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ERS

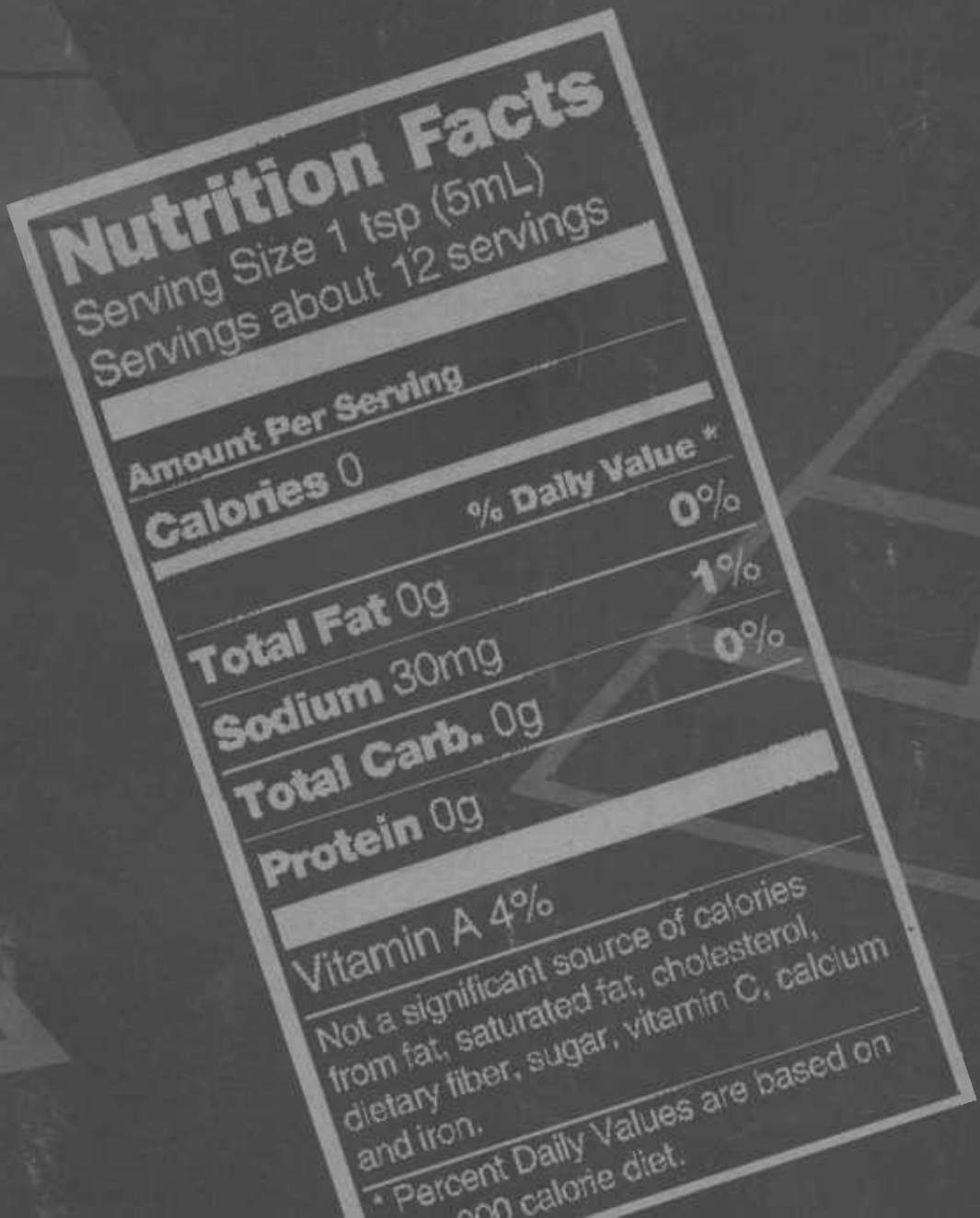
Agricultural Handbook Report Number 715

An Economic Research Service Report

Consumer Use of Information

Implications for Food Policy

Lorna Aldrich



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National Agricultural Library Cataloging Record:

Aldrich, Lorna
Consumer use of information : implications for food policy.
(Agricultural handbook (United States. Dept. of Agriculture) ; no. 715)
1. Nutrition policy--United States. 2. Consumer behavior--United States.
3. Diet--Economic aspects--United States. 4. Diet--Health aspects--United States. 5. Advertising--Food--United States. 6. Food--Labeling--United States. I. Title.
TX360.U6

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Consumer Use of Information: Implications for Food Policy. By Lorna Aldrich. Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Handbook No. 715

Abstract

Government programs that are designed to improve health by changing diets focus on information: education, public information campaigns, and regulation of advertising and labeling. Research from several social science disciplines offers insights for public dissemination and regulation of nutrition information. A review of selected literature in economics, nutrition education, and marketing highlights several research themes. These are the need to motivate consumers to use nutrition information, the value consumers place on time, the possibility that information can change the effects of income on food choices, and the value of enhanced life and health from improved nutrition.

Keywords: nutrition education, economics of information, unfolding, benefit/cost, labeling, NLEA, FTC, USDA, FSIS, FDA, advertising, food, consumer

Acknowledgments

The author thanks James Blaylock, Betsey Frazao and Jay Variyam of ERS and Carol Kramer-LeBlanc of the Center for Nutrition Policy and Promotion, USDA, for helpful suggestions and comments. Pauline Ippolito of the Federal Trade Commission was exceptionally generous in providing background and suggestions at the very beginning of the project. Cathy DeShano's editing significantly improved the manuscript.

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June 1999

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Summary

Government programs designed to improve health by changing diets focus on information: education, public information campaigns, and regulation of advertising and labeling. Research from many social science disciplines offers insights for public dissemination and regulation of nutrition information. This report synthesizes research from economics, nutrition education, and marketing on the use of information. Several themes emerged from this selected review of literature: the importance of motivational knowledge, the value of time to consumers, the changing effects of economic variables on food choices over time, and the high value of enhanced health and life expectancy.

During the decades in which nutrition educators have been stressing the relationship between diet and disease, average per capita income in the United States has increased, making food more affordable for the average consumer. Furthermore, as people's incomes rise, they place greater value on time and demand more convenient foods, needs met by prepared foods and restaurants. Overall, it appears that the forces of rising incomes and convenience are outweighing nutrition and health information. These trends may not be inevitable. Economic studies reveal that even as consumers' incomes increase, they may choose to eat more healthful foods as they become more aware of nutrition.

The economic approach to consumer information on nutrition depends on two assumptions: that the consumer believes acquiring information will lead to benefits and that the consumer can use the information to reap the benefits. Nutrition education strives to inform people about nutrition and, ultimately, aims to change eating behaviors so that people reap the benefits of healthful eating and reduced risks of disease. The conclusions of the nutrition education literature review emphasize specific features that must be present if nutrition education is to prompt change: motivation, clear and relevant messages, advocated actions consumers can understand and do, and continued reminders.

Producers provide significant amounts of nutrition information in advertising and labeling. Since the mid-1990's, regulation has increased and channeled this information, but consumers still need motivation to obtain it, process it, and change their behavior. The convenience of nutrition information on packages could make nutrition education and information programs more effective if they can provide motivational knowledge as well. The potential benefits to consumers from the regulatory developments in the 1990's will ultimately depend on the ability of education, advertising, and package claims to motivate people to use labels and to improve their diets and health.

Nutrition information programs aim to enhance life and health through improved nutrition. Government support of nutrition education and regulation of advertising and labeling support this goal. Because these are government programs, policymakers seek benefit-cost calculations for these programs. The high value that consumers place on health and life means that information programs with demonstrated efficacy in improving health will offer benefits that consumers will likely feel exceed reasonable costs.

Consumer Use of Information
Implications for Food Policy

Lorna Aldrich

Introduction

Government programs designed to improve health by changing diets focus on information: education, public information campaigns, and regulation of advertising and labeling.[1] What does research on consumer use of information offer to support these policies? This report synthesizes research from economics, nutrition education, and marketing on the use of information to change food purchases by healthy adult consumers in the United States. The report focuses on the marketing of food products because dietary change for most people requires changes in food purchases.

The government plays two roles in determining what nutrition information consumers receive. By regulating advertising and labeling, the government changes business' costs of providing market information. Second, the government provides information directly through a wide variety of nutrition programs. Estimates of the benefits of these programs, while difficult, are necessary to achieve the most improvement in consumer health. Even imprecise measurements can help policymakers decide which alternative program options yield the most benefits per dollar of public expenditures.

The economic approach to consumer decisions begins with predetermined consumer perceptions and tastes and describes the logical process of making purchases with limited time, information, and money. The purpose of nutrition policy is to change consumers' perceptions so they consider the health benefits along with enjoyment of food. Therefore, economic approaches will not cover the full range of policy considerations. Because a goal of nutrition education policy is to change food purchases, however, economic analysis of consumer behavior can contribute useful insights to nutrition policy.

The Economic Approach: Why Does the Consumer Want the Information?

Theoretical Considerations From Economics

In 1961, George Stigler asserted in "The Economics of Information" that consumers seek information on prices of goods because sellers' prices vary as a consequence of their imperfect information on competitors' prices. Subsequent analysis of the economics of information incorporates his insights. When buyers search for products, they may pay less; but that search costs consumers time, a commodity valued more by high-income consumers than by those with low incomes. Consumers will stop searching for lower prices once they decide the time they could continue to spend searching is as valuable as the money they would save with a lower price.

After Stigler, developments in the economics of consumer demand introduced by Lancaster and Rosen laid the groundwork for further developments in the economics of consumer information. Consumer welfare, the goal of economic activity, is usually defined as utility based on consumption of specific goods. Lancaster extended this idea to incorporate the characteristics of goods, rather than the goods themselves, as the basis of utility—a food is valued for taste, convenience, nutrition, status, etc., rather than for being a food. The consumer transforms the food into the characteristics. This simple extension stretches the traditional consumer demand theory used by Stigler to the constantly changing array of consumer goods, with different combina-

[1]For a listing of nutrition education programs, see Center for Nutrition Policy and Promotion, "A Catalog of National Nutrition Education Promotion Projects."

tions of characteristics. Rosen later emphasized the characteristics even more by defining utility as a function of the characteristics themselves (Ratchford). The new formulation evaluates consumers' search for price and characteristic information among different brands of the same product and also considers new and changed products which offer novel combinations of valued characteristics.

This more realistic formulation of consumers' behavior also highlights the role of consumer information. While Stigler discussed consumers' search for the best price, he also suggested that consumers seek quality. While price can be determined before purchase, other characteristics that consumers value cannot be. The contemporary consumer is confronted with an array of characteristics for which information about quality could be obtained.

An economics of information literature describes products' search characteristics (price, size of package, color) that can be determined before purchase. These characteristics lend themselves to Stigler's original analysis. But products also have characteristics that can be determined only by experience (taste, durability, maintenance needs). Finally, products have characteristics that the consumer cannot determine even after consumption (nutritional value of a food, expertise of a doctor, honesty of a car repair shop). The three types of characteristics are referred to as search, experience, and credence characteristics. The nature of supply and demand for information about each of the three categories differs. Consumers' acceptance of producers' claims will vary by the nature of the characteristic advertised. Search characteristics, which can be readily checked by the consumer before purchase, are hypothesized to be the most accurately advertised. Experience characteristics (i.e., testimonials such as "the cologne appealed to the opposite sex," "the food tasted good," "the appliance had low maintenance needs") can sometimes be determined in advance from third parties, either informally or through formal information services. Consumers will evaluate those goods they repeatedly purchase in somewhat the same manner as search goods; bad-tasting food will quickly lose its share of the consumer's budget.

Credence characteristics will always require the consumer to acquire information from the seller or third parties. The subject of this report—nutrition information—is a credence characteristic of food. The consumer cannot determine the nutritional value of a food from consuming it but must obtain nutrition information from other sources, whose credibility will vary. How much nutritional knowledge will the consumer seek? Stigler's discussion of the supply and demand for information will still apply: consumers will seek information until they decide continued searching will yield less than the value of time spent. If consumers are to spend time seeking nutrition information, then they must believe nutrition information will yield utility.

In Stigler's formulation, the main cost of information is time. In 1965, Becker specifically analyzed time in "A Theory of the Allocation of Time," in which he emphasized that consumption, as well as production, requires time, a valued commodity. Utility depends not only on the characteristics of products, as in Lancaster's and Rosen's formulations, but also on the time required to consume products. A book requires both consumers' time and money. The movie made from the book is a different experience, but one requiring less time.

The same principle applies to food. Acquisition and consumption of both information and food require time. Different consumers will need different amounts of time to obtain and process information; education should help improve how efficiently consumers process information. Regardless of one's efficiency, however, time required to obtain nutrition information and to prepare nutritious food is time that otherwise could be contributing to utility, either by earning money for other goods or by consuming other goods.

In this context, a consumer seeking information about nutrition faces alternative sources of information, each with a time cost and a perceived contribution to utility. Sellers' advertising information will have the lowest cost, but not necessarily the highest perceived contribution. Generally, consumers obtain information from sources that require little of their time, but value information from other sources more. In one poll, respondents cited print media and TV as the most common sources of nutrition information, but cited doctors, books, and dietitians as the most useful. Family and friends fell in between (table 1). This apparent discrepancy between use and usefulness of information is consistent with the costs of information sources. Information from medical professionals is both expensive (in time and money) and rarely used. Information

from books costs time and is rarely used. Information that is nearly free through the media is widely used, even if assigned a low value.[2]

Applied Economic Studies of Nutrition Information

Economic studies of information using data on individuals have explored the effect of nutrition information on food consumption. These studies yield estimates of the relative weight of economic forces, primarily income, and individual knowledge. Other, more aggregate studies have compared aggregate consumption in the population before and after the general availability of information about diet-disease connections. The aggregate studies provide further corroboration of the role of nutrition information in food choice.

[2]The use of packages and labels in the Gallup poll is lower than use found in surveys that have focused on labels per se; this may be because respondents to the poll interpreted "nutrition" information as dietary advice, as opposed to nutrient content.

Table 1—Sources/usefulness of nutritional information

	Use of information	Advice "very useful"
	Percent	
Magazine/ Newspaper	46	23
TV	22	23
Doctor	13	55
Books	10	51
Family	4	44
Dietitian	3	61
Food/labels		
Packages	2	N/A
Friends	2	46
Government	1	26

N/A = Not applicable
Source: Gallup Poll conducted for International Food Information Council and the American Dietetic Association, 1989.

Studies Based on Individual Data

The Economic Research Service (ERS) has published detailed studies based on consumption of fat, cholesterol levels, and fiber intake of individuals who plan household meals (Variyam et al. 1997, and 1995). The research uses Lancaster's and Becker's theories in which the meal planner for the household combines food, information, and other resources to provide food that is enjoyable and possibly healthful. The studies use two surveys of the same population: the 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) and the Diet and Health Knowledge Survey (DHKS) of USDA. The CSFII is an interview and diary record of food ingestion for a 3-day period. The DHKS is a follow-up telephone survey that asked food managers of the responding households questions on knowledge and attitudes about nutrition.

The ERS work on fat and cholesterol included several measures of knowledge. The work assessed consumers' views of the importance of a healthful diet with queries on the importance of avoiding too much of each of three nutrients: fat, saturated fat, and cholesterol. Consumers responded on a scale from 1 to 6, with 6 reflecting "very important." The second type of knowledge was called diet-disease awareness and respondents indicated with "yes" or "no" answers whether they had heard about health problems related to each of the three nutrients. The final type of knowledge was nutrient content knowledge, measured by consumers' correct choices between pairs of foods on the basis of fat or cholesterol contents. Diet-disease awareness and nutrient content knowledge were closely correlated with each other, but not with the importance of a healthy diet. Thus, knowledge seems to be of two kinds: a general idea that healthful eating is important and specific knowledge of why and how to achieve a healthful diet.

Results indicated that specific knowledge had much larger effects on reducing intake of fat and cholesterol than did general knowledge that having a healthful diet was important. However, general knowledge did reduce intake of the three nutrients (table 2). As indicated below in the section on nutrition education, the importance of diet-disease and nutrient-content information is consistent with the theories underlying the design of effective nutrition education programs.

Some significant results of the study reflect the roles of income and schooling on fat and cholesterol intake,

mediated through information. The study design permitted estimation both of the direct effects of income and schooling on intake measured in grams and of their indirect effects through increased knowledge. This was done by having two sets of equations.[3]

As expected, income and schooling limit intake in fat grams indirectly by contributing to general and specific knowledge about nutrition. However, the direct effects of income and schooling on fat and cholesterol intake are larger: with additional income and schooling, people consume more fat, saturated fats, and cholesterol (table 3). Thus, as incomes grow and educational levels rise, more nutrition education efforts are needed to offset the direct effects of income and schooling.

An earlier study that examined the determinants of fiber consumption found similar results (Variyam et al., 1995). Although higher income was associated with greater knowledge about the fiber content of food, as people's income levels increased, they reduced fiber consumption, despite its health benefits. One reason for

[3]The information variables appeared as dependent variables in their own equations and as independent variables in the intake equations. The whole system of equations was estimated simultaneously.

Table 2—Relationship between consumer knowledge of healthful eating and nutrients*

Variable	Total fat	Saturated fat	Cholesterol
Healthy diet importance	-0.087 (2.56)	-0.131 (4.77)	-0.066 (2.44)
Diet-disease awareness	-0.321 (2.75)	-0.296 (3.02)	-0.243 (1.86)

*Minimum distance coefficients on variables indicating healthy diet importance and diet-disease knowledge in equations estimating intake in log grams of total fat, saturated fat, and cholesterol (absolute t-values in parentheses)
Source: Adapted from tables 3, 4, and 5 in Variyam et al., 1997.

Table 3—The effects of income and schooling on food intake

Variable	Direct effect	Indirect knowledge effects		Total effect
		Healthful diet importance	Diet-disease	
Total fat (grams:				
Income[1]	5.316*	0.126	-3.667**	1.775*
Schooling[2]	1.554*	-0.032	-1.091**	0.431*
Saturated fat (grams):				
Income[1]	1.630*	-0.042	-0.968*	0.621*
Schooling[2]	0.566*	-0.038***	-0.430*	0.097
Cholesterol (milligrams):				
Income[1]	18.327*	-0.105	-7.955**	10.267*
Schooling[2]	2.499	-0.020	-3.144***	-0.665

Note: *, **, and *** indicate coefficient estimates significant at 1-, 5-, and 10-percent levels, respectively, under two-sided t-tests.
Figures are for a doubling of income.
Figures are for an additional year of schooling.

this may be that foods higher in fiber, such as whole grains, may be considered inferior goods, that is, goods whose consumption declines as income rises.

A later study (Variyam et al., 1998) again employed a similar approach to analyze determinants of the Healthy Eating Index, developed by USDA to assess multiple components of good nutrition simultaneously. The estimated direct effects of income and education on healthy eating were negative although their total effect on the index, which includes many more dimensions of diet than fat, fiber, and cholesterol, was positive. The total positive effects of income and education in this study result from their indirect effect of fostering information acquisition.

One explanation of the fat, fiber, and cholesterol results may be that meals eaten away from home may increase as incomes and education rise. Away-from-home foods typically contain more of nutrients overconsumed (fat and saturated fat) and less of nutrients underconsumed (calcium, fiber, and iron) by Americans (Lin et al.,

Table 4—How income affected food purchases*

Product group	1980-81	1988-89
Total food	0.3468	0.3183
Food away from home	.5583	.5308
Food at home	.2006	.1566
Meat, poultry, fish, and eggs	.2170	.1181
Beef	.2341	.0979
Pork	.1597	.0404
Other meat	.1900	.0929
Poultry	.1053	.1264
Fish	.3750	.2069
Eggs	.0012	-.1080
Cereals and bakery products	.1603	.1111
Dairy products	.1381	.1124
Milk and cream	.0205	-.0378
Cheese	.3171	.2217
Other dairy products	.2109	.2789
Fruits	.1934	.2401
Fresh	.1881	.2528
Processed	.2217	.2248
Vegetables	.2402	.1455
Fresh	.2437	.1659
Processed	.2267	.1182
Sugars and sweeteners	.1669	.1577
Nonalcoholic beverages	.1258	.1087
Fats and oils	.1809	.1152
Butter	.3497	.1869
Margarine	.0827	.1300
Other	.1439	.0899
Miscellaneous	.2507	.2100

*Comparison of estimated income elasticities between 1980-81 and 1988-89.
Source: Blisard and Blaylock, Table 35.

1999). As people's income and education rise, they may place greater value on time and choose not to prepare meals that could be lower in fat and cholesterol and higher in fiber even though they have a greater diet-disease knowledge. Income allows consumers to choose from many products, while education may create the ability to engage in more activities.

Studies Using National Aggregate Data

Some studies using national aggregate data offer insight into the economic forces countering nutrition information, even though the studies do not specifically include information. Blisard and Blaylock estimated individual equations containing economic, regional, and demographic variables for 28 categories of food expenditures, and used their results for projections. Their equations provide a basis for determining the effects of income on each category of food (table 4). The expenditure data approximate food quantities in these data because all households faced the same prices during the time of the study.

Based on the 1988-1989 Consumer Expenditure Survey, Blisard and Blaylock found an income elasticity for food away from home of 0.53, compared with 0.16 for food at home. This means that a 1-percent increase in income will increase expenditures on food away from home by .53 percent, and for food at home by .16 percent. Because food away from home contains more fat and cholesterol and less fiber per meal, its higher income elasticity could counter improved knowledge and attitude effects of higher income, provided that higher expenditures translated into more, not just more expensive, meals away from home.

It is also possible that rising incomes increase fat and cholesterol because foods containing them are consumed more as incomes rise. Blisard and Blaylock's results provide mixed evidence on this point. The highest income elasticity for an individual food, .28, was for "other dairy," a mixture of low- and high-fat items. The second highest elasticity, .25, was for fresh fruit, very low in fat and cholesterol. However, cheese, a high-fat item, had a relatively high-income elasticity in that study, .22. Per capita intake of cheese has increased markedly in recent years as people have consumed more pizza and other manufactured and prepared foods, which are common in away-from-home and at-home convenience meals (Putnam and Gerrior). This trend illustrates the earlier argument that time's value to consumers is increasing.

Two aggregate studies explored the effects of information by examining national consumption and price data for cholesterol and the fats and oils complex (Brown and Schrader, Chern et al.). Brown and Schrader developed an index of cholesterol information based on the cumulative number of articles in medical journals that supported a link of diet, serum cholesterol, and heart disease. They found that the increase in information about cholesterol decreased per capita egg consumption 16-25 percent over the 1955-87 period. Chern et al. also used the index of medical journals and several alternative indicators of information—a time trend, the mean of health beliefs from survey data on health beliefs, and the variance of beliefs. They found that cholesterol information reduced consumption of butter and lard, but not necessarily of all fats and oil.

Many studies assume that consumers' responses to prices and income remain constant over the period studied. Others assume responses will vary over time. Brown and Schrader allowed responses to vary and found that price and income responsiveness changed over time, as more cholesterol information became available. By the end of the study period (1955-87), they discovered that if egg prices dropped and incomes rose in a given year, shell egg consumption increased less than it would have at the beginning of the period.

Blisard and Blaylock's study updated an earlier one (Blaylock and Smallwood) that had used the same methods but earlier data. A comparison of income elasticities between the two studies gives an indication of change in the strength of economic responses over time, which may change because incomes rise, relative prices change, or consumers' perceptions of food qualities change. For example, nutrition information may transform a positive characteristic, such as percent butterfat in milk, into a negative characteristic and thereby change the expenditure, and possibly the consumption, in response to higher income.

In general, Blisard and Blaylock found lower income elasticities in 1988-89 data than in 1980-81 data (table 4). People continued to spend a large part of additional income eating out, but added less from that additional

income to spending for food at home. The proportion of additional income going to meat, poultry, fish, and eggs was about halved, while additional income was associated with less spending on eggs, consistent with the findings in the two studies just discussed. Additional expenditure on cheese remained high, but was less than previously. People also consumed more fresh fruit as income increased, but additions to butter consumption were much smaller. These changes in response to incomes are consistent with a shift toward more healthful diets over the decade, but they could also reflect differences in relative prices, demographics, and other factors. The data demonstrate that consumer responses to economic forces adjust over time.

Relative Roles of Information, Income, and Convenience

During the decades in which nutrition educators have been stressing the relationship between diet and disease, average per capita income in the United States has increased, making food more affordable for the average consumer. From 1961 to 1996, disposable income spent on food decreased from 17 percent to 11 percent, of which the share spent on more expensive food away from home grew to 40 percent (Elitzak). Variyam et al. show that income's influence offsets the effects of information. Furthermore, as people's incomes rise, they place greater value on time and demand more convenient foods, needs met by prepared foods and restaurants. Overall, it appears that the forces of rising incomes and convenience are outweighing nutrition and health information. Between 1970 and 1994, the calorie level per person of the food supply rose 15 percent (Putnam and Gerrior). In 1998, the American Heart Association (AHA) declared obesity a risk factor for heart disease, while also citing increasing levels of obesity in the United States, from 25 percent in 1976-80 to 33 percent in 1988-91. The increase in obese Americans accompanied a decline in the share of calories from fat: from 40 percent of the diet in 1965 to 34 percent in 1991. That decline is probably somewhat illusory, however, due more to an increase of calories in the diet rather than to a decrease in fat intake. The AHA also noted a lack of exercise likely contributed to obesity (American Heart Association, 1997, 1998).

These trends may not be inevitable. Economic studies reveal that even as consumers' incomes increase, they may choose to eat more healthful foods as they become more aware of nutrition (Blisard and Blaylock, Blaylock and Smallwood). Still, existing studies indicate that, despite being more informed, people usually spend more money on food when they have more to spend. New information strategies are necessary to counteract such tendencies.

Nutrition Education Approaches: Public Information Supply

The economic approach to consumer information on nutrition depends on two assumptions: that the consumer believes acquiring information will lead to benefits and that the consumer can use the information to reap the benefits. Helping consumers achieve this belief and ability is an intermediate goal of nutrition education.

Those educating consumers about nutrition ultimately aim to change eating behavior so that people reap the benefits of better nutrition and reduced risks of disease. At the motivated, action stage of consumer behavior, the economic calculation of costs and benefits of information, as described by Stigler and others, applies.

How effective is nutrition education? To answer this question, USDA sponsored a systematic review of nutrition education. The results were published in the December 1995 issue of the *Journal of Nutrition Education* (Contento et al.). This chapter relies on the results of that review.[4]

Theoretical Considerations From Nutrition Education

The review classifies theoretical models into two basic types: knowledge-attitude-behavior models and "other," which includes motivational, behavioral change, and community development models. Knowledge-attitude-behavior models assume that when consumers are informed about components of a healthy diet, they will modify their attitudes and their diet. In general this approach has not been successful in changing behavior. Knowledge of healthful diets alone will not affect behavior; people also must be motivated to change. The knowledge-attitude-behavior approach has often been applied by providing "how-to" knowledge—how to have a healthy diet—without also motivating people. People may become motivated to change their habits if they believe healthy eating will produce improved health and reduce risk of chronic disease. Unless consumers are convinced that consumption of fat can increase risks of cancer and heart disease, their knowledge that pretzels contain less fat than potato chips is not likely to precipitate a switch from potato chips to pretzels.

Models in the second category, basically "other," are not sharply distinct from each other or from the knowledge-attitude-behavior models. Models that focus on individual behavior first emphasize the need for motivation, such as a threat to be averted or a gain to be acquired. Threats are apparently more effective motivators than gains. The models also require that individuals believe they are capable of carrying out actions necessary to improve their health. Additional aspects of individual change models emphasize that individuals interact with others and evaluate and alter their behavior based on the interaction. Finally, these models identify stages of behavioral change: precontemplation, contemplation of change, decision to change, overt behavioral change, and maintenance of change. Nutrition education programs need to target the appropriate stage of change to alter behavior.

Additional theories should be considered with respect to education programs targeting individuals. The information processing approach asserts that individuals have a finite capacity to process information and, therefore, process information by using "rules of thumb," by searching the environment, and by using their own memories for clues. This approach resembles the economic approach because it emphasizes the costs of acquiring and using information. The applications to nutrition education are direct. Nutrition education can provide rules of thumb—5 A Day (meaning five servings of fruits and vegetables a day), so consumers need not remember the specific nutrients provided by different fruits and vegetables. Consumers' tendency to search the environment for information is important for developing programs at the point of purchase or choice. In addition, the message itself needs to be considered carefully. Communication theory and marketing practices can contribute in the search for effective messages.

Examples of Interventions

Cases in which nutrition educators have changed consumers' eating habits illustrate these considerations. In addition, many of the successfully targeted behaviors require little or no additional time or money than the less healthful behavior: the consumer simply picks up one cafeteria item rather than the other or selects from different menu items or products on a grocery store shelf.

[4]Much of the same literature was also reviewed in an earlier National Academy of Sciences study (Thomas, ed., 1991).

Three national health campaigns used media heavily: the National High Blood Pressure Education Program, initiated in 1972; the National Cholesterol Education Program, initiated in 1985; and the 5 A Day for Better Health program, initiated in 1992. Nutrition educators used focus groups, concept tests, and message tests to determine if their message about blood pressure was effectively informing the target audience. By 1985, the share of people aware of the link between high blood pressure and heart disease had increased from 29 percent in 1972 to 92. Physician visits for hypertension and the percentage of diagnosed hypertensives under treatment increased as well.

When the cholesterol program began, 65 percent of people understood the link between cholesterol levels and heart disease, but only 35 percent of people had had their cholesterol checked. The campaign aimed to change this. By 1990, 65 percent of adults reported having had their cholesterol checked.

The 5 A Day for Better Health program advocates, through media and other channels, that individuals consume five servings of fruits and vegetables each day. The amount of information disseminated about the program was impressive. Within 1 month, there were 1,800 media messages. Within 1 year, all governors had signed proclamations of support, 225 newspapers had carried stories, and 1 million brochures had been distributed about the program. Results were less encompassing than for the other two campaigns:

> The campaign and the principal message had substantial penetration during 2 years: the percentage of Americans who knew that five or more were the number of servings of fruits and vegetables to eat each day for good health rose from a baseline of 8% to 29% and the percentage who believed that eating fruits and vegetables would "quite likely" help prevent cancer rose from 45% to 64%. On the other hand, 13% (up from 8%) reported that it would be "very hard" to eat five or more servings of fruits and vegetables per day (Contento et al., page 314).

Excluding potatoes, per capita fresh fruit and vegetable consumption increased 34 percent between 1970 and 1996, while processed fruit and vegetable consumption increased 18 percent. This campaign, higher incomes, and other sources of information apparently produced some shift in diets; however, most of the change occurred before the campaign's kickoff in 1992 (Putnam and Gerrior).

Contento et al. note that these national campaigns and other information sources appear to have had a strong secular effect in reducing risk factors for heart disease over the 15 years preceding the review. In fact, many smaller, community-scale studies using media and other communication channels found that both their control communities and their targeted communities improved. It was difficult to achieve statistically significant effects in targeted community populations in addition to the national effects.

Many nutrition education efforts are conducted in small groups, as part of larger Federal programs, in community settings, and at work sites. Groups can be effective at each stage of change when they first motivate consumers to alter their eating habits and then inform and educate people about how to change. Because group settings differ so widely, it is difficult to characterize the results of all attempts to change behavior. Generally, more effective programs are interactive, tailored to the clients, and run for a long time.

Nutrition education interventions at the point of choice occur in stores, restaurants, work-site cafeterias, and vending machines. Point-of-choice programs generally involve labeling the food, shelf, or menu with nutritionally relevant information such as "low fat." The review found that these programs change choices while they are present, but change generally does not persist once the labels are withdrawn. The initial success and lack of persistence of these approaches is consistent with an information-processing view of consumers. This view asserts that consumers will rely on signals from the environment rather than their memories. When the information is absent, consumers revert to old habits.

Conclusions From a Review of Nutrition Education Interventions

The conclusions of the literature review reinforce the theoretical considerations for conditions for success in nutrition education that advocates action:

1. Motivation must be present. Consumers must perceive personal consequences from undertaking or not undertaking change.

2. Messages advocating action must be clear and relevant to consumers' situations. For some, messages must emphasize motivation and consequences; for others, messages should emphasize how to's. An important part of a nutrition education program is determining in advance the state of knowledge and attitudes of the target population.

3. Advocated actions must be understood by consumers, who must feel capable of implementing them. From an additional economic perspective, if advocated actions are low-cost in money, time, and effort, consumers will be more likely to adopt them.

4. Reminders via media or at points of choice are effective while they continue. Thus, nutrition education must be a continuing effort, not a one-time program.

Regulation of Advertising and Labeling: Conditions of Private Information Supply

Advertising and labeling of food make large amounts of nutrition information available to consumers. In 1996, producers spent $21 billion for advertising and $47 billion for packaging (Elitzak). While only a fraction of these expenditures supports nutrition information, that fraction is probably larger than the total of public nutrition education programs. In the 1980's, widespread, but inconsistent, claims and advertising accompanied increased public recognition of the connection between nutrition and health. Consequently, in the early 1990's, significant new regulation of food labeling was established through the Nutrition Labeling and Education Act (NLEA) of 1990, which was implemented with regulations that took effect in 1994. Advertising policy changed as well. Current discussion among nutrition educators focuses on the effects of these changes in policy and regulation.

Federal Regulation of Nutrition Advertising and Labeling

Three agencies share primary responsibility for Federal regulation of nutrition information: the Food and Drug Administration (FDA), the Federal Trade Commission (FTC) and the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA). The Federal Trade Commission regulates food advertising, while the other two agencies share responsibility for regulating labels; FSIS regulates meat and poultry product labeling and FDA regulates other foods' labeling. The NLEA addressed FDA-regulated packages, and FSIS issued parallel regulations.

The NLEA and related policy developments channeled nutrition labeling and package claim practices that had expanded greatly during the 1980's. Beginning in 1973, the FDA required nutrition labeling for packaged products that contained nutrients added during processing or that made health or comparative content claims. Nutrition labels were on about 40 percent of food packages in 1977 (Wang et al.). In the early 1990's about 70 percent of packages displayed nutrition labeling (Caswell). Many consumers reported using the labels at least some of the time. In USDA's 1987-88 Nationwide Food Consumption Survey, 45 percent of households reported that they had obtained nutrition information from food labels in the previous year (Wang et al.). Bender and Derby reported that the percentage of consumers who claimed to pay attention to nutrition labels rose from 68 percent in 1982 to 74 percent in 1988. In 1990, 79 percent of respondents to a National Food Processors Association survey said they "always" or "sometimes" read labels before buying a food for the first time (Mueller).

The NLEA, its implementing regulations, and parallel regulations issued by FSIS prescribe three aspects of package labeling: nutrient contents, nutrient content claims (such as "low fat"), and diet-disease claims (such as high fiber will reduce risk of cancer). The now-familiar nutrition panel that must appear on most packaged foods contains nutrient content information and the percent of the daily value these nutrients represent in a 2000-calorie diet. Regulations also prescribe nutrient contents for each claim.

The FDA also restricted health claims to those that it determined were supported by significant scientific agreement. Permitted health claims are:

- Calcium with reduced risk of osteoporosis
- Sodium with increased risk of hypertension
- Dietary fat with increased risk of cancer
- Dietary saturated fat and cholesterol with increased risk of coronary heart disease
- Fiber-containing grain products, fruits, and veg etables with reduced risk of cancer
- Fruits and vegetables with reduced risk of cancer
- Sugar alcohols and increased risk of dental caries
- Whole oat foods and reduced risk of heart disease
- Foods containing psyllium and reduced risk of heart disease
- Folate with reduced risk of neural tube defects

More claims are likely as scientific evidence accumulates. The Food and Drug Administration Modernization Act of 1997 permits claims based on statements of U.S. Government scientific bodies with responsibility for public health or the National Academy of Sciences or its subdivisions. Distributors and manufacturers must

submit notification of claims to the FDA, which will determine whether the claim fits the Act's provisions.

While the regulations require most food packages to be labeled, they exempt ready-to-eat foods prepared primarily on site, such as deli and bakery items and restaurant food. Nutrition information is voluntary for raw fruits, vegetables, fish, meat, and poultry. Since food-away-from-home now comprises 40 percent of consumer food expenditures (Elitzak), an ever-growing part of the food supply is exempt from nutrition labeling, unless the seller makes a nutrient content claim, such as "low calorie."

After the NLEA was implemented, the FTC issued a policy statement on food advertising that automatically makes claims acceptable for advertising if they conform to the FDA regulations. Claims inadmissible for labeling are not admissible in advertising. Advertisers can make other claims, however, under carefully prescribed conditions for accuracy and presentation of substantiating evidence (Starek).

Theoretical Considerations With Respect to Advertising and Labeling

Economic analysis of advertising focuses on producer behavior in competitive markets. Generally, producers disclose only information advantageous to them. For example, the producer of a product low in fat will voluntarily advertise that fact, while failing to disclose a high sodium content. However, competitors might advertise that their products are low in both fat and sodium. Consumers would then be suspicious of products that failed to make both claims. This competitive disclosure, or unfolding process, results in explicit claims for all positive aspects of food and causes consumers to be suspicious of foods without claims. The unfolding hypothesis also operates to alert consumers to negative aspects of products. For example, the cigarette brand that advertises less tar is alerting consumers to a negative aspect of all cigarettes. Under the theory, disclosure of tar levels will be widespread among low-tar cigarettes and nonexistent among high-tar cigarettes. The unfolding theory implies that the presence of advertising is a signal of quality and that lack of advertising about a specific quality alerts consumers to a probable absence of quality (Grossman; Ippolito and Mathios, 1990).

Advertising is voluntary for sellers. Although some labeling is voluntary, much is now mandatory and is likely to have effects beyond those of the unfolding hypothesis. Mandatory labeling could improve food products if producers reformulate products to avoid making unfavorable disclosures, such as high fat or sodium content. This process would extend the benefits from nutrition labeling to consumers who do not actually use labels to make purchase decisions (Caswell and Padberg). Mandatory labeling also changes the function of nutrition information, a credence characteristic of food, when the consumer cannot evaluate it before purchase and consumption. If nutrition information that the consumer trusts is available, nutrition labels could function as a search characteristic (Caswell and Mojduszka).

Theoretical approaches from the nutrition education literature provide additional useful insights about how current labeling regulations may affect consumers. By itself, the nutrition label panel would not be expected to have significant effects. The knowledge-attitude-behavior approach in which provision of nutritional facts is expected to lead to behavioral changes would apply. But this approach is generally not successful because motivational knowledge must precede how-to knowledge to produce behavioral changes. When information provided by nutrition and health claims on packages and advertising motivates consumers, however, the how-to aspect of nutrition-content labeling might have an effect. Claims could provide the motivational knowledge necessary to move the consumer along the first few steps of the stages of change model, which include precontemplation, contemplation of change, decision to change, overt behavioral change, and maintenance of change (Contento et al.).

A similar marketing theory, the information-processing model, hypothesizes a series of steps that consumers would take before actually purchasing a product: exposure, reception, persuasion, retention, and behavior. Consumers may ignore the messages at any step by not hearing (seeing) the message, by not processing the message, by rejecting the message rather than being persuaded by it, by forgetting it, and by not changing their behavior. Each decision may be affected by other aspects of the message: the source, the substance and style, the channel, and the nature of the target audience (Scholten).

The same consumers may process information that they hear from several sources. For example, a nutrition education class may alert consumers to a diet-disease relationship, a connection that may be reinforced by a

media ad promoting a low-fat product, and that is again reinforced on a label as consumers purchase products. Even if the label were the most proximate cause of dietary change, the other programs would have been necessary to alter consumers' decisions.

Applied Studies of Advertising and Labeling

The economics of information literature treats advertising as a source of information about product characteristics, be they search, experience, or credence characteristics. This view of advertising is that it contains factual information. Other literature emphasizes the image or persuasive nature of advertising. For the economists of information literature to be relevant, advertising must be informational. Abernathy and Franke conducted a meta-analysis of 59 studies on the information content of advertising to determine how much and what kind of alleged facts or cues were contained in the average ad. The study relied on widely used categories of ad content, one of which is nutrition characteristics (table 5). The studies represented 91,000 ads from a number of countries. More than 84 percent had at least one cue, or fact, 58 percent two or more, and 33 percent three or more. The most common type of information was about product performance, contained in 43 percent of ads. Other facts included in the ads were availability, 37 percent; components, 33 percent; price, 25 percent; quality, 19 percent; and special offers, 13 percent. Thus, advertising does provide information some of which consumers can verify. The finding is consistent with the economic analysis of information introduced by Stigler, the economics of information theory, and the unfolding hypothesis.

Table 5— Advertising Information Content Categories

Price
Quality - characteristics of product
Performance - what the product does
Components - materials and ingredients
Availability - when and where to purchase
Special offers
Taste - citation of other consumers
Nutrition - content, comparisons
Packaging - size, shape
Warranties
Safety - special features
Independent research - citation of studies
Company research
New ideas - new concepts embodied in product

Source: Resnick and Stern as quoted in Abernathy and Franke.

If advertising is informational, nutrition advertising could be a form of nutrition education. Ippolito and Mathios (1990) conducted a widely cited study of the effects of nutrition-advertising claims regarding fiber in cereal. The study examined conditions in the ready-to-eat cereal market before and after manufacturers began a mid-1980's campaign that stated the relationship between fiber consumption and a reduced risk of colon cancer. The claim, first made by the Kellogg Company, asserted the message was endorsed by the National Cancer Institute.

Comparing the pre- and post-claim periods regarding fiber in cereal, Ippolito and Mathios found that knowledge of the fiber-cancer link increased among all educational levels, market share shifted to higher fiber cereals, the fiber content of cereals in general increased, and disclosure of other nutrients, such as sodium, increased. The example demonstrates that advertising can transmit nutrition information and change food choices when it contains a simple message that requires low-cost actions (more purchase of high-fiber cereals).

In 1985, the FDA, in effect, relaxed a prohibition against health claims and permitted them if they met the standards of non-deception and substantiation required of all advertising. Consequently, the marketplace experienced a flood of health claims. Ippolito and Mathios (1995) also examined this second period. They found that fat consumption per capita fell continually from 1977 to 1989/90, but that it fell faster after the ban was lifted. The results are consistent with an information role for advertising.

Their results also illustrate one advantage of advertising information—specificity. In 1977-85, before nutrition claims were permitted in advertising, consumption of fat declined among categories of food whose fat and/or cholesterol content was widely communicated—meat, eggs, and fats and oils. However, increases in fat content from other foods largely offset these consumption declines. After 1985, people consumed less fat across more categories, with less increase in other categories. This result suggests advertising claims provide a finer level of detail than broad nutrition information and that such details assist consumers making choices within such categories of food as frozen dinners. Other nutrition information programs also affected consumers'

diets. Together with advertising, these programs could explain the findings in Contento et al. that nutrition knowledge and improvement in diets spread widely during the 1980's and that community-level efforts at nutrition education often had no statistically significant additional effects.

Evidence that ads provide some facts does not mean they provide all the facts; the unfolding theory predicts many ads would not. Ippolito and Mathios (1990) reviewed four applications of the unfolding hypothesis to markets. Evidence supported the idea that producers disclose favorable nutrient composition for cereals and spreads—butter and margarine—but not for frozen pizza and cigarettes. They conclude, "...this evidence supports the view that competitive forces can *sometimes* be relied on to fill in missing information in the market" (page 432, italics added). Caswell (1992) reported similar inconsistent evidence for the unfolding theory.

The possibility that unfolding through competitive advertising claims will sometimes add to nutrition information in markets remains relevant because producers' advertising claims, unlike labeling, are voluntary. Package claims are often more visible and eye-catching than the required nutrition-label panel. The possibility that the absence of eye-catching claims should arouse consumer suspicion is likewise still relevant, but the nutrition-label panel makes it easier for consumers to confirm or allay their suspicions.

When mandatory nutrition-labeling regulations were enacted, some speculated that new and reformulated food products would be introduced so that producers could advertise products' improved nutritional characteristics. Large numbers of nutritionally improved foods (mostly fat reduced) have been introduced, but there is debate over whether they can be attributed to mandatory labeling (Petruccelli).

Consumers' knowledge of store prices provides some clues about their likely behavior toward nutrition information after the NLEA. Despite price labels, market researchers report that consumers generally do not know the prices of most items in their grocery baskets. Consumers appear to be more concerned with the cost of shopping time and rely on general impressions of the cost competitiveness of stores they develop through advertisements (Avery). It is also possible that past investment in price information is reflected in current choices. A similar approach could be expected for consumers' use of nutrition information.

The quantity of standardized nutrition information available to consumers has increased markedly since the 1977-90 period studied by Ippolito and Mathios. FDA's implementation of the NLEA, FSIS's parallel labeling regulations, and FTC's conforming policy statement all increased the consistency, uniformity, and pervasiveness of nutrition information in the marketplace. The cost of information acquisition has been reduced to reading and processing package or display labels. However, the time costs are still significant enough that they will be a barrier to some consumers.

Moorman assessed the effects of the NLEA by comparing samples of grocery shoppers in the same cities and stores in October 1993 and October 1994, several months before and after the NLEA effective date of May 1994. Her questions were as follows: Has the introduction of the NLEA increased nutrition information processing at the point of sale? Has the NLEA promoted nutrition information processing regardless of individual consumer differences? Has the NLEA increased nutrition information processing at the point of sale for both healthful and non-healthful products? Moorman wanted to know if the NLEA increased information use while reducing the effects of consumer backgrounds and the nature of products. Consumers were questioned immediately after they were observed selecting a brand in 1 of 20 product categories in grocery stores.

In the pooled data for the 2 time periods, consumers spent an average of 12 seconds choosing a brand, and nearly half of consumers made their choice in 1 second (figure 1). If either price or nutrition information influenced most purchases, that influence was probably based on memory or general impressions of brands, products, and stores. Results indicated consumers' ability to recall fat content was inaccurate.[5] These data appear surprising compared with the pre-NLEA findings that large proportions of consumers claimed to use labels, but the consistency with which consumers claimed to use labels varied from "in the past year" to "always or sometimes." Moorman's results suggest that label use is neither pervasive nor continuous. Moorman found statistically significant increases in information acquisition, measured by search time in seconds, after the NLEA took effect. Motivated con-

[5]When shoppers were asked to recall the grams of fat per serving in the last brand selected, the average error of recalled fat grams per brand was 5, with a standard deviation of 14. Since fat content varied from 0 grams for orange juice to 3 grams for cereal, to 17 for frozen pizza, the average recall appears inaccurate.

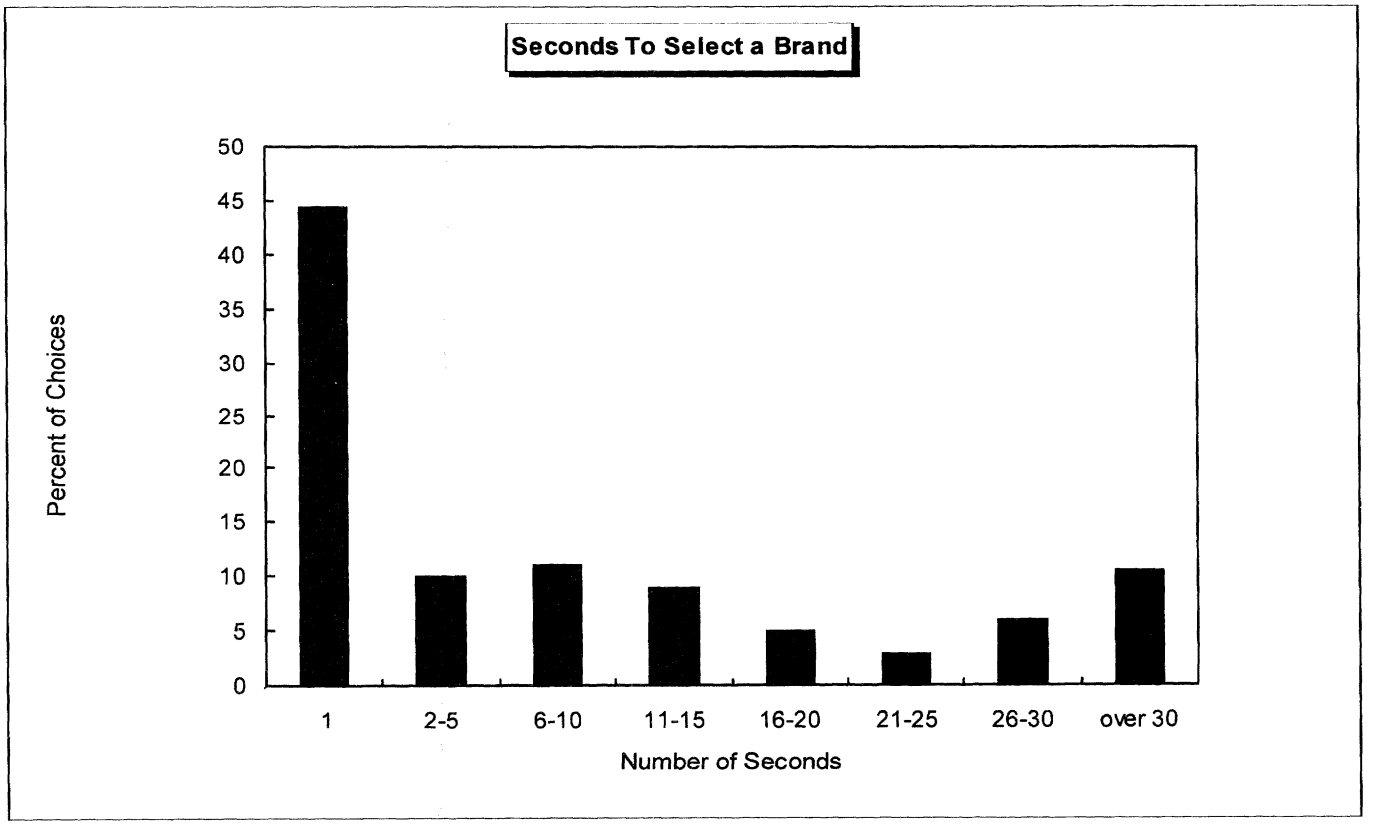
sumers acquired more information after the law than before, and even the less motivated more accurately recalled fat content afterwards. Likewise, the level of knowledge consumers had about label regulations and diets in general became less important to fat recall after the law. Diet-disease knowledge became more important, however, possibly because diet-disease claims on packages were carefully regulated. Finally, consumers retained more information about higher fat products (those defined as having more than 5.5 grams of fat per serving) than they did about lower fat products. The author speculates that standardized and adequate reference information, required by the NLEA, raised awareness of the nutritional quality of food products, thereby increasing the focus on higher fat products. Thus, the NLEA may have spurred product competition, even among higher fat products.

If mandatory labeling is to make nutrition a focus of market competition, consumers must use the information. The nutrition education and marketing literature emphasizes the need for awareness and motivational knowledge to precede the use of how-to information and change in behavior. Motivational knowledge does appear to be a precursor to use of labels, as these theories suggest. Moorman and other researchers have found that health-conscious consumers use labels more than other people (Wang et al., Mueller).

Conclusion

Producers provide significant amounts of nutrition information in advertising and labeling. Since the mid-1990's, regulation has increased and channeled this information, but consumers still need motivation to obtain it, process it, and change their behavior. The convenience of nutrition information on packages could make nutrition education and information programs more effective if they can provide motivational knowledge as well. The potential benefits to consumers from the regulatory developments in the 1990's will ultimately depend on the ability of education, advertising, and package claims to motivate people to use labels and to improve their diets and health.

Figure 1— Consumers Choose Food Products Quickly



Public Benefit Cost Considerations

Nutrition information programs aim to enhance life and health through improved nutrition. The multiple inputs contributing to a final outcome— good health— complicate an attempt to value the benefits. Some of those inputs include nutrition, medical care, and lifestyle over many years as well as the genetic disposition of the individual. In addition, nutrition information programs probably interact with each other and commercial information to lead consumers along the steps of nutritional awareness.

Placing a Value on Improved Health

Because nutrition educators and advocates of other health and safety programs have found a need to place a value on health and life as they assess the benefits of their programs, two approaches have been developed to estimate these values. One approach measures the cost of medical treatments of illness and the earnings lost because of illness and premature death, while the other approach measures the amount of money people will spend for safety devices that preserve health and life and the extra wages required to induce people to take risks. The second approach is preferred because it recognizes that life and health are valued as ends in themselves, not only as a means to income or as an avoidance of medical costs.

For 1970, 1980, and 1990, Cutler and Richardson used the second approach to estimate "health capital" for individuals at birth and at age 65. They measured health capital as the expected years of remaining life, and adjusted for expected disability from chronic diseases. Expected years of life were based on death rates by age in the three years. The authors value a year of life at $100,000, in 1990 dollars, citing economic literature that derives the value of life from the premiums required for risky jobs and the prices people are willing to pay for safety devices.

The authors used the National Health Interview Survey, which contains data on individual health from 1969 on, to estimate the effect of chronic conditions on self-reported health. A year of life as an invalid may not have the same value as a year of life in complete health. The authors derived weights for impaired years that they based on personal health reports of people with impairments. For example, a year of life for a person with heart disease was valued at 64 percent of that of a healthy person in 1970 and 70 percent in 1990, apparently a reflection of improvements in medical treatment. The final adjustment Cutler and Richardson made was to discount the value of future years of life by 3 percent, even though such practice is controversial. They also made their calculations with rates of 0 and 6 percent. Their undiscounted estimates of the change in value of health capital for a baby born in 1970 versus one born in 1990 was $387,000 (table 6). For a 65-year-old in both years, the change was $247,000. Discounted at 3 percent, the values are $95,000 and $169,000. They conclude with a general statement that health capital in the United States improved by approximately $100,000 to $200,000 per person between 1970 and 1990, or $5,000-$10,000 per person per year.

Clearly, this is an approximation. What it does imply is that improved health and life are highly valued, a hardly surprising conclusion. The high value that consumers place on health and life means that information programs with demonstrated efficacy in improving health will offer benefits that consumers will likely feel exceed reasonable costs.

Has Knowledge Increased?

Efficacy of nutrition information requires not only increases in knowledge of nutrition information but also consequent improved eating patterns, which enhance life and health. The FDA has determined that there is scientific agreement on specific connections between diet and some diseases. Although knowledge and eating patterns have improved somewhat since the 1970's, potential improvements that remain are still large. Relaying nutrition information so that consumers understand how diet affects disease remains a challenge.

With respect to increases in knowledge, a wide range of potential and actual knowledge could be examined. Nutrition knowledge ranges from the general value of eating fruits and vegetables to understanding the consequences of eating different kinds of fats. At the most straightforward end of the continuum, a journalist reduces the necessary knowledge to a few words:

> lots of fruits and vegetables and grain-based foods [that are] rich in fiber, vitamins and min-

erals and [also] low in calories, fleshed out with modest amounts of animal protein—four-ounce portions of well-trimmed meat, skinless poultry or fish—and low-fat and nonfat dairy foods (Brody, 1998).

Some research does indicate consumers are retaining nutrition information. The FDA's Health and Diet Surveys found that the number of people who said fats and fatty food are a major cause of heart disease increased from 8 percent in 1970, to 29 percent in 1983, and to 55 percent in 1988 (Frazao). Consumers' understanding of the sources and characteristics of fat, polyunsaturated fat, and cholesterol, however, did not improve from 1983 to 1988 (Levy et al.).

Other evidence reveals improved knowledge over time. The applied economic studies of egg consumption and cholesterol (Brown and Schrader, Chern et al.) described earlier indirectly provide evidence that more people became aware of this diet-disease connection during the period studied. Ippolito and Mathios found that consumers knew more about diet-disease connections and that they changed their diets in both of the periods they studied. The changes in responses of expenditure on different categories of food when income increased, as reported by Blisard and Blaylock, suggests indirectly knowledge has improved.

Have Eating Patterns Improved?

Putnam and Gerrior reported that in 1996 Americans consumed two-fifths more grain products and a fifth more fruits and vegetables than in 1970, ate leaner meat, and drank lower fat milk, habits that are consistent with the dietary guidelines. They are also reported to be eating fewer shell eggs (eggs sold in the shells rather than in food products). Offsetting these trends that improve diets, Americans are consuming record-high amounts of sugar and other caloric sweeteners, high-fat dairy products, and near-record amounts of added fats — including salad and cooking oils and baking and frying fats. Although consumers have reduced their intake of shell eggs, they are eating more food with processed egg products, such as baked goods. People are also consuming large amounts of fat in cheese as they eat out or buy pre-prepared food to save time. Overall consumption of milkfat did not decline between 1970 and 1996, despite the trend toward lower fat milk. Increased consumption of cheese and fluid cream compensated for the reduced fat intake from fluid milk.

Putnam and Gerrior found that Americans appear to be changing their diets based on nutrition information, but that they offset changes by consuming more calories and added fats and oils. These trends may reflect both economic forces — income and a desire to save time — and less recognized calories and fat in packaged food, despite labels, or in food eaten out. Although economic forces will persist, the NLEA may make information on calories and fat more recognizable. Limited evidence for 1993-96 does suggest the NLEA may affect consumer behavior. Putnam and Gerrior reported annual per capita consumption of added fats and oils declined at least 8 percent in those years.

Other evidence shows modest improvement in diets. Between 1989 and 1996, USDA's healthy eating index rose from an average of 61.5 to 63.8, on a scale of 0 to 100. Scores over 80 represent a good diet so the average U.S. diet needs improvement; but the average is above the 20-50 percent range that indicates a poor diet. Consumers scored best in areas that indicated limited total fat and cholesterol consumption, scores that may reflect package and advertising claims (Bowman et al.).

Conclusion

Circumstantial evidence indicates government nutrition information and regulation may be affecting consumers' diets. The FDA has determined that significant scientific agreement on diet-disease connections supports the health claims that are currently permitted on food pack ages. There is evidence of increased knowledge of these connections and of some changes in diets consistent with recommendations. Therefore, a portion of the large value of improved health could be due to nutrition information from commercial and public sources. Still, the unrealized benefits remain large.

Table 6— Change in value of health capital per person in the United States, 1970-90*

Discount rate	At birth	At age 65
0	387	247
3 percent	95	169
6 percent	38	122

*Figures are in thousands of 1990 dollars.
Source: Cutler and Richardson

Conclusion: Common Themes Across Disciplines

Several themes emerged from this selected review of literature: the importance of motivational knowledge, the value of time to consumers, the changing effects of economic variables on food choices over time, and the high value of enhanced health and life expectancy.

Motivation

"Stages" theories—stages of change and stages of information processing—provide important insights into how public information and regulation could affect food choice. The stages of change theory hypothesizes that consumers move through the stages of precontemplation, contemplation of change, decision to change, overt behavioral change, and maintenance of change. Information processing theory suggests that consumers may be exposed to a message, may receive the information, may be persuaded by the information, may retain the message, and may alter their behavior if they respond to the advertisement. In both theories, behavioral change follows the other stages, thus stressing the need to motivate consumers to adopt healthy lifestyles. Commercial, public, and educational sources of information may reinforce each other in guiding consumers through stages. Different sources could provide consumers with the motivation, reinforcement and how-to information they need to modify behavior.

Research findings are consistent with these theories. Contento et al. found that providing specific knowledge without motivational knowledge was not successful. Both motivation and how-to information must be provided, and should be targeted to an audience's needs. Variyam et al. (1997) found that a general attitude that healthful eating was important was not closely correlated with diet-disease and nutrient-content knowledge, which were themselves closely correlated. Furthermore, diet-disease and nutrient-content knowledge had a larger effect in diets.

From the perspective of these theories, consumers who think it is important to have a healthful diet, but who lack the specific knowledge to do so, are probably in an earlier stage of the information process— they are aware, but not sufficiently motivated to invest in specific information. Providing consumers diet-disease information— how to reduce the risk of cancer and heart disease— is likely to be more motivating than offering general information about healthful eating without identifying the benefits.

The Value of Time

Both economic theory and observations of consumers' shopping behavior indicate that saving time becomes more important to consumers as incomes rise. Convenience minimizes the time costs (forgone wages or alternative consumption) of buying, preparing, and consuming food. Marketing studies of grocery-shopping patterns reveal that consumers do not spend the time required to know the prices of the items in their grocery cart (Avery). Moorman reported from observations of shoppers that nearly half of consumers' choices were made in 1 second.

Flexible Economic Effects on Food Choices

Consumers' responses to food choice when prices and/or incomes change summarize complex behavior in which consumers balance the perceived utility of one expenditure against the other possibilities. If consumer perceptions change as a result of information, it would be expected that consumers' responses to price and income variation would change as well. Brown and Schrader demonstrated that consumers' purchases of food respond differently to changes in prices and income at different times, and Blisard and Blaylock demonstrated the same thing for changes in income.

The flexibility of economic effects is encouraging because current responses to income and prices are leading to overconsumption. The AHA identified easily affordable food as one of the root causes of overconsumption, a practice that has caused obesity to become an important risk factor for heart disease (American Heart Association, 1998). Variyam et al. (1997) found that high incomes encourage consumption of fat and cholesterol and offset the effects of knowledge in determining the diet. Given the flexibility of economic responses, affordable food will not inevitably defeat nutrition information in forming the diet. Economic responses can change over time if consumers reevaluate foods' characteristics.

High Value of Enhanced Health and Life Expectancy

The goal of providing and regulating nutrition information is to enhance health and increase life expectancy through improved food choices and nutrition. Because people place high value on health and life, as asserted by Cutler and Richardson, effective programs will very likely produce benefits in excess of costs. However, interacting forces that produce health and interacting information programs make tracing the effects of programs challenging.

Integrating the Themes With Policy

Mandatory nutrition labeling has created an environment rich in instructional information, at least for packaged foods. Motivated consumers can access information much more easily than they could before mandatory labeling. These circumstances suggest that moving more nutrition information efforts into motivational messages around the existing how-to of labels could be an efficient use of educational resources. Potential messages might combine motivation and instruction, for example, "Excess calories can be dangerous— read the label."

Even the motivated consumer will still value time. Regulators and educators could incorporate the value of time into their programs. One way would be to use symbols that summarize other information, such as a symbol for combined lows— fat, sodium, cholesterol, and calories. Other symbols could communicate high fiber, calcium, and/or protein. Consumers could use symbols that summarize information to simplify nutrition information processing when they are making their choices in very few seconds. Otherwise they may not process nutrition information.

The value consumers give to food characteristics can be changed by information, education, and advertising. One sandwich chain compared the fat content of its beef sandwich with the higher fat content of a competing hamburger using the slogan "Fat is cheap!" Regardless of the outcome of that campaign, evidence reveals that information can lead consumers to change their economic responses to foods' characteristics. Public programs could address similar image issues, such as "A real taste" for unsweetened, low-sodium foods.

Research from many social science disciplines offers insights for public dissemination and regulation of nutrition information. Given the value of improved health and life that could result from effective programs, it is worthwhile to weigh these results during program and policy development.

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