New Health Information Is Reshaping Food Choices

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Over the past half century, consumption patterns of many food commodities have shifted dramatically in the face of changing consumer demand. For example, until the early 1950s, eggs were a staple of the American diet, especially at the breakfast table. Since then, however, egg consumption has steadily dropped. Per capita egg consumption in the United States fell from 390 in 1950 to 233 in 1991, the lowest level ever recorded. Today, annual egg consumption stands at about 250 eggs per person.

While other commodities have undergone similar drops in consumption, some have enjoyed booming demand. For example, consumption of whole milk has declined over the past 60 years, while consumption of reduced-fat milk has risen more than threefold. Similarly, the consumption of red meats (beef, veal, pork, and lamb) has declined since the late 1970s, while poultry consumption has shown a continuing upward trend, replacing red meats as the meat of choice in the late 1990s. During this same period, the use of butter and lard has declined, replaced largely by the increased use of salad and cooking oils.

What accounts for such shifts in food consumption patterns? While changes in relative prices and income levels are responsible for much of the shift, there is an additional and increasingly important factor at play—the growing scientific evidence linking health to diet. Many consumers have modified their food choices in reaction to the flood of diet and health information coming out of the Nation's laboratories and research institutions. This article examines how health information is reshaping consumer food preferences and the Nation's food and agricultural sectors.

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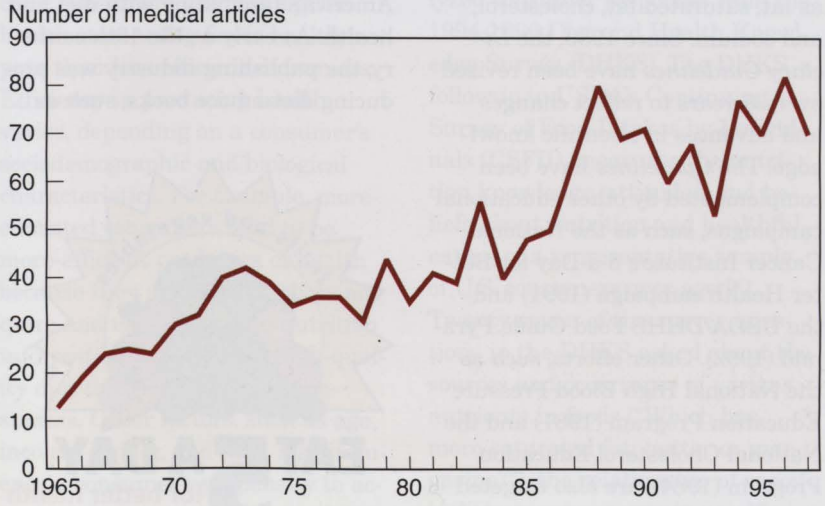
Evidence Linking Diet and Health Is Growing...

Nutrition research in the first half of the 20th century focused on identification and prevention of nutrient-deficiency diseases. In the second half of the century, the focus of research shifted to the role of diet in maintaining health and reducing risk of chronic diseases, such as heart disease and cancer. Concerns about dietary inadequacy were largely replaced by concerns about overconsumption of fats, cholesterol, and calories. The first scientific accounts of the link between diet and heart disease began to appear in the early 1960s. Since then, evidence associating specific foods and dietary components with specific health outcomes has expanded rapidly. For example, data collected through MEDLINE, a database containing the abstracts of all articles published in medical journals worldwide, show that the annual number of English-language articles linking fats and cholesterol to heart disease grew from 13 in 1965 to 82 in 1996 (fig. 1). By 1997, a cumulative total of 1,543 published scientific studies had linked fat and cholesterol to the increased risk of heart disease.

Since the earliest studies linking diet and health, nutrition research has expanded in many directions. The wide range of diet and health linkages examined include those between metabolism and hormonal regulation, neuro-

Figure 1—Number of Studies Linking Dietary Lipids, Blood Cholesterol, and Heart Disease Grew Rapidly in the 1980s



Source: Chern and Zuo (1997).

science and nutrition, genetic makeup and nutrition, and nutrition and immunology.

...and So Is the Amount of Diet and Health Information Available to Consumers

As advances in scientific understanding of the link between diet and health are translated into practical advice regarding food choices and diet, this advice is disseminated to consumers. Aside from word of mouth and personal physicians, there are at least four major sources of information on diet and health for the consumer: government education programs, nutrition facts labels, product health claims, and the popular media.

Government education programs. In 1977, the Senate Select Committee on Nutrition and Human Needs released *Dietary Goals for the United States.* This study shifted the focus of Federal dietary guidance from obtaining adequate nutrients to avoiding excessive intakes of nutrients linked to chronic illnesses. Soon after, USDA released the *Hassle-Free Guide to a Better Diet.* In 1980, USDA and the U.S. Department of Health and Human Services (DHHS) issued the first edition of the *Dietary Guidelines for Americans.* The first *Guidelines* recommended consumption of a variety of foods to provide essential nutrients, as well as moderate consumption of certain dietary constituents, such as fat, saturated fat, cholesterol, and sodium. Since 1980, the *Dietary Guidelines* have been revised every 5 years to reflect changes and advances in scientific knowledge. The *Guidelines* have been complemented by other educational campaigns, such as the National Cancer Institute's 5-a-Day for Better Health campaign (1991) and the USDA/DHHS Food Guide Pyramid (1992). Other efforts, such as the National High Blood Pressure Education Program (1981) and the National Cholesterol Education Program (1984), are also targeted at increasing public awareness of the relationship between diet and disease.

Nutrition facts labels. Since implementation of the Nutrition Labeling and Education Act (NLEA) in 1994, the U.S. Food and Drug Administration (FDA) has required the inclusion of nutrition information on most packaged foods. The NLEA gives consumers a powerful source of information on health and nutrition. Through nutrition labeling, consumers have ready access to information on product content, nutrient content, and contribution toward a 2000-calorie diet.

Product health claims. Manufacturers may include product health claims, which are monitored by either FDA or USDA, on their product labels or in their advertising. Nutritional claims provide consumers with information about the link between diet and health. For example, oat products labeled "heart-healthy" help to inform consumers about the benefits of diets high in dietary fiber. The number of products with nutritional claims has grown significantly in the past two decades (see "Food Product Introductions Continue to Decline in 2000" elsewhere in this issue). For example, in 1995, in anticipation of increased demand due to consumer awareness of the link between fat consumption and heart disease, producers introduced nearly 2,000 new food products with reduced- or low-fat claims.

Popular media. The popular media has always taken note of America's fascination with diet and health. As early as the 19th century, the publishing industry was producing diet-advice books, such as the popular *How to be Plump*. By midcentury, the press had become adept at expeditious dissemination of nutrition information. For example, the articles "Are You Eating Your Way to a Heart Attack?" (*Saturday Evening Post*, December 1, 1956) and "Fat, Food, and Heart Disease" (*Consumer Reports*, August 1962) contained newly issued information on research linking heart disease and diet. Currently, information on the link between diet and health is readily available in newspapers, magazines, and books, as well as via radio and television shows. A September 2001 search of recent publications on www.amazon.com found 16,563 matches with the term "diet."

Health Information Influences Food Choices

Information is a powerful influence on food choices. Evidence of this claim is revealed by the amount of resources dedicated to generating such information—including the large advertising budgets of food manufacturers. In 2000, U.S. food producers spent $26 billion on advertising. To better understand the role that the influx of diet and health information plays in changing food consumption patterns, economists have developed statistical models to examine the joint influence of prices, rising or falling incomes, and diet and health information on consumer food demand.

In one study, Purdue University economists Deborah Brown and Lee Schrader developed a cholesterol information index based on the number of articles on the link between cholesterol and heart disease that were published in scientific journals quarterly between 1955 and 1987. The economists used this index to examine the relationship between the decline in egg consumption and the increase in health information about cholesterol. After accounting for the effects of changes in egg price, price of meat (a substitute for eggs), per capita income, and the percentage of women in the labor force, Brown

and Schrader found that, between 1955 and 1987, the increase in information on the links between cholesterol and heart disease resulted in decreased per capita consumption of shell eggs by 16-25 percent.

A study by Texas A&M University economists Oral Capps and John Schmitz strengthened the claim that health information is a contributing influence to changes in food consumption patterns. Capps and Schmitz used the cholesterol information index to show the relationship between increasing health information and the demand for beef, pork, poultry, and fish. The economists used a model that took into account the effect of relative prices of the four foods and per capita income as well. The study showed that, between 1966 and 1988, health information increases led to decreased consumption of pork and increased consumption of poultry and fish. The effect on beef consumption, though negative, was not conclusive.

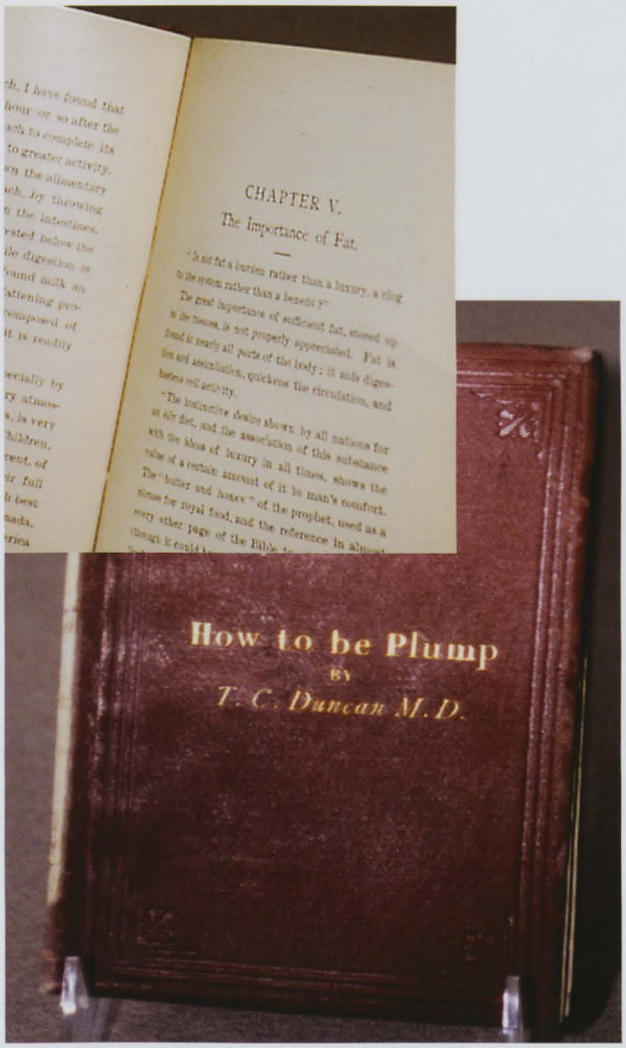
Ohio State University food economists used an updated version of the cholesterol information index to examine the influence of health information on the demand for various food commodities. In one study, Wen Chern and Jun Zuo examined the changing demand for whole milk versus low-fat milk. They found that a 10-percent increase in fat and cholesterol information resulted in an 8-percent decline in the proportion of households purchasing whole milk and a 4-percent increase in the proportion of households purchasing low-fat milk. Because the decrease in whole milk purchases is not fully offset by the increase in low-fat milk purchases, total milk consumption tended to decline with more information on the health effects of fats and cholesterol.

In another study, Chern examined the impact of fat and cholesterol information on the U.S. demand for 10 food items ranging in fat content from low to high, again taking into account relative food prices and household incomes. An increase in health information led to increased consumption of fresh fruits and vegetables and decreased consumption of meats, eggs, and fats and oils.

Some Consumers More Responsive to Diet and Health Information

The studies examined above present evidence at the aggregate level that the consumption patterns of many food commodities have been affected by growing information on the link between diet and health. To understand how this effect is generated at the individual consumer level, economists have developed theories of consumer behavior. When tested with person-level data on consumers' health and nutrition knowledge and dietary intake, these theories help us to better understand how health concerns have reshaped consumer food choices.

Consumers seek to maximize satisfaction through consumption of goods and services. While some of these goods and services, such as cars or clothing, are purchased in the marketplace, others, such as a person's health, are "produced" by the consumers themselves using time and other resources. Consumers produce health through a number of activities, including exercise, consumption of medical services, and consumption of healthful foods. Some consumers are more efficient producers of health than other consumers. Efficient consumers produce a given health state using fewer health inputs than less-efficient consumers. Efficiency in producing health varies, depending on a consumer's sociodemographic and biological characteristics. For example, more-educated consumers tend to be more-efficient producers of health because they are more likely to acquire and use health and nutrition information to produce a high-quality diet than less-educated consumers. Other factors, such as age, income, gender, and race, also influence a consumer's propensity to acquire and use health information in dietary decisionmaking.



The publishing industry has sated the public's appetite for diet-advice books since the 19th century. Early titles, however, celebrated weight gain and "plumpness."

Credit: Ken Hammond, USDA.

To investigate the factors associated with differences among consumers in their ability to acquire and use diet and nutrition information, researchers at USDA's Economic Research Service (ERS) analyzed consumer responses from the 1994-1996 Diet and Health Knowledge Survey (DHKS). The DHKS, a followup to USDA's Continuing Survey of Food Intakes by Individuals (CSFII), measures the nutrition knowledge, attitudes, and beliefs about nutrition and healthful eating of a representative sample of U.S. consumers over age 20. Twenty-seven of the survey questions in the DHKS asked about the sources and occurrence of various nutrients in foods ("Which has more saturated fat: butter or margarine?"), the relationship of specific dietary components to specific

diseases ("Have you heard about any health problems caused by eating too much cholesterol?"), and the number of servings of various food groups in a healthful diet ("How many servings would you say a person of your age and sex should eat each day for good health from the vegetable group?"). The number of correct answers to these questions provides a direct measure of a respondent's diet and nutrition knowledge.

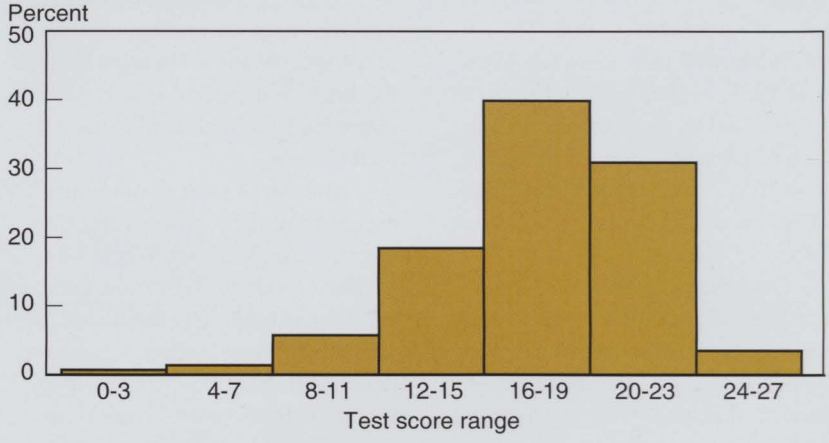
In general, the survey respondents had high diet and nutrition knowledge. Seventy-four percent of the respondents scored 16 or above on the 27-point test (fig. 2). Knowledge varied greatly, however, based on the respondents' sociodemographic characteristics, such as education and gender (table 1). For example, other sociodemographics being equal, a college-educated female scored 4.7 points higher on the test than a male with less than a high school education.

Studies show that nutrition knowledge differences among consumers translate into measurable differences in food and nutrient intake. University of Nevada economist Steven Yen and colleagues estimated the impact of consumers' awareness of the health effects of cholesterol on their decision to consume eggs. Taking into account differences among consumers, Yen found that the egg consumption level of consumers who were aware of the health effects of cholesterol was 13 percent lower than the average egg consumption level.

ERS researchers have used CSFII-DHKS data to conduct several studies on the effect of health and nutrition information on the consumption of nutrients and diet quality. These studies provide clear evidence that as an individual's diet and nutrition knowledge improves, so, too, does his or her nutrient intake and diet quality. In one study, ERS examined the level of diet and nutrition knowledge of main meal planners and preparers in sample households and then measured their actual diet quality. The study assessed diet quality using USDA's Healthy Eating Index (HEI), a comprehensive measure of how well a person's diet conforms to 10 dietary recommendations. The study found that, for two people with similar sociodemographics, the person scoring one point higher on a knowledge scale also scored four to five points higher on the HEI. Based on a mean HEI score of 64.1 on a scale of 0-100, ERS found that a person who acquires the knowledge to answer one more question correctly than a person of similar sociodemographics will improve his or her diet quality by about 7 percent over the average diet quality.

The diet and nutrition knowledge of the people who plan and prepare the meals in a household influences not only the planner's food choices but also the diets of other members of their households. Brian Gould and H.C. Lin of the University of Wisconsin examined the impact of meal planners' diet and health knowledge on the daily fat intake of the planners' households. The study results showed that, for households similar in other respects, the saturated fat in-

Figure 2—Many Consumers Score High When Tested on Their Diet and Nutrition Knowledge



Source: USDA's Economic Research Service.

Table 1—Diet and Nutrition Knowledge Increases Steadily With the Level of Education

Sociodemographic characteristic	Additional diet and nutrition knowledge questions answered correctly
Level of education (compared with those with less than a high school education):	
High school graduate	1.4
Some college	2.4
College graduate or higher	3.1
Age (compared with those age 70 or older):	
20-34	.7
35-54	1.0
55-69	1.3
Male (compared with female)	-1.6
Race: Black (compared with White)	-1.6
Annual per capita income (for an additional $10,000 above the mean income of $17,061)	.3

Source: USDA's Economic Research Service.

take of a household in which the meal planner was aware of the health problems related to saturated fat intake was 19 percent lower than a household in which the meal planner was unaware of such a link. ERS studies show that a mother's knowledge of nutrition and the effects of diet on health affects the nutrient intake and diet quality of her children. ERS research has also established an association between several dimensions of parental nutrition knowledge, such as awareness of the link between diet and health and nutrition facts label use, and the likelihood of the children being overweight.

Dietary Gaps Remain

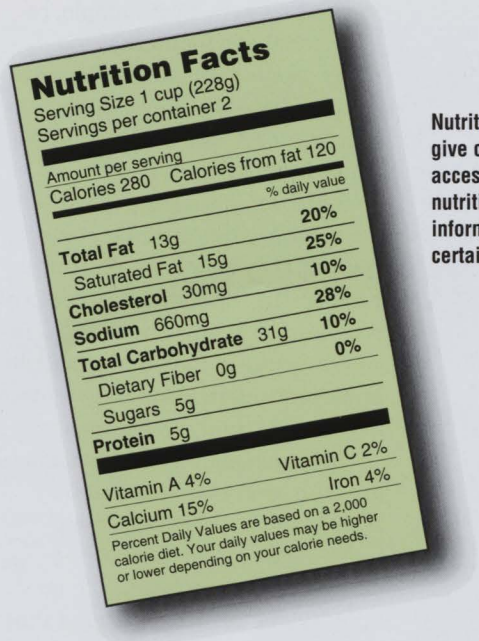
Though evidence at both the aggregate and the individual consumer level shows that many consumers react to diet and health information by changing their food-consumption patterns, a large gap remains between the average diets of individuals and a healthful diet as defined by health authorities. USDA's HEI shows that during 1994-96, the latest years for which data are available, 88 percent of individuals had diets classified as "needs improvement" or "poor." Only 12 percent of individuals had diets classified as "good."

ERS researchers have used aggregate food supply data to determine the daily per capita Food Guide Pyramid servings available in the United States and compare them with Pyramid serving recommendations for the U.S. population. The findings suggest that the American diet is heavily weighted to added fats and sugars and falls short of recommended servings for fruits and dairy products. In 1999, the U.S. food supply provided 1.4 servings per day of fruit, less than half the 3 fruit servings recommended by the Food Guide Pyramid for a 2,200-calorie diet. Although the food supply provided a daily average of four servings of vegetables, which met Pyramid recommendations, actual consumption was tilted to starchy vegetables, such as potatoes, and fell short on consumption of dark-green leafy vegetables.

The growing girth of the American population is yet another indicator of continuing imbalances in the American diet. From 1966 to 1999, the share of overweight children (ages 6 to 11) in the United States rose from 4 to 13 percent, while the share of overweight or obese adults rose from 47 to 61 percent from 1976 to 1999. Clearly, the changes in food consumption brought about by increases in new health and nutrition information have not been enough to close the gap between healthful diets and average diets.

For some consumers, the gap between optimal and actual diet may be a result of misperceptions about diet quality. Although consumers may be aware of the relationships between diet and disease, many consumers have an erroneous perception of the nutritional adequacy of their own diets. A 1996 survey conducted by New York University and the Center for Science in the Public Interest found that trained dietitians underestimated the calorie content of five restaurant meals by an average of 37 percent and the fat content by 49 percent. The difficulty shown by nutrition experts in assessing the nutrients in their diets magnifies the plight of the general public, especially in light of the growing proportion of food eaten away from home. A recently published ERS study reported that 40 percent of household meal planners/preparers perceived the quality of their diets to be better than the actual quality of their diets.

Another reason for the gap between actual and healthful diet is that some consumers may maximize satisfaction through unhealthful food choices. Given their preferences over a wide variety of food attributes, including taste, convenience, familiarity, and health benefits, some consumers choose to consume unhealthful foods—even when their knowledge of health and nutrition is high. Similarly, despite near universal knowledge about the hazards of smoking, about a quarter of American adults remain smokers.



Nutrition facts labels give consumers ready access to health and nutrition-related information about certain products.

Nutrition information can benefit consumers even when the information does not have a measurable impact on specific food-consumption choices. Nutrition and health information helps consumers make informed choices about health risks and how to balance such risks. For example, informed consumers may choose to eat an "unhealthful" meal but then increase their daily exercise routine or eat extra-healthful foods for the next couple of meals.

Optimal Food Choices Depend on Good Information

Information will continue to play an important role in influencing consumer food choices. With the expansion of the Internet and other sources of information, the potential to educate more consumers about the link between diet and health is growing, thereby increasing the potential for substantial reductions in nutrition-related disease. However, along with this potential come problems. The great wealth of information on diet and health may often prove to be overwhelming and counterproductive. Information overload may lead consumers to disregard all information

from all sources. For example, researchers have found that too many product warnings or overly detailed lists of product information on labels may cause many consumers to disregard labels completely. Even if consumers gather information from a number of sources, they may have difficulty ranking the information in order of reliability and importance. As a result, consumers may underreact to important information or overreact to less important information.

Research shows that consumers are often overwhelmed and frustrated by the numerous and diverse messages about diet and health that are issued to the public. A 1996 USDA study found that 40 percent of main meal planners/preparers in households strongly agreed with the statement "There are so many recommendations about healthy ways to eat, it's hard to know what to believe." A 1995 American Dietetic Association survey found that almost 50 percent of respondents thought news reports on nutrition were confusing and 81 percent preferred to hear about new research only after it was accepted by nutritional and health professionals.

The Federal Government has initiated a number of programs to preserve the power of science-based information in helping consumers make optimal food choices. For example, www.nutrition.gov, a Federal resource established in 2001, provides easy access to all online Federal Government information on nutrition and dietary guidance. The Federal Government also funds programs to examine rival diet and health claims. For example, in February 2000, USDA hosted the Great Nutrition Debate to examine the safety and validity of competing diets, such as the "Atkins' Diet," "Sugar Busters," the "Ornish Diet," and the "Zone Diet." In addition, USDA's Agricultural Research Service conducts original research to identify optimal diet and nutrient intake, determine the nutritional constituents of foods and diets that sustain and promote health throughout the life cycle, and identify biomarkers of nutritional relevance.

Optimal food choices depend on accurate scientific information. Without accurate information, consumers are unable to allocate food budgets to best match their preferences. As the wealth of information on diet and health grows, the role of the Federal Government in helping consumers sift through competing health claims will also grow. Through its growing network of Web sites and outreach programs, the Federal Government has begun to tackle this important task.

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