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**Report: Research Priorities**

**Methodologies Conference**

**on Economics of Malnutrition**

**Office of Nutrition/Technical Assistance Bureau  
Agency for International Development  
U. S. State Department**

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## Purpose of Conference

The two-day "mini conference" was organized by the Office of Nutrition, Technical Assistance Bureau of AID, to describe for the Agency for International Development; and make available to other U.S. and International "donor" Agencies and the various foundations concerned with food and nutrition policy some of the important research issues in the Economics of Malnutrition. Over the past five years, research has grown in widely scattered locations in this field and the research perspectives have been highly varied. The conference brought together many individuals and organizations to consider the major future research needs in this area.

Other issues which led to this conference included: a need to more clearly outline the impact of malnutrition on national development; the need of the planner to know recommended nutrition programs are workable and that they will achieve their objectives (shown through other demonstrations) for a given set of costs; and, the need for developing a method of selecting a combination of approaches based on a realistic appraisal of a given society.

To simplify tasks for both the conferees and those who would utilize the results of this conference, three topics were selected for discussion. One was concerned with examining the food and nutrition system of a nation to select where to intervene to enhance the nutritional status of the malnourished population. This topic encompassed a consideration of methods and data needed in the examination of the social system of a nation or region in order to determine what would be necessary to enhance the nutritional status of the population.

The second topic considered questions that arise in comparing alternative interventions once the general points of intervention are known. This topic encompassed problems of determining the worth of various programs in the course of suggesting and selecting the best approaches by or for planners.

The third topic was concerned with the rationale for focusing on the improvement of nutritional status and the implications of the various forms of nutritional intervention alternatives and encompassed considerations of what further methods are needed to refine the method of intervention.

#### Organization of Conference

The conferees were invited on the basis of their known interest and experience in the economics of malnutrition and the relevance of their work to one of the three topics. Also interested and experienced representatives of international agencies and AID participated.\*

After brief opening remarks by Dr. Martin Forman and Mr. Joel Bernstein, both of AID, the participants divided into three groups. A chairman had been selected for each group. His role was to assist the participants of each group to examine the following four questions on the topics of nutrition intervention identification, quantification, and implications.

- (1) What is our state of the knowledge?
- (2) What information is needed in this area?
- (3) How should the subsequent gaps in the knowledge be filled? and
- (4) What priorities should be set for filling the gaps?

The conferees were asked to focus on both the important areas or topics for research and the appropriate methodologies. Each group delineated what are thought to be significant areas for research and discussed issues of various research methodologies. Each group's discussions were, of course, much richer on the topic of methodologies than is possible to convey in this brief report.

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\* The list of participants and the agenda are attached as Appendix A and Appendix B, respectively.

## Group Reports

### Group I. Analysis of Systems: Where does intervention take place?

To maximize or improve the nutritional status of a population or any target group, numerous points in a social system need to be examined. Two problems confront us. First, there are numerous ways to improve the nutritional status without direct nutritional intervention. Some of these are: the provision of jobs; subsidization of food through price manipulation or direct distribution; plant hybrids to improve yields or nutritional content; and the elimination of infectious diseases which interact synergistically with nutritional ingestion to increase dietary needs or to cause malabsorption. It must be determined how intervention through these and other non-nutritional approaches would substitute for or be complementary with direct nutritional intervention such as child feeding or fortification programs.

Once the link between the various forms of development and nutritional change are made, the point of nutritional intervention must be determined. Ideally, the link with other forms of intervention (i.e. social, agricultural) and nutritional intervention would be known so that our nutritional programs will not be developed in a vacuum. The discussion concerned the identification and analysis of the system to determine the most effective points of nutrition intervention along the entire spectrum of nutritional behavior from production of food to its final consumption (an aspect of consumer behavior). The group outlined the stages of the analysis. The first stage was the delineation of the goals and analysis of the population's status in relation to the stated goals. There was discussion of the subsystems for nutrient production, distribution (processing, storage and transportation), household behavior, relations among the above groups discussed as subsystems, relations with other sectors and alternate intervention patterns were discussed.

## A. Goals

The minimum nutritional needs by age and activity documented to establish goals for planning were considered by the group to be adequate. The next step is to assist planners in the determination of the most effective intervention points. This requires a thorough knowledge of the target population, through investigations to provide appropriate baseline information and to indicate the likely character and magnitude of significant relationships. Such investigations require far greater disaggregation of data than economists and others have typically employed. Such data would include nutrient content of commodities, family decision-making, and feeding practices. Intelligent determination of intervention points is most difficult without detailed descriptions of target group behavior and the factors affecting it.

The methodological problems encountered when conducting and analyzing findings of these investigations are less serious than the data gaps that prevent empirical quantification. Hypotheses can be developed for some of the relationships thought to be significant, but less is known about their form and magnitude. Despite the need for disaggregated data, research and analysis using existing data are more important than either methodological refinement or further data collection. While there is an established methodology for surveying a population's nutritional status and needs, this methodology is expensive and time-consuming. AID and others are encouraged to continue supporting the formation of a "short form" method of obtaining the most essential data.

Planners need two kinds of baseline studies; one concerning the determinants of nutritional status of households and another concerning the availability of nutrients from agricultural production, imports, and other sources. The first study would document the clinical condition of a sample of the population and would also survey the sample's food intake. In addition, the

baseline study of families would document the basic demographic and economic characteristics of family members and would describe other aspects of family behavior that are considered closely related to nutrition. Subsequent to this baseline survey, a monitoring system of, say, a body weight and height would be maintained.

The second type of baseline study, that of nutrient availability, would document the production and perhaps the productivity of agriculture in the country, and the nutrient content of foods actually supplied in the private market. This study should include the food losses in the production and distribution steps.

#### B. Nutrient Production

Lack of methodological tools is not a binding constraint in the analysis of nutrient production. Computer accessibility is limiting in some areas and appropriate data are sometimes lacking, but many countries do possess suitable data. Disagreement among nutritionists concerning nutrient analyses and dietary standards often stands in the way of the setting of realistic goals.

#### C. Distribution: processing, storage and transportation

In the area of distribution, there is a great deal of methodological technique--inventory theory, location theory, linear programming, and so on. Few of these techniques have been applied in the LDC's. Data in the distribution area do not seem as thorough as production data, but are certainly better than in the case of family behavior. Information on the flow of products through the steps of distribution is warranted and could be improved in low-income countries, particularly in the non-monetized sectors, though a great deal of useful work could be done with available data in many places. Knowledge of relevant and appropriate analytical techniques in the production area is severely lacking among LDC planners in general. Knowledge of the non-commercial or subsistence sector requires major attention. Commercial information is more adequate.

#### D. Consumer Behavior

The major unfilled data and methodological limitations are in the household system. Preferred intervention points depend heavily on knowledge of the determinants of individual behavior. Effective use of agricultural production models requires complementary research on family behavior to identify maximizing patterns related to nutrition. More specifically, data on intra-family food distribution and its determinants, food preferences and taboos with the consumer behavior linked to outside "community factors" where possible is essential. For example, little is known about the influence of prices and wages, family planning, and educational programs on nutritional behavior. Some of the group questioned whether the technique of maximizing could be applied uniformly in all household analyses.

Filling data gaps in the behavioral area, particularly those concerned with family life cycle behavior and with responses to communication, presents unresolved methodological and statistical problems because relationships may be especially indirect and complex.

The group expressed the desirability of relating a family's nutrition behavior to other aspects of their behavior that might be influencing health and nutritional status, and of the necessity of relating all these inter-related aspects of family behavior to factors in communities that governments may affect through public programs and policies. It was recognized that consumption patterns vary greatly by age in the first five years of life so that both the initial baseline nutritional status survey and ongoing research and evaluation should disaggregate scrupulously by age. Other younger age groups may be far more important than the preschool children of 3-5 years. Nutritionists have apparently started paying attention to differences among "preschool children" only in the last three to five years. Perhaps a "weaning to two" concept is what is called for: nursing, weaning, and up to two years of

age. Research findings indicating the importance of the last trimester of pregnancy are emerging and may offer new alternatives for planning.

#### E. Relations Among Subsystem

The relationships among the production, distribution, and family behavior were discussed and it was agreed that the three could be linked without great difficulty if more were known about family behavior, that is, if the community factors that are important in influencing a family's nutritional status were correctly identified.

#### F. Relations to Other Sectors

Separate from the relation among the subsystems is the concern with other components of the society. Among the important factors might be population and family planning, education, sanitation and infectious disease, and communications. The population category was discussed as the relationship between nutrition and total number of pregnancies or births, the relationship between nutrition and completed family size, and the relationship between child nutrition and child spacing. In each of these areas it was thought possible that causal influence might exist on each side of the relationship.

#### G. Alternate Intervention Patterns

Suggested hypotheses about appropriate intervention points included:

- a) prices in the community of important food staples and supplementary nutrients;
- b) wages of family members;
- c) local nutrient values of given commodities;
- d) belief patterns of persons concerning nutrition and related behavioral activities;
- e) sex of the child (evidence was given in several countries of the remarkable difference in child mortality by sex, and the evidence that these differentials are due largely to nutritional and feeding differences);
- f) mother's health while pregnant and while lactating and the influences on her health of diet and infections;
- g) demand versus schedule breast feeding;
- h) the psychological effect on children of mother's presence or

absence; and 1) the question of who cares for the child. For example, there is evidence that young children cared for by older children or grandparents fare worse in health and nutrition than young children cared for by their parents.

#### H. Priorities

The major unfilled data requirements are in the household subsystem (consumer behavior) and, to a lesser extent, in the tracing of nutrient flows through processing and distribution. Knowledge of the non-commercial or subsistence sector requires major attention, but commercial information is more adequate. Since preferred intervention points depend heavily on knowledge about the determinants of individual behavior, linking subsystems within the food system presents much less difficulty than attempts to integrate other factors to the overall nutrition system, such as health and environment.

Recommendations for matching the planner's needs to the analyst's research within countries follow:

- (1) Develop a data base and an internalizing capability for analyzing and maintaining the base. This should be a high priority. The priorities include data on family member nutrition status, intake, aspirations and preferences and amenable community factor influencing these factors.
- (2) Review of the nutritional implications of interventions designed to attain other goals should be encouraged. Available data and methodologies are already adequate for this purpose in many cases.
- (3) Compare trade-offs involved in integrating nutrition goals with other typical governmental goals, such as employment generation or GNP growth. These are possible, very useful and should receive immediate attention.

- (4) Fill critical information gaps through systematic evaluation of results from replicable, extendable action programs chosen both for likely impact and for research value. This experimental approach should be applied particularly to problems of communications and food delivery to clarify factors influencing behavioral response. Careful attention should be given to assessing results and not just intermediate activity goals.

#### I. Discussion

A key point raised in this discussion was the absence of a specific method on a country basis for extending the use of agricultural and other planning models in nutrition planning. The discussion revealed the need for such research.

A second point was left as a question: Can one compromise in nutrition planning when food resources are inadequate? Furthermore, are there various intermediate thresholds of nutritional well-being available for planning?

Group II. Design, Cost-Effectiveness, and Evaluation of Intervention: How to Intervene

To intervene in the food system so as to reduce the incidence or severity of malnutrition may be done in a number of different ways. Some may be costly to governments, others may have costs borne by the consumer. All activities planned to change nutritional status may not focus on the ones most vulnerable, but for the purpose of this discussion the conferees assumed the most vulnerable should receive their attention.

The conferees considered gaps in knowledge of project design, costing, and evaluation of results. Its task was to consider available methodology for obtaining the best program design and techniques of comparing the cost and effectiveness of alternative programs of intervention techniques. This would include the continuous evaluation of a program both to enable it to function efficiently and to measure its benefits.

A. Design\*

1. Given the wide range of possible programs to avoid or alleviate malnutrition the group was not able to consider project design for each one.
2. In general methods for project design were not thought to be a major problem requiring a high priority for research. On the other hand more care in project design at the outset is strongly recommended, giving particular attention to the possibility for obtaining short term results in long term projects. For example, project design of effective systems to reach the vulnerable groups with nutrients seems to be lacking. The need for better systems is also a problem for health, family planning and agricultural extension activities. It is suggested that we be alert for -- is there a

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\* The following working assumptions were used. The nature of the nutrition problem (causal factors of malnutrition) must be explicit and discussion would focus on a specific target group, in this case preschool children and pregnant and lactating women.

need for a basic methodology in project design of delivery services for persons in rural areas?

#### B. Costs

1. The basic methodology for costing programs--or alternative intervention--exists. This theory is discussed at length in the cost-benefit literature indexed under the term cost-effectiveness.
2. Predicting demands for social programs was identified as a significant problem. Estimating costs of a social program becomes speculative when demands are not predictable.
3. Assessing the costs of the nutrition element of programs with multiple objectives was identified as a problem. Some basic methodological tools of the economists may be useful but there is little experience in applying them to social programs in less developed countries. Costs may be non-linear and subject to economies of scale.
4. The conferees recommend that the concept of opportunity costs be applied to nutrition programs, including as well estimates on the sacrifice of foregone opportunities. Very often the use of opportunity costs in the analysis of wages, foreign exchange and other inputs will produce results quite different from the normal use of market prices. The methodology is available. A special problem requiring further research is that of assessing opportunity costs where non-monetary constraints are a major factor--e.g. managerial and planning skills.

#### C. Evaluation

1. Most of the discussions involving evaluation centered around the measurement and the selection of the appropriate benefits of nutrition programs. The simplest measure of benefit was the delivery of improved nutrients. This can be measured in quantitative terms such as the amounts and kinds

of nutrients available. This would not measure, of course, the impact of these nutrients in any way. Other approaches could look at changes in food behavior and the frequency of consumption of "indicator" foods.

2. The more important measure of benefits analyzes the improvement of the actual consumption of the target group. Here the dietary survey is the principle technique. Although there is substantial experience with dietary surveys, obtaining accurate data remains a problem.
3. The even more desirable measure of benefit was the impact of the diet change on the nutritional and health status of the individual. Clinical, biochemical, anthropometric and demographic data provide the means for measuring benefits. The application of these techniques in the field for evaluative purposes poses a serious problem. Even simple measurements of height and weight can be unreliable. For example, the height-weight measurements require a knowledge of age which is difficult to obtain. Good baseline data against which to measure change is needed. Research on simple low-cost techniques of assessing the nutritional and health status of target groups is needed. As a precursor to this, analysis of measurement techniques used by various investigators is needed. For example, the four-day family observation techniques used by the Caribbean Food and Nutrition Institute is suggested as a possible standard.
4. Physical and mental performance may be the ultimate in precise benefit measurements but they are also the most difficult to measure. The widest gap in knowledge exists in this area of the behavioral effects of programs. A survey of existing basic research must be completed before taking the next step of devising effective tests of mental and physical performance applicable at reasonable costs on a mass basis in LDC's. The actual need for sophisticated measures on mental and physical performance for planning purposes is also subject to debate.

5. Evaluation of the relative effectiveness of several projects by comparing their performances against each other would be very useful. This is complicated by the likelihood that various projects will provide different mixes of benefits and, furthermore, that causal parameters underlying the malnutrition may not have been well defined.
6. Another problem is evaluating clusters of projects which may be mutually reinforcing (e.g., child feeding combined with nutrition education). Evaluative techniques are lacking particularly in cases where the cluster of projects has multiple goals. Here, the complexity of a social situation renders the more sophisticated techniques such as multiple regression partially useless. Often the only way to proceed is to analyze the relative effects of various bundles of programs.
7. The group noted the need for sensitivity to adverse effects of programs in the evaluation process. Interviewing, the presence of the evaluators, etc., often bias the program results.
8. The design of evaluative efforts should take into account the cost of the project. The sophistication of the evaluation should be geared to the importance of the project. Too often the evaluations are not built initially into the programs or individuals familiar with scientific forms of experimental design or evaluation are not consulted. Most evaluations have utilized unsophisticated techniques of analysis which do not bear the meaningful components. Also, the results of the techniques used are interpreted poorly or incorrectly.

#### D. Priorities

The general thrust of the conferees was that evaluation methodologies merited the highest general priority because of the need to establish techniques for the objective assessments of alternative nutrition intervention

programs. (Group III discussed some of the research necessary before beginning this task.)

A lesser priority should be given to the design of effective and low-cost delivery systems, to the use of opportunity costs, and to costing programs with multiple objectives so that costs can be assigned to each objective (this may seldom be possible).

Group III. Overall Costs of Malnutrition and the Predicted Benefits from its Elimination and Interrelations with Other Sectors: Implications of Intervention

While Group III recommends a number of research approaches to aspects of the economic impact of malnutrition and the benefits from alleviating malnutrition, the group prefaces these suggestions with a strong plea to put the examination of the returns to better health in a different perspective; different from the returns from investment in traditional areas like power and transportation.

(a) Adequate nutrition and well-being of a population, as reflected in the high proportion of expenditures of the very poor on food and the high income elasticity of food expenditures, represents the first fruit of higher income, i.e. development, desired by the poor, as shown by their revealed preferences. As one of the primary objectives of development, therefore, it seems misguided to insist that adequate nutrition must be justified (or to admit that it ought to be justified) primarily by its incremental effect on the income flows subsequently generated by those enjoying the adequate nutrition (the human capital effects of mental and physical performance, morbidity, and mortality). Unlike education, where the investment aspect is seen even by most students to be the dominant objective, one eats to live and to enjoy well-being, and these are ends in themselves.

(b) Further, the difficulties facing quantification of the economic benefits flowing from adequate nutrition may not be so much greater than hitherto assumed compared with knowledge of the returns to other forms of investment. This is most easily seen with the many weaknesses of estimating returns to education, but is also now increasingly recognized regarding more traditional fixed capital projects (e.g. irrigation and hydroelectric power plants) where important ecological and other diseconomies have been normally omitted from the analyses.

Still, for lack of better tools, standard planning techniques are likely to remain important in determining resource allocation and consideration of certain approaches of measuring the benefits from adequate nutrition were recommended.

An immediate and practical contribution would be the introducing of human capital (including nutrition) and quality-of-life indicators into such standard measures as GNP. This question of formulating considerations of social development represents a basic thrust of this group.

The complexity of analyzing the economic effects of nutritional change are great. The analytic problems were separated into five areas for clarity. The emphasis of the discussion was on practical and simple approaches of delineating useful answers in an area where so little is known and so many factors hinder the pursuit of the necessary knowledge.

The first two considerations relate to purely nutritional effects on demographic and economic variables. A key issue in economic development for more than a decade has been the problem of surplus labor. In attempting to place a positive benefit on improved productivity or lower mortality of a peasant or urban dweller in an LDC, the assumption implicit behind all such studies of close to full employment for the relevant occupational groups must be examined. Without meaningful work, good health is of little benefit for national production. The participants didn't subscribe to the naive aspects of this surplus labor argument; nevertheless the difficult problems of the alternative, measuring the total economic effects of diseases affecting sizeable portions of the population was recognized.

1. The complexity of analysis can be appreciated by first analyzing a nutritional disease which affects a relatively small fraction of the population (vitamin A deficiency or goiter). The epidemiology of the disease may be complex but attention should be on the measurement of economic impact.

Measurement of the economic impact close to the problem would not be affected by numerous sets of interactions among elements such as changes in the size of the labor force and school population.\*

2. Considering a prevalent deficiency such as protein-calorie malnutrition (PCM), the set of secondary effects from alleviating PCM would be sizeable. Elementary PCM would set into motion many demographic and economic changes which would greatly affect an economy. These vast demographic and economic changes makes it difficult to complete an analysis of the effects of eliminating such a significant nutritional problem. Knowledge about the effects of eliminating much less prevalent problems (number 1) would render an analysis of the more prevalent nutritional problems much more useful.
3. Sectoral interrelationships between nutrition, education, demographic change, and disease were discussed.
4. The group considered the distributional impact, viewing nutrition expenditures as a potentially powerful instrument for improving income distribution.
5. As with all complex interactive subjects, the unintended effects of various external forces (private foods, media, price changes, etc.) on nutritional status and, in turn, the effect of nutrition on numerous development strategies (balance of payments and agriculture patterns, etc.) were considered important.

#### A. Nutritional Deficiencies Affecting Relatively Small Population

The attraction and importance of the study of illnesses affecting a small part of the population is that the desirable nutritional status is relatively uncomplicated and specific clinical identification is possible.

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\* Economists would say the decomposibility is small as relative prices would not change. Thus partial equilibrium analysis could be used.

For such cases (xerophthalmia, endemic cretinism and some anemias), it should be possible to measure both the economic and social costs of the problem, and thus the benefits that would flow from elimination and the costs of potential interventions. The simplest possible cases are recommended for study in order to limit the complexity of the impacts and enable concentration on the methodology of measuring nutritional intervention benefits in relation to costs in order to derive a rate of return. With this approach the decomposibility is smaller, secondary effects are small--that is, the indirect secondary price effects produced by numerous sets of interactions of the resultant effects (via changes in the labor force, the dependency ratio, school age population, and so on) are very small.

The planner, however, may find such studies useful only as demonstration projects. For the researcher, the synergistic complexity of even the simplest nutritional diseases which affect small fractions of the population must be stressed. The group suggested the research project should be a carefully planned social experiment analyzing the absolute and relative costs of several forms of intervention and the resultant economic and social benefits. The important thrust would be the generalization of the findings of both the delivery system and the benefits. The methodology of this microeconomic approach should be a simple partial equilibrium analysis.

1) There would be three other suggestions in this economic category. The first suggestion is a systems approach to structuring a time-phased attack on reducing infant and child mortality. Based on data on causes and incidence socioeconomic characteristics of affected families and on cost data on possible interventions (running from medical to economic), it should be possible to develop and measure the cost-effectiveness of some alternative programs to reduce the observed mortality. Data should be household and not average

data. The cost-effectiveness part could be supplemented by a cost-benefit analysis based on standard techniques for measuring mortality effects (e.g. loss of capital invested in children prior to entering labor force).

2) Industrial institutional feeding and plantation feeding has been shown significant enough in some environments to warrant more systematic study of its impact on training costs, absenteeism, product quality and other costs of worker mal- or undernourishment. Too often, the assumption of surplus labor blinds us to other bottlenecks or costs. Several careful studies of feeding programs may produce significant results.

3) Most studies look at 3rd degree malnutrition. Little is known about the behavioral and economic impact of either moderate or subclinical malnutrition. Medical and economic research should begin on this topic.

#### B. Highly Prevalent Nutritional Problems

It was felt that further research efforts to develop measurements of the total economic effects of protein-calorie malnutrition affecting a good portion of the future labor force, would be less fruitful at this time than focusing on the more modest objective of specific illnesses as defined in A above. The reason is that the causes of these problems relate nutrition to many other inputs. Adequate nutrition is really one (major) component of good health and there is no useful general theory of the relation between different levels of health in an LDC population as a whole and economic development. These relationships--with survival, fecundity, fertility, the size of the future labor force, mental and physical performance potentials, educational performance and its economic effects--are too numerous and complex to allow much more fruitful delineation of malnutrition's impact beyond the broad outlining of the ways in which malnutrition fits into general ill health in its impacts. This has been discussed in some of the papers before

this conference. Rather it is the specific studies (A) that will lay the ground work for later research when our knowledge has improved.

Research should consider the question of age of intervention for nutritional supplementation from the pregnant mother (-9 months) to the school age child (say 10 years). Measurement of costs of interventions during pregnancy, infancy and in school present no conceptual problems, only empirical or experimental. Biological/behavioral studies appear to be the primary need at this time.

There was group discussion on the use of macroeconomic models. Research was not proposed on this topic. Reservations about the use of macroeconomic models were:

- (a) The data requirements and interpretation are complicated;
- (b) They tend to gloss over regional and class distributional implications, family statistics and other factors underlying the observed problem. They gloss over perceptions of problems to get at their implications.

### C. Interrelationships Among Sectors

Many interrelationships among sectors may be usefully explored with existing analytic tools (partial equilibrium analysis).

1) Education - It does not seem fruitful to examine the impact of school feeding on education effectiveness. Furthermore, measurement of subsequent productivity benefits is hampered by the general weakness of rate of return analyses of education in LDC's. If and when it becomes possible to link school performance with subsequent income differentials, it may be possible to link feeding (or health/nutritional status) with performance and thus derive incremental rates of return.

2) Population - The relations between nutrition and population (fecundity, infant mortality and desired family size, etc.) are being explored and should

be further explored by, for example, comprehensive family decision-making analyses. Little is known about the effects of nutritional improvement on mortality declines and hypotheses are still to be tested on the relations among nutrition, mortality, and fertility.

#### D. Distributional Impact

All economic approaches to nutrition have focused on productivity and growth effects (including via population, etc.), but have neglected the distributional implications. Nutrition expenditures made by governments can be viewed as a potentially powerful instrument of income (or welfare) distribution. The extent to which this is true depends on the kinds of programs undertaken and the actual incidence of nutritional (or nutrition/health) benefits. The group suggests the potential of nutrition as a serious alternative instrument for income redistribution be considered and compared with other fiscal programs of assets redistribution such as land reform. Of course, feeding programs have been used in many countries, most extensively in Ceylon and the U.S., as a direct form of income redistribution. But in many situations, other nutrition interventions such as iron fortification should be considered. The implications of questions of allocation come in when the value of the food is placed in income-equivalent terms.

The economic tools to carry out the type of studies needed are available, but it remains for investigators to apply these to countries' conditions and programs. The manner in which malnutrition has been dealt with by countries of varying ideological perspectives was seen as part of this broader topic.

#### E. Unintended Effects

Numerous forces of social change are constantly affecting nutritional status positively or negatively. Among these are urbanization, the introduction of a commercial food sector, media, production changes, social unrest (insurrections, wars, revolutions), and price and income changes. Some of these forces can be predicted and should be analyzed.

At the same time, nutritional change and nutrition programs affect other development strategies. Among these are effects on the balance of payments, political violence, agriculture patterns, and school attendance rates. Many of these effects have been discussed. Economic analyses of implications of nutritional programs should look at the more important effects such as balance of payments.

#### F. Priorities

The main thrust of the group's discussion was toward simple, practical and short-term research. Thus, when possible, cross-section analysis is preferable to the longer, more expensive longitudinal analysis.

The group felt that much more attention should be given to research design prior to field studies on nutrition. One reason cited is that tracing the long-term effects of experimental changes introduced by the investigator is difficult. It is important to simplify the research design through the design of a specific package of inputs and expected effects; and the population units to be studied should be kept small enough to be manageable for the more complex data gathering.

Another important point raised is that the analysis of the employment generated through nutritional investments may be significant and should be integral in the planning and analysis of the benefits of nutrition programs.

Appendix A. Conference Participants\*

**I. Analysis of Systems: Where Do We Intervene?**

Jim Pines, Chairman  
William Butz  
Frank Consolazio

Martin Forman  
Norman Holly  
F. James Levinson  
George Poynor  
Harold Rice

**II. Design, Cost-effectiveness, Evaluation of Intervention: How Do We Intervene?**

David G. Mathiasen, Chairman  
Alan Berg  
David L. Call  
Uwe Kracht  
Uma Lele  
Jean McNaughton  
Robert Simpson  
Victor E. Smith  
Robert Weil  
Jayetta Zimmerman

**III. Overall Cost of Malnutrition and Predicted Benefits From Its Elimination, Interrelationships With Other Sectors: Implications of Intervention**

Robert Muscat, Chairman  
Ralph Andreano  
Solomon Chafkin  
Hector Correa

Barry Popkin, Conference organizer  
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\* Special thanks go to Michael C. Latham for reviewing this report.

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Appendix B

Economics of Malnutrition

Methodologies Conferences

AGENDA

September 14, Thursday

- 9:00 - 9:30 A.M. - Assemble in PAHO Conference Room C
- 9:30 - 11:30 A.M. - Introduction - Historical Perspective on  
Reasons for Conference
- Discussion of the three areas
- Area 1. Systems, PAHO Room 203  
Area 2. Intervention, PAHO Room 205  
Area 3. Benefits, Interrelationships  
PAHO Conference Room C
- 11:30 - 1:00 P.M. - Lunch break, Executive Dining Room of  
AID - State Dept. 2nd Floor
- 1:15 - 5:00 P.M. - Area Meetings -- reconvene (same rooms)

September 15, Friday

- 9:30 - 11:45 A.M. - Area Meetings (same rooms)
- 11:45 - 1:15 P.M. - Lunch, Van Buren No. 4, State Dept., 8th  
Floor (Reports will be typed,  
xeroxed and distributed during lunch)
- 1:15 - 4:00 P.M. - Discussion of three Area Reports in PAHO  
Conference Room C

Appendix C. Bibliography\*

Group I. Where Does Intervention Take Place?

Call, David L. and Levinson, F. James, "A Systematic Approach to Nutrition Intervention Programs," presented at International Conference on Nutrition, National Development and Planning (Cambridge, Mass.: MIT, October 1971).

Berg, Alan and Robert Muscat, "Nutrition Program Planning: A Conceptual Approach," presented at International Conference on Nutrition, National Development and Planning (Cambridge, Mass.: MIT, October 1971).

Lele, Uma, "The Green Revolution: Income Distribution and Nutrition," presented at Western Hemisphere Nutrition Congress III (Miami: 1971).

Mellor, John W., Comment on "The Role of Nutrition in National Development," presented at International Conference on Nutrition, National Development and Planning (Cambridge, Mass.: MIT, October 1971).

Group II. How to Intervene?

Kracht, Uwe, "Choice of Strategies for Amino Acid Fortification Programs," in: Nevin S. Scrimshaw and Aaron M. Altschul, eds., Amino Acid Fortification of Protein Foods (Cambridge, Mass.: MIT Press, 1971).

Mathiasen, David G., "Measuring Children as a Means of Evaluating Public Nutrition Programs: A Study of Indian School Feeding Program in the State of Orissa," presented at 1970 Social Statistics Section Proceedings of the American Statistical Association (Minneapolis, Minn.: 1970).

Smith, Victor E., "Efficient Resource Use for Tropical Nutrition - The Nigerian Case," excerpts from unpublished manuscript (East Lansing, Michigan: MSU, 1971).

Group III. Implications of Intervention

Berg, Alan and Robert Muscat, "Nutrition and Development: The View of the Planner," presented at Secretary-General's Panel to Formulate a UN Strategy Statement on the Protein Problem (New York: 1971).

Popkin, Barry M., "Economic Benefits From the Elimination of Hunger in America," Public Policy (Winter 1972).

Selowsky, Marcelo, "An Attempt to Estimate Rates of Return to Invest in Infant Nutrition Programs," presented at International Conference on Nutrition, National Development and Planning (Cambridge, Mass.: MIT, 1971).

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\*Excerpts from the following papers were used as background material for this conference.

Narangwal Rural Health Research Center, Integration of Health and Family Planning in Village Sub-Centers, Report on the Fifth Narangwal Conference (Narangwal, India: November 1970).

Malnutrition and Infection in Weaning-Age Punjabi Children. Progress Report, 1971.

Weisbrod, Burton A., Ralph L. Andreano, R. E. Baldwin, E. H. Epstein, and A. C. Kelly, Disease and Economic Development: The Impact of Parasitic Diseases in St. Lucia (Madison, Wis.: Univ. of Wisconsin Press 1972).

Popkin, Barry and Russell Lidnan, "Economics as An Aid to Nutritional Change," The American Journal of Clinical Nutrition 25:3 (March 1972) pp. 331-344.

Butz, William P., "Nutrition, Lactation, Morbidity, and Fecundity: An Approach to Modeling Their Biological and Behavioral Interactions," preliminary (Santa Monica, Calif.: 1972) Unpublished manuscript.

Correa, Hector and Gaylor Commins, "Contribution of Nutrition to Economic Growth," The American Journal of Clinical Nutrition 23:5 (May 1970) pp. 560-65.