

Consumer Use of Information Implications for Food Policy

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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.

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

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 combinations of characteristics. Rosen later emphasized the characteristics even more by defining utility as a func-

tion 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 informa-

tion—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.

²The 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" |
|-------------|--------------------|----------------------|
| | <i>Percent</i> | |
| 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

³The 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.

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

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 | 5.316* | 0.126 | -3.667** | 1.775* |
| Schooling | 1.554* | -0.032 | -1.091** | 0.431* |
| Saturated fat (grams): | | | | |
| Income | 1.630* | -0.042 | -0.968* | 0.621* |
| Schooling | 0.566* | -0.038*** | -0.430* | 0.097 |
| Cholesterol (milligrams): | | | | |
| Income | 18.327* | -0.105 | -7.955** | 10.267* |
| Schooling | 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.

¹Figures are for a doubling of income.

²Figures are for an additional year of schooling.

consumption, despite its health benefits. One reason for 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

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.

(calcium, fiber, and iron) by Americans (Lin et al., 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.