research and food intervention activities might be better coordinated. At the same time, Federal research activities might become more responsive to consumer views and needs because of USDA's major involvement in food and nutrition education programs.

Table 5.—A Seven-Point Nutrition Research Strategy

<i>The role of diet in the prevention of chronic disease and obesity</i>
Major health problems and diet-related risk factors
Diet, aging, and disease
Methods for preventing obesity
Nutrition and mental development
The role of nutrition in the treatment of disease and support of therapy
Nutritional support of patients with severe disease and injury
Other disease states
Technology for delivery of nutrients to patients
Behavioral and emotional problems
Nutrition education and consumer information
Factors affecting lifetime eating habits and identification of critical points for education
Development and evaluation of nutrition education and communication methods
Methods for simplifying consumer information utilization
Requirements for essential nutrients
Methods for determining nutrient needs
interactions among nutrient requirements based on functional criteria
Pharmacologic and toxicologic effects of on nutritions
Bioavaiability of nutrients in foods
<i>Nutritional aspects of food science and food safety</i>
Food composition
New food processing and handling procedures to maintain nutrient content
Better methods of assuring food safety
<i>Monitoring nutritional status</i>
Methods for improving integration of food consumption and nutritional status surveillance
Evaluation of the effects of food and nutrition education programs
<i>Nutrition policy and management</i>
Food-related interventions
Other Interventions

USDA now coordinates research in the area of food production with the State agriculture experiment stations and other cooperating institutions. Some link between the nutritional concerns of consumers and the food production system seems to be essential, But USDA has traditionally had little responsibility or expertise in the area of human health and disease. One of the major needs in Federal nutrition research activities is a reorientation of priorities to stress the role of nutrition in the prevention of disease, Thus separating health-related nutrition research from the overall direction of health research may not be wise, If health-related nutrition research fell exclusively under USDA, potential conflicts might arise. The research might produce recommendations for substantial shifts in food practices. Such findings and recommendations could conflict with the traditional interests of producer groups.

Many of the research priorities identified by OTA as well as other groups involve the relationship of human health to nutritional practices. Therefore, there are strong argu-

ments for giving HEW, the agency concerned with health, the lead responsibility for directing nutrition research, However, such research has not been a main HEW concern in the past. Disease-prevention research has generally received much less support than specific disease-oriented or curative-oriented research. Moreover, HEW has not been concerned with the nutrient requirements of healthy people, food consumption patterns, or food composition. In addition, HEW has no nationwide programs of nutrition and health education comparable to those developed by USDA.

The report by OSTP recommended that the lead role in nutrition research be given to a third party which would formulate policy and coordinate and monitor programs. Under this arrangement, various agencies would retain their existing nutrition research responsibilities, but their activities would be overseen by the third party. The concept offers some positive features, It would focus attention on nutrition while retaining the healthy

competition among agencies involved in nutrition research.

However, such a third-party concept also raises several problems. It involves another layer of Federal bureaucracy. A third-party oversight body might have no real power to influence budgets and allocate resources within and among agencies, especially since it would lack a political constituency. These potential deficiencies would be further magnified by inadequate staff and expertise. In the end, such a coordinating mechanism would probably only serve as a means to exchange information, much as the nutrition coordinating committee does within NIH and the Current Research Information System (CRIS) does for USDA,

Another alternative would give assistant secretaries in HEW and USDA responsibility for coordinating nutrition research policy within and between their respective agencies. Lack of high-level commitment to nutrition research has been a problem in the past. Placing responsibility for nutrition at the assistant secretary level might create the visibility and commitment needed to effectively coordinate nutrition research efforts. Such an arrangement would require administrative changes within both agencies. At present, it is unclear if the USDA reorganization that created a Human Nutrition Center within SEA will accomplish this goal.

A final option would consolidate nutrition programs in one agency, either USDA or HEW. These activities would include research, education, regulation, training, service delivery, monitoring and surveillance, and food and other intervention programs. Both USDA and HEW have recently shown interest in this concept in papers entitled USDA'S Commitment to Food and Nutrition Policy and The Role of HEW in Human Nutrition: Future Directions. However, the wisdom of such a consolidation is debatable. Although both agencies currently have a number of nutrition programs, the expertise involved is quite specialized. Whether this approach would solve coordination problems probably depends on the agency's commitment to the field of nutrition.

A pluralistic approach to human nutrition research, with well-defined agency responsibilities for HEW and USDA, appears to be the best means of coordinating Federal research efforts. Such an approach could produce the kind of creative competition that would likely enhance human nutrition research. It would also result in some overlapping of efforts, which should be minimized by the coordinating process.

The coordinating function might best be carried out by an interagency committee with a rotating chairmanship. This arrangement would be consistent with a pluralistic approach to research. At the same time, it would help ensure against any one agency building a "most-favored" relationship with the coordinating committee.

Coordination of Federal nutrition activities extends beyond specific mechanisms for intra- and inter-agency coordination. It also includes information storage, retrieval, and integration. No uniform system presently exists among the various agencies involved in nutrition research. Computerized systems that permit information integration and retrieval need to be explored. At the very least, relevant branches of HEW and USDA should have a common indexing and data retrieval system for this type of information. Since federally supported research accounts for the major share of research in the nutrition and health maintenance areas, integration among these agencies is essential. Integration of nutrition research data is also desirable among the public, private, and voluntary sectors.

Definition and Funding

As outlined under issue 2, OTA could not perform an analysis of the present Federal human nutrition research budget, since present expenditure estimates are so disparate.

Federal spending on human nutrition research should be precisely determined. By eliminating the present confusion, Congress will be better able to judge appropriate levels of funding for nutrition research. Congress could request GAO to audit the human nutri-

tion research expenditures of Federal agencies. The GAO audit, based on a constant definition, should determine total Federal spending for human nutrition research, the number of scientist years involved, and Federal expenditures in the seven priority areas set out in this report.

On the basis of such information, Congress would have several options. The first would be to maintain the status quo in nutrition research funding, with possible reallocation of some funds to areas not now receiving support. As a second option, Congress could appropriate additional funds to specific nutrition research areas that are not getting enough support. Finally, Congress could earmark a percentage of Hatch funds for human nutrition research. Such an audit, together with a uniform system for reporting human nutrition research spending, could also

facilitate future congressional oversight hearings,

Personnel Resource Requirements

If Congress were to choose to implement the OTA comprehensive nutrition research strategy, there is a clear need to establish how many scientists are both presently involved in, or training for, nutrition research. This census would include a breakdown in terms of various research areas, such as Government facilities, universities, medical facilities, private institutes, and industry. This kind of census would identify where nutrition research personnel gaps exist and where greater support is necessary. To fill such gaps, expanded Federal support should be considered.