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# Assessing Concerns about the Fat Content of Meats among Primary Grocery Shoppers in Louisiana and Southeast Texas

Patricia E. McLean-Meynsse

An ordered-probit model was used to assess concerns about the fat content of meats by primary grocery shoppers in Louisiana and southeast Texas. The results suggested that women, married shoppers, or non-Catholics were more likely to have concerns about fat content than men, unmarried shoppers, or Catholics. Price is an important determinant in meat purchasing decisions when fat content is a concern.

Heart disease, cancer, stroke, and diabetes are the leading causes of death in the United States, and all have been linked to poor diets (Frazao, 1995). Despite scientific evidence linking diets and health, and efforts by the federal government, the Center for Science in the Public Interest (CSPI), the American Heart Association, and the American Cancer Society to publicize this information, per capita consumption of fat and calorie-rich foods continues to rise (Shaw and Davis). Consequently, one-third of the U.S. adult population is obese (Morse). Obesity costs the country about \$100 billion annually in medical costs and lost productivity (Frazao, 1995; Palmer, Rose). Scientific evidence further suggests that increased consumption of saturated fats can elevate cholesterol and blood pressure levels, and lead to heart disease (*American Medical News*; Frazao, 1995; Gannon, Palmer, Smith-Anderson; *Tufts University Diet and Nutrition Letter*). These findings have prompted the federal government to recommend that consumers limit their daily caloric intake of fat to 30 percent and saturated fat to one-third of the total fat intake (Frazao, 1994). However, many Americans do not know how much of their diet consists of fat, especially the hidden fats in many of the foods eaten away from home (Frazao, 1994; Frazao and Cleveland).

The CSPI, a consumer watchdog on nutritional issues, has worked tirelessly to spread nutritional awareness and has brought pressure on the food industry to provide more nutritionally-rich foods. CSPI's other successes include per-

suading Wendy's, Burger King, and McDonald's to cook french fries in vegetable oil rather than in beef fat, inducing them to offer salads and other low-fat choices, and uncovering the hidden fats in movie popcorn and in some Chinese, Mexican, and Italian dishes (Morse). That agency also is credited for getting the Nutrition Labeling and Education Act passed in 1990.

Rising health concerns about fat consumption and pressure from the CSPI have caused cattle and pork producers to breed slimmer animals. Today, roasts contain about 30 percent less fat than ten years ago, and consumers have a wider range of selections in the meat department (Marston). Beef is no longer shipped in anonymous bulk; it now carries brand labels such as Coleman Natural Beef, Oregon Country Beef, or gourmet Certified Angus Beef (Marston). Cuts from these brands cost more but, on average, consumers appear willing to pay more for them. Retailers routinely trim the fat from beef and pork cuts to within one-eighth inch or trim them completely of all visible fat (Frazao, 1994 and 1995; Putnam; Putnam and Allshouse). Consumers also have a wide variety of low-fat poultry products from which to make their selections. The availability of skinless chicken and turkey parts further reflects the poultry industry's response to the concerns of health-minded Americans (Marston; Putnam and Allshouse).

Despite the nutritional information and greater availability of nutritious food products, Louisiana's obesity rate is the second highest in the nation, and its death rates from heart disease, cancer, and diabetes exceed the national rates (Anderson, Smith; *Statistical Abstract of Louisiana*). Because of its 38 percent obesity rate, New Orleans has been dubbed "fat city." These statis-

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Patricia E. McLean-Meynsse is a professor in the Division of Agricultural Sciences at Southern University in Baton Rouge, Louisiana. Funding for this project was provided under the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service.

tics suggest that Louisiana's residents, on average, may not be following the federal guidelines for caloric intakes. Researchers have long recognized that a dichotomy can exist between being aware of the composition of a healthy diet and what is actually eaten (Kinsey; Senauer, Asp, and Kinsey; Tippet and Goldman). Eating habits are influenced by cultural, psychological, behavioral, socio-economic, and geographic factors (Blisard, Blaylock, and Smallwood; Frazao, 1993, 1994; Henneberry and Charlet; Lutz, Blaylock and Smallwood; Rose; Variyam, Blaylock, and Smallwood). Therefore, national averages do not fully capture all the subtleties of what drives specific eating patterns. Studies need to be done on smaller geographic areas.

With this in mind, this study assesses consumption patterns in Louisiana and southeast Texas. The paper focuses on the purchasing decisions of primary grocery shoppers and their concerns about the fat content of the meats they buy. Specifically, the study analyzes (1) primary grocery shoppers' levels of consciousness about the fat content of the meats they buy, and (2) the influence of selected factors on the likelihood that they are conscious about fat content. If shoppers are conscious about fat content, then, *ceteris paribus*, they should be buying leaner cuts, and be willing to pay more for these cuts. Thus, the study's hypothesis is that the probability of being conscious about fat content is influenced by geographic location, gender, age, household size, education, marital status, religion, employment status, race, household income levels, and the importance ratings given to meat prices.

### The Consumer Survey

Data for the study were compiled from a random survey of telephone subscribers in Louisiana and southeast Texas during February 1993. Responses were solicited from the primary grocery shopper in each household. A private marketing research firm conducted the survey. The data were collected by the computer-assisted telephone interviewing (CATI) technique. With the CATI technique, interviewers read questions from a computer screen and enter the responses on the computer keyboard. The technique has automatic skip and rotation features which help to lessen data collection errors. Data were collected on primary grocery shoppers' meat preferences, eating

frequencies of selected meats, importance ratings of specific meat attributes, health and nutritional concerns regarding their meat purchasing decisions, consumption of or interest in trying specialty meats, and on their socio-economic characteristics (age, household size, education, marital status, religion, employment status, race, and household income). The survey contained 1,002 respondents. To measure primary grocery shoppers' consciousness about the fat content of meats, the interviewers asked them to respond to the following statement: "I am very conscious about the amount of fat in the meats I buy." Shoppers were asked to record their responses as strongly disagree (1), somewhat disagree (2), neutral (3), somewhat agree (4), or strongly agree (5). Today, most retailers trim the fat on meats to within one-eighth of an inch; some trim away all visible fat. In general, low-fat cuts are more expensive than other cuts. To find out how sensitive grocery shoppers were about meat prices, they were asked to rank the importance of prices to their meat purchasing decisions. Their rankings were recorded on a five-category Likert scale as follows: not at all important (1), not very important (2), somewhat important (3), very important (4), and extremely important (5).

### The Theoretical Model

The dependent variable (*CONFAT*) is ordinal; therefore, ordinary least squares regression technique cannot be used to estimate the model because it yields biased coefficients. Thus, the ordered-probit model (OPM) was used to generate the regression coefficients. The theory underlying the OPM is drawn, with modifications, from utility theory. Its reasoning is as follows. When asked to choose from a set of  $J(j=1, 2, \dots, J)$  ordered alternatives, a consumer will base his or her choices on a personal preference function,  $U$ . If the consumer chooses  $j=1$ , then the utility associated with that choice,  $U_1$ , must exceed those for the choices not selected, and its corresponding probability,  $P(U_1)$ , must be greater than  $P(U_2), \dots, P(U_J)$  (Jordan and Elnagheeb). Utility is unobservable, but the outcomes of the selection process are observable. These outcomes are assumed to reflect the underlying utilities. The consumer's preference function and outcomes vector,  $y$ , can be expressed as

$$(1) U = \beta'X + \varepsilon, \varepsilon \sim N[0, 1]$$

$$\begin{aligned}
 y &= 0 && \text{if } U \leq 0, \\
 y &= 1 && \text{if } 0 < U \leq \mu_1, \\
 y &= 2 && \text{if } \mu_1 < U \leq \mu_2, \\
 &\vdots \\
 y &= J && \text{if } \mu_{J-1} \leq U.
 \end{aligned}$$

$U$  is the vector of unobserved preferences;  $X$  is a matrix of explanatory variables reflecting grocery shoppers' geographic location, socio-economic characteristics, and the importance of meat prices;  $\beta$  is the vector of unknown parameters to be estimated;  $\varepsilon$  is a vector of random stochastic error terms. The outcomes vector,  $y$ , reflects the  $J$  response categories associated with the preference function,  $U$ . The  $\mu$ 's are unknown threshold parameters separating the adjacent categories (Liao). If  $\varepsilon$  is normally distributed across observations, then the following probabilities can be derived for the outcomes vector,  $y$  (Greene, 1993):

$$\begin{aligned}
 (2) \quad \text{Prob}[y = 0] &= \Phi(-\beta'X), \\
 \text{Prob}[y = 1] &= \Phi(\mu_1 - \beta'X) - \Phi(-\beta'X), \\
 \text{Prob}[y = 2] &= \Phi(\mu_2 - \beta'X) - \Phi(\mu_1 - \beta'X), \\
 &\vdots \\
 \text{Prob}[y = J] &= 1 - \Phi(\mu_{J-1} - \beta'X).
 \end{aligned}$$

The cumulative standard normal distribution function is given by  $\Phi$ , and  $0 < \mu_1 < \mu_2 < \dots < \mu_{J-1}$  must hold. The log-likelihood function for equation two is

$$(3) \quad \text{Ln}L = \sum_i \text{Ln}L_i = \sum_i \text{Ln Prob}[y_i = j].$$

### Model Specification and Variables

The empirical model examined whether there were any relationships between the probability that grocery shoppers were conscious about fat (*CONFAT*) and their geographic location, socio-economic characteristics, and their importance ratings of meat prices ( $X$ ). The selected socio-economic characteristics were gender, age, house-

**Table 1. Variable Definitions and Summary Statistics.**

Variable Definitions	Variable Name	Mean	Std. Dev.
<b>Explanatory Variables:</b>			
Geographic Area Louisiana=1; Texas=0	<i>AREA</i>	0.7998	0.4004
Gender Female=1; Male=0	<i>GENDER</i>	0.7495	0.4335
Age	<i>AGE</i>	42.0000	2.9278
Household Size	<i>HSIZE</i>	2.8500	1.4564
Education High School=1; 0 otherwise	<i>EDUC</i>	0.8592	0.3480
Marital Status Married=1; 0 otherwise	<i>MARD</i>	0.6590	0.4743
Religion Catholic=1; 0 otherwise	<i>CATH</i>	0.3632	0.4812
Employment Status White collar=1; 0 otherwise	<i>WCOLL</i>	0.4648	0.4990
Race Caucasians=1; 0 otherwise	<i>WHITE</i>	0.7907	0.4070
Household Income \$50,000=1; 0 otherwise	<i>INC</i>	0.1992	0.3996
Price per pound Somewhat important, very important, and extremely important=1; 0 otherwise	<i>IMPRICE</i>	0.8400	0.3668
<b>Dependent Variable:</b>			
Conscious about Fat Content 0 = disagree 1 = neutral 2 = agree	<i>CONFAT</i>	1.8360	0.5040

hold size, education, marital status, religion, employment status, race, and household income. A variable was included for geographic location, to capture differences in consciousness between Louisiana and southeast Texas residents, and one to measure the importance of prices in meat purchasing decisions concerning fat content.

The five-response categories for the dependent variable, *CONFAT*, were reclassified in three categories: disagree, neutral, and agree. All the explanatory variables, except household size and age, were entered as binary variables. The unknown parameters ( $\beta$ 's and  $\mu$ 's) and marginal effects were generated by the maximum likelihood technique for the OPM model in the *LIMDEP* 7.0 computer software (Greene, 1995). The regressors, their definitions, means, and standard deviations are shown in table 1.

### Descriptive Statistics

Almost 80 percent of the respondents were Louisiana residents; seventy-five percent were women; the mean age was 42 years old; the average household had about three persons; eighty-six percent of the respondents had at most a high school diploma; about 20 percent had household incomes of \$50,000 or more; seventy-nine percent

of the grocery shoppers were Caucasians; eighty-four percent indicated that price was an important consideration in meat purchasing decisions (table 1). Results for the five-response categories for *CONFAT* showed that 70 percent of the grocery shoppers strongly agreed that they were conscious about the fat content of the meats they bought (table 2).

**Table 2. Consciousness about Fat Content for the Five-Response Categories.**

Response Categories	Percentage
Strongly disagree	3
Somewhat agree	4
Neutral	5
Somewhat agree	18
Strongly agree	70

### Empirical Results

Table 3 shows the empirical results for the OPM. It contains the estimated coefficients, standard error, marginal effects, and several "goodness-of-fit" measures. The statistically significant coefficient for the threshold parameter,  $\mu_1$ , suggests that the response categories are ordered. Eighty-nine percent of the responses are predicted correctly. From the chi-square coefficient (82.03),

**Table 3. Regression Estimates and Marginal Effects from the Ordered Probit Model.**

Variable	Estimated Coefficient	Standard Error	----- Marginal Effects -----		
			Disagree	Neutral	Agree
<i>CONSTANT</i>	0.4151	0.2738	0.0368	0.0279	-0.0646
<i>AREA</i>	-0.0212	0.1457	-0.0019	-0.0014	0.0033
<i>GENDER</i>	0.2712**	0.1299	0.0240	0.0182	-0.0422
<i>AGE</i>	0.0016	0.0220	0.0001	0.0001	-0.0002
<i>HSIZE</i>	-0.0063	0.0452	-0.0006	-0.0004	0.0010
<i>EDUC</i>	0.2000	0.1515	0.0177	0.0134	-0.0311
<i>MARD</i>	0.3523***	0.1317	0.0312	0.0236	-0.0548
<i>CATH</i>	-0.2201*	0.1224	-0.0195	-0.0148	0.0343
<i>WCOLL</i>	0.1936	0.1314	0.0171	0.0130	-0.0301
<i>WHITE</i>	-0.0137	0.1500	-0.0012	-0.0009	0.0021
<i>INC</i>	0.0749	0.1737	-0.0066	-0.0050	0.0117
<i>IMPRICE</i>	0.8981***	0.1284	0.0795	0.0603	-0.1398
$\mu_1$	0.4605***	0.0531			

Note: \*, \*\*, \*\*\* indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

#### Other Statistics:

Log likelihood = -366.45

Log likelihood, restricted = -407.47

Model Chi-Square (11) = 82.03\*\*\*

Percentage Correctly Predicted = 89

the null hypothesis is rejected; therefore, the selected regressors influence the likelihood that shoppers are conscious about the fat content of meats. The results further suggest that consciousness is likely to be influenced by gender, marital status, and religion. Meat prices are important determinants of shoppers' buying decisions. The probability that shoppers are conscious about fat content is invariant to area, age, household size, education, employment status, race, and household income levels.

The coefficients from the OPM are difficult to interpret; therefore, researchers must use caution when making inferences (Greene, 1993). The marginal effects and predicted probabilities give better indications of how changes in the regressors affect the probability of a particular event. The marginal effects in table 3 represent changes in the dependent variable for given changes in a particular regressor while holding the other regressors at their sample means. From the table, a unit change in the regressor, *GENDER*, from a female to a male shopper causes a 4-percentage point reduction in probability for the "agree" category. Therefore, women are more likely to agree that they are conscious about the fat content of meats than men. Married grocery shoppers have a 5-percentage point greater likelihood of agreeing with the statement than unmarried respondents. Non-Catholics have a 3-percentage point greater level of consciousness about fat than Catholics.

On average, U.S. consumers have been willing to pay more for leaner meats. Thus, purchases of leaner meats should be invariant to their prices. Our study suggests that this is not the case among survey respondents. These consumers are sensitive to meat prices although they may be conscious about the fat content of meats. For example, in the "agree" category, the probability of being conscious about fat falls by 14 percentage points as the importance ranking of meat prices changes from being important to being unimportant. Thus, although shoppers are conscious about fat content, prices may force them to buy meats with higher fat content. For example, they may forego purchases of chicken and turkey breasts for cheaper cuts, such as leg quarters, or wings.

## Concluding Remarks

About one-third of the adult population in the United States is obese. Obesity and other diet-related illnesses put a heavy toll on society with respect to health care costs and lost productivity. Four of the leading causes of death in the United States have been linked to poor diets, and Louisiana leads the Nation in death rates from heart disease, cancer, and diabetes. It also has the second highest obesity rate in the United States. Because of these statistics, the federal government has recommended that the daily fat intake should not exceed 30 percent of total calories. However, few Americans reach that target. There is more nutritional information now available to consumers, but has it made a difference? Are more consumers making healthier food choices or other lifestyle changes because of the nutritional information?

This study addressed a small subset of these questions. It examined consumer concerns about nutrition in one region of the country in regards to one food item — meat. The main focus was on primary grocery shoppers' levels of consciousness about the fat content of meats, and how geographic location, socio-economic characteristics, and meat prices influenced the probability of that consciousness. Given the regional differences in eating habits in the United States, our study assessed the behavior of primary grocery shoppers in Louisiana and southeast Texas. From the survey, 88 percent of the respondents agreed that they were conscious about the fat content of meats. Results from the OPM indicated that women, non-Catholics, or married consumers were more likely to be concerned about fat when buying meats than men, Catholics, or unmarried shoppers. These purchases were also associated with meat prices.

A 3.5-ounce portion of broiled eye-of-round beef, roasted skinless chicken breast or pork tenderloin has 1.3, 1.0, and 1.7 grams of saturated fat, respectively (Marston). These cuts are usually more expensive than other cuts. Thus, a price-sensitive consumer may be forced to buy chicken leg quarters or wings instead of skinless chicken breasts. However, a 3.5-ounce serving of chicken drumstick, thighs, or wings, with skin has 3.0, 4.3

and 5.5 grams of saturated fat, respectively (Marston). Are consumers readily substituting between leaner and fatter cuts of meat in the two states? Unfortunately, our study cannot answer that question because shoppers were not asked if there were instances when they had to forego fat content because the leaner cuts were too expensive. These are some of the issues that must be addressed as nutrition experts in Louisiana, south-east Texas, and the nation try to persuade more Americans to consume less fat and calories, and to adopt healthier lifestyles.

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