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Panel on Factors Affecting Food Selection
Committee on Food Consumption Patterns
Food and Nutrition Board
Commission on Life Sciences
National Research Council

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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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PREFACE AND ACKNOWLEDGMENTS

This report has been compiled by the Panel on Factors Affecting Food Selection of the Committee on Food Consumption Patterns, Food and Nutrition Board. The study of factors affecting food selection was undertaken at the request of the Food and Drug Administration. The Panel has focused its deliberations upon the strengths, limitations, and possibilities that various disciplinary approaches bring to problems of interpreting, predicting and understanding food consumption patterns and factors affecting food selection. The panel includes individuals with expertise in food science, nutrition, economics, anthropology, epidemiology, and marketing. Such a combination of disciplines does not necessarily encompass the views of social scientists working in the field of food selection and nutrition. The lack of a social psychologist has been felt keenly, and no doubt there are others whose points of view would have contributed significantly. The current study was designed as a modest preliminary overview. The more extensive variety of input available to the Food and Nutrition Board Committee on Food Consumption Patterns and represented in the supporting papers appended to its 1981 report, Assessing Changing Food Consumption Patterns, provides further breadth.

The deliberations of the panel have resulted in a focus upon several areas of agreement and mutual strength, the illumination of some problems and limitations in the application of social science methodologies to nutritional problems, and some suggestions for encouraging the development of research in this area. The report contains background papers representative of disciplinary perspectives on problems of food selection. Each paper provides an introduction to the world-view or basic assumptions peculiar to the discipline, a history of the development of attention to food use within the discipline and critical evaluation of the utility and limitations of existing approaches to understanding food selection. These papers provide the reader with an introduction to the variety of intellectual contexts within which social science research on food selection has evolved.

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ASSESSMENT OF FOOD HABITS--OPPORTUNITIES FOR COORDINATION OF METHODOLOGIES

The Food and Nutrition Board's involvement in the assessment of food habits and their impact on the nutritional status of the American people was initiated during World War II. At that time, the National Research Council was asked to establish two committees to guide the U.S. government in the effort to provide nutritionally adequate diets for the civilian and military populations during war years. The NRC established two committees of equal standing. The first, the Committee on Dietary Allowances, which has functioned continuously since that time, dealt with biochemical and physiological aspects of human nutritional needs. The second, the Committee on Food Habits, active only from 1941 to 1945, dealt with psychological, social and cultural patterns related to diet and food selection. The objective of the Committee on Food Habits was to identify the most effective means of changing or reinforcing food consumption behavior so that the nutritional needs of the population could be met with available food supplies. The committee, under the leadership of anthropologist Margaret Mead, produced two documents: "The Problem of Changing Food Habits" (National Research Council, 1943), and "Manual for the Study of Food Habits" (National Research Council, 1945). Both have been widely used.

These studies of the Committee on Food Habits were part of a general interest during the late 1930's and, the 1940's in social and cultural aspects of food consumption. The field was relatively dormant except for research undertaken by the food industry for the next 20 years. Indeed in the early 1960's, Dr. Mead commented that little methodologic development had occurred in this field in those years (Mead, 1964). Interest was rekindled beginning in the 1960's (Mead, 1964) when the social context and consequences of malnutrition began to be appreciated. Increasing numbers of nutritionists and social scientists now conduct research in areas related to food use and selection. The current report by a panel of the Committee on Food Consumption Patterns is the first Food and Nutrition Board activity since the 1940's to focus upon factors affecting food habits or food selection.

FOOD CONSUMPTION PATTERNS

The term food consumption pattern has been defined (National Research Council, 1981) as "combinations of food which constitute an individual's usual dietary intake which includes daily and longer cyclical variations." Food consumption patterns include repetitive, consistent decision-making and behavior about food selection and use. Patterning of such decision-making and behavior occurs with regard to person or persons, places and times. Examples of person variables are age, sex, economic resources, social and cultural characteristics, household composition and structure, health, employment patterns, and

time availability. Examples of place variables are geographic region, rural or urban environment, local food supplies and marketing facilities, and transportation. Time variables include cyclical and noncyclical changes, sudden or gradual changes, and changes in diet over time. Cyclical changes include meal patterning, day of the week, recurring economic effects, and seasonal and holiday patterning. Examples of noncyclical change over time include adoption of a modified diet for health reasons and adaptations in food selection and use that may occur when the household structure or composition is altered (such as when a child starts school or an adult's employment status changes).

In the United States, there are a number of social and food supply factors which when taken together make it clear that decisions of individuals are critical in determination of food consumption and nutritional status. These include:

- an abundant, varied and highly processed food supply, with limited seasonal change;
- social, cultural, and economic diversity and change;
- potent homogenizing influences which include a highly mobile population, the influences of mass media and advertising, franchised and chain restaurants and uniformity of guidelines for widely used food programs, i.e., school meals, WIC;
- emphasis on individuality, self-reliance and self-sufficiency; and
- changing population and household structure, including an increase in older persons, an increasing percentage of small and single person households, and an increasing proportion of women in the paid labor force.

In this context, the composition of the diet is heavily dependent upon decisions made by the individual within the context of perceived available options. The decision-maker may be the individual consuming the food and/or a "gatekeeper" who controls or influences the options available for others. The person who functions as "decision-maker" depends in part upon conditions such as the context of the decision and the age and condition of the individual.

The tasks of identifying and predicting changes in both food consumption patterns and segments of the population at nutritional risk as a consequence of these changes require insight into the decision-making processes and a perception of available options within which the changes occur. The explanatory and predictive value of data collected to document food consumption is limited by the degree to which the decision-making processes involved in food selection (including economic "trade-offs" when income is limited) are not understood.

Food selection has been studied from a number of perspectives by nutritionists and by social scientists of several disciplines. It is possible to trace the history of the contributions of a particular social science discipline to food and nutrition issues, such as Montgomery (1978) has done for cultural anthropology. However, the overall history of research in the area of food selection is fragmented. Food selection research by social scientists has occurred within disciplinary contexts; thus the problems selected, the theoretical frameworks employed, the methods used, and the interpretation of results have been responsive to and reflected the state of development of method and theory within each social science discipline.

Nutrition scientists also developed considerable interest in the social, economic and cultural aspects of food use during the 1960's as a result of the discovery that energy protein malnutrition had potentially profound consequences for behavioral and cognitive development. As interest grew, academic nutrition departments began to welcome scientists from many disciplines and to incorporate courses which gave attention to social science methods and applications; a few departments committed themselves to long-range interdisciplinary development through the expansion of their permanent faculties to include economists, psychologists, and/or anthropologists. These developments are consistent with the view of nutrition as a field of study where the expertise of a variety of scientists is appropriate to solving nutrition-related problems.

THE CURRENT STUDY--PROCESS AND DEFINITION

The purpose of this report is to identify strengths and limitations of the application of social science methods to food selection research and to recommend some actions which might be taken to increase the amount and quality of research in this area. In addition, some of the major methodologic approaches to the study of food selection and consumption at the individual and household level are discussed in the Appendices to the report. These papers present detailed examples and evaluations of methodologies formerly or currently in use by researchers in several areas of study. The opinions expressed in the papers are those of the authors and not necessarily those of the panel. These papers on Nutrition (Appendix A), Food Technology (Appendix B), Economics (Appendix C), Marketing Research (Appendix D), Anthropology (Appendix E), and Epidemiology (Appendix F) were, however, significant sources of background information for the Panel in the course of its discussions.

THE SOCIAL SCIENCES--MAJOR AREAS OF STRENGTH

Social science disciplines generally recognize the complexity of the context within which food selection occurs and the multivariate nature

of the systems involved. Experience with methods other than experimental control to conceptualize and study the influences and interactions of multiple variables has equipped social scientists with skills necessary for development of methods for understanding human food-related behavior in its natural settings. The approaches taken to deal with such complexity vary among the social science disciplines.

The particular methods and approaches have varied with the theoretical and methodological tools available within each discipline. Within nutrition and food science, attention to food selection has evolved from relatively simple to more complex ecologic models which incorporate various economic, social, and cultural variables (Appendices A and B). The tools of multivariate statistics and the availability of computers have made studies involving multiple variables possible. Overall the particular method and approaches applied to the study of food have depended less on the nature of the food-related behavior under study than on the theoretical and methodological tools available within each discipline. Economists have developed complex models to predict behavior while statistically controlling some of the complexity of the real world (Appendix C). Marketing researchers have approached the problem in part by delimiting the universe of interest to a relatively small group of products and by realizing that the ability to predict very small shifts in consumer preference and behavior has sizable economic consequences (Appendix D). Anthropologists have taken a variety of approaches, usually characterized by focusing on small communities and attempting to use participant observations to document behavior and potentially related variables in very fine-grained and complete ways (Appendix E).

A concern common to several disciplines is finding meaningful categories and perceptions about food and food-related behavior. Cognitive anthropologists, for example, use techniques that are derived from linguistics to elicit and describe the ways in which people categorize their environments. Biological and ecological approaches have been successfully and jointly undertaken by anthropologists and nutritionists. Marketing researchers acknowledge that one of their greatest problems is defining the relevant universe of interchangeable items or products from the point of view of the consumer; and food and nutrition educators and nutritional anthropologists have begun to look seriously at the perceptions that individuals have about food (for example, see Olson and Sims, 1980). All these efforts suggest that nutrient-based categories which make sense to nutrition scientists do not correspond to the categories within which people make decisions about food selection.

A common focus of concern is evaluation of the effects of nutrition interventions and other events upon the food consumption patterns of individuals and groups. Evaluation of nutrition intervention programs has attracted the interest of many other social scientists. The methods

and approaches for evaluation used in the several social science disciplines are quite similar. Epidemiologists have argued for application of the rigor of their discipline, especially with regard to sampling and the validity of measures used, to field studies and evaluation in nutrition (Appendix F). Anthropologists have done considerable work in nutrition program evaluation (see Pelto, 1981, for a summary). Disciplines represented in such evaluation studies evolve in part from the nature of the intervention itself, i.e., economic or educational. Much of the major health, nutrition and welfare evaluation research of the 1960's and 1970's has its basis in social psychology and economics (Campbell and Stanley, 1966; Abert and Kamrass, 1974; Reicken and Boruch, 1974). Economists are currently evaluating various food and nutrition programs as well as studying determinants of various dimensions of food selection behavior (Appendix C). The research projects are based on experience gained from very large quasi-experimental design projects on such social program topics as negative income tax, housing allowances, health co-insurance, and medical care organizations, e.g., Pechman and Timpane (1975).

Thus, there are several areas of established interest in which social science methods have been applied in the task of understanding food selection: (1) development of methods for coping with the multiple variables and contextual complexity of food selection decisions; (2) elucidation of categories and perceptions relative to food which are meaningful to the people actually making the decisions; and (3) evaluation of the impact of intervention and education programs or other events on food consumption patterns and food selection decisions.

PROBLEMS AND LIMITATIONS

There are several barriers to the application of nutrition to social science problems. Some arise predictably at any interdisciplinary interface; others seem peculiar to the relationships between nutrition scientists, policy makers and social scientists. Failure to recognize these barriers may result in mutual disillusionment and disappointment.

The heterogeneity of social sciences poses special problems. Biologists have been acculturated professionally in a common model based upon experimental methods. While they recognize that they do not have a command of all the facts in another experimental field, they seldom have difficulty communicating their basic assumptions and methods to one another. Frequently, methodologic advances, such as radioimmunoassay, are of obvious and immediate importance to a variety of scientific fields and subfields.

No analogous situation exists in the social sciences. Although many assumptions are shared by virtue of common membership in the scientific subculture and focus on human subjects and problems, heterogeneity of

method, theory, and language is great. Differences among professional subcultures and implications for research have only occasionally been addressed in the literature (for example, see Harrison and Ritenbaugh, 1981). A single social scientist is often expected to represent an entire assumed social science point of view in a cooperative study; such an expectation is unrealistic. The problem is acute when it comes to stimulating and developing research programs that bring social science expertise to bear on nutritional problems; inclusion of a single social scientist in the review process will not assure adequate peer review and evaluation.

Not only have the various social sciences grown from different roots, but there is increasing specialization within disciplines. There is a gap between applied and basic social science, so that the social science program evaluator may be as far removed from a theoretical colleague as is the nutrition educator from the physical chemist. The more applied nutrition scientists have been most active in seeking out collaboration with social scientists. Social scientists who devote their energies to applied problems and to interdisciplinary work encounter the same professional problems faced by nutrition scientists with similar interests and commitments.

Most studies of factors affecting food selection have been and continue to be descriptive in nature. Some experimental work has been done in the area of eating "styles" in obesity and other presumed eating disorders and in the area of elucidating how humans learn food preferences and/or aversions (for example, see Appendix A and Rozin, 1980, 1981); but much work in the area is, appropriately, descriptive. There is some disagreement as to whether descriptive studies represent the beginnings of a new field and therefore a pre-experimental stage (what Rozin (1981) has called "Stage I Science") or whether description should be regarded as an end in itself. Even within social science disciplines, there are differing points of view about whether careful description can lead to prediction with regard to human behavior (Appendix E). Recognition of the value of description *per se* may be difficult for scientists accustomed to biological or physical systems in which the ability to generalize and reproduce findings are an important criterion of validity. Although economists and others working with larger populations have identified regularities of human response to various situations that can form the basis for intervention programs, most situations involving groups of people are not entirely reproducible. Opportunity for generalization is, at best, limited. It should be recognized that a variety of small-scale studies, approached with the appropriate tools and techniques of various social science disciplines, can provide valuable information on specific problems of sub-groups at risk.

Most studies of factors affecting food selection have been conducted not in response to the needs of nutrition science or nutrition policy

makers, but in pursuit of the particular methological and theoretical directions taken within individual social science disciplines at the time of the study. For example, several of the studies described by Montgomery (Appendix E) deal with the categories people utilize in perceiving different types of beers, wines, and eating utensils. These domains clearly were not selected as topics for study because of the nutritional significance of changing patterns of beer or wine consumption, but rather for reasons peculiar to the investigators' methodologic and theoretical concerns at that time. The domains may have been selected because of their relative accessibility, the availability of several groups of people with different types and degrees of experience with the items, or for other completely different reasons. While the methods utilized in these studies could be applied profitably to other food-related domains, the availability of literature related to food within any social science discipline has seldom been related to the needs of nutrition scientists for information.

Most of the advances in the "New Home Economics" research (Appendix C) relevant to nutrition came through analyses of fertility and labor supply. Subsequently, the models, with their sensitivity to time, household technology, knowledge and information flows, and other factors have begun to be applied to nutrition issues.

A fourth major difficulty has been pointed out by Pelto (1981), in a review of anthropological contributions to nutrition education research. When any field of study borrows from another discipline, there is a danger that the ideas borrowed either will already be out of date or will fossilize in their borrowed environment since they have been removed from the ongoing dynamic evolution of the field in which they originated. Pelto uses the example of Margaret Mead's influence on nutrition as an illustration. Because of Mead's interest and influence, cultural anthropologists attended to problems of food habits for some time and their writings found their way into nutrition literature and textbooks. The same papers are still prominent in nutrition sources and there is little of the attention to the intracultural diversity, technologic and environmental interrelationships, and cognitive structures which characterizes cultural anthropology in the 1980's. New developments in any field find expression first in the professional journals of the discipline; only later are they found in textbooks within the discipline and still later are they reflected in scientific literature outside the discipline. Interdisciplinary journals are one way of solving this problem; several have appeared recently in the area of foods and nutrition, e.g., Ecology of Food and Nutrition, Nutrition Behavior, Nutrition Research, and Appetite. Another approach is for academic departments of food and nutrition to employ social scientists with major interests in food or nutrition. Such long term employment has been most productive when care has been taken to build ongoing networks with each individual's disciplinary base so that contact with developments in his/her own disciplinary area is maintained. Peer review, ideas and

rewards must continue to come from the parent discipline as well as from the adopted home. Successful incorporation of social scientists into non-social science academic departments is difficult. Many medical schools have attempted with unimpressive results to establish "social perspectives" departments without adequate ties to academic social science. The population field has seen the growth of, first, independent population studies centers and, later, the use of such centers mainly to backstop persons located in various academic disciplines. It has taken one to two decades for population scholars to gain the strength in size and scope of work to develop meaningful peer review in many of the social sciences.

The foregoing discussion of problems and limitations is meant to provide some insight into the potential barriers to utilization of social science methodologies by practitioners in food selection research. The heterogeneity of the social sciences is often not appreciated; ideas which form the basis for research activities may be outdated in current disciplinary terms; no social science has food or nutrition as its primary focus; and an appreciation for what descriptive social sciences can and cannot do is often lacking.

RECOMMENDATIONS

Several actions which should significantly promote and develop the productivity and amount of rigorous social science research in the areas of nutrition, food selection, and other aspects of food-related behavior can be taken by government agencies and others. The following list is limited to those which the panel believes can be accomplished and should have demonstrable payoff.

1. In the context of a national system for monitoring food consumption patterns [such as that proposed by the Committee on Food Consumption Patterns (National Research Council, 1981)], there should be provision for small-scale social and behavioral studies in population groups found to be at high nutritional risk and in those in which rapid change is found to be taking place. Such studies are usually best done by social scientists who are *in situ* and familiar with the local situation and population. The individuals best suited to conduct such studies will vary with the presence and strength of particular academic departments in local universities and colleges and other sources of research expertise. There need not be any prior determination of how much of the research need be psychological, versus anthropological or economic, in orientation. The important aspect is that local, competent social scientists be asked to apply their expertise to particular problems or opportunities that arise in the course of a continuous monitoring system. Information from these studies should be fed back into the system where it may be useful in forming policy at a variety of levels and in action programs.

Some social scientists would stress the potential productivity of including multiple, small-scale studies in the surveillance system. Given the state of the art in the social sciences in relation to food selection and given the relatively small number of social scientists with interest in this area, such an approach may yield much more useful information than any single, large-scale study divorced from the surveillance system.

However, some social and economic research on behavior will continue to require large survey research efforts, particularly longitudinal studies, to assist in understanding changes in food consumption patterns.

Existing nutrition and food consumption surveys e.g., National Health and Nutrition Examination Survey and the Nationwide Food Consumption Survey, collect considerable social and economic data. It may be desirable to consider expansion of the types and amounts of social science and economic data collected. It is crucial that designers of such surveys address the shortcomings and begin to collect data which will increase understanding of how major social changes affect diet and well-being. For example, these surveys should include the following types of data:

- level and sources of income;
- time allocation and work patterns of household members;
- household structure and composition;
- level and types of expenditures and site of food consumption for all ages;
- data that reflect historical and current forces that affect diet and nutrition;
- history of participation in food, nutrition, health and welfare programs which can affect diet and nutrition; and
- factors specific to selected age groups such as availability and use of transportion by the elderly.

2. Activities which encourage long-term communication and collaborative relationships between nutrition scientists and social scientists interested in food should be developed and strengthened. The ability to solve specific problems that might surface in an ongoing surveillance system will depend upon the presence of a reservoir of nutrition/social scientist teams or individuals who understand each other and can collaborate on short notice. This state of coordination and understanding arises slowly. Many starts have been made, and encouragement should be given to new structures for encouraging such

relationships. Interdisciplinary journals have been mentioned; another example is the National Science Foundation-supported workshop on applications of social science to nutrition education research held at Cornell University in 1980 (Olson and Gillespie, 1981). Chairs in social science exist in some nutrition departments. Fellowships for social scientists in mid-career (or immediately post-doctoral) in departments or divisions of nutrition might range from full-year appointments to summer stipends, lecture series, or short visiting appointments. In general, activities which encourage long-term collaborative relationships between social and nutrition scientists who maintain their primary disciplinary ties are to be encouraged.

3. Involvement of epidemiologists or other social scientists who have skills in investigating causation by observing outcomes in disease and disability against baseline risk factors including social structure and behavior has an important place in any multidisciplinary study or center undertaking community-based studies. Validation of hypotheses and measurement techniques and evaluation of intervention procedures in nutrition ultimately involve both biological and social outcomes. Design, implementation and evaluation of studies with nutritional concerns, together with identification of suitable study populations, are not the exclusive perogative of epidemiologists, but their collaboration in multi-disciplinary approaches may contribute to avoidance of pitfalls and snags.

4. The amount and quality of social science research on food and nutrition issues should be increased and ways must be found to develop and maintain interdisciplinary research groups of reasonable size. Relatively long-term "center grants" have been successful in developing new multidisciplinary groupings in clinical medicine, e.g., cancer centers, in the population field, and to a more limited extent in the aging, drug abuse and alcoholism areas. Such groupings require a cadre of scholars of sufficient size and continuity to develop depth in the applied problem area and in methodologic research which must be rooted in parent disciplines.

5. There is a need for increased training and research support for both social and nutrition scientists with primary training in one area and additional training and experience in the other. Social scientists should be encouraged to direct research efforts toward problems of interest to nutrition education, policy and science. Some past efforts to encourage such research have been less productive than hoped, perhaps due at least in part to the difficulty of soliciting good-quality proposals and reviewing them adequately. Development of solicitation and review procedures which reflect accepted standards of rigor and excellence within social science disciplines is essential.

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APPENDIXES

METHODOLOGIES FOR FOOD SELECTION RESEARCH

APPENDIX A

NUTRITION*

Nutritionists have tried to determine what and how factors influence food choices because these choices affect an individual's nutritional status. The purpose of this paper is to review the state of the art by presenting methods and models which have been used by nutritionists to study the factors that influence individual food choices. Models, methodologies and results from both the broad area of food and nutrition and sensory evaluations of food are reviewed.

An overview of the development and direction of food habit research with an emphasis on food selection will be provided. Representative studies available in the food and nutrition literature will be cited. Methodologies and techniques used in identifying the factors affecting food related behaviors will be traced.

One aim of food habit research has been to provide an understanding of the environmental, economic, sociocultural and psychological forces, constraints, motivations and perceptions operating as the individual, group or family makes food choice decisions. This information has been used in development of nutrition education materials and dietary change programs. The impetus for understanding food selection often has come from outside the food and nutrition disciplines.

Perhaps the work most often quoted by nutrition fieldworkers was conducted by Kurt Lewin's description of the gatekeeper and channel theory of food (Lewin, 1943). He noted that food came to the family from various channels and that the gatekeeper--generally the mother--was ultimately responsible for the foods available to the family. While this theory is frequently quoted, few researchers find it relevant to today's American lifestyle. Although no alternate theory has surfaced, many suggest that individuals are their own gatekeepers.

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*Authored paper by Kathryn M. Kolasa, Food, Nutrition, and Institution Management, School of Home Economics, East Carolina University, with contributions by Carolyn J. Lackey, Food and Nutrition Extension Specialist, North Carolina State University and Amy B. Slonim, Program Analyst, Nutrition Specialist, Health Sciences and Public Health Policy, Dept. of Health and Human Services, 1982.

The Committee on Food Habits prepared a "Manual for the Study of Food Habits" (National Research Council, 1945). The manual included specifications for obtaining data on food patterns, social organization of food, the ideology of food, the induction of new generations into food patterns, the material culture and technology of food, food pathology, and study of stability and changes of food habits in culture. The Committee defined the unit of study as "a given human being whose whole behavior has been modified by human means, at a given place where the availability and quality of food will have been determined at a given period in history with its climatic and social characteristics." The key words describing the unit of study of food habit research include: a given human being...consuming a given food item...in a given place... at a given time. These definitions are widely used today by nutrition educators.

Margaret Mead (1964) noted that food habit research in the 1960's differed little from that conducted in the 1940's and that little advancement in theory or methods for the conduct of research had been accomplished. She proposed a multi-dimensional code for describing dietary patterns including physiological and sensory terms, chemical terms, and cultural terms.

Over time nutritionists and dietitians have used several basic tools such as the 24-hour dietary recall, the food record, the food history, and food frequency assessment to obtain information about individual food choices. These tools were used not to discern what foods individuals chose to consume and by calculation what nutrients were consumed, but these methods could not be used to discern why they selected those foods. These nutrient intake data could then be used as indicators of nutritional status. These data, too, were utilized to advise individuals on which foods they should "eat more or less of." Although training of dietitians and nutritionists utilizing these tools may have improved over time and minor modifications may have been made in the data gathering techniques, there have been no significant improvements in these methodologies (Young, 1981).

Some nutrititionists and dietitians have also used food preference checklists to assist them in understanding individual food tastes. These, too, have been used in a counseling setting to advise individuals of what foods "to eat more of."

Decision-making about food by individuals has been little studied by nutrition professionals. The limited theoretical research in food habits conducted by food and nutrition professionals has been directed toward relating the environmental, economic, socio-cultural and psychological factors that impact on the knowledge and attitudes of individuals and families as they make food decisions. The practical aim of the on-going work has been to modify food choices or food selections of individuals and to evaluate changes made by education or other intervention.

Food and nutrition professionals can list many factors that may impact on food choices of individuals. The list varies, but often includes: age, sex, physical health including dental health, ethnic origin, race, geographic location, household composition, income, nutrition knowledge of mother, weight for height, and employment status of mother. Food and nutrition professionals also point to a variety of studies that document that high levels of knowledge of food and nutrition do not alone lead to "good food habits." Nutritionists have, to a limited extent, employed the techniques and tools of anthropologists, epidemiologists, psychologists, sociologists, and educational measurement specialists in obtaining these understandings of food choice.

METHODOLOGIES

This section includes examples of approaches nutritionists have used to study food behavior and to develop the ability to predict consumer food choices. Neither a discussion of the use of dietary recalls and records nor a comprehensive review of the literature is included. The Addendum to this paper (pages 32-37) outlines some of the approaches and models used in studies on food behavior.

Nutritionists often use a dietary recall or record method to gather intake data and a questionnaire or survey form to obtain information on demographics, attitudes, knowledge, and/or shopping practices. Some researchers develop a model of how food choices are made and shape their survey instrument from that model. Others identify key concepts on which they will gather information and attempt model or framework building after data collection. Generally, the methods used are observation, case analysis, mail surveys, interview surveys, and self administered in-person surveys. A few of these approaches will be discussed in more detail.

Ethnographic Survey Combined with Nutrition Survey

The quantitative data obtained in the classical nutrition survey (height, weight, skinfold thickness, nutrient intake, nutrient levels in blood and urine) have allowed nutritionists to describe the nutritional status of individuals and of groups. The techniques did not allow one to understand how or why those food choices were made. Therefore, some nutritionists have added qualitative data collecting techniques to their studies. One of the earliest to do so was Jerome (1967) who utilized anthropological techniques. She explored the dietary practices and nutrition of families in an ethnographic study designed to provide descriptive and comparative observations of cultures for the purpose of formulating generalizations about human nature.

The underlying objective of Jerome's work was "to understand the conditions and processes of change in food habits within the context

of acculturation." Jerome's work expanded the work of Cussler and deGive (1942) which identified means to study the psycho and social elements that affect what and how people eat. The techniques Jerome used included: objective observation, informal and structured interviews, life history collection, food frequency tests, seven day family food consumption records, and reviews of documents and newspapers. Jerome (1967) provided the following rationale for her methods:

> "This intensive study of food habits of a population group represents an effort to establish the why of a dietary practice as well as the whats in household food consumption. This is a prerequisite for dietary surveys; as a technique, it goes numerous steps beyond collecting data. Not only does it identify the individual characteristics which define food selection and consumption practices, but also relates the individual to his social setting and to the local and regional structure."

Others have followed this line of thinking in their research designs.

In the late 1960's and early 1970's others began to experiment using anthropological research methods to study food habits. These techniques were often used with other more accepted methods such as large scale random sample surveys.

Participant Observation, Purposive Samples, Random Samples

Kolasa (1974) included the participant observer procedure, key informant, case study techniques, and interviews, in addition to the random sample survey procedure in her research. The participant observer is one who resides and participates in a community before and during data collection. The observer is thus able to better develop and refine data collection instruments. The data collected from key informants and in case study interviews, while potentially biased, can be used to build a more comprehensive model of food behavior including food choice. Kolasa (1974) conducted a random sample survey to elucidate possible bias in the key informant and case study interviews as well as validate her findings. Others have also used this strategy.

Recently Pelto (1981), Kolasa (1981) and Ritenbaugh (1981) argued for the continued expansion and use of these qualitative data gathering methods in food behavior and in nutrition education research. In Kolasa's work (1974), the survey questionnaire and interview techniques were employed to isolate factors involved in the cultural transmission of foodways and factors that might change foodways. The random sample survey provides a general reference for assessment of possible bias introduced by the purposive sample interviews or generalizations developed in the study.

Nutritionists have used case analyses in only a limited way to develop sets of hypotheses about food choice. A case analysis includes

a qualitative research method which may use observation, participant observation, interviews, life histories, diaries, documents, and other information to gather data which goes beyond descriptions and presents explanations.

Lackey's study (1974) of family food purchasing in a case analysis approach yielded detailed accounts of the complexities of mothers' decisions in food buying. The case approach, done in hopes of defining areas for hypotheses testing, allowed for intensive consideration of cultural, sociological, economical, psychological and environmental factors of a small group of people. The intensive study may lead researchers to an increased awareness of nutrition attitudes, beliefs and values. Interviews, observations and record keeping instruments provided the means for data collection on demographic, behavioral and attitudinal elements. Analysis of the qualitative case analyses data provides a unique picture of the participants in sample groups. Case analysis alone will not predict food choice, but it can be useful in identifying those behaviors and beliefs individuals use in making decisions about food.

Continuing Concerns

Researchers in some disciplines including anthropology are beginning to combine case study analysis and interactional analysis. Analyses of microbehaviors are costly and time consuming. However, since nutritionists seem to be stagnated in their methods for analyzing food behavior and understanding food choice, such analyses might be useful. Examples include work by Dreyer and Dreyer (1973) and Pollitt and Wirtz (1981).

MODELS

Qualitative data can be used to develop hypotheses, framework or models for additional study. Models utilizing ecological, sociological and family concepts have been used in nutrition research. While models can describe food patterns of groups, they cannot be utilized to predict food choice. Many of the traditional methodologies, such as interviews about food habits, dietary food frequency questionnaires and food histories have been incorporated into the testing of models or conceptual frameworks.

Lund and Burk (1969) utilized a conceptual framework for the analysis of the structure of children's food consumption behavior (see Figure 1). Many variables were used to characterize a child's food consumption event: the school environment, home and family environment, the child's motivation, and the child's cognition. Burk (1970) diagrammed the complex process of food economics, indicating that the

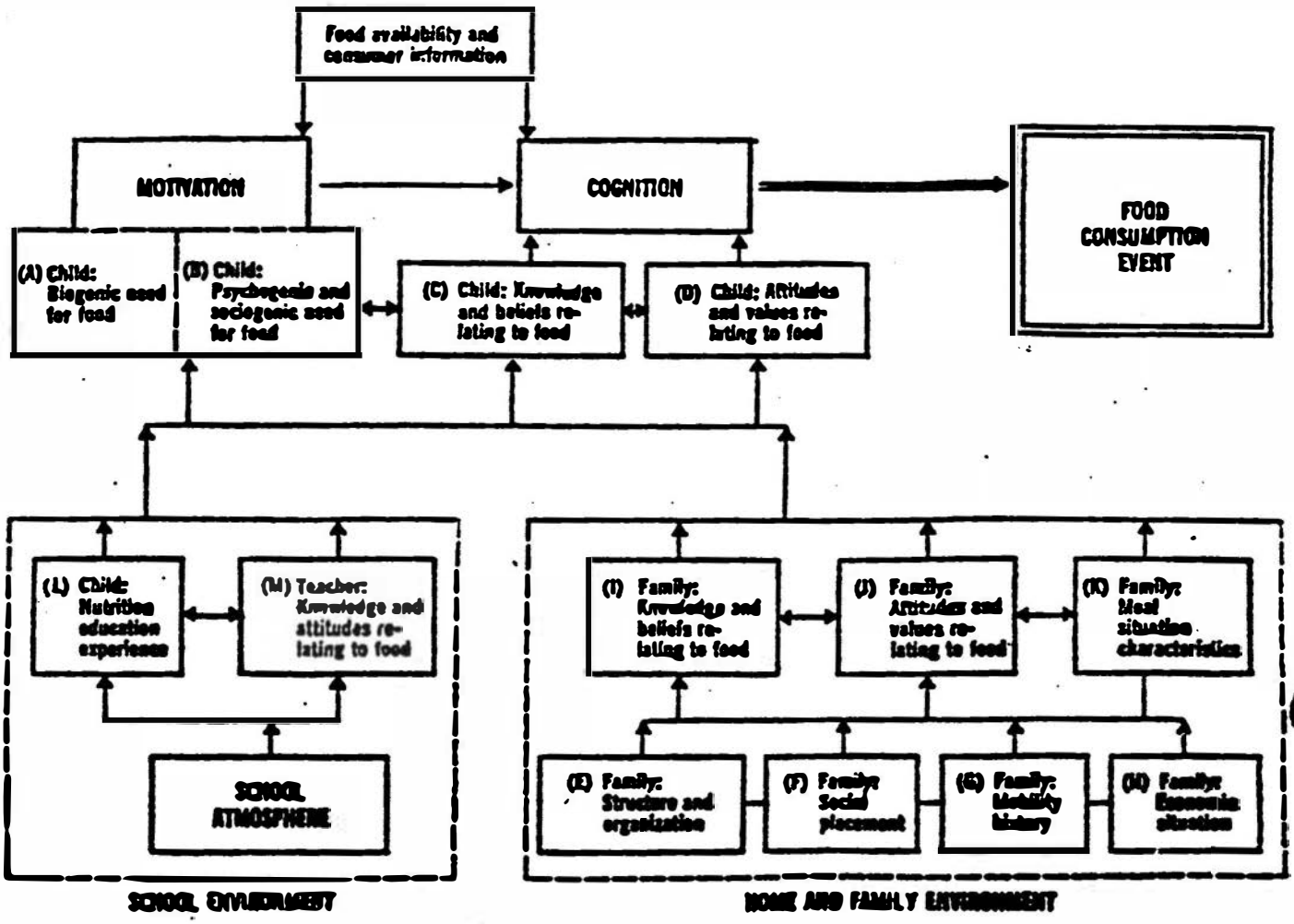


Figure 1. Children's Food Consumption Behavior (Lund and Burke, 1969).

information-decision subsystems for the family included a flow of measureable events, concepts and interrelationships. Social, psychological, economic, and environmental subsystems were integrated into this systems approach. The pioneering efforts of Lund and Burk to construct multi-variable models of food behavior are noteworthy because such models made obvious the fact that any changes planned to effect dietary patterns had to take under consideration a great number of essential elements in the 'life styles' of individuals and families.

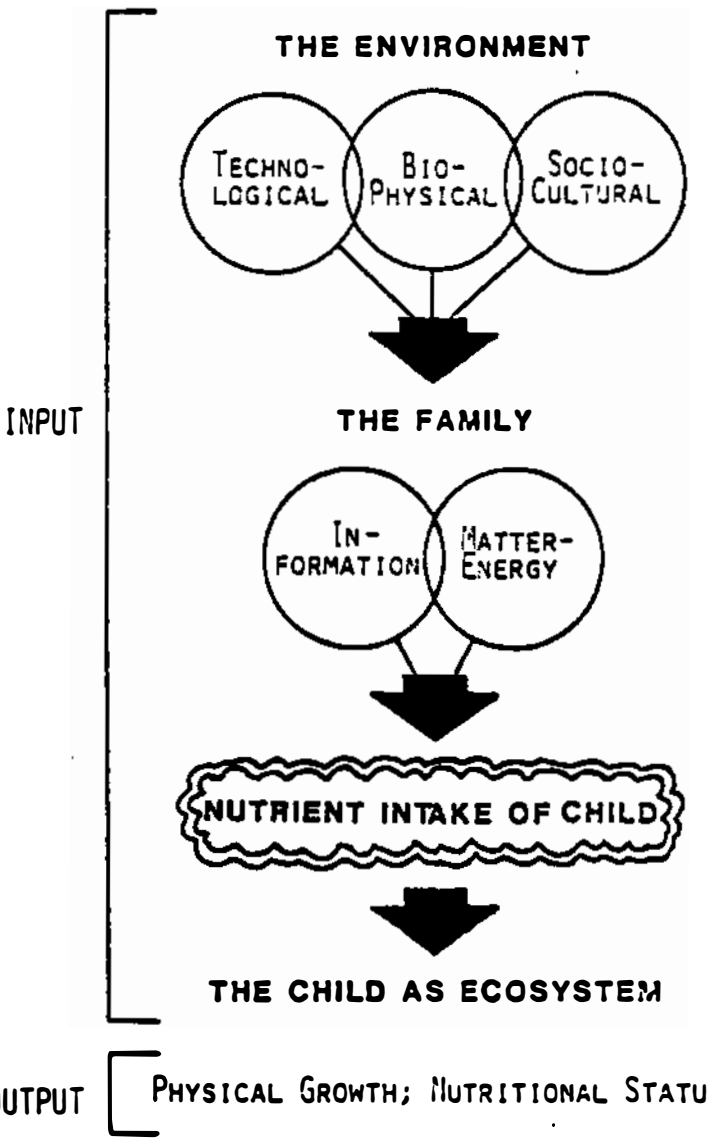
Sims et al. (1972) introduced their ecological model for study of the interrelationships between the socio-economic, psychological and biochemical factors involved in a child's physical growth and nutrition status. Their model (Figure 2) pictures the variety of inputs from the environment and the family that impact on a child and result in his/her state of health and well being. Using slightly more sophisticated statistical approaches than possible with qualitative data, the researchers were able to develop a typology of family characteristics and maternal attitudes which were directly related to the dietary intake and resultant physical status of the children.

The Sims model was modified by Caliendo et al. (1977) (Figure 3) who hoped to understand more clearly the relationship between the dietary intake of a preschooler, the nutritional status of the preschool child and other factors that intervened. Data analysis techniques such as correlation, multiple and step-wise regression and path analysis were used. The statistical relationship between the dependent variables and independent variables was assessed and compared with non-probability, purposive sample studies. The dependent variables were related to nutritional status. The selected independent variables included demography, family resources, maternal psycho-social and attitudinal qualities, and selected variables particular to each child.

The studies conducted by Sims et al. (1972) and Caliendo and co-workers (1977) demonstrate the early attempts of nutritionists to build frameworks for study of the factors (including food choices) that affect nutritional status. These and similar models measure only in part the variations in nutritional status of individuals and in food choices. Further refinement of techniques to measure food intake and exploration of appropriate statistical methods for analyses of these types of data are required.

Yetley (1974), taking a different approach from that described above, incorporated theoretical orientations and data analysis techniques from the social sciences into a theoretical model for food behavior with a social-psychological framework. Data describing frame-of-reference (internal-personal and external-situational factors), food behavior, and nutrient intake or weight status variables were collected in separate interviews of husbands and wives. Multiple regression analysis of all possible relationships among variables in a model, path analysis, and other causal model techniques were applied to the

A CONCEPTUAL MODEL FOR THE STUDY OF NUTRITIONAL STATUS OF CHILDREN



A CONCEPTUAL MODEL FOR THE STUDY OF NUTRITIONAL STATUS OF CHILDREN

Figure 2. (Top) **A Theoretical Model for the Study of Nutritional Status: An Ecosystem Approach**
(Bottom) **A Conceptual Model for the Study of Nutritional Status of Children (Sims, L., B. Paolucci, and P. Morris, 1972).**

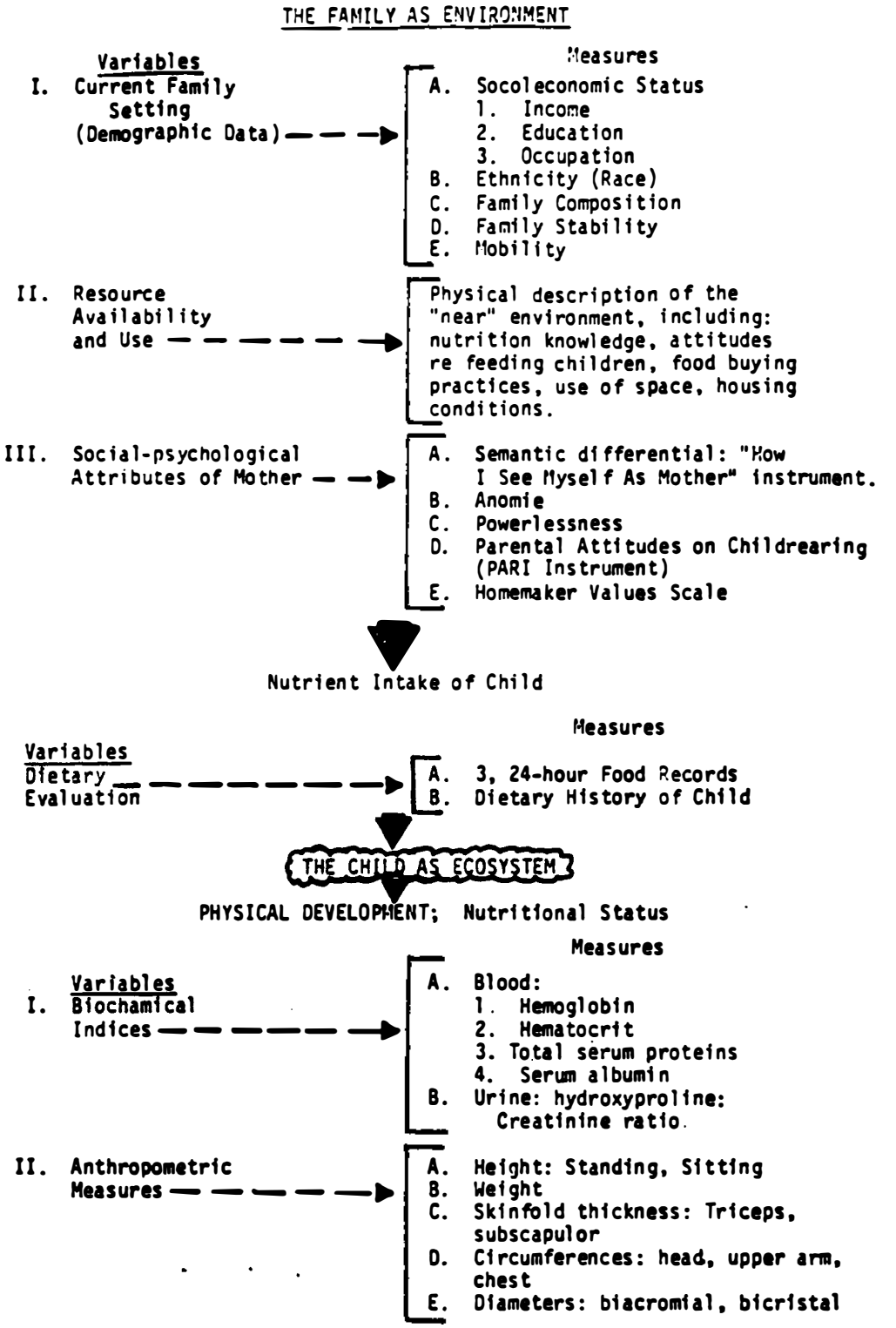
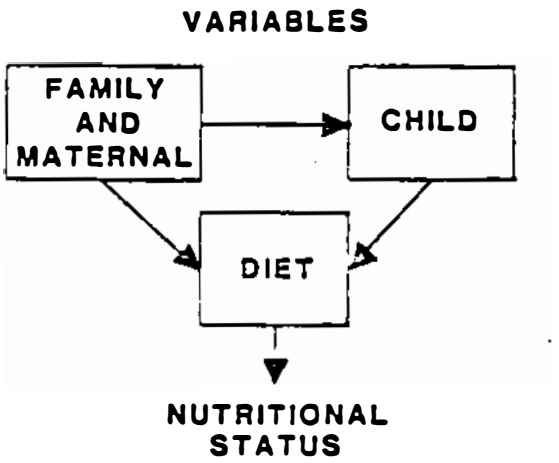


Figure 2 (continued). The Variables and Their Assessment.



MODIFIED SIMS MODEL USED TO DETERMINE RELATIONSHIPS BETWEEN VARIABLES.

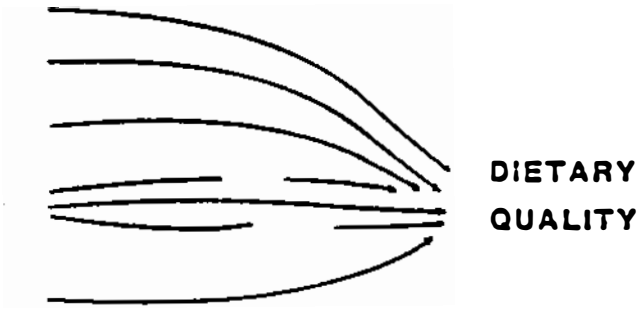


Figure 3. (Top) Modified Sims Model Used to Determine Relationships Between Variables. (Bottom) Path Model of Dependent Variables Regressed on the Independent Variables (Caliendo, M. A., D. Sanjur, J. Wright, and G. Cummings, 1977).

data. A descriptive information and empirically-modified causal model for both husbands and wives was reported by Yetley (1974) (Figure 4) While the analysis by Yetley (1974) was more complex than that reported by Sims et al. (1972) and Caliendo and co-workers (1977), the predictive value of each in determining food choice is limited.

Hertzler and Owen (1976) also encouraged the use of the sociological orientation to understand food behavior. Specifically, they suggested the use of scalogram analysis to document present food patterns and changes in food habits. They suggested that this type of analysis would mitigate the problems of comparing food habits at different time periods and in different cultures with variability of food availability and other difficult to control variables. Selected variables important in determining food choice have been indicated by use of this technique.

Outside of the agricultural economics literature, there are few reports of work that would include seasonality or market place parameters in more than a cursory way. Very little is known about the influence of ecologic events, such as seasonal conditions, temperature changes, and day of week, on food choices. Reaburn and coworkers (1979) have, however, presented a "model" to explain food selection when food is available in the market and economically accesible to the choice maker. The model included nine food selection determinants. The methods included a questionnaire with a demographic section and a food attitude section with food frequencies, availability, price, convenience and prestige. However, the researchers concluded that although a relationship was found between social determinants and food choice, other factors may play a larger role in determining food choice.

APPLICATION OF APPROACHES AND MODELS

Since the mid 1970's, the general food and nutrition literature has carried reports describing food habits of various groups of people using primarily qualitative measures and determining the influence of education, income, ethnicity, food and nutrition knowledge, and a host of other variables on food habits. An overview of this literature may be organized into the following categories: family attitudes and food behavior, family food choices, family food consumption, family food preservation and production, and policy in relation to food choices and habits. A few examples of the kind of research which has been conducted in each of these areas follow.

Family Attitudes and Behavior

Zimmerman and Munro (1972) investigated behavior modification in relation to family food attitudes and practices. Attitudes and personality traits in assessing change-proneness and nutrition-related behaviors were researched by Carruth et al. (1977). The relationship

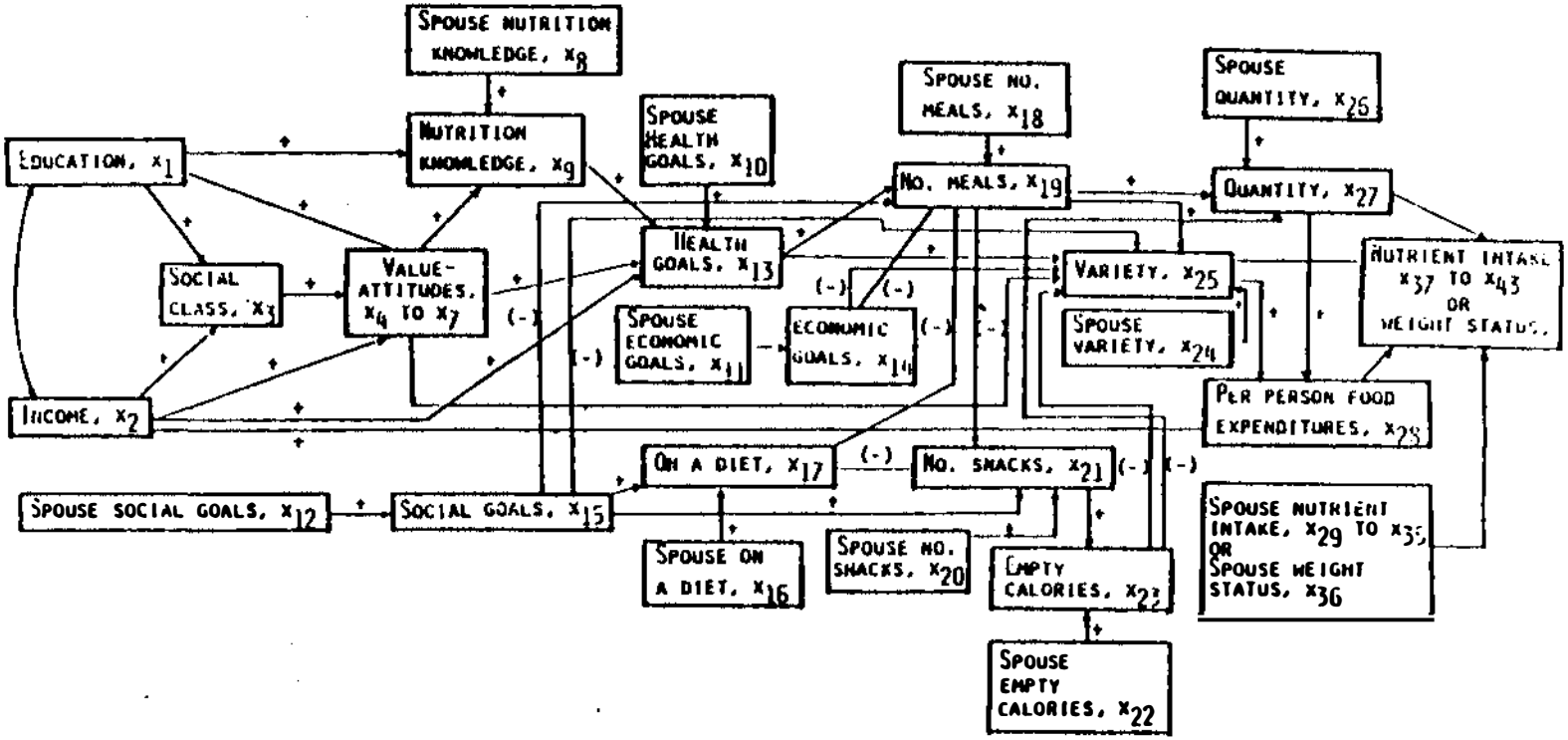


Figure 4. A Casual Model Analysis of Food Behavior (E. A. Yetley, 1974).

between taking home economics courses and an individual's knowledge, attitudes, and practices has also been studied (Schwartz, 1975). The combination of cultural, religious, preference and idiosyncratic attitudinal factors that guide behavior and influence nutrition have been investigated on many levels by Pyke (1970); Maslansky et al., (1974); Steelman (1976); Church and Doughty (1977); and Mills (1977).

Family Food Choices

As an outgrowth of Lewin's work in 1940, the mother's influence on family food choices has been further explored (Eppright et al., 1970; Maslansky et al., 1974). Building on the earlier work of Burk (1970), Coughenour (1972), Beyer and Morris (1974), Armstrong (1975), and Cosper and Wakefield (1975) have investigated the various goal directed group (family) interaction processes in family food behaviors.

Family Food Consumption

USDA National Food Consumption surveys conducted about every 10 years have been used to characterize the food and nutrient intakes of households and individuals within families (Pao, 1977) and, more recently for creation of typologies of meal patterns in the sample population (Guthrie, 1980).

Specific variables and the impact on the families' or family members' actual intake have been measured. For example, the relationship between food behaviors or attitudes and occupation or occupational status of the mother have been measured (Burk, 1961; Jalso et al., 1965; and Clancy-Hepburn et al., 1974) and between food behaviors or attitudes and educational status (Jalso et al., 1965 and Eppright et al., 1970). Income and its impact on food consumption, as well as opportunity, cost of time, and other socio-economic effects (Prochaska and Schrimper, 1973), have been researched by economists.

Family Food Preservation and Production

Surveys and systematic analyses of family food preservation and production practices have been conducted (Burk, 1970; Parrish, 1971; Phillips and Bass, 1976; Kaitz, 1977). The energy expenditure on food production has also been researched (Manning, 1968; Walker and Woods, 1976).

Policy in Relation to Food Choices and Habits

Paarlberg (1977) and Manchester (1977) discussed the application of the theoretical and analytical expertise of economists, sociologists and nutritionists in measuring food related behaviors in policy-oriented research. They identified the strengths and gaps on the present "state of the art" in this area.

OUTLOOK FOR FUTURE

The descriptive and analytic studies continue to increase our awareness of the complexity of individual and group food behaviors and the factors that support or change food behaviors. However, they provide only a general understanding of food behavior with little power to know or predict how education or other interventions will affect food choices. This ability is at the core of policy decisions.

Research projects focusing on food choice, in which the researchers have time and money to seriously and thoroughly explore and combine the theoretical, practical and analytical tools of their fields, are viewed as the most promising area through which to gain an understanding of food selection. Nutritionists, anthropologists, psychologists, sociologists, epidemiologists, agricultural economists, family ecologists, physicians, and food and nutrition policy analysts should be given the support to integrate and develop:

1) research designs that include data on several levels of analysis: individual, family, institutional, community populations and the broader society;

2) valid and reliable measurement tools for food intake, food and nutrition beliefs and attitudes;

3) solid criteria for field work data collection, recording, coding, editing; and

4) means for data anlysis:

   a) to test diversity of hypotheses incorporating expertise as groundwork for theory, and

   b) to test models based on theories where variable measurements are valid and reliable.

The individuals must have the time to be innovative and thorough in the development and follow-through of the initial and future projects and to build on the strengths and curb the weakness of each cooperative venture in order to expand the ability to quantify impact on food selection behaviors.

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APPROACHES AND MODELS USED IN STUDIES OF FOOD BEHAVIOR

ADDENDUM TO PAPER ON NUTRITION

I. Approaches and Models to Study Habits

A. Ecological

1. Nutritional status of preschoolers--an ecological approach (Sims, 1973; Sims et al., 1974) (see Figure 2)

2. Modified Sims model - multi-faceted factors involved in a holistic approach. (Caliendo, Sanjur, Wright and Cummings, 1977) (see Figure 3)

B. Sociological

1. Model for sociologic study for food habits (Hertzler and Owen, 1976)

2. Casual Model Analysis of Food Behavior (Yetley, 1974) (see Figure 4)

C. Family-Oriented Models

1. Systems analysis of information and decision subsystem for the family economy (Burk, 1970)

2. Family decision making

3. Children's food consumption (Lund and Burk, 1969) (see Figure 1)

II. Family Attitudes and Behavior

A. Behavior modification of family food attitudes and practices (Zimmerman and Munro, 1972)

1. Attitudes and personality traits in assessing change-proneness and nutrition-related behavior (Carruth, Mangel and Anderson, 1977)

2. Home Economics courses and the relationship with present nutritional knowledge, attitudes, and practices (Schwartz, 1975)

B. The combination of cultural, religious, likes and idiosyncrasies that guide behavior and influence nutrition (Pyke, 1970)

1. Cultural influences interact in feeding patterns practices by mothers (Maslansky, Cowell, Carol, Berman, and Grossi, 1974)

2. Attitudes toward food as indicators of subcultural value systems (Steelman, 1976)

3. Local eating patterns evolve over centuries to make best use of food and equipment available intervened with complex and important social and sensory considerations within every culture (Church and Doughty, 1977)

4. Psychosocial aspects of family food habits (Mills, 1977)

C. In relation to feeding children:

1. A model of factors effecting food and energy intake of young children (Woolfe, Wheeler, VanDyke and Orraca-Tetteh, 1977)

III. Family Food Choices

A. Food choices as a goal directed social group interaction process (means-end basis), (Coughenour, 1972)

1. Family as an information processing unit for evaluation and change in food practices. (Armstrong, 1975)

2. Changes in food habits revolve around family as a whole. (Beyer and Morris, 1974)

3. Family combination of cultural, social and personal factors of all members (Cosper and Wakefield, 1975)

B. Economic perspective of food choices. The ingestion of food is a matter of nutrition, taste, habit, mores, economics, and politics. (Paarlberg, 1977)

C. Mother's influence on family food choices:

1. Education of mother more highly related to dietary components than income (Eppright, Fox, Fryer, Lamkin and Vivian, 1970)

2. Mother's cultural influences on feeding patterns practices (Maslansky, Cowell, Carol, Berman and Grossi, 1974)

IV. Family Food Consumption

A. The food and nutrient intakes of individuals within families in the South (Pao, 1977)

B. Variations and changes result from a complex interworking of social, behavioral, and economic factors (Burk, 1961; Chou, Harmon, Kahn and Wittwer, 1977)

1. Occupational considerations

a) Occupation reflects income and status, perhaps differences in values placed on food (Burk, 1961)

b) Working mothers' impact on food patterns (Jalso, Burns, and Rivers, 1965)

1) Convenience motivates diet change and its influence grows as more women work outside the home (Chou, Harmon, Kahn and Wittwer, 1977)

2) Greater flexibility and use of prepared foods (Burk, 1961)

3) The children's attitudes towards T.V., ads and snacks of mothers who worked varies from those who did not (Clancy-Hepburn, Hickey and Nevill, 1974)

c) Eating trends of farm families now closely parallel those of other families (USDA, 1968; Jalso, Burns and Rivers, 1965)

2. Educational level considerations

a) education and higher standards of living affect what people want to eat, when and where they eat (Jalso, Burns and Rivers 1965)

b) The educational level of the mother direct impact on specific food groups and nutrients consumption (Eppright et al., 1970)

3. 30 to 40% of the household work of families is estimated to be food related (Hirst, 1974)

4. 31% of the non-renewable energy used in the food system is expended directly or indirectly by families (Hirst, 1974)

5. Men vs. Women (Holmes, 1976)

B. Away-From-Home Food Consumption

1. Opportunity, cost of time and other socio-economic effects (Prochaska and Schrimper, 1973)

V. Family Food Preservation

A. Survey of home preservation (Kaitz, 1977)

B. A systematic analysis of food preservation in the storage system (Burk, 1970)

C. Preservation practices in East Tennessee (based on family traditions, lack of equipment, or flavor/texture of product (Phillips and Bass, 1976)

VI. Family Food Production (What is known about it?)

A. Food preparation in the production (decision-making) system (Burk, 1970)

B. Survey of home food production (Kaitz, 1977)

1. Sketch of percentage of food consumed that families produced themselves (Parrish, 1971)

2. Residence and food production (Parrish, 1971)

C. In nine out of ten households the woman produces the meal (Cosper and Wakefield, 1975)

D. Energy expenditure on food production

1. 34 to 42% of total household work time of all family members in food related activities (Manning, 1968)

2. 30% of homemakers' work time devoted to food related activities (Walker and Woods, 1976)

E. Ten-state survey reflected educational attainment of person responsible for buying and preparing families' food was related to nutritional status of children (Futrell, Kilgore and Windham, 1971)

VII. Food Preferences

A. Factors determining common ingredients in man's diet are aesthetic values relating to religion, prestige, and upbringing, as well as economy, health, convenience, technology and taste (Chou, Harmon, Kahn and Wittwer, 1977)

1. Cultural, social, personal and situational factors motivate or encourage food habits (Cosper and Wakefield, 1975)

a) Environmental influences, Afro-Americans of southern rural origin vs. West Indian Americans (Jerome, 1975)

2. Agricultural productivity, economic status-action of food industry medial (advertisements), social and cultural influences are reflected in food habits (Latham and Stephenson, 1977)

3. Personal or family food preferences are motivational factors in eating in each food category (Cosper and Wakefield, 1975)

B. Early eating experiences conditioning future eating habits (Maslansky, G. Cowell, R. Carol, S.N. Berman, and M, Grossi, 1974; Beyer and Morris, 1974)

1. Theory of modeling in childrens responses to observations (Highberger and Carothers, 1977)

2. Young children imitate the family food habits (Beyer and Morris, 1974)

3. Food patterns do not change significantly from early middle age to old age (Garcia, Battese, and Brewer, 1975)

C. Convenience foods increased preference due to women working outside the home (resultant additional income, combined with loss of time) (Chou, Harmon, Kahn and Wittwer, 1977)

VIII. Food Purchasing

A. Who does it?

1. In nine out of ten households--women (Cosper and Wakefield, 1975)

a) Wives are more influential than husbands in the decisions concerning food purchasing (Schafer and Boheem, 1977)

B. What part of income spent?

1. Available food market facilities, pricing policies, selection and quality of merchandise in the market family characteristic and shopping skills affect portion of income spent on food (Marion, Simonds and Moore, 1968)

2. Size of family, per capita family income and expenditure for food per week by family life cycle (Coughenour, 1972)

a) Per capita income and family life cycle - 60% of variation of grocery expenditures (Southern Region Project SH-35, 1972)
b) No pattern to food expenditures and income elasticity between household sizes (Herman, 1967)

3. Regional Evaluation (Urban families food worth more)--(USDA, 1968)

C. Nutrients/Dollars Spent

1. Cost: Convenience vs. foods cooked from home recipes (Cromwell and Odland, 1974)

a) 59% of convenience foods have cost comparable to home prepared foods (Trevis, 1977)

D. Purchasing as part of the consumption decision-making system (Burk, 1970)

1. Theory of consumer behavior in food-buying situations based on recognized steps in decision-making (Hammett and VanDeMark, 1972)

E. Convenience foods market increase due to women entering work force; time for preparation of meals decreases (Trevis, 1977)

IX. Policy in Relation to Food Choices and habits

A. Policy is a blending of systems and expertise of the economist, sociologist and nutritionist in combination with tradeoff's among nutritionists, economists and politicians (Paarlberg, 1977)

B. Application of household consumption behavior in policy-oriented research (Manchester, 1977)

APPENDIX B

FOOD TECHNOLOGY*

Generally, food technologists are interested in developing and refining acceptable, safe and marketable food products. Consumer responses to food products are an important concern in the development or the refinement of a food product and therefore, the consumer's response to a food product is one that technologists would like to predict. Traditionally, the flavor, color, texture, odor and general acceptability of the food product and consumers' reactions to these food attributes have been studied. More recently, and with more frequency, the questions of nutritive value and long term safety have been considered in the development of some food products and in studies of consumer responses.

HISTORY

As indicated, sensory evaluations of general product acceptability, color, flavor, texture, and odor have been the central concerns of food technologists. Methods for evaluating these food attributes have been developed and refined (American Society for Testing and Materials, 1968). Generally, sensory evaluation has been viewed as a means to provide information regarding the effect of a treatment to a food on the reaction of consumers. For example, does the consumer detect a difference in the flavor, color or texture of a product when ingredients or processes are modified?

Brandt and Arnold (1977) surveyed the sensory evaluation practices of food companies and found 66 percent utilized triangle tests, 57 percent used hedonic measurements, 55 percent used paired comparisons and 33 percent utilized multiple comparisons, general preferences, rankings, and degree of preferences by taste panels to determine acceptability of food parameters.

Technologists conducting sensory evaluation research have determined that some color, flavor, and odor changes do have a confounding influence on consumer choice. Moskowitz and Chandler (1978) have demonstrated that poor flavor is a major cause of food product rejection. Color is a prominent food attribute in consumer choice determination when flavor-color associations are strong. Szczesniak (1979) has demonstrated that texture is a food attribute that contributes to acceptance and choice of foods, but that consumers have a wider range of acceptable textures than of flavors.

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Food technologists generally have focused on the acceptability and safety aspects of food products and have left the marketing and economic aspects to others. More recently, interaction between the food product developers and the market researchers has occurred in an attempt to predict consumer food choice. Several researchers have discussed the use of focus group interviews and a variety of computerized mathematical models for problem tracking and prediction (Dillon, 1977; Scully, 1977; Cheskin, 1976; Segger, 1979; Wall, 1978; and Elrod, 1978). However, it appears that sensory evaluation continues to play a minor role in market research.

As food attributes are distinct, their confounding influences on food choice have often been studied separately. As a result, the sophistication and accuracy of the methods used to study the influence of the food attribute on the consumer's food choice vary with the attribute (i.e., flavor, color, texture).

Texture--An Example

The following discussion on texture demonstrates the questions and problems that exist in studying the influence of food attributes upon food choice. Objective and sensory measurements of texture can provide some, but not all, information to allow prediction of food choice.

The food industry and advertising media have recognized the impact texture can have on consumer preferences. Research focusing on consumer reactions to flavor and color has had considerable attention; research on texture has been less frequent (Szczesniak, 1979). Little specific information has been generated to understand the role of texture in food acceptance and food choice.

Consumer interviews have been used to determine consumer acceptability and preference for textures. Consumer testing generally involves rating texture on a hedonic scale. This type of rating may not be useful because of the multiparameters nature of texture. Szczesniak (1979) has developed a tool that combines popular texture terminology, classified texture terms used by trained texture profile panels, and a scaling technique similar to semantic differentials. This tool yields a quantitative description of a food product texture as perceived by the consumer.

Progress in methodological work on texture profiling has been hampered by the lack of a world wide accepted glossary of food terms. A classification of terms is a necessary foundation for hypotheses building.

Moskowitz and coworkers (1979) have suggested that quantitative analysis, methods of sensory evaluation, rheology, psycho-rheology and product development can be utilized to determine combinations of ingredients which maximize consumer preference. They further suggested that

by interrelating these measures expert panel data could be used to predict consumer responses to texture.

Therefore, food scientists today can predict to some extent how consumers will respond to a food texture. The technologists' methods, however, do not allow one to predict food selection or food choice based on textural parameters. This is particularly true when sensory influences are food specific.

FUTURE

Research that combines sensory evaluation techniques with other techniques may hold the promise for better prediction and understanding of factors influencing food choice. Schutz and coworkers (1977) discussed the use of two concepts, personality and psychographics, to predict food acceptance. The use of personality alone to predict food acceptance has not been successful. The use of psychographics or measurement of attitudes, interests and opinions has been more successful in predicting food acceptance. Schutz and coworkers (1977) described a method that used multivariate techniques of multiple regression. They represented the relationship between consumer behavior and attitudes to measure selected consumer food behaviors in order to predict food purchase and use. While they have reported some success, the researchers suggested that design and use of more specific consumer oriented attitudinal and lifestyle measures would increase the chances of correctly predicting consumer food choices. This technique did not include any aspect of sensory evaluation; inclusion of some sensory methods might improve the prediction outcome.

Much of the prediction variance of food preference is due to factors other than color, flavor, and texture. Progress has been made in developing sensory and objective measurements of attributes of food products to predict consumer food choices. Lau and coworkers (1979) have suggested that "selection determinants" can be used to interpret the influence of consumer perception of foods in terms of cultural, social, personal and environmental factors upon food choice. The "selection determinants" methodology used by Lau and coworkers (1979) included use of a questionnaire designed to obtain the following data about ten different foods: food use frequency, food preference, perceived values of taste, tolerance, familiarity, price, prestige, convenience and health beliefs. Food selection determinant scores were mathematically derived and linear relationships were determined. Multiple regression analysis using seven selection determinants as predictor variables and food use frequency as outcome variables was used. This work has indicated that some determinants in food choice may be food specific and change with each food. The researchers suggested that personality factors be incorporated in the methodology.

Another approach, described by Moskowitz and Chandler (1977), allowed for estimation of the potential gap between the consumer perceived ideal

food product and currently available food products. The method included sensory evaluation by consumers, consumers' creation of a magnitude estimation scale on food attributes that have meaning to them, and statistical approaches to identification of a set of ingredients that produce a desired sensory profile of a product a consumer would desire.

Moskowitz and Chandler (1978) have also attempted to measure consumer "trade-off-willingness" to determine consumer flavor choices. Their method included (1) psycho-physical scaling where the consumer panelists scaled their perception of the food product and rated the acceptability, (2) measurement of flavor attributes, and (3) market research techniques for trade-off analysis.

The volume of literature on combining food sensory methods with marketing research methods is currently not sufficient for prediction of the superior potential of any one method to understand the consumer food choice.

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APPENDIX C

ECONOMICS*

INTRODUCTION

In this paper, we (1) explore the ways economists have analyzed determinants of food selection, (2) review some of the newer theories being used to expand the conceptual framework and empirical models, and (3) discuss potential avenues in which economics can contribute to a fuller understanding of the individual and household decision processes in which food selections are made. Unlike many other social scientists who analyze behavior inductively, economists generally analyze individual and household decision making and behavior through basically deductive reasoning. Economics in the consumer behavior (demand) area is based on utility theory and utilizes models to facilitate empirical testing conducted for many different situations. Changes in economic theory are accepted only to the extent the relationships studied have been found empirically to conform to reality. Basic assumptions about human behavior which underline this theory have changed much less frequently. For example, the assumptions of consumer rationality and comparability (the ability to rank desired goods and services in order of preference) have changed little over the last century.

MICRO ECONOMIC FOCUS

Micro economic research focuses on regularities of economic behavior. It searches for broad generalities which can apply across individuals and across wide socio-economic groupings. For example, general laws such as Engels' Law relating levels of consumption to income changes have been found to apply quite universally. As economic research has become more sophisticated and definitions and measurement of income, price, education, knowledge, ethnicity, and so forth have become clearer, various universal postulates about changes in income, price, other determinants, and demand behavior (among various behaviors studied) have become much clearer. For example, Mincer (1963) has shown how consideration of both the time price and money price for items demanded clarifies these demand relationships considerably.

Unlike behavioral and social psychologists who often focus on consumer behavior as determined by basically internal factors such as motivation, cognition, and learning, the economists' focus is more on what might be termed external, or predisposing and enabling, factors such as income and prices. It must be noted that behavioral modeling

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done by any discipline is only as complete as the researchers' understanding of the factors which contribute to behavioral differences. For instance, to study the determinants of breast-feeding behavior, the economist must understand the biological factors which can affect either the suckling behavior of the infant (e.g., appetite as affected by supplemental feeding) or lactation ability of the mother (e.g., use of estrogen or other oral contraceptives and age). Failure to do so could lead to misspecification of any model and misinterpretation of results (e.g., Popkin et al., 1983).

Because economic research can both identify structural relationships in market situations and individual consumer demand, and use this information to predict outcome or behavioral changes subject to modifications in the structural variables, economics is an effective tool for policy analysis. The economist is able to identify marginal impacts of specified behavioral determinants and measure the size of the related outcome change.[1] It has been possible to assign dollar costs to programs and policies used to modify behavioral outcomes and to ascribe dollar benefits to the resulting consumer outcomes. Cost-benefit analysis and more recently cost-effectiveness analysis have been increasingly used in the health field to compare the dollar efficiency of alternative program options.

The above discussion has been broad and general. The next section addresses past and present research being conducted by economists in the area of determinants of food selection. Economists focus mainly on demand research--the area where most policy changes are open to nutritionists. The area of food supply clearly affects demand and there are numerous ways governments affect food selection through farm subsidies and other policies (e.g., Popkin, et al., 1980).

DEMAND FOR FOOD RESEARCH BY ECONOMISTS: THE PAST AND PRESENT

Consumption, defined in terms of food selection, food expenditures, and related topics, has long been a cornerstone of research by demand economists, be they called agricultural economists, economists, or market researchers. Research has focused on issues related to demand for a single commodity (e.g., citrus fruit, milk), market shares (e.g., the percentage of the market captured by fresh orange juice versus

[1] A key difference between economics and other disciplines is the economist's interest in relating changes in independent and dependent variables. Economists have a greater focus on determining factors which can change behavioral outcomes while sociologists have tended more on determinants of the factors which explain variance in behavioral outcomes. The difference may appear subtle but the policy differences are large. See Cain and Watts (1970) and the Coleman (1970) response for an important example.

concentrate), the absolute magnitude of household food expenditure or the breakdown of total food expenditures into commodity groupings. Overall, most economic analyses have dealt with demand for market goods with market prices (e.g., demand for beef or clothing), and thus less emphasis has been given either to nutritionally defined consumption issues such as the demand for calories, protein, or other nutrients or to attempts to delineate and study dietary patterns. Early traditional research focused primarily on understanding the influence of price and income, but recent efforts have been broadened to encompass the effects of a wide variety of socioeconomic, cultural, demographic, and program factors. An expansion of neoclassical economic theory termed the New Home Economics explicitly allows a broader conceptualization of food behavior, and initiates behaviorally meaningful hypotheses relating to the wide variety of factors affecting consumption.

THE TRADITIONAL ECONOMICS APPROACH

The traditional theoretical approach to consumer behavior assumes that households consume goods which maximize utility with a budget constraint. That is, it is assumed that consumers can express preferences which maximize a single objective, utility. Each consumer is assumed to have a limited access to resources, viewed as an income or budget constraint. The prices for consumer goods are outside of consumer control. Consumers are assumed to be rational in that they can consistently rank choices and are assumed to have full knowledge of all commodity characteristics. The traditional economic model does not describe how consumer preferences are formed or the feedback mechanism by which buying experience affects preferences. No attempt is made to describe the way the consumer searches for and selects specific products, services, or brands. The analysis is typically static, since it takes place at one point in time.

The traditional theoretical economic approach has little to say about selection of specific foods. The major focus of the analysis is on relative household consumption responses to income and food price changes. Typically, the unit of analysis is expenditures, rather than the quantity of a good *per se*. Therefore, over time, expenditure analyses have reflected not only changes in consumption of selected quantities of foods, but also modifications in the nature of the food purchased. These differences are associated with the addition of market services to the food--for example foods undergoing varying degrees of refinement, enrichment, prepreparation, combination with other foods, packaging, or labeling. Although expenditures analyses have also reflected modifications in consumption practices with respect to the percent of food consumed at home versus away from home, the traditional economic approach has not done a great deal to try to explain this type of food pattern change and has not done much to test ways in which the theoretical economic relationships may need to be redefined to accomodate such behavioral differences.

Income-Consumption Relationships

The relationship between income and food consumption can be expressed in a number of ways, e.g., the percentage of total income spent for food, total food expenditures, or expenditures for a food subgroup such as dairy products. The income relationship can also be expressed as the Marginal Propensity to Consumer (MPC)--the fraction of each extra dollar of income that would be spent to purchase additional food, and the similar income elasticity--the percentage change in the demand for a good resulting from a one percent change in income.

Analysis of data from the USDA 1965 Household Food Consumption Survey indicated that households with annual incomes below $4,000 spent approximately 42 percent of income for food. In the $4,000-$8,000 income range, households spent 25 percent, while households with incomes in excess of $8,000 spent 14 percent of all incomes for food (Egbert and Hiemstra, 1969). In order to analyze the potential shift in budget shares given income changes, economists conduct simultaneous analyses of all expenditure patterns--see, for example, Pollak and Wales (1980) and Benus, Kmenta, and Shapiro (1976). The budget share devoted to food is usually measured as a function of the price of food, the price of other goods such as housing, family size and household income.

Economists have also been interested in measuring the MPC out of different types of income. This type of information can be used to assess the relative consumption impacts of different federal food program alternatives, such as the effect of a cash income supplement versus food stamp supplementation or the consumption impact of participation in the school meals, Head Start, or Nutrition Program for the Elderly programs. Normally, the MPC out of wage income is in the .04-.11 range. That is, for each additional dollar of wage income, households would be expected to supplement food expenditures by 4 cents to 11 cents (Tomek, 1977; Hymans and Shapiro, 1974). Similarly, MPC's out of welfare or cash transfers have ranged from .09 to .22 (Benus et al., 1976). However, in studies conducted while the Food Stamp Program still had a purchase requirement, estimates of the MPC out of Food Stamp bonus income ranged from .3 to .86, averaging .5 to .6 (Reese et al., 1974; West and Price, 1976; Benus et al., 1976; Salathe, 1980). This can be interpreted to mean that for every additional dollar of food stamp bonus value, a household would be expected to increase its food expenditures by 50 to 60 cents.

The traditional economic approach has also measured other factors thought to influence the income-consumption relationship: farm-nonfarm differences, urban-rural differences, and differences by household size (Lee and Phillips 1971; Prochaska and Schrimper, 1973; Herrmann, 1967). Normally, analyses are conducted at one point in time, so it is assumed that prices are the same for all consumers. However, the traditional economic approach has not been very successful in identifying different food behaviors which result because of true differences in food

prices. More recent research suggests that much of the difference in food consumption originally attributed to farm-nonfarm or urban-rural differences may be more closely related to differences that may exist in home production of food through gardening, hunting, and fishing, and the fact that food prices and availability of foods away from home may differ for different consumer groups. These differences would result in different at-home and away-from-home consumption activities between households which the traditional model is not able to explain well.

Economists have also used price and income information to measure the demand for a particular food or food subgroup. Income elasticities are used to classify goods as inferior, normal, or luxury referring to relative consumption changes with a one percent income change. Consumption of inferior goods declines with increases in income. Selected grain products have often been cited as inferior commodities for American consumers since consumption declines as income increases. Most foods are classified as normal goods, usually with elasticities of less than .5. Typically, meats and fresh fruits and vegetables have had higher income elasticities, while staples such as milk, bread, and eggs, have had lower elasticities as consumption does not change much with changes in income. Currently the best examples of luxury goods are snacks and meals purchased away-from-home. Income elasticities for these foods have been estimated in excess of 1.0 (Prochska and Schrimper, 1973; Fletcher, 1980). This can be interpreted to mean that a one percent increase results in a greater than one percent increase in away-from-home consumption.

Finally, although most work is from developing countries, economists have also examined the effects of income on dietary composition relationships such as the absolute and relative amount of animal protein and the starchy-staple ratio (percentage of calories from starchy roots, cereals, starchy fruits) (Pinstrup-Anderson *et al.*, 1976; Levinson, 1974).

Price-Consumption Relationships

Comprehensive sets of own-price and cross-price elasticities for foods appear in Rockwell (1959) and George and King (1971). As the price of a food changes, not only will consumption of that food change, but consumption of "complements" and "substitutes" will also change. For example, an increase in the price of french fries would result not only in lower consumption of french fries, but also lower consumption of the complement, ketchup. An increase in the price of beef would result not only in lower beef consumption, but also in higher pork consumption, the substitute. Economists have tried to measure these types of relationships for several types of foods so that food price changes for selected commodities can be used to predict changes in the composition of the food bundle purchased by the household. Economists have also examined price differentials and their effects on food selection patterns.

An example is the effect of price on the purchase ratio of store-bought and home-delivered milk (Reid, 1963).

The Marketing Approach

Economists and marketing researchers have modified the traditional theoretical economics approach of analysis of consumer behavior by relaxing some of the neoclassical assumptions. The marketing approach acknowledges that a consumer does not have perfect knowledge of all commodity characteristics, and that factors such as brand loyalty and risk aversion may influence demand for a product as much as price and income. While the primary interest of neoclassical theory is the estimation of the income, price, and consumption relationships, the primary interest of the marketing approach is identification of general market determinants of the demand for a specific product or group of similar products. The marketing approach divides determinants of the purchase decision into variables external to, or outside the control of, the consumer--such as prices, product availability, advertising, promotion, merchandising, and credit availability--as opposed to variables internal, within the control of, or intrinsic to, the consumer--such as demographic, socioeconomic, physical, and psychological variables. This approach is dynamic in the temporal sense in that learning and use of product knowledge affect future demand decisions. Although this research has not been well integrated with the price and income theory of the traditional economic models, it has been able to address such realities as new products (Padberg and Westgren, 1979), consumer selection among products with multiple attributes (Bernardo and Blin, 1977; Pras and Summers, 1978), and the existence of multiattribute consumer utility functions (Ladd and Zober, 1977). The research in product information ranges from analyses of the impacts of advertising (Ward and Meyers, 1978; Goldberg et al., 1978) and of coupon availability and use (Ward and David, 1978) to analyses of the influence of nutrient and product labeling on demand (Geistfeld, 1977; Jacoby et al., 1977; Scammon, 1978).

Economists have used distributed lag models to attempt to incorporate habit formation into demand analyses by assuming that future behaviors will be a function of past purchase and price-income situations (Houthakker and Taylor, 1970). The type of analysis still, however, fails to identify behavioral determinants and depends on the price-income consumption relationships to define habit formation.

Limitations of the Traditional and Marketing Economics Approaches

Neither the traditional nor the marketing approach has used many physical or psychological determinants of food behavior in analysis of food demand. The marketing approach has not been able to incorporate the product differentiation concepts into the utility maximization framework. The traditional approach analyzes differing income responses

among households of different incomes, sizes, races, and urbanization status, but has not been able to incorporate a consumer decision-making framework which does not assume a single household goal--the maximization of utility. The traditional approach has not fully considered a full resource constraint in which not only income, but also the value of household members' time is considered. Although the marketing and traditional economics approaches have the capability of identifying alternative consumer objectives, and of incorporating household decision-making determinants which are both internal and external to the consumer, to date, little research of this type has been conducted. One of the basic assumptions of traditional economic theory--perfect consumer knowledge of all product characteristics--is contrary to the practice of much health and nutrition education. Whereas the economist might not see conflicting consumer motivations as barriers to improving nutritional health, because that would contradict the concept of the rational consumer, nutrition educators see both motivational differences and nutritional ignorance as factors related to differences in food selection patterns.

THE NEW HOME ECONOMICS APPROACH

The New Home Economics (NHE) approach to the analysis of household consumption behavior assumes that households and individuals not only consume goods to achieve a level of utility, but can also act as producing units which combine the attributes of market goods, their own time, their physical resources, and their own skills (human capital) to produce a good or commodity from which the household obtains utility (Becker, 1965; Lancaster, 1966; Nerlove, 1974; Schultz, 1974). An example of such a good might be a meal produced from inputs including raw food products, household members time, and kitchen equipment. The degree to which the meal provides utility depends on household goals and priorities and also the various characteristics of the meal (Lancaster, 1966).

At its most general level, the New Home Economics approach provides a broad framework in which to analyze household decision making. It emphasizes the value of time and the allocation of purchased goods and time within the household. It allows incorporation of nonmarket aspects of behavior by defining alternative household goals and measuring their achievement. Demand for marketed goods is tempered by household skill levels and assets. For example, this approach allows a framework in which food preparation skills within a household and the availability of physical resources, such as applicances, can be used to explain differences in food patterns between otherwise comparable households. In the NHE approach, consumers gain utility from commodities which have no market prices--a good meal or good health. The demand for selected foods can then be viewed within the framework of attaining these household objectives and not as ends to themselves. Consideration can be given to the nature of joint decision making within a housekeeping

unit as well as individual consumption decisions in light of the joint household resource constraint.

NHE Model

The new approach focuses on obtaining utility or satisfaction from the use of commodities which are not necessarily exchanged in the market and which have shadow prices. These commodities are phenomena produced in the home using marketing goods and own time (e.g., child quality, adult health, aesthetic states, etc.). Households are assumed to maximize utility over bundles of these home-produced commodities, subject to a budget constraint and the technical conditions of household production.

Household production is carried out by combining market goods (the sole object of traditional analysis), home time of household members, and the services from human capital and physical capital (or durable good).

The decision making unit is constrainted by a total resources (full income) constraint, including unearned and earned financial and time resources. The household exhausts its full income on expenditures of time and money for the commodities it consumes. Thus, even if the market goods prices are the same for two households, different consumption patterns may exist if the households' values of time vary. Households with a lower value of time will consume more time-intensive consumables. Thus, the shadow price in the household economics framework consists of the total resources devoted to obtaining an item, not simply monetary outlays. The full income of the household is the total value of all market and home production time, including, usually, the flow of goods and services from unearned assets.

Implications for Food Selection Research

Ultimately we are interested in the ways various socio-economic and other factors affect diet selection. The NHE framework provides a household decision model for deciding which factors belong in models attempting to examine food selection. For example, the household's demand for a specific food would be affected by the time and money cost of this food, the prices of substitutes and complements, income knowledge of the way this food affects good health (if this is one reason to consume the food), other knowledge dimensions related to this food, household skills, household equipment (capital) available for food preparation, and various demographic factors, *inter alia*. Individual consumption of this food would relate to most of the above factors, consumption decisions of other members, this individual's value of time, and knowledge of the needs of this individual relative to others in the household, *inter alia*.

Knowledge of a household's time and human capital resources can be useful in analyzing many nutritionally related questions. Participation of children in the school meals programs may depend in part on the availability of household production time. The decision of a household to purchase convenience foods to shorten preparation time may be a common result of the redistribution of productive time between market work and work at home.

Information regarding levels of food preparation knowledge, nutrition knowledge, and household values can be incorporated into a NHE model. For example, one household value which cannot be purchased in the market but which provides utility to the household could be defined as cardiovascular health. The household is seen as producing a given level of health through selection of market goods and use of home time of household members--perhaps time spent in exercise, or in tending a home garden, or in home processing of garden food. The level of cardiovascular health would also be a function of the level of human capital, which might have a heredity component and an education component. Household members who attend food preparation classes teaching low fat cookery or restaurant food selection might be assumed to have achieved motivational and knowledge levels (and thus human capital level) not achieved by nonparticipants. Thus, realizing that differing levels of cardiovascular health resources and priorities exist within and among households, the relative impact of individual counseling or nutrition education can be analyzed in a conceptual household decision-making framework.

Empirical Research

Economists have begun to use the NHE framework for consumption research only in the past four or five years (e.g., Butz, 1978; Popkin, 1978; Chernichovsky and Coate, 1980; Chernichovsky, 1979; Evenson *et al.*, 1979; Heller and Drake, 1979). More precise causal modeling and analyses are currently being undertaken using the NHE framework, but such work is in its infancy and cannot yet be judged (e.g., Popkin *et al.*, 1983; Akin *et al.*, 1980).

At this point, considerable food selection and consumption research is underway. In fact, it appears that more economic research is currently funded by various groups in the Department of Agriculture than has been funded in the last three decades. In addition, some economic research has been funded by the Department of Health and Human Services and other departments. Research in progress includes household consumption and the effects of school feeding programs; individual, intrahousehold, and household consumption and the effects of school feeding programs; dietary impact of a large number of government programs; and food demand and consumption behavior using a variety of data bases. The aim is coordination of a number of separate microeconomic food demand research programs and international food pattern selection issues.

The NHE framework is being used in the last of the above programs. The research should provide a means of better judging the value of this framework in research on factors affecting food selection.

However, it is important to realize that for many purposes, the traditional neoclassical approach can encompass many of the considerations necessary for nutrition and food selection research.

WHAT DOES THE FUTURE HOLD

The economics discipline is increasingly becoming an integrated part of multidisciplinary research with the behavioral sciences. At the same time, economists are becoming more and more capable of estimating models reflecting the complexity of household behavior.

Substantive Focus

Economists will increasingly address nutritional concerns, be they obesity, away-from-home food consumption (Prochaska and Schrimper, 1973), breast-feeding (Popkin et al., 1980), or child diet (Chernichovsky and Coate, 1971). Some will undertake the investment of learning about nutrition concerns and nutritional measurement issues and will be interested in contributing to the nutrition literature. Most, however, will use nutrition issues only as case studies for their economic models. Nevertheless, their work will be important to policy makers attempting both to understand nutrition-related behavior and to allocate scarce nutritional program resources to meet health needs.

Methodological

Many aspects of human behavior occur recursively but much occurs simultaneously. An infant may breast-feed, formula feed, and eat some supplemental food on the same day. Decisions about shopping, preparing, and consuming food are interrelated. The statistical aspect of economics--termed econometrics--has focused a great deal of research on the estimation of complex interrelated models in recent years. Dependent variables can be dichotomous (e.g., to breast-feed or not, to eat out or not); or they can relate to recursive (first decision A, then B) or joint recursive/simultaneous systems (Schmidt, 1978; Schmidt and Strauss, 1979). These systems and the computer programs to estimate them will continue to be refined and be available for nutrition research.

Multidisciplinary

The usefulness of economics in analyzing food selection patterns can be improved significantly by working with other disciplines. Some of the issues which can be addressed in relation to food selection include:

Decision making--Cognitive anthropologists and psychologists and behavioral psychologists can help to clarify household goals and decision-making processes. Economic models can be highly refined as can estimation procedures, in light of such knowledge.

Model specification--Economists do not observe the decision-making process, but rather they observe outcomes and strive to account for factors associated with differing outcomes. Economics is a theoretical discipline using statistical and mathematical techniques to consider a broad range of relationships. Anthropologists, social psychologists, and others can provide a basis for understanding which factors might be most important and for selection of relevant variables, model refinement, and hypothesis development.

Measurement--With the exception of agricultural economists, and some economists in the demography, health, and nutrition areas, economists, in general have not paid particular attention to measurement at the micro level. Refinement of definitions of independent and dependent variables, and development of appropriate data bases are key needs of economists. Specific areas of concern include measurement of knowledge and preferences. Economists can attempt to structure models delineating the possible roles of knowledge in resource allocation (e.g., understanding of specific diet and disease, and diet and growth relationships); however, they need help from others in understanding the different degrees to which knowledge affects behaviors and ways to model this type of determinant.

Finally, it is useful to point out that much of the ongoing economic research is program oriented and will not allow clarification of the more basic issues related to the effects of socioeconomic, cultural, and other factors on individual and household food selection. Program usage implications must be understood, however, if meaningful national food and nutrition policies and programs are to be developed. If nutritionists, economists, psychologists, anthropologists, and others better understand the contributions of each others' discipline, it will become easier to identify problems, formulate testable hypotheses, and define and estimate causal models. Information developed from multidisciplinary research can then be used by nutrition educators to plan educational programs with richer content and improved compliance rates and to provide meaningful input into national food and nutrition policy making decisions.

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APPENDIX D

MARKETING RESEARCH*

WORLD VIEW AND BRIEF HISTORY

The goal of marketing research is to obtain information from or about customers (or possible customers) to aid in the decision-making by marketing, advertising and other management people. Marketing research has enjoyed rapid growth over the past 35 years, and the scope and variety of activities engaged in by those in the profession in the United States have expanded and become more sophisticated. The same rapid growth has occurred in the European community, and to a lesser extent in all parts of the world.

The general approach of marketing research depends heavily on initial problem definition (usually dictated by the management's interests on a specific issue). This is followed by design and execution of a study (usually collection of data regarding consumer behavior or attitudes). Analysis of the data forms the basis for a recommendation relating directly to the corporate decision-making process. Because of the diversity of American businesses, almost all products and services produced and purchased in the United States are subject to some sort of marketing research investigation. Those companies marketing food products have been among the leaders in the growth of marketing research as an adjunct of the marketing field.

Because so much of the development of techniques for data collection and analysis has taken place under private sponsorship and is of a confidential nature, few of the major uses of marketing research by business have been documented in the literature. Several publications do, however, report on current developments in marketing research. The primary ones in the field are:

Journal of Marketing, a quarterly publication of the American Marketing Association, Chicago, Illinois

Journal of Marketing Research, a quarterly publication of the American Marketing Association, Chicago, Illinois

Journal of Consumer Research: An Interdisciplinary Quarterly, a quarterly publication co-sponsored by 11 associations, including those in anthropological, public opinion, economics, marketing, psychological, statistical, management, and communication fields; a publication of the University of Illinois and Chicago Circle.

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At its earliest stages, marketing research involved asking a sample of people several questions, adding up the answers, and presenting the results in a way that attempted to portray reality. Tracing the broad outlines of the development of marketing research techniques shows that at the outset, the major thrust was to improve the clarity and precision of the questions and the training of the investigators in order to produce more uniform handling of those questions of primary concern. This was followed by the development of random sampling techniques and the use of machines, such as key punch, tabulators and, finally, computers. Recently, highly sophisticated modeling techniques have been extensively employed to simulate alternative outcomes by means of variations.

For a broad review of the marketing and marketing research functions, see Principles of Marketing by Kotter (1980). For further information, consult the references listed in the Appendix according to subject matter.

OVERVIEW OF CURRENT MARKETING RESEARCH ACTIVITIES

The purpose of this discussion is to describe the contribution that marketing research might make towards the task of providing an understanding of the factors affecting food selection (FAFS). The assumption is that such an understanding may help in directing and evaluating public policy insofar as it impacts the nutritional health of the population.

The analogous task for a marketing researcher would be to provide an understanding of the factors affecting brand selection (FABS) for the purpose of developing an optimal marketing strategy.

For both the FAFS and the FABS task, one needs to define:

(a) the nature of the choice objects; in marketing terms, the competitive frame,

(b) the population of selectors, the consumers, and

(c) the selection process, primarily the criteria used by the consumer to select a member of the competitive frame.

Not until these elements have been defined can one hope to measure, let alone predict or evaluate, the effect of any economic, social or cultural change upon food selection.

The following material describes how the marketing researcher encounters and deals with the problem of defining these elements in a manner that will be useful in predicting and evaluating the effect on brand selection of changes in the market.

Perhaps the most common type of marketing problem is one where the marketing researcher is asked to provide the information needed for selection of action(s) to optimize the sale or profitability for an existing product, e.g., a dry breakfast cereal. Typically, the choice objects are assumed to be well defined, although the assumptions may prove to be incorrect. In this example, the universe of choice objects, the competitive frame, is assumed to be dry, ready-to-eat breakfast cereals.

The company uses its own unit and dollar sales, revenues, and profit margins as criteria to judge the ultimate effectiveness of any marketing actions that are undertaken. In most instances, the company will have access to the sales of competitive products via one or more of the syndicated services that supply information on product movements through retail outlets, on warehouse shipments, or from consumer purchase diary panels. Such data are likely to be presented in terms of market share and total sales figures aggregated at the level of geographic region and type of outlet for sales and shipment data and at the level of demographic grouping of households for purchase data. Purchase diary panels may also provide data on purchase patterns which may yield useful insights into the interactions among the items in the competitive frame. One service (MRCA Menu Census) provides information on household consumption as well as purchase.

These marketing problems have been effectively approached through the use of stochastic models of buyer behavior. These models start with a given competitive frame and the selector population of individuals or households buying the products in the frame. The criteria of selection are inferred from the buyers' previous selection patterns as determined by data on household purchases over a period of time (generally from purchase diaries). Researchers seek relatively simple probability models which make it possible to characterize each buyer's purchase behavior with a minimal number of easily measured parameters of brand choice and purchase frequency, and to study the effect of changes in price, availability, advertising and promotion upon the parameters.

These methods estimate the effect of economic, social or cultural changes in terms of departures from the buying behavior predicted by the model. Their chief value is in providing the ability to measure and to predict, on the basis of objective data, the impact of market perturbations on brand share and volume. They form a basis for judging more complex theories of consumer behavior by providing a baseline against which to measure the increased predictive power provided by those theories. See Engel, Blackwell and Kollat, Consumer Behavior (Engel et al., 1978) for a broad review and Massy, Montgomery and Morrison, Stochastic Models of Buyer Behavior (Massey et al., 1976) for a more comprehensive discussion.

The marketing researcher's problem becomes more complex when the competitive frame for a product is not appropriately defined. In the dry breakfast cereal case, the appropriate competitive frame might be all breakfast foods or an even broader category rather than the limited dry breakfast cereal category. The competitive frame for a new market entry may be unclear.

While purchasing behavior may provide some important clues as to the identity of the appropriate competitive frame for a given product or brand, most contemporary marketing research is addressed to an examination of how and why the product is used, who uses it, and the consumer needs and wants that are to be satisfied by the product. The researcher may start with a new or existing product and seek to position the product by understanding how it relates to a group of similar products. Or, a need that presents an opportunity for a new brand or product may be discovered by a careful examination of the consumers' perceptions and uses of a group of products.

A number of concepts, theories, and techniques have been used in marketing research to address the factors that affect food or brand selection. A common thread in all of these is the view that a product (or food) is considered as representative of a bundle of attributes, each of which offers the consumer a definite (but possibly unknown) level of utility or dis-utility. For example, in choosing one of several foods on a particular occasion, the consumer considers each as to taste, nutritional value, time or effort required for preparation, cost, and possibly such attributes as whether or not it has all natural ingredients. His choice will depend on:

(a) What level of each attribute he perceives each food as having

(b) How much utility he perceives each level of each attribute offering him--to part-worth of the attribute level

(c) How the attribute part-worths are combined to form a utility value for each product, that is, each bundle of attribute levels. The probability of choosing a product will be proportional to its utility.

The part-worths and utilities decisions of consumers are often inferred on the basis of past choice behavior and/or by eliciting choices among hypothetical products or attribute-level bundles. One approach is made by benefit segmentation, in which statistical techniques are used to group consumers on the basis of the importance they attach to certain combinations of rational, sensory, and emotional benefits expected from each product (Haley, 1968; Green et al., 1968, 1972). An article by Wind (1973) describes a procedure for evaluating new product concepts based largely on this approach.

An approach widely used in a non-food marketing research area, specifically public transportation planning, is the logit model that

relies entirely upon information about past individual, in this case travel, behavior to predict future choices of travel modes (McFadden and Reid, 1975; Gensch and Recker, 1979).

The most promising approach in market research is that of conjoint measurement which measures the joint effect of several variables (attributes) on the ordering of preference. The subject consumer is presented with forced choices that reflect his trade-offs among conflicting choices. The result is a simultaneous measurement of relative preference and the contributions of the separate attributes to these relative preferences. The effectiveness of this approach depends primarily on skillful selection of product attributes. A product is considered in terms of relevant attributes instead of a competitive frame, and attention is thus focused on those aspects of the product that may be more relevant to measuring the impact of economic, social and cultural changes.

FUTURE PERSPECTIVES

The goal of most marketing research is to use available syndicated data and data collected specifically for a given objective to predict what will occur.

In the dry cereal example cited earlier, a manufacturer may be considering introducing a new bran cereal with a certain level of fiber and other nutritional virtues. Alternative ways of selling (advertising strategies), expenditures for advertising and merchandising efforts, prices, and possible introductory incentives to retailers may be under consideration. The manufacturer employs historical data relating to relevant factors such as expected trial (the first purchase per household), expected repeat (subsequent purchases by those households trying it), interval between repeat purchases, price elasticity in the category, and effect of promotional efforts. In addition, the manufacturer submits the new product to income testing in a sample of households to determine degree of overall acceptability, comparability or substitutability with other products currently on the market, estimates of frequency of purchase, and other factors for which normal data have been collected on other products. Much of these data will be integrated into a model, usually developed specifically for the product category by the manufacturer, to provide predictions based on alternative choices, with the aim of choosing the alternative that maximizes profit.

Predictions on purchasing or consumption are based largely on choices consumers make. How, and for the most part why, consumers make the choices are not evaluated, largely because few researchers know how to go about it. At some future point, this void may be filled, but nothing currently reported in the literature suggests that this will occur soon.

The widespread availability of sophisticated analytic programs that handle multiple variables suggests that the most immediate changes will be increases in the ability of marketing researchers to study more alternatives and ones with greater complexity. The problems of accurate and relevant data input continue, however, as data collection at the household level has not changed radically in the past two decades.

The use of scanners in supermarkets in food check-out situations had provided an avenue for a new type of data collection which can remove some of the problems inherent in asking one or more persons in the household to do the tedious recording of what was eaten by whom, or the somewhat less difficult task of recording what was purchased. Coded family cards used at the time of purchase can lead to accurate collection and storage of the household purchases. At the same time, test commercials broadcasted on that household's TV screen can be controlled and varied experimentally. More refined measurements of the effect of TV on sales are currently being made in this manner. The firm leading the way in this recent development is Information Resources, Inc. with their service, BehaviorScan.

It seems safe to say that any major development that will improve prediction abilities of marketing researchers will come as the result of an independent company's syndication of the service, since cost factors generally prohibit any one company from developing its own comprehensive system with substantial innovation.

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APPENDIX E

ANTHROPOLOGY*

SELECTING FOOD IN THE UNITED STATES: CULTURAL-BEHAVIORAL RESEARCH INQUIRIES

INTRODUCTION

Here I take an idiosyncratic look at the topic of U.S. American food selection. There are many good reasons for knowing more, scientifically, about the subject. Public health, commerce, medicine, nutrition, and social behavioral science all have significant practical and/or academic interests in the mundane acts of food use practiced perpetually in U.S. American society. Large health, agricultural, and political problems might become solvable if we better understood why Americans eat as they do. However, not much is well-known about this subject, and what is known tends to be fragmented among a number of professional specialities--hence, this Panel's preliminary efforts. Further, to an extent greater than most might admit, our deeply held American cultural principles regarding food and food use render our research and its scarce products ethnocentrically-biased and value-laden. This conclusion extends another advanced previously; that food- and nutrition-related cultural variability cannot be explained on a nutritional basis (Montgomery, 1978, page 53). Here I maintain that not only do our cultural principles shape our food uses (for all of us, including food scientists, nutritionists, dietitians), but also our specialty research inquiries and results. This position avows hypothetical or critical, as opposed to naive, realism.

BACKGROUND

A useful beginning can be made by generally describing what culture is. Basically, culture is learned, shared behavior and its products. It is the pool of non-genetic, non-random information transmitted extra-somatically among conspecifics. A number of species exhibit a cultural aspect of some behavior. For humans the cultural dimension is so pervasive that virtually every component of even surviving necessarily includes it.

Humankind's proclivity to elaborate and fragment culturally has created countless cultural-social groups across the world; those loosely described as cultures include societies, some nations, ethnic and language groups; those more loosely considered as subcultures can include sects, classes, and occupations, to mention a few. Which aspects of culture are shared, and to what extent, roughly accounts for the levels of distinction among groups. By this view, the sciences themselves are a reified part of cosmopolitan culture, essentially, specialized subcultures. This perspective---that all or nearly

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all human activity has a significantly and sometimes predominantly cultural dimension--is, however, not widely held or used either by professionals in cosmopolitan societies or by peoples in a popular sense anywhere. Intellectuals sometimes find it problematic that so much knowledge concerning culture/cultures too frequently seems similar to common sense. And in popular contexts, groups find it compromising to foster potent cultural common demoninators that unite them with others; so doing can place notions of social distinctiveness, group worth, acceptable resources, and appropriate lifestyles at risk.

The study of culture is variously developed. Certain facets such as determining the existence and nature of basic elements of culture continue to be stubbornly unyielding of understanding. Stern critics might liken the situation to that in biology when, early in this century, the theory of the chromosome and gene began to cohere. A related, similarly intractable problem area concerns knowing the extent of the cultural dimension in particular behaviors; isolating it has proved infinitely more difficult than has describing human action in physical-mechanical terms. Given issues of this magnitude, it is not surprising that theories about culture have had their shortcomings too; more reliance has been placed on theoreticians like Durkheim, Freud, Marx, Weber, and Darwin than on developing rigorous theory encompassing the cultural dimension. On the other hand, much has been learned descriptively about hundreds of particular cultures, most of them traditional, preindustrial ones, past and present. What is perhaps most well-developed in the body of accumulated knowledge about culture concerns how it is ordered; that is, the ways that certain aspects of culture are related to or linked with other aspects. Collectively the approaches to cultural ordering may be considered here as models of culture.

Numerous models of culture have been developed in just over a century of research. As a set they can be very roughly distinguished by their focus on either: (1) behavior in general (i.e., the full spectrum of behavior of people in a particular culture or groups of cultures, or universally); (2) verbal and mental activity (e.g., language, cognition, thought, beliefs); or (3) nonverbal behavior (e.g. movements including gestures, postures, dance, "body language"). The great majority of the research to date has been invested on the first of these three; the second has received most of the rest of inquiry. Many terms have been advanced to identify particular models and to distinguish them from those with which they have been designed to compete. For example, proponents of models said to explicate either cultural organizations, structures, systems, patterns, interactions, themes, exchange systems, networks, fields, processes, strategies, or dramas, among others. Researchers of verbal/mental models have variously studied belief systems, cognitive systems, value orientations, ethnosciences, cognitive maps, cultural templates, cultural grammars, cultural rules, semantic nets, propositions and inference rules, decision-making processes, constructed schemes, or knowledge structures, among others. Finally, investigators of nonverbal behavior have described their models of cultural order with terms like kinesics, proxemics, choreometrics, morphokinemics, or actonics, among others. Unfortunately, very few of the several dozen models of cultural order have focused on food and

food use in any culture. In general, food-related investigations have had at best a peripheral role in and almost negligible influence on the history of development of significant theories and models of culture. Although it has never been demonstrated that the nature of different domains of culture (e.g., law, kinship, medicine, politics) is ordered in some essential way that has a necessary bearing on models of it, there is a rather good chance that future research will establish this. There may well be special differences among such domains, food and food use included, that partly explain the sorts of models which have been and can be generated.

Because so little attention has been given to the cultural dimension of food use behavior in the available models and because space is limited here, let it suffice to proceed through the next three sections of this chapter according to the three broad sorts of models described above (conceptual, general cultural, nonverbal behavioral) without distinguishing specific details of variant models within these approaches.

American Foods: Conceptual Models

Comprehensive scientific evidence is lacking on what Americans culturally/behaviorally regard as foods. Consider first the conceptual aspect. Osgood has found in his cross-cultural semantic inquiries that his American subjects conceptualized "food" in a highly stereotyped manner (Osgood, 1964, pages 175, 190). On the other hand, Rosch, who has done considerable research with Americans on "basic objects in natural categories", chose not to investigate "food" in American English because of its status as a category which cross-cuts a number of other categories (Rosch *et al.*, 1976, page 388).

One way of getting at this conceptual domain is to look at what "food" contrasts with in some broader category, rather than to search definitionally for distinctive semantic attributes or to try to locate it as a highly discrete categorization. Werner's study of Navaho systems of classification fairly well illustrates what is intended here. Werner examined the whole of the Navaho conceptual universe, which included "several hundred food names", and established that "Navaho food" represented just one of a subset of contrasting Navaho terms within a broader set which concerned "by means of which Navaho live". His findings (Werner, 1975, pages 119-120; Perchonock and Werner, 1969) can be presented here, by giving only the English glosses (in quotes) but not the Navaho terms, as follows:

"by means of which Navaho live"	"makeup of a person"
	"fire"
	"water"
	"Navaho food"
	"Navaho ceremony"
	"Navaho life"

For Americans' culture there may be shorter conceptual distance to the next highest inclusive conceptualization which subsumes "food". Consider the following scheme:

Substances intentionally ingested by Americans	sacraments
	medications
	drugs[1]
	foods
	packaging materials[2]
	sexual substances[3]
	pica substances[4]

1. e.g., alcohol, tobacco juice, certain controlled substances.
2. e.g., artificial hotdog casings, wax-encased candies.
3. e.g., sexual fluids via oral sex, oral fluids via kissing.
4. e.g., earth, laundry starch.

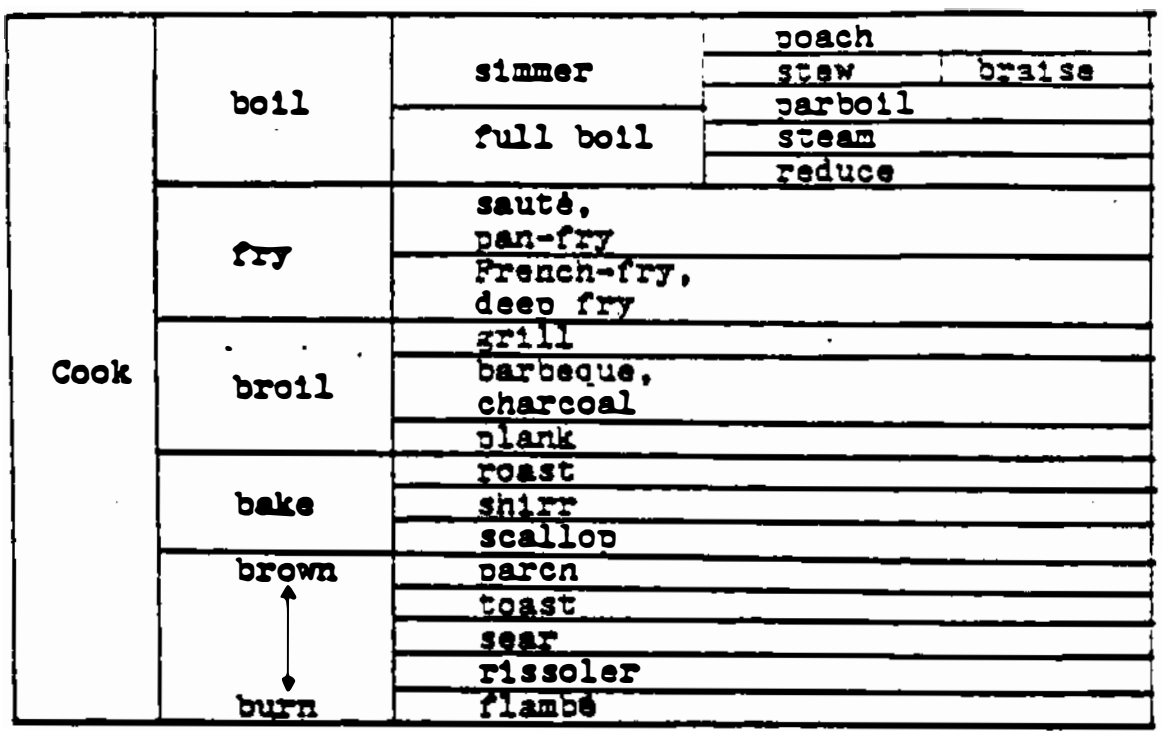
This scheme points to substances which some or other Americans are willing to take/put into their bodies orally. The set is probably not exhaustive, and certainly it implies nothing about which Americans ingest any of these substances or with what frequency. It indicates that generally Americans consider it appropriate to ingest at least certain other substances besides "foods".

Just as there is surely disagreement about the completeness of the above scheme, so also there will be diversity and lack of unanimity among Americans on the substances they would agree are "foods". Presently the extent of agreement remains unknown because not even the basic research has been done on the terms in use, substances in use to which these terms are applied, or relations among those terms and substances (e.g., inclusion relations: X_1 is a kind of X) (see for examples D'Andrade, 1976; Frake, 1980).

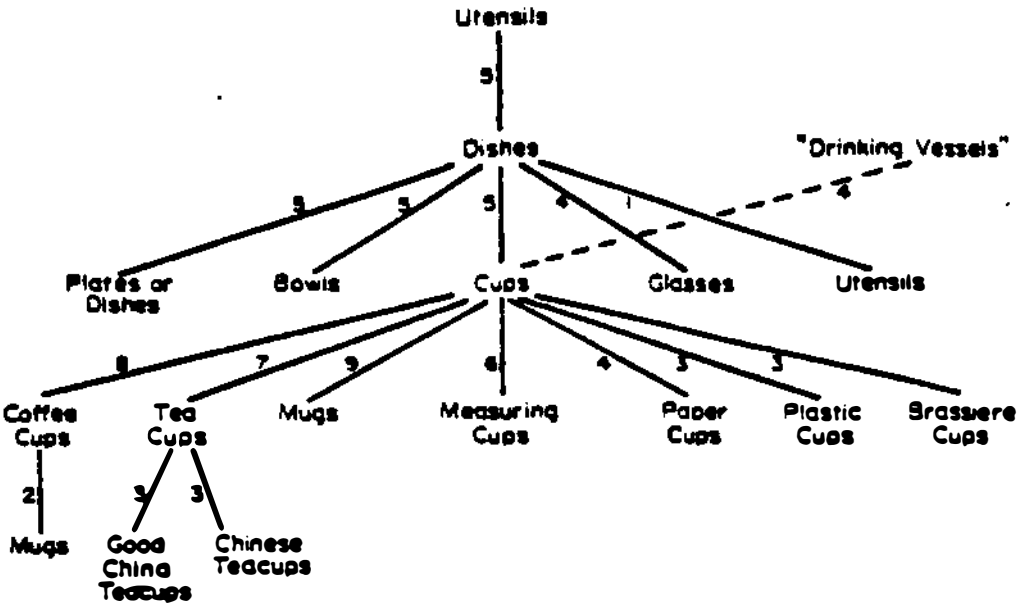
A second way to determine what Americans consider as "food" is to investigate contingent conceptual domains. For example, concepts for "uses" can be informative. Among "uses", "eating" is perhaps the most obvious. Again, comprehensive evidence regarding Americans' culture is lacking, but we do have suggestive material from research on Navaho, Jicarilla Apache, and Tzeltal Maya (Landar, 1964, 1976; Berlin, 1967). Such work shows how terms for eating can relate to various aspects of ingested substances: size, texture, separability, and shape, for examples. Similarly, certain American terms for eating (e.g., sip, slurp, guzzle, nibble, gobble, wolf, inhale) suggest not only a drink/chew distinction but also a concern with the pace of ingesting. However, Americans also conceptualize several other uses of foods. Examples include: for frivolity as in food fights and young children's plate play, for creativity/artistry as in adorning festive tables, for competition as at fairs and contests when garden produce and canned/baked goods are evaluated, for medication as when giving chicken soup as a home

remedy, and more generally for enhancing health. Certainly there are many other concepts of uses; some of these can be seen in others' work reviewed below.

"Cooking" is another contingent conceptual domain which aids understanding what Americans consider as "foods". Lehrer has studied the semantics of "cooking" in its most specific sense: the application of heat to produce an irreversible change in food (Lehrer, 1969), and she finds that a number of conditions relate to the various types of cooking: use of liquids or fat, heat source, vigorousness of cooking action, duration, kind of appliance or utensil used, and others. Although combinations of these vary unsystematically, types of cooking seem to differentiate neatly:



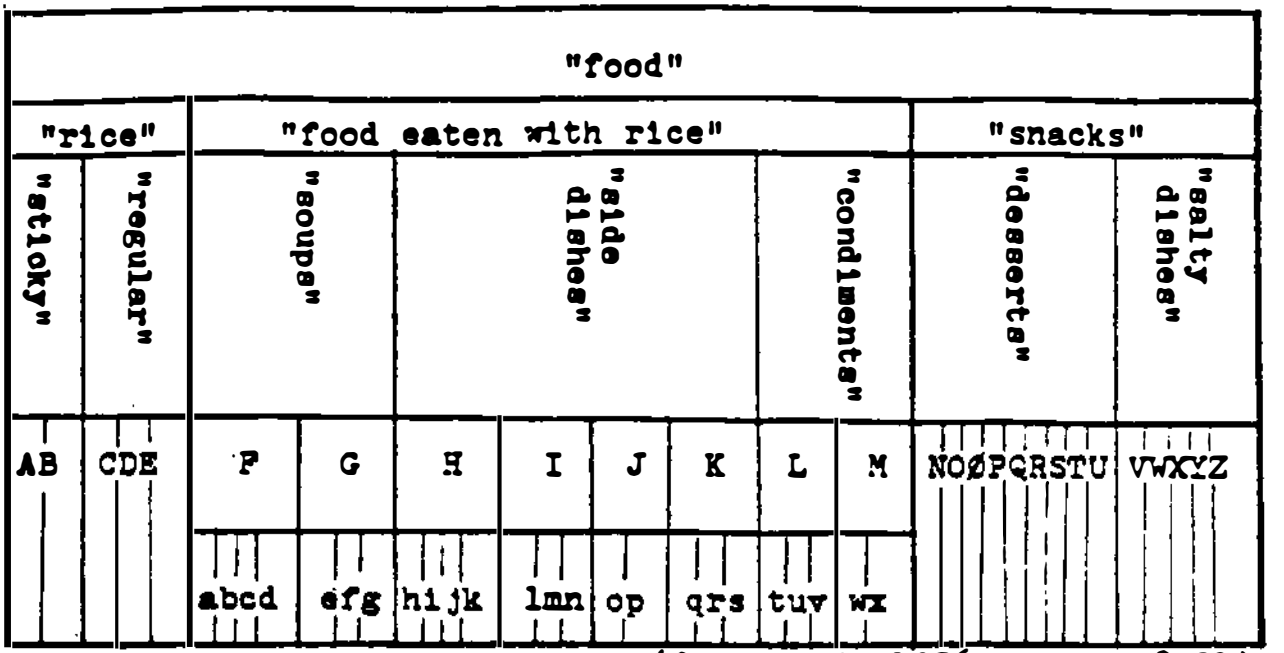
Another major contingent conceptual domain concerns the "things" (objects, appliances, utensils) that Americans use in relation to "food". Once again, knowledge is scant. Besides Lehrer's work, Kempton has studied a small group of Americans, and by starting with the term "cup", has elicited both more general and more specific terms across five levels of inclusiveness. In his chart which follows, the numbers refer to how many of the eleven informants reported the specific relationships (reproduced from Kempton, 1978, page 47):



If the relationships among different kinds of foods and food-related things (utensils and appropriate paraphernalia) were inquired into, the set of things would expand greatly, ranging at least from paperboard boxes for boxed lunches to fish knives or finger bowls for certain other foods. The "cup" case shows how certain aspects of the food-related domain are naturally ambiguous or amorphous for Americans. However, as the recent study of 82 Chicago area families documents in detail, these sorts of utensils as well as appliances generally are not the things in the home that people consider as having special meanings for them (Csikszentmihalyi and Rochberg-Halton, 1981).

The final contingent conceptual domain to be considered here concerns the "body". A people's conceptual beliefs about how the body is constituted and functions can significantly relate to what they are willing to do with and to it. What people consider acceptable as "foods" may relate far more to their concepts of digestion, metabolism, elimination, ability to withstand parasites and toxins, and so forth, (contra Leach, 1964) than to their concepts of appropriate sexual relationships. Burton and Kirk show that American English speakers have rather different concepts of the body relative to its parts than do Maasai and Kikuyu (Burton and Kirk, 1979). They rightly call for more research on peoples' concepts of the body's interior, rather than just its surface.

Most of what is known conceptually about "food" concerns kinds or types of food rather than food as one domain among others. Descriptions of whole food schemes are still rare. Reed's outline of Thai food usefully illustrates how such a scheme can be ordered (Reed, 1976). She finds that the ordered relations among Thai foods permit Thais to make increasingly specific distinctions across as many as five levels of contrast. The outline, condensed, can be shown as follows:



(from Reed, 1976, pages 18-31)

Other studies of non-Western food conceptualizations have been made (e.g., Watson 1943; Regelson, 1972; Basso, 1977; Cole, 1983). Such research has tended to focus on ways that other, apparently less-closely related aspects of culture, find expression in the food domain (e.g. religion, social status, health, sexuality). Cole's work on Balinese food shows that as many as six of these dimensions can intersect in a particular type of ceremonial food (Cole, 1983).

Certain of the research on particular kinds of food has examined closely how distinctions among types within a category are made on the basis of characteristics of the food itself. Hage researched conceptualizations of beer in Munich and found that the city's seven major breweries produced a total of 72 different beers which locals could choose among (Hage, 1972). Only 10 major types proved to be commonly known, and these were distinguished according to strength, color, fizziness, and age. In most instances, a contrast in one of these characteristics meant a difference in type. More precise knowledge about strength, fizziness, and clarity could be expressed by connoisseurs, who could distinguish 17 major beer types. However, Hage also learned that place of drinking or purchase was a factor determining actual choice of a subtype of beer.

The ways that different characteristics of, or terms for a food are created in the manufacturing process have been illustrated in a study of California wine categories done with University of California, Davis, enologists (Lindstrom, 1975). When this study was done, all the characteristics which formed the bases for distinguishing California wine categories (color, proportion of varietal grape, possible addition of alcohol or carbonation) were instilled in manufacture. This contrasted them with

French wines, for which vineyard area also is part of their categorization. The distinction between "generics" and "varietals" has in California been codified in state law: "a varietal is a wine made from more than 51% of a certain grape variety while a generic is a wine made from a mixture of varieties none of which compose more than 51% of the total grapes used in the wine" (Ibid, p. 275). Thus, a particular grape variety can be manufactured into any of a number of wines. The Grey Riesling grape, for example, can be used to make the following:

if > 51% ⟶ white varietal "Grey Riesling"
if < 51% ⟶ white generic "Chablis"
if < 51% ⟶ red generic "Claret"
if carbonated ⟶ "Champagne"
if fortified & oxidized ⟶ "Sherry"

Further, if market conditions require, interchangeable generic names can be switched for a particular product. The label "Burgundy" may be substituted for "Claret" when bottling if marketing information suggests it may sell better. Apparently, such refined understanding of the instilling of attributes is learned in the process of becoming a wine specialist. That laypersons were supposed to have different understandings of California wines was made clear by Lindstrom's research on the professionals' presumptions about laypersons' beliefs about wines. His chart with these presumptions is copied on the next page from Figure 7, page 281.

Stated briefly, these enologists supposed that dining contexts, knowledgeability, ethnic background, social status and status aspirations, health aims, and intoxication desires were the important connotations in the wine categories for laypersons. Whether these specialists' presumptions had any validity and salience, were merely stereotypes, or were, as I believe, held in significant ways by the specialists themselves remains open to questioning because these issues were not investigated. As such research is done and reported, surely both precise and vague aspects of categorization will be more apparent. Now certain recognized ambiguities form a basis for some current advertisements: "It is a soup or a meal?" "It's nutty, chewey, crunchy; is there one word for it?" "Huh-uh."

Before leaving this part of the discussion of cultural concepts, one final matter needs mention. How Americans learn their concepts for foods and how the concepts are culturally ordered is surely a topic of considerable significance and yet it is one that has received little research. From Dougherty's work on child language learning, which focused on plants and plant names rather than foods and food names, we have some suggestive information (Dougherty, 1979). Her subjects, aged two and three, knew some food names and initially associated ones like spinach and bananas with source (garden, grocery store) and not as plant products. By age eight, her subjects could identify numerous plants, including food plants, and she suggests that "it is probably by about age nine that children in this study completed the basic hierarchical organization of the plant world, having some examples of flora classified at each rank in the hierarchy" (Dougherty, 1979, page 309). Andersen's study on learning about cups and glasses also may be cited (Andersen, 1975).

Cognitive and Behavioral Connotations of Wine Categories

WINE CATEGORY	WHEN WINE IS (SHOULD BE) USED	TYPES OF WINE USERS	WHY WINE IS USED
RED	with dinner well aged with heavy foods with red meats	experienced wine drinkers Southern Europeans	healthy is an intoxicant snob appeal of red wine
WHITE	with dinner soon after bottling with light foods with white meat	less-experienced wine drinkers Northern Europeans	healthy is an intoxicant
ROSE	with picnic lunches with dinner	uneducated wine drinkers lower socio-economic status drinkers	healthy is an inexpensive intoxicant
SPARKLING	before dinner as an aperitif on festive occasions	higher socio-economic status drinkers celebrants	has prestige value is a speedy intoxicant
DESSERT	before or after dinner	wine connoisseurs tramps and winos non-table wine drinkers	is a cheap intoxicant high alcoholic content

American Foods: General Cultural Models

Most cultural research relating to foods and food uses has been done in the general mode. However, because nearly all has been with peoples living under very different economic circumstances than contemporary Americans', little of it can be considered here. A number of characteristics of the U.S. economy (e.g., the regional/national/international scale of food production/processing/packaging/distribution/advertising; the significant proportion of away-from-home food preparation/consumption: and the relatively low percent of personal income spent on food as compared with other expenditures (health care, education, leisure-recreation, transportation, communication, etc.), preclude forcing into relevancy here the many distributional, functionalist, and ecological sorts of food use studies reviewed in some detail previously (Montgomery, 1978; Montgomery and Bennett, 1979). Rather, a few recent cases directly concerning the United States warrant discussion.

One interesting line of research concerns household food and money management systems. Murtaugh and colleagues have been studying grocery shopping, budgeting, and dieting in southern California, and they have come to view grocery shopping as one activity among others (list making, store behavior, storage behavior, meal planning, cooking, eating) that make up a household food management system (Murtaugh, 1980; Murtaugh et al., 1980). They propose that income, food preferences, time constraints, and family composition account for variation among households in their food management strategies.

Social structural and leadership systems have been found to be the sustaining forces in San Francisco urban food cooperatives, which are basically fragile, economically marginal endeavors (Zimmer, 1981).

A variety of studies have looked at prepared food uses in several different settings. Some have focused on food uses for health-enhancing purposes, both with the health food movement (Dubisch, 1981; Hongladarom, 1976) and among rural countercultural groups ("communes") (Molgaard and Byerly, 1981); strong, almost religious-like belief systems seem to support such alternative food practices. Not too dissimilarly, a study of one fast-food chain (McDonald's) reveals that its predictable character gives patrons a sense of comfort, reassurance, and security (Kottak, 1978). In four New York City households it is the patterns of control over access to food that relate significantly to patterns of authority (DeHavenon, 1971, 1977). The single study which shows that exercise of choice about foods is a most highly held value is Bohannon's on the elderly residents of San Diego's center-city hotels (Bohannon, 1981). The opportunity to make choices seems to be the most important reason why certain restaurants are used; having such small elements of choice in their otherwise highly structured life situation seems to keep these people going.

For perspective, the following framework sketches many of the settings where Americans use foods and, hence, where there are opportunities for making choices among foods:

more restricted access		more open access
private	public	public
homes	coops	produce markets
picnics	institutions:	grocery stores
clubs	schools	restaurants
communes	dormitories	cafeterias
	work-places	fast-food outlets
	hospitals	automats
	mess-halls	vending machines
	prisons	bars

The framework suggests several kinds of food choices:

kinds of choices:	settings:	placement of choices:	set of alternatives:
shopping	markets, groceries, coops	displays, shelves	packages, products
preparing	kitchens	storage areas	products, ingredients
ordering	restaurants, fast-food outlets	signs, menus, waiters' repertoires	written or spoken words
selecting$_1$	cafeterias, automats, vending machines	counters, vending slots	prepared foods ("dishes")
selecting$_2$	dining situations	table, lunchbox, plate	prepared foods ("bites")

Certain of these choices may be made over relatively longer periods of time. For example, shopping can involve making a mental or written grocery list, preceded by considering available food stores at home (constrained by home storage space, family demand for perishable items, etc.); when in the grocery store, considering a particular food item tends not to involve comparing all relevant characteristics of all available brands (Murtaugh, 1980). However, part of the ordering of the grocery list may also coordinate with the shopper's knowledge about item placement in a familiar grocery store; hence, the sequence of terms on the list can represent a strategy for shopping without backtracking (Tyler, 1978, page 258).

Other of these choices may be made over relatively shorter periods of time. For example, an adult's selection among foods on a plate no doubt often appears to be an almost automatic ordering of bites. On the other hand, a young child's choices from the plate sometimes may seem to reveal more dawdling than deliberation. It would appear that for some of these food-choice types (especially, selecting$_2$) there tends to be rather early maturation of choice-making skills. Further, it seems likely that factors of social influence (pressure and/or support) can affect the nature of decisiveness at least as much as can the combined effects of time and resource constraints and of characteristics of the setting.

Nonverbal Behavioral Models

One example of nonverbal behavioral research on American food is Harris' detailed analysis of making cheese-burgers, boiled stringbeans, pan-fried potatoes, and sliced tomatoes (Harris, 1964, pages 72-90, 185-189). Four hundred and eighty episodes of behavior occurring over a 20 minute period were analyzed to reveal approximately 100 nodes and five nodal chains (Harris' terms for increasingly comprehensive units of order); the aim was to determine order through analysis of activities which were logio-physical requisites for others to follow. (A somewhat analogous method is entailment analysis, which identifies activities that entail others; White *et al.*, (1977) use it to explicate cross-societal regularities in task allocations across production sequences.) The point to be drawn here is that the complex ordering of cultural behavior can be documented by such approaches, but the research methods can be time-expensive and the procedures for relating the results to belief systems and to life situations and choice-making remain problematic.

CONCLUSIONS

The foregoing indicates that much is knowable about the cultural dimension of foods and food uses. Attention should be given to this and to realizing the opportunities for research. The current wide gap between known and knowable in this area is bridgeable with relatively moderate ease and investment. U.S. Americans place highest value on the cultural principles of life, liberty, and the pursuit of happiness; it would seem natural to explore further how these become expressed in food and food uses. Today's broad array

of choices among food products and choice-settings manifests these basic cultural principles; specialty interests (e.g., medicine, commerce, nutrition, social-behavioral science) tend over time toward harmonization of contradictions among themselves. In the short term, however, individual and specialty interests often seem to heighten conflicts among these principles as, for example, when commitments to consuming or producing certain foods are asserted in the face of scientific evidence on risk to health. Resolving such contradictions lies at the heart of successfully enhancing cultural knowledge in this area.

Available cultural knowledge about how U.S. Americans select foods indicates that this domain of culture is complexly ordered. The many dimensions of ordering include an hierarchical one which appears virtually universal. Factors of social influence, accessibility, and choice setting figure prominently in food choice-making, as do other cultural understandings about color, shape, size, texture, aroma, and flavor, but not, generally, sound nutritional and medical knowledge. How these various attributes may be ordered in relation to each other remains largely unknown; quite likely, relatively short cycles of informational significance are operative for some, if not many, of these. One can imagine that during the now-past era of infectious diseases, the ordering of surface attributes of foods may have had informational significance health-wise and socially by signaling imminent risk of infection or toxicity. Now that some of the risks associated with contemporary food uses are apparently long-term and gradually cumulative in effect, major reordering of our understanding of such attributes seems likely. Given that much of our society is currently unwilling to change risk-increasing food use (and other) behaviors simply on the basis of long-term (even decades) projected health increments, such cultural reordering may be inevitable. The more evident it becomes that received cultural wisdom conveys only insufficient information to sustain current practice, the more probable it is that this domain of culture will be generally reordered.

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APPENDIX F

EPIDEMIOLOGY*

The use of epidemiology is central to the national need to predict the effects of future economic, social and cultural changes on food selection and to measure outcome in terms of morbidity and mortality. Epidemiology is the study of the distribution of disease and disability in defined populations. Epidemiologists use their skills and resources investigating and assessing the health needs of whole populations, the healthy as well as the sick, in order to determine priorities for delivery of medical care, prevention of disease and promotion of health (Lilienfeld and Lilienfeld, 1980). Epidemiology emphasizes the study of causation as it occurs in whole populations rather than in individuals and is less concerned with understanding of biologic mechanisms as they affect the atomic, molecular, tissue or organ structures of the human body. By the same token, involvement with apparently healthy people in preventing disease is a more compulsive and pervasive interest to epidemiologists than is curing or rehabilitating those already sick. Most epidemiologists believe that control of disease and disability lies more with prevention than cure and the preventive measures based on knowledge of causation are not dependent on detailed knowledge of biologic mechanisms to be effective. Thus, it is more important to understand and intervene in coronary heart disease risk factors such as high serum cholesterol by lowering dietary intake slightly in whole communities, than it is to deal with atheromatous plaques in artery walls by bypass operations in survivors of coronary artery disease. In the short term, population and clinical approaches are complementary. In the long run, the preventive approach makes the major impact on public health. Thus means of measuring factors affecting food selection and food intake are of major interest to epidemiologists.

For well over two decades, cholesterol in the diet has been as much a preoccupation in the prevention of coronary heart disease as has smoking and raised blood pressure (Royal College of Physicians, 1976). The dramatic reduction in mortality in the United States since the mid-sixties has been attributed by Cooper et al. (1978) to preventive measures and to remedial procedures. Two out of every three sudden deaths from coronary artery disease occur before medical aid can meet the emergency (Royal College of Physicians, 1976), so behavioral changes in smoking, exercise and diet habits would seem to have a greater claim than do cardiac resuscitation and bypass surgery for credit in the achievement. Between 1962 and 1975 there was a reduction in numbers of the U.S. population with high serum cholesterol by 6 and 14 percent in males between 45 and 54 years and 55 and 64 years respectively. In

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females of the same age group, the reduction was in the order of 13 and 29 percent. Dietary change and change in food selection behavior, together with changes in smoking and exercise habits and the detection and control of untreated hypertension, can with confidence be regarded as having made the major contribution to an overall reduction in coronary heart disease mortality in the region of 20 percent in U.S., compared with an increase of approximately 10 percent in Great Britain. Epidemiology has a clear interest and a central role in planning, implementing and evaluating future alteration in food selection behavior. Changes which affect a phenotypic profile may ultimately be measured in mortality or morbidity.

The employment of epidemiology is by no means confined to use with mortality and morbidity data. In multidisciplinary or multi-center activities, epidemiologists attempt to establish a health information system which provides as many indices as possible for evaluation. The epidemiologist is concerned with identifying for comparison subgroups whose demographic features would be consistent with those of the whole study population and characteristic of the community, region or country. Within these selected study groups, observations of food selection behavior, for example, can be used as a baseline or benchmark to measure subsequent outcomes on health either with or without modified behavior induced by intervention. In longitudinal designs, the first round of observations is used in the short term as the baseline for measures of physical or behavioral changes in second and subsequent rounds. In the long-term, the baseline data permit enumeration of incident cases of sickness, disability or mortality.

Measurement of risk (Fig. 1) is integral to establishing cause and effect relationships. It has many applications in studies of food selection behavior and its outcomes. A behavioral intervention aimed at altering the effect of exposure to a given risk; e.g., varying level of salt intake, would begin by recording salt consumption in the form of a continuous distribution within the defined population appropriately stratified by age, sex and other socio-economic and socio-demographic factors. Surveillance would be established over a suitable interval to determine, either directly by re-examination of the sample or indirectly by medical record linkage, morbidity or mortality related to exposure to salt and presence or absence of intervention to affect salt-taking habits. The relative risk ratio (Fig 1a) would be determined by dividing the incidence or number of new cases or deaths during the period of observation in those with the "high" salt intake (a/a+b) by incidence or number in those with "low" or "normal" salt intakes (c/c+d). A relative risk ratio (ad/bc) of more than one, ideally more than four, between high and low intake subgroups would establish salt as an etiological factor. The higher the ratio, the greater the significance of the relationship.

Subtracting morbidity and mortality incidence in the group of "low" or "normal" salt intake participants in the study, from incidence in "high" salt consumers, provides a measure of individual attributable risk or risk difference, an incidence rate which in combination with other risk factors suggests an appropriate strategy for managing the individual patient (Fig. 1b).

Attributable risk for the whole community under study is derived by multiplying the risk difference in incidence rates between the low and high salt exposure groups, by the total number in the subgroup with high salt intake at baseline (Fig. 1c). Expressed as a number of sick or deceased participants arising over the specified period of study in the high risk group, the measurement can be expressed as an estimate of the percentage of the total in the whole of the study population becoming sick or dying. This simple measure is a means of estimating the total effect which could be obtained by a completely successful intervention such as reducing salt intake to the lowest level obtainable in the whole study group.

In summary relative risk measures the strength of a causal association and attributable risk measures the extra amount of risk for the individual and the number of extra sicknesses, disabilities or deaths which could be averted in the whole community by effective intervention. This information is essential not only in establishing etiologic hypotheses, but also in determining priorities and costing different strategies of prevention for different levels of exposure to risk.

The same type of health information system will provide estimates of efficacy, whether the study population was the better or worse for a specified behavioral intervention; efficiency, whether the best use was made of resources; and effectiveness, the need met in relation to the extent of unmet need. The last index can be sub-classified into response within a defined population as represented by the number and proportion responding to an offer of, say, dietary assessment and guidance; compliance, the number and proportion complying with advice given on behavioral modification, and outcome, measured in the short term by change in behavior or in blood level of a risk factor like serum cholesterol, and in the long term by reduction in hospital admissions for dietary related diseases or disabilities or in dietary related mortality.

The development and evaluation of acceptable diagnostic methods for use in population studies also lie within the province of epidemiology. Failure to validate methods has done much to discredit preventive approaches to the control of disease and disability associated with maladaptive behavior. In a diagnostic procedure (Fig. 2), the same simple two by two table is used to compare the number of cases diagnosed by the new procedure with the number diagnosed by the old. "Positives" detected by the new screening procedure are designated "true positives"

when they coincide with "positives" from the old standard test. "True negatives" are similarly determined. Ideally, sensitivity (the ability of the test to detect as few false negatives as possible) should be as high as possible. Specificity (the ability of the test to detect as few false positives as possible) should be equally high--a relatively rare achievement in practice. Low sensitivity and low specificity carry penalties wasteful of resources and distressing to participants. If sensitivity is low, a large number of people will be falsely advised that their behavior is satisfactory; if specificity is low, interventive unnecessary procedures will be introduced and service resources will be overloaded. Both forms of errors have implications for response and compliance in interventive measures.

Use of the same two by two table (Fig. 2) can allocate a predictive value to a particular test. Planners are thus provided with an opportunity to rank a number of tests and decide which are worthy of inclusion, which should have priority when choice is restricted, and which should be used in combination. Again, the same two-by-two table can produce estimates of repeatability (Synonyms: stability, reproducibility, or reliability). This index measures the extent to which use of a diagnostic technique at one point in time agrees with use of the same technique after an interval. The same index can estimate intra- and inter-observer error including the ability of one group of investigators to replicate the results of another.

Use of a cross-sectional study at a single point in time produces the index called prevalence, defined as the number and proportion in the denominator population having a characteristic at a point in time. An example could be the number preferring a particular brand of dietary fat in a defined group. A more sensitive index, however, would be the incidence rate or proportion in a defined population changing to this behavioral pattern over a defined time interval. Incidence rates can be derived only from longitudinal, as opposed to cross-sectional, epidemiological studies. Epidemiology also provides measures for comparison between one population and another, and between different sub-groups of the same population. Epidemiological studies can be interventive as well as observational. They can provide information on the natural history of disease and disability, and on the effects of different exposures within populations. They can measure the extent to which behavioral change may modify or arrest the development of exposure-related disease or disability.

Measurement of attitude and opinion is common in nutritional research, and many health care studies use techniques developed by sociologists (Moser and Katon, 1972; Thurstone, 1959; 1967). Opinion on degree of disability, for example, may be useful as an objective measurement of outcome. In mental health, indices of neuroticism, introversion and depression are constructed from patients' statements of opinion. Opinion measurement is more sensitive to the way a question is worded than are more factual and objective data. Opinion measurement

usually requires more intense questioning, since a simple "yes/no" response to a single question is rarely sufficient. Some refinement can be achieved by using a series of yes/no questions covering different aspects of study content.

Intensity can be approached by presenting respondents with a number of attitude statements of varying intensity and asking them to select the one that most closely approximates personal attitude. Alternatively, attitude can be depicted pictorially (scalogram) and the respondent asked to mark the scale appropriately.

A more sophisticated approach to attitude measurement is to use scaling techniques. The first stage is to assemble a series of statements, clearly worded and unambiguous, to differentiate between respondents with favorable and those with unfavorable attitudes toward the subject under study. The statements should cover all aspects of the attitude. Selection of items for use in the final scale depends on the type of scale used. The Likert, Thurstone, and Guttman scales are common. The Likert Scale can be used to measure attitudes of physicians to emotionally disturbed patients (Table 1). Questions 1, 2, 6 and 7 in this example are positively worded (scores 5-4-3-2-1) and items 3,4,5,8,9, and 10 negatively worded (scores 1-2-3-4-5).

The total score for attitude toward the emotionally disturbed patient is the sum of scores for all the questions. Statements with little discriminatory power elicit similar answers from all respondents. This was found to be the case with items 2 and 8 in the above scale; the items were therefore rejected.

The Thurstone Scale collects a large number of statements (about 100) representing all extremes of opinion to be measured. A large number of judges (say 50) is asked to arrange the items into groups (usually 11) representing degrees of favorableness of attitude. Then each item is scored from 1-11, the score being the point at which half the judges allocate a lower score, and half a higher.

The final items are selected to exclude those with wide scatter of scores as they are ambiguous; and to produce equal intervals of scores from one extreme to the other. The final selection of items is included in the questionnaire in random order; and respondents endorse items with which they agree. The average of the item scores endorsed is the final rating.

Thurstone scales attempt to form an interval scale of measurement. Ideally, the respondent should endorse only items with scores near his own attitude rating and disagree with those more extreme on either side.

The Guttman Scales have the main advantage that all items belong to the same dimension. This is achieved by choice of items, based on results from respondents, to produce a cumulative type of scale. In a

perfect scale of this type, every respondent would endorse all the items less extreme than the most extreme one with which he agrees.

An example is given of a scale to test physicians. Attitudes to salt restriction:

Salt restriction is acceptable for:	Score
stroke patients	1
angina patients	2
hypertensive patients	3
obese patients	4
the whole population	5

There are only 6 possible scores (including 0) and individual answers can be detemined from the score. The scale is ordinal, not interval. In practice no scale will be perfect; the deviation is expressed as coefficient of reproducibility.

RESEARCH OPPORTUNITIES

Over the last two or three decades epidemiologic attention to food intake has been preoccupied with dietary methodology and most concerned with the advantages and disadvantages of dietary recall alone or combined with dietary history as means of quantifying the extent and describing the nature of the dietary contribution to the metabolic and cardiovascular diseases and cancer (Hawthorne, 1981). A major study presently supported by the National Cancer Institute is designed to determine current reproducibility of dietary assessments made thirteen years earlier in the same subjects. Valuable as these methodologies are in risk assessment, there is need for their wider deployment in areas like factors determining food selection. Using the best of long established methods (Thalgerson, 1958), it is possible to envisage studies in which sensitivity, specificity and predictive value of belief in what constitutes appropriate food selection behavior, predict conformity with independently determined, appropriate, food selection behavior.

There is a need to determine relationships between food selection and eating behavior and the nature of differences between the obese and lean in their different interpretations of the appearance of food and its palatability (Kozlowski and Schachter, 1975). The difference between obese and lean people in eating and food selection behavior and the extent to which these differences are related to socio-economic status, has been questioned by Garn (1981).

Perhaps most pertinently, studies are needed on how factors affecting food selection affect attainment of nutritionally-related objectives for promoting health and preventing disease for the nation as defined in 1980 by the Surgeon-General (DHHS, 1980). Research must begin now to determine the effect of food selection behavior on nutritional measures recommended in this Panel's report. These measures provide for prenatal and perinatal health care services, education and information services for the public, breakfast and lunch programs for school children and the elderly, and legislative regulatory and economic means for manufacturers. Specific objectives for 1990 include increasing public awareness of the relation between diet and health by 50 percent and increasing public understanding and use of reliable nutritional information in making food choices by 25 percent. Without reliable baseline data, assessment of progress toward stated objectives will be vitiated.

SUMMARY

The development of methodology to assess behavioral factors determining food selection requires an epidemiologic perspective to validate measures in large populations, quantify the food selection contribution to causation of nutritional diseases and disabilities, and evaluate outcomes of intervention. Epidemiology can contribute in the approach to defining populations, standardizing methods, collecting and reporting results, validating new techniques, classifying disease and disability, estimating relative risk ratios for etiology, estimating individual and community attributable or excess risk, predicting amounts of disease and disability avoidable by prevention, assessing efficiency and efficacy of interventive measures, and evaluating the effectiveness of these measures. Epidemiology has a special research interest in testing personal belief in food values against performance and a major interest and contribution to make in measuring the impact of national nutritional recommendations for promoting health and preventing disease for the 1990's.

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[a]Literature reviewed to 1981.

TABLE 1
THE EMOTIONALLY DISTURBED PATIENT

	STRONGLY AGREE	AGREE	UNCERTAIN	DISAGREE	STRONGLY DISAGREE	COMMENTS
1. The treatment of emotional problems is a major part of a general practitioner's work						
2. Personally, I feel competent to treat most of the emotionally disturbed patients I see.						
3. Neurotic patients impose a greater strain upon the general practitioner than do other types of patients.						
4. Neurotic patients, by and large, tend to be ungrateful for the trouble taken with their treatment.						
5. Under present conditions, it is not practicable for a general practitioner to engage in psychotherapy.						
6. The training of general practitioners to deal with neurotic illness is one of the most urgent needs in medicine.						
7. I should like to undergo further training myself in the management of neurotic disorders.						
8. Until the advent of more effective methods of treatment there is little to be done for psychiatric patients.						
9. The distress shown by many neurotic patients is due more to lack of control than to real suffering.						
10. Neurotic patients often behave as if their illness absolved them from responsibility						

FIGURE 1

ESTIMATING RISK

(e.g. Salt-intake and Coronary Heart Disease CHD)

	CHD	
	POSITIVE	NEGATIVE
HIGH SALT	a	b
LOW SALT	c	d

FIGURE 1a

$$\text{RELATIVE RISK RATIO} = \frac{a}{a+b} \div \frac{c}{c+d}$$

$$= \frac{ad}{bc}$$

$\left(\frac{ad}{bc} \text{ should be } > 1 \text{ for etiologic significance}\right)$

FIGURE 1b

$$\text{Individual attributable (excess) risk} = \frac{a}{a+b} - \frac{c}{c+d}$$

(for individuals in high salt group)

FIGURE 1c

Community attributable (excess) risk = number(n) in high salt intake group x attributable risk rate (1 balance)

i.e. $\left[n \text{ (high salt)} \times \left(\frac{a}{a+b} - \frac{c}{c+d}\right)\right]$ deaths or disabilities from CHD

FIGURE 2

ESTIMATING VALIDITY AND PREDICTIVE VALUE OF A NEW DIAGNOSTIC TEST

		ESTABLISHED REFERENCE TEST	
		POSITIVE	NEGATIVE
NEW DIAGNOSTIC TEST	Positive	a	b
	Negative	c	d

SENSITIVITY - ability of new test to detect as few false negatives as possible

$$\left(\frac{a}{a+c} \times 100 \right) \%$$

SPECIFICITY - ability of new test to detect as few false positives as possible

$$\left(\frac{d}{b+d} \times 100 \right) \%$$

PREDICTIVE VALUE - probability if test is positive it will correctly identify the disease or disability

$$\left(\frac{a}{a+b} \times 100 \right) \%$$

REPEATABILITY
REPRODUCIBILITY
RELIABILITY
STABILITY

$$\left(\frac{a}{a+b+c} \times 100 \right) \%$$