

# Information and Advertising Policy: A Study of Fat and Cholesterol Consumption in the United States, 1977-1990

## EXECUTIVE SUMMARY

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This study examines fat, saturated fat, and cholesterol consumption in the United States during the years 1977 to 1990 in an effort to better understand the effects of information on consumer behavior. Public health organizations, such as the American Heart Association, and the popular press have been spreading information on the role of saturated fat and cholesterol in heart disease since at least the 1960s. Government joined these efforts in the mid-1970s, with dietary guidelines and a variety of public education programs, including the National Cholesterol Education Program in the post-1985 period.

In the mid-1980s, a series of policy pronouncements by the Federal Trade Commission (FTC) for food advertising and by the Food and Drug Administration (FDA) for food labeling changed the regulatory environment to make it easier for firms to discuss diet-disease issues in food advertising and labeling. While still subject to the normal rules that govern all claims -- claims must be truthful and not deceptive -- the new environment increased the economic pressure on firms to compete on the nutritional characteristics of foods. A number of major food companies began to link food choices to disease risks explicitly, and health-related claims of all types became more frequent in advertising and labeling as the decade progressed. Thus, this study examines dietary changes in the years before and after 1985 to provide some evidence on whether these policy changes appear to have led to improvements in food choices, or as some fear, to confusion sufficient to undermine consumers' success in responding to the continuing public health advice on dietary choices.

Overall, the study provides substantial evidence that fat, saturated fat, and cholesterol consumption fell significantly between 1977 and 1990, as information spread to consumers. The available evidence also indicates that improvements in these dietary characteristics occurred more rapidly and more consistently across food choices after 1985, when health-related claims became more explicit and more frequent in advertising and labeling.

In assessing this evidence, it is important to recognize some caveats implicit in any study of this type. First, this type of evidence cannot definitively prove or disprove that any two events are causally related. What we can do is test hypotheses to determine which hypotheses are consistent with the available evidence, and thus, more likely to be true. Moreover, measurement of any consumer behavior as complex as food consumption is difficult, and every data set relevant to the issue has limitations. Because the quality of the available data is a topic of continuing academic scrutiny, we examine three major, independent federal datasets relevant to consumer knowledge and food consumption. Consistent findings across these independent data sets provides greater assurance that the findings are a reflection of behavior and not an artifact of the data. Finally, as in any study of the effects of policy change, it is important to recognize other factors that could affect behavior. In particular in our case, public education efforts continued to evolve throughout the period of interest, including the consolidation of the federal government's heart disease education efforts in the National Cholesterol Education Program in the post-1985 period. Little quantitative information is available, however, to assess the effectiveness of these efforts and whether their effectiveness changed over time.

With these caveats in mind, this report describes a variety of evidence on changes in consumers' fat, saturated fat, and cholesterol consumption over the period. This evidence is generally consistent with the information hypothesis for producer claims, that is, the hypothesis that the relaxation of advertising and labeling policies that allowed more explicit diet-health claims added information and competitive pressure to food markets, thus, complementing other sources of information and leading to reduced consumption of these dietary components. The available evidence is generally inconsistent with the alternative deception/confusion hypothesis, in which producer claims are hypothesized to undermine public health advice, leading to overall deteriorations in consumers' diets. The study presents several types of evidence that suggest reasons why advertising and labeling claims, when added to the flow of other health information, may have been an important part of the information environment that appears to have helped consumers make better dietary choices during the late 1980s.

When more recent data become available, the evidence from this study will also provide a baseline against which we can begin to assess the effects of the changes in food claim policy developed under the Nutrition Labeling and Education Act of 1990. This evidence, together with other studies currently underway, should help us better understand how information spreads in consumer markets and how the rules for advertising and labeling can be refined to best serve consumer interests.

### Why Study Consumption of Fats and Cholesterol?

In an earlier study, we examined changes in the ready-to-eat cereal market, where fiber-cancer claims were the first major category of health claims during this period (Ippolito and Mathios 1989, 1990). The cereal study indicates that consumer knowledge and behavior improved significantly once producer claims helped spread the information that fiber cereals might reduce colon cancer risks. Product development also shifted to reflect this enhanced ability to market a cereal's nutritional characteristics.

Health claims also spread to other markets, including some in which the primary focus was the role of fats and cholesterol in the development of heart disease. Several potentially important differences exist between the fat-heart case and the fiber-cancer case, however. For instance, the scientific basis for heart-disease claims is considerably older than that for fiber-cancer claims, and public and private efforts to spread the heart information had been substantial for many years. Moreover, some heart-disease claims focused on saturated fat (the primary risk component) without a comparable focus on other negative components of the product, such as total fat, raising concerns about the net effect of the claims. These types of differences led us to undertake this comprehensive study of fat, saturated fat, and cholesterol consumption over the 1977-1990 period in an effort to assess whether the results found in the cereal study generalize to other cases.

The study examines detailed food consumption data from the U.S. Department of Agriculture's (USDA) *Nationwide Food Consumption Surveys (NFCS)* in 1977 and 1987/88 and from its *Continuing Surveys of Food Intakes By Individuals (CSFII)* in 1985, 1986, and 1989/90, knowledge data from the Food and Drug Administration's *Health and Diet Surveys* in 1984, 1986, and 1988, and aggregate annual food production data for major commodity categories for the years 1977 to 1990, also from USDA.

These data allow us to examine consumer knowledge and behavior from several perspectives with different types of independent data. This multifaceted approach allows a more comprehensive assessment of whether and how diets changed, as information continued to flow to the market from many sources, and as the policies governing diet-disease claims in advertising and labeling were relaxed in the mid-1980s.

### **Changes in Average Daily Consumption of Fat, Saturated Fat, and Cholesterol, 1977-1990**

To examine the average consumption of fat, saturated fat, and cholesterol between 1977 and 1990 the study uses 1-day recall data on all foods eaten during a 24-hour period from the USDA's food consumption surveys. The NFCS surveys from 1977 and 1987/88 are national population surveys that cover the entire year, but the CSFII surveys from 1985 and 1986 are limited to subsamples of adults during particular seasons of the year. Some data, such as education, are collected only for heads of households in the NFCS surveys.

Since a primary purpose of this study is to examine changes over time, the analysis is restricted to subpopulations consistently sampled by the USDA in the years available and for which the basic variables of interest are collected. Thus, the study focuses on adults, 19-50 years of age, who are heads of households, in spring for women and in summer for men.

For both men and women, these data indicate that average daily fat consumption falls between 1977 and 1985, and the rate of decline accelerates between 1985 and 1990. Average fat consumption for women is 73.3 grams per day in spring 1977 and declines significantly by 3.7 grams in the eight years between 1977 and 1985. Average fat consumption falls significantly by an additional 7.5 grams per day in the next four years, so that fat consumption for women in the 1989/90 sample is 62.1 grams per day. For men, fat consumption in summer 1977 is 112.8 grams per day, which declines significantly by 5.3 grams by 1985. Fat consumption falls significantly by an additional 14.9 grams per day in the post-1985 period, resulting in a 92.6 grams per day average by 1989/90.

Changes in saturated fat consumption generally parallel changes in fat consumption. As with fat, the absolute reductions in saturated fat consumption are larger in the post-1985 period than in the pre-1985 period. For women saturated fat consumption is 26.2 grams per day in spring 1977 and drops by 1.0 grams by 1985. Consumption falls by an additional 3.5 grams per day in the 1985-1989/90 period, to 21.7 grams per day in 1989/90. For men, average saturated fat consumption declines by 1.0 grams per day from 1977 to 1985 and an additional 7.2 grams per day in the following years, to 32.4 grams per day in 1989/90.

Cholesterol consumption shows the same pattern of accelerated decline in the post-1985 period, and the magnitude of the acceleration is more pronounced than for the other food components, though a change in the cholesterol data for eggs in 1987 suggests the need for caution in assessing the magnitude of this result. For women, daily cholesterol consumption declines from 345.3 milligrams in 1977 to 304.9 milligrams in 1985. By 1989/90 average daily cholesterol consumption falls to 221.2 milligrams (this number is estimated to be approximately 266 milligrams if the old cholesterol data for eggs are used). For men, average daily cholesterol consumption is 498.9 milligrams in 1977, 446.6 milligrams in 1985, and 389 milligrams in 1989/90.

In summary, these aggregate results indicate that the average consumption of fat, saturated fat, and cholesterol declined significantly during the years 1977 to 1990 for both men and women. This evidence is consistent with the view that consumers respond to information on health issues. The evidence also indicates that the rate of decline is significantly greater after 1985. Thus, these consumption data are consistent with the information hypothesis for producer claims, that is, that the policy changes that induced producers to focus more on diet-disease issues in advertising and labeling added information to the market and complemented other information sources, leading to a faster rate of improvement in consumers' diets in these dimensions. This aggregate evidence is inconsistent with the alternative hypothesis that the diet-disease claims confused or deceived consumers sufficiently to cause either a deterioration of diets in these dimensions or a slowing in the rate of improvement underway prior to the changes in policy.

Consumer reactions to diet-health information about fats and cholesterol can be measured in several ways. We focus on changes in the average levels of fat, saturated fat, and cholesterol in the diet per day because we believe these are more appropriate measures for a study of consumer responses to information. Nutrient density measures, such as the percentage of calories from fat or saturated fat, are alternative measures often used in nutrition research, because these measures allow the researcher to abstract from individuals' different caloric needs and to use uniform standards in evaluating consumption across the population. Also, density measures have advantages if food consumption is randomly underreported in the surveys over time, and the available evidence suggests that consumption may be under-reported.

Nutrient density measures have a number of disadvantages, however, which we believe make them inappropriate as the primary measure in a study of consumers' responses to diet-health information. Nutrient density measures reflect both the consumption of the nutrient in question and of calories. Changes in the density measure can be caused by changes in either of these underlying components. Thus, the use of a nutrient density measure alone requires an assumption that caloric consumption is itself irrelevant to the topic under study and unlikely to change, an inappropriate assumption in a study of consumer information. One of the major diet-health recommendations throughout the period of this study is that individuals should consume only the calories necessary to achieve and maintain a desirable body weight. Given the observed and possibly increasing percentages of overweight adults in the U. S., average caloric intakes cannot be assumed to be stable. Also, any independent movements in calories could affect these density measures for reasons having nothing to do with the successful absorption of information. The increasing consumption of soft drinks and alcoholic beverages during this period provides an example of this concern; the additional calories from these drinks acts to reduce the percentage of calories from fat, even if nothing else in the diet had changed.

As described in Chapter 3, the evidence on these issues supports the view that a careful assessment of underlying nutrient levels is important in assessing dietary change. Caloric consumption is found to vary considerably over time in the surveys and these changes have substantial effects on the observed density measures. For instance, the percentage of calories from fat is found to fall faster in the years before 1985 than after, but this greater reduction is primarily the result of an increase in reported consumption of calories between 1977 and 1985, rather than a relatively greater reduction in fat versus nonfat calories as would be predicted if information had caused the shift. The percentage of calories from saturated fat falls at approximately the same rate before and after 1985, but again the reduction in the early period is primarily due to an increase in calories, while the reduction after 1985 is due to a relative reduction in calories from saturated fat compared with those from other sources.

To the extent that these changes in caloric intake reflect behavior, conclusions based on density measures can be inaccurate indicators of consumers' success in absorbing diet-health information. On the other hand, if some of the observed change in caloric intake is due to changes in survey design and execution, the movement in calories may overstate changes in behavior. These issues suggest the need for caution in assessing this type of data and the importance of understanding the source of observed changes at the lipid and calorie level. These issues also reaffirm the value of examining other independent data sources, as we do, for confirmation of basic results.

### Changes in Consumer Knowledge of Fat-Disease Issues

The study next examines data on consumers' knowledge of the relationship between fats and disease risks from the FDA's *Health and Diet Surveys* for 1984, 1986, and 1988, a series of national telephone surveys dealing with diet-disease issues. Unfortunately, the earlier and later surveys in the series do not contain fat-disease questions comparable to those in the core years examined here. In order to parallel our consumption analysis, these data are analyzed for men and women who are 19 to 50 years of age.

While not directly tied to behavior, knowledge data offer some advantages for assessing the information questions in this study. Knowledge measures are a direct attempt to gauge the spread of information. Moreover, knowledge measures should not be affected by confounding events, such as price changes or new information on other diet-disease issues that might indirectly affect consumption. Finally, knowledge data represent independent evidence, collected by a different organization for different purposes, and thus provide independent observations on changes during the 1980s.

These survey data provide substantial evidence that consumer knowledge of the fat-heart disease issue increases after 1984. For instance, consumers are asked the questions "Have you heard about *heart disease* or heart attacks being related to things people eat or drink?" and if they answer yes, "What things people eat or drink make them *more* likely to get heart disease or heart attack?" In 1984, 30 percent of women and 18 percent of men give fat-related answers. By 1986 these responses rise to 66 percent for women and 69 percent for men; and by 1988, 76 percent of women and 70 percent of men give fat-related responses.

Taken as a whole, these and other questions from the knowledge surveys indicate that knowledge of the fat-heart disease issue is considerable in 1984 and rises significantly by 1988. The prominence of dietary fat as a heart disease risk shows particularly strong growth between 1984 and 1988. Knowledge about fat as a cancer risk is considerably less than that for heart disease throughout the period, though key measures here also show significant increases. Unfortunately, data from the 1970s are not available to test whether improvements in knowledge occurred prior to 1984 and at what rate, but the level of knowledge of heart disease issues in 1984 suggests that this information was absorbed by many during this earlier time period.

### Trends in Per Capita Food Production

From a research perspective, self-reported data, such as the data in the previous two sections, always raise a concern that respondents may color answers to give desired responses. Whenever possible, reevaluation of research results using data that are not self-reported provides an important assurance of key findings. In the case of fat consumption, such an opportunity is provided by the food production data gathered by USDA directly from producers or other intermediaries in the supply chain. These annual data, often referred to as *disappearance data*, measure basic food supplies moving through trade channels towards domestic consumption, and thus, measure the amount of food available for U.S. consumers.

This study uses two approaches to examine whether information affects dietary choices during the years of interest. First, trends in broad food categories that comprise a sizable portion of the overall diet are examined to determine if consumption shifts away from higher-fat and cholesterol categories towards lower-fat and cholesterol categories. In particular, trends in red meat, poultry, fish, fats and oils, and dairy products are examined, as are those in the lowest-fat categories, such as flour and cereals, fruits, and vegetables. The second approach uses more refined tests of the information hypotheses by focusing on particular food substitutions for which other factors are not likely to play an important role. These foods are required to be similar enough that potential confounding factors, such as movements in input prices and other changes in demand, are common to both products. The substitute foods identified in the USDA production data that meet these requirements are types of milk, ice cream and ice milk, butter and margarine, creamed cottage cheese and low fat cottage cheese.

For each food group, the underlying trend is estimated, as is any change in trend during the 1985-1990 period, when advertising and labeling policies were relaxed. The evidence is consistent with the hypothesis that information spread to consumers throughout these years if underlying trends are negative for higher-fat food categories and positive for lower-fat categories. If the relaxation of the policies towards producer health claims added to the available information, these trends should improve during the post-1985 period, that is, the trends should become more negative for higher-fat categories and more positive for lower-fat categories. Alternatively, if producer claims add confusion to the market that undermines public health advice, the trends should deteriorate, with the opposite effects on post-1985 trends.

The per capita production data provide substantial evidence that during the 1977-1985 period information about fats and disease spread to consumers, leading to improvements in some important aspects of diet. Per capita production of red meat, eggs, and whole milk all fall significantly during the pre-1985 period, and the lower-fat categories of poultry, fish, low fat milk, flour and cereals, and fruit all increase.

The evidence for this period is not entirely consistent, however. Per capita production of some higher-fat products (e.g., cheese and cream products, and fats and oils) increase during the pre-1985 period, contrary to expectations. In fact, only 12 of the 20 coefficients for the underlying trends have the expected sign (11 of the 12 are significant). Eight of the 20 coefficients have the wrong sign (7 of the 8 are significant), indicating that consumers were increasing consumption of some higher-fat categories and decreasing consumption of some lower-fat categories, contrary to expectations if they were successfully absorbing information. Together, this evidence provides a mixed picture of dietary progress during the pre-1985 period.

The production evidence for major food groups provides a more consistent picture during the post-1985 period. Per capita production trends for food categories with the highest levels of fat either stay on the trend that existed prior to 1985 or decline relative to that trend. Similarly, the lower-fat food categories all show a consistent pattern of added consumption relative to the underlying trend during this period. Overall, 19 of the 20 trend coefficients for the post-1985 period have the correct sign (11 of the 19 are significant), and the 1 inconsistent sign is insignificant. Thus, the production data provide no evidence that the added health-related claims had adverse effects on the rate of dietary improvement. Examination of specific food substitutions also supports the hypothesis that during the post-1985 period movements towards lower-fat substitutions accelerate compared with the pre-1985 period.

Taken together, the individual consumption data, the knowledge data on fat-disease issues, and the production data provide evidence supporting the view that consumers responded to information about dietary issues between 1977 and 1990. The evidence also indicates that the period between 1985 and 1990, when advertising and labeling claims about diet-disease issues became more explicit and more frequent, is one where dietary changes occurred more rapidly and more consistently, supporting a positive role for such claims. None of this aggregate evidence supports the hypothesis that the relaxation of the policy towards health claims harmed consumer diets when measured against the fats and cholesterol levels in 1985 or against the rate of change in these levels prior to 1985.

### Changing Sources of Fats and Cholesterol in the U.S. Diet

In an effort to better understand the roles of different information sources in the market, the study also examines some of the relative advantages and disadvantages of the key sources of diet-health information. Theoretically, government and public health organizations, together with other general information sources, should provide a credible and broad perspective on the major diet-disease relationships and the primary food categories where changes could improve diet. Thus, these sources should have their greatest effect in reducing consumption from the easily identified high-fat or high-cholesterol food categories, such as meat, dairy, and eggs, and in increasing consumption of "good" food categories, such as grain products, fruits, and vegetables.

In contrast, if nutrition becomes a focus of competition, producer-provided information is likely to contain information about a particular brand of a particular food, identifying where the brand is superior to its competition and why consumers should consider this difference important enough to buy the product. Producers are presumably less credible than public health authorities on diet-disease issues, but cites to authorities or confirmation by background information may be sufficient to overcome this credibility deficit. If producers' claims are generally informative, the more detailed claims, added to the flow of other diet-disease information, should lead to improvements across a broader range of product categories, as consumers are made aware of more food substitutions that could contribute to their dietary goals and the basic health message is reinforced through repetitive advertising claims. On the other hand, if producer claims mislead consumers, either because claims are false or sufficiently incomplete to lead to inappropriate substitutions on average, we would expect the added producer claims to lead to deteriorations in food choices in a broad range of categories.

To examine these hypotheses, foods in the USDA consumption surveys are classified into 16 mutually exclusive categories that reflect typical consumer choices. This food group analysis indicates that in 1977 the *Meat* category contributed 37 percent of the fat consumed by women and 42 percent of the fat consumed by men. Between 1977 and 1985 the largest reduction in fat consumption by far comes from the *Meat* category, which falls by 10.3 grams per day for women and 15.5 grams per day for men. Only 5 other categories experience any declines in fat for either sex, and 3 of these are specifically mentioned in government dietary advice from the period, namely *Eggs*, *Fats and Oils*, and *Milk*. While reductions in the *Meat* category are quite substantial and responses occur in the other specifically named categories, fat consumption increases enough in 10 other food categories to eliminate approximately 70 percent of the fat reductions in *Meat*, resulting in the moderate overall reductions of 3.7 grams per day for women and 5.3 grams per day for men.

In contrast to the concentrated pattern of reduction and the substantial compensation in the pre-1985 period, fat consumption falls across a large number of food categories in the post-1985 period, and compensation is seen in very few categories; fat declines in 10 of the 16 categories for both sexes and increases by more than 0.5 grams per day in only 2 food categories for women and in only 4 categories for men.

Thus, this food category analysis indicates that the larger overall reduction in the post-1985 period reflects broader and more consistent reductions across the range of food categories, in contrast to the more concentrated reductions prior to 1985.

The data indicate very similar results for saturated fat consumption. During the 1977-1985 period, saturated fat from the *Meat* category falls substantially, but that decline is largely offset by increases in 10 other categories. During the post-1985 period, saturated fat declines in 10 of the 16 food categories and increases by more than 0.2 grams per day in only 2 categories for women and 3 categories for men. In most cases, the saturated fat movements parallel the fat movements quite closely, but a few important exceptions exist. For example, health claims were a major theme in a number of advertising campaigns in the *Fats & Oils* category, and saturated fat falls disproportionately in this category in the post-1985 period, as consumers apparently shift their fat and oil choices to the lower saturated fat options within the category at a more rapid pace than in the pre-1985 period.

Finally, in 1977 cholesterol consumption is highly concentrated to two product categories, *Eggs* and *Meat*. Between 1977 and 1985 daily cholesterol consumption from these categories falls significantly for both sexes; by 61.4 mg for women and by 75.6 mg for men. No other category loses more than 3 mg of cholesterol for either sex. Thus, reductions in cholesterol are essentially confined to these two food

categories, which are specifically identified in government dietary advice from the period. Between 1985 and 1989/90 average cholesterol consumption from the *Eggs* category continues to decline for women but not for men. However, unlike the earlier period, reductions in cholesterol occur across a broad number of food categories. Thus, qualitatively, the results for cholesterol mirror the results for fat and saturated fat, with reductions from more categories producing a larger overall reduction in the post-1985 period.

### Who Consumed Less Fat and Cholesterol and Who Reacted After 1985?

In each year, differences in consumption across individuals are presumably the result of differences in the taste for these food components, in consumers' valuation of health, in the effectiveness of government and general sources of diet-disease information in reaching different types of individuals, in the incremental effectiveness of producer sources after 1985, and in differences in consumers' abilities to use the available information to change their diets. Multiple regression analysis is used to examine how these various factors affect consumption of fat, saturated fat, and cholesterol in each year. An analysis of calcium consumption is also presented because of calcium's potential to confound the fat equations.

The key results of this cross-section analysis are the following:

- *Higher education is generally associated with lower levels of fat, saturated fat, and cholesterol consumption throughout the period for men and women. Individuals at all education levels shared approximately equally in the reductions observed between 1977 and 1990.*

When compared to college graduates, individuals with less education are usually found to have higher consumption levels for the three lipids examined, other things equal. Evidence suggests that calcium information colors our interpretation of the basic equations somewhat, especially in 1985, when calcium consumption increased dramatically and when higher education is strongly associated with higher calcium consumption for women. This year is the one case where higher education is not associated with lower levels of fat or saturated fat consumption for women.

No significant movements in education differences over time are found for either sex, suggesting that the observed reductions in average fat, saturated fat, and cholesterol consumption were shared approximately equally by individuals at all education levels during this period, other things equal, with the possible exception of the least educated men.

- *Black women and black men may not have experienced the same reductions in fat and saturated fat consumption as individuals in other racial and ethnic groups.*

The results for black women and black men show a consistent movement over time. In 1977 no significant difference is found in fat or saturated fat consumption for black versus white women, other things equal, but black women consume significantly more fat in the 1987/88 and 1989/90 equations, and more saturated fat in the 1989/90 equation. For black men, the significantly lower levels of fat and saturated fat consumption found in 1977 eroded over the period, so that by the 1989/90 equation, no significant differences are found between black men and white men. Thus, for both sexes our estimates indicate that blacks did not share in the same rate of reduction in fat or saturated fat consumption as the rest of the population, other things equal. Cholesterol consumption follows the same pattern for men, but not for women. Black women had significantly higher cholesterol consumption in 1977 and no change occurs over time in this relative position. These results suggest that information from all sources did not reach blacks as effectively as the rest of the population during this period.

Women of other races (primarily Asians) and Hispanic women tend to consume less fat and other lipids compared to whites during this period; these differences do not change significantly over the period. Consumption differences for men in these racial and ethnic groups are quite variable, probably reflecting the small samples involved, and show no systematic movements over the period of this study.

A note of caution is warranted in assessing these racial results. The data for other seasons in the 1987/88 and 1989/90 samples do not confirm the higher levels of consumption for black women found in the spring samples, raising the concern that the small samples for minorities in the later years may not be adequate for assessing these differences with confidence. A larger data set that focuses more directly on minority populations may be needed to assess racial differences in consumption over time.

- *Smokers tend to consume more fat and saturated fat than nonsmokers, other things equal. Women smokers also consume more cholesterol.*

With the exception of cholesterol consumption by men, smokers consistently consume more fats and cholesterol than their nonsmoking counterparts in the post-1985 estimates, where we have data on smoking behavior. This result is consistent with the hypothesis that individuals who value health more highly will adopt more healthful choices across behaviors on which they have the relevant information.

In contrast to our expectations, however, regular users of vitamin supplements do not consume significantly less (or more) fat, saturated fat, or cholesterol during this period.

- *Older age within the 19-50 range is usually associated with lower fat and cholesterol intakes, but these differences are statistically significant only for men in the 1987/88 and 1989/90 equations.*
- *Men and women in households with 2 adult heads do not consume more or less fat, saturated fat, or cholesterol than their single-adult-head counterparts throughout this period.*
- *Income is not significantly associated with fat and cholesterol consumption in most years examined here, other things equal.*

The only exception to this finding is in the 1977 data, where women living in households with higher incomes consumed *more* fats and cholesterol than their lower income counterparts. This evidence indicates that income is not primarily reflecting higher human capital

beyond that reflected in the education variables.

- *The other dietary controls are consistently important predictors of fat, saturated fat, and cholesterol consumption. Food eaten on weekends, holidays, or away from home shows substantially higher fats and cholesterol content on average. Those on special diets or sick on the survey day had significantly lower levels of fats and cholesterol consumption. The size of the weekend difference for fat and saturated fat consumption has fallen significantly for women since 1985.*

### **Who Has Diet-Disease Knowledge? Do These Knowledge Differences Match Consumption Differences?**

Finally, we examine how knowledge of these diet-disease issues varies with individual characteristics, and how these differences compare to those found in consumption.

The key findings are the following:

- *Higher education levels are consistently associated with greater fat-heart-disease knowledge for women. The education relationship is especially strong in 1984 and remains important in 1988.*

In 1984 at least one education coefficient is statistically significant for each of the 5 knowledge measures examined, and the magnitudes of the differences are large. Women at all education levels show significant gains in these knowledge measures. These results are broadly consistent with our findings for consumption, which also show approximately equal improvements by women at all education levels. The knowledge measures differ only in that the gains are somewhat stronger for less educated women.

- *Education is also strongly associated with knowledge of fat-heart-disease issues for men, but the change over time is somewhat less consistent.*

For men education is significantly associated with these measures of fat-heart knowledge in most years, and this knowledge generally increases at all education levels. Men with the lowest level of schooling generally showed increases in knowledge but not as consistently as those with higher education levels. These results closely parallel our findings in the consumption data, where reductions in lipid consumption are approximately equal across education levels, with the possible exception of the least educated men.

- *Racial characteristics, especially being black, are associated with less knowledge on these diet-disease measures, other things equal. Knowledge improved significantly for black men on all measures between 1984 and 1988, reducing black-white differences for 4 of the 5 measures. Black women showed increased knowledge on 2 of the 5 measures, and no significant movements on the other 3 measures.*

The less consistent improvements in knowledge for black women may explain the smaller reductions in lipid consumption observed in the consumption analysis. For black men, the knowledge data and consumption data are not consistent; the knowledge data show more rapid improvements relative to the base group, but fats and cholesterol consumption did not improve as rapidly.

Men and women of other races (usually Asian) report lower levels of knowledge of these diet-disease measures, suggesting that the lower fats and cholesterol consumption levels found above may reflect the underlying advantages of the Asian diet.

- *Smokers show some tendency to have less diet-disease knowledge than nonsmokers, but differences are often not significant.*

This finding is consistent with our interpretation of the significant smoking results in the consumption analysis, namely, that smokers consume more fats primarily because they place less value on long-term health than nonsmokers.

- *Income is a significant predictor of diet-disease knowledge in several measures of knowledge in 1984. Income differences in knowledge fade by 1988.*

Contrary to the consumption results, knowledge data suggest that income may reflect human capital advantages beyond those reflected in education variables, as hypothesized in the previous analysis. The role of income as a measure of human capital may not be observed in the consumption data, because this effect may not be large enough to dominate the income effects also reflected in the consumption data (since key high fat foods, such as meat and desserts, are relatively expensive).

- *Age is consistently associated with more knowledge, especially for women, as found in the consumption analysis.*
- *Living in a household with two adults had no relationship to fat-heart-disease knowledge, also as found in the consumption analysis.*

Finally, the report examines knowledge of the calcium and osteoporosis issue in order to assess whether the potential confounding effects of calcium information on the fat equations in the mid-1980s is supported by the available knowledge data. The key calcium result is:

- *Education is very strongly related to calcium-osteoporosis knowledge in 1986 and had equalized somewhat by 1988, the two years for which we have direct measurements.*

The best knowledge evidence on this issue is derived from the question "What health problems might be related to not consuming enough calcium?" available in the 1986 and 1988 surveys. In 1986, knowledge is very strongly related to education; the predicted probability of knowledge is 30 percent for women with less than a high school education, 60 percent for high school graduates, 71 percent for those with some college, and 86 percent for college graduates, other things equal. These predicted probabilities had risen to 63 percent, 62 percent, 88 percent, and 89 percent, respectively in 1988, a substantial reduction in the strength of the education relationship.

These and other calcium results generally support the view that calcium knowledge increased in the mid-1980s, especially among more

educated women, but that education differences fell in the later 1980s. These knowledge results suggest that the one case where we found no education differences in fat and saturated fat consumption (in the 1985 equations for women) may indeed reflect the confounding effects of the new calcium information released at that time.

Overall, the knowledge results parallel the consumption results quite well, and thus add confidence to those findings.

## **Conclusion**

Producer health claims have been controversial. While always subject to the normal legal rules for all claims -- claims must be truthful and not deceptive -- some believe that the increased use of health and nutrition claims in advertising and labeling during the late 1980s may have undermined consumers' ability to make more informed dietary decisions and may even have harmed consumers. The results of this report do not support this premise, at least as it relates to fat, saturated fat, and cholesterol consumption. Between 1977 and 1985, available evidence indicates that consumption of these lipids fell, but between 1985 and 1990, when the regulatory environment governing diet-disease claims was relaxed to make it easier to make explicit claims, consumption of lipids fell faster. Individual food consumption data and food production data support the view that improvements in the consumption of fat, saturated fat, and cholesterol occurred faster in the post-1985 period and that the gains are widely shared across the population. Data on diet-disease knowledge is generally consistent with the behavioral evidence.

While we cannot conclusively determine how much of the added improvement is due to the information environment created by health claims *per se*, as opposed to continuing government and public health efforts to inform consumers, or to the general media coverage of these issues, nothing in the evidence suggests that these producer claims undermine consumer learning or efforts to improve diets. In fact, the available evidence examined here suggests that these diet-disease claims may have been beneficial to consumers overall by helping to foster an environment in which firms compete more directly on the nutritional features of their products and in which consumer learning and dietary change proceed more rapidly.

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