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Household Perceptions of the Nutritional Labeling of Meats

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Previous research on the relationship between diet and health has increased consumer interest in the nutritional content of specific foods. Federal programs, such as the *Dietary Guidelines for Americans* and *The Food Pyramid*, have had similar impacts. A 1994 mail survey of 3,080 Louisiana households in eight rural and urban parishes examined consumer awareness of the nutritional labeling of fresh meats and its importance. Rural respondents placed more emphasis on nutritional labeling than did urban respondents. The respondents also ranked three descriptive terms (lean, extra lean and low fat) for fat content as defined by the USDA. Eighteen percent of households ranked them correctly with white households displaying better ranking capability. These results tend to justify an earlier decision by Congress to implement legislation covering the nutritional labeling of fresh meats.

The nutritional characteristics and contents of foods have become more important as consumers have learned more about the relationship between diet and health (Bass, 1991). A recent study (FMI, 1990) indicates that more than 70 percent of shoppers identify nutrition as the third most important factor in product selection, after price and brand.

The government, educational institutions and other agencies have contributed to this increasing nutritional awareness by developing, distributing and promoting nutritional guidelines and labeling requirements for packaged foods. The U.S. Department of Health and Human Services (USDHHS) published the *Dietary Guidelines for Americans* in the 1970s and, more recently, the *Food Guide Pyramid* (USDA, 1990).

The U.S. Congress enacted, in November 1990, the Nutrition Labeling and Education Act (NLEA, Public Law 101-535), which amended the Food, Drug, and Cosmetic Act of 1939. The NLEA mandated that the Food and Drug Administration (FDA) promulgate new nutrition labeling regulations. One innovative feature was the mandatory labeling of nutrients, such as saturated fat, cholesterol and dietary fiber, which was previously not

required. Likewise, the U.S. Department of Agriculture (USDA) published a proposed rule for voluntary labeling of fresh red meats and poultry under the same guidelines.

The FDA (1991) nutrient profile included a mandatory listing of calories, fat, cholesterol, carbohydrates, protein, sugar, fiber, sodium, vitamins, calcium and iron per serving for almost all packaged foods. The USDA (1991) allowed general descriptors of fat content (such as lean, extra lean and low fat) to be used for fresh poultry, pork, and beef as well as packaged meat products. These new labeling requirements have added uncertainty to the meat products industry. Shifts in demand for individual meat products could occur with disclosure of their nutritional content.

Consumers need comprehensive nutrition information to make informed choices. Several studies of label format, performance and preference have found that the typical shopper's ability to use nutrition information is affected by the format itself (the way the information is displayed), misleading advertising, and conflicting advice (Levy, Fein and Schucker, 1991; Schucker et al., 1992; Geiger et al., 1991).

The overall objective of this study was to estimate Louisiana consumer (household)¹ awareness

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¹ The term consumers and households are used interchangeably in this article. The individual purchasing and preparing fresh meats in the home was requested to complete the questionnaire, in most cases an adult female. While respondents were asked to reply on the basis of the household, their responses are more likely to represent their individual perceptions rather than a composite of the household.

of the nutritional labeling of red meats, poultry and finfish as they relate to selected household characteristics. Specifically, the objectives were (1) compare consumer perceptions of the importance of nutrition labeling of fresh meats; and, (2) analyze consumer knowledge of the fat content of specific descriptors of fresh meats.

Conceptual Framework

A useful approach to demand theory holds that demand is conditioned by the consumer's knowledge of and perceptions toward attributes contained in the product (Lancaster, 1966). A consumer's utility, therefore, is assumed to be derived from the characteristics of the goods rather than from the goods themselves.

Zarkin and Anderson (1992) and Zarkin and Magat (1991) suggest that, in an environment in which nutrition labeling is not required for all products in the market, consumers choose food based on the demand relationship (income, own-price and price of substitutes, and tastes and preferences), beliefs about the relationships between health and nutrient intake, and beliefs regarding nutrient content.

The foci of this study are on estimating the importance that consumers place on nutrition labeling and on ascertaining the consumers' knowledge of specific terms that are descriptive of the fat content of red meats. Demand for specific fresh meats may increase or decrease depending on the factors influencing the perceptions and knowledge of consumers. Capps and Schmitz (1991) suggest that consumer perceptions of the nutrient content of fresh meats depend upon the information available to consumers in time *t*, which, in turn, are affected by consumer socioeconomic characteristics (Bass, 1991; Menkhaus, et al., 1993; Byrne, et al., 1991).

Data and Procedures

Primary data for the study were obtained from a mail survey of 3,080 randomly selected Louisiana households from four urban and four rural parishes stratified according to population and location (north or south Louisiana). The names and addresses of these households were obtained from the Motor Vehicle Registration Division of the Louisiana Department of Commerce. A modified

Dillman (1978) mail survey procedure was used. The questionnaires were mailed in April, a reminder postcard was sent a week later, and a follow-up questionnaire was sent to nonrespondents three weeks later. The households returned 734 useable questionnaires (24.7 % of the total mail-out).

Table 1. Selected Socioeconomic Characteristics of the Sample and State of Louisiana, Louisiana, 1994.

| Variable | Frequency (Sample) | Percent (Sample) | Percent (State) ^a |
|---------------------------|--------------------|------------------|------------------------------|
| Gender | | | |
| Female | 533 | 72.6 | N/A |
| Male | 201 | 27.4 | N/A |
| Race | | | |
| White | 626 | 85.3 | 67.3 |
| Non-white | 108 | 14.7 | 32.7 |
| Location | | | |
| Rural | 200 | 27.2 | 32.0 |
| Urban | 534 | 72.8 | 68.0 |
| Education | | | |
| Less than high school | 61 | 8.3 | 31.7 |
| High school | 219 | 29.8 | 31.7 |
| Trade school | 109 | 14.9 | N/A |
| Some college | 163 | 22.0 | 20.5 |
| College degree | 115 | 15.7 | 10.5 |
| Graduate work | 67 | 9.2 | 5.6 |
| Income | | | |
| Less than \$15,000 | 156 | 22.6 | 36.3 |
| \$15,000 - \$24,999 | 124 | 17.8 | 18.8 |
| \$25,000 - \$34,999 | 121 | 17.5 | 14.8 |
| \$35,000 - \$49,999 | 135 | 19.4 | 14.7 |
| \$50,000 - \$74,999 | 100 | 14.5 | 10.3 |
| \$75,000 - \$100,000 | 31 | 4.5 | 2.7 |
| More than \$100,000 | 26 | 3.8 | 2.4 |
| Family Structure | | | |
| Single adult | 138 | 18.9 | N/A |
| Couple without children | 215 | 29.4 | N/A |
| Single parent w/ children | 55 | 7.3 | N/A |
| Couple with children | 326 | 44.5 | N/A |
| Occupation | | | |
| Unemployed or student | 61 | 8.3 | N/A |
| Employed | 406 | 55.3 | N/A |
| Retired or homemaker | 267 | 36.4 | N/A |

^aU.S. Census of Population and Housing, 1990 and Louisiana Fact Book, 1990.

The survey was designed to reveal consumer awareness of and perceptions toward nutrition labeling of red meats, poultry and finfish (such as catfish and redfish). The survey collected consumer perceptions of the importance of nutritional labeling and use of three nutritionally descriptive terms. In addition to the responses concerning nutrition labeling, the respondents also provided socioeconomic and demographic characteristics.

The frequencies and percentages of respondents with specific socioeconomic and demographic characteristics are given in Table 1. The sample had slightly larger percentages of white, higher educated or higher income households than the state of Louisiana. Telephone numbers were not available, however, to check for nonresponse bias. These biases, however, tend to be characteristic of mailout surveys (Cristoffersen, 1987; Po-takey, 1993).

Survey Results and Discussion

Importance of Information on the Nutritive Content of Meat Products

Ninety-four percent of the 723 useable responses favored the labeling of fresh meats with respect to nutritive content. The respondents' also indicated their level of agreement with a statement

concerning the importance of information on the nutritive content of red meats, poultry and finfish. Agreement was measured on a seven-point scale, where agreement ranged from strongly agree (1) to strongly disagree (7). Individual responses covered the entire spectrum of the seven point scale.

Table 2 contains summaries of these levels of agreement by socioeconomic characteristics. In general, the respondents showed a high level of agreement on the importance of nutrition information for the three types of meats. The overall mean level of importance was the same for red meats and poultry, however, it was lower for finfish.

Analysis of Variance (ANOVA) is a univariate statistical technique that analyzes the sample variance to estimate and test sample means. It utilizes a parametric distribution called the F-ratio. ANOVA tests the null hypothesis that the population means are equal against the alternative hypothesis that the means are not all equal (Ramanathan 1992).

Table 2. Level of Agreement with the Statement "Information on the Nutritive Content of Fresh Red Meats, Poultry and Finfish is Important" by Household Location and Socioeconomic Characteristics, Louisiana, 1994.

| Source | Red Meats | | Poultry | | Finfish | |
|-----------------------|--------------|------|--------------|------|--------------|------|
| | Observations | Mean | Observations | Mean | Observations | Mean |
| Overall | 720 | 1.94 | 720 | 1.94 | 717 | 2.07 |
| Location | | | | | | |
| Rural | 722 | 1.86 | 520 | 1.89 | 520 | 1.99 |
| Urban | 198 | 2.14 | 200 | 2.09 | 197 | 2.28 |
| Ethnic Grouping | | | | | | |
| Whites | 615 | 1.92 | 614 | 1.95 | 611 | 2.04 |
| Non-White | 105 | 2.03 | 106 | 1.92 | 106 | 2.28 |
| Education | | | | | | |
| Less than High School | 58 | 2.20 | 58 | 2.05 | 58 | 2.52 |
| High School | 216 | 2.03 | 216 | 2.02 | 216 | 2.18 |
| Trade School | 162 | 1.92 | 161 | 1.91 | 160 | 2.11 |
| Some College | 106 | 1.79 | 106 | 1.84 | 105 | 1.91 |
| College Degree | 112 | 1.86 | 113 | 1.95 | 112 | 1.93 |
| Graduate Work | 66 | 1.92 | 66 | 1.91 | 66 | 1.95 |
| Income | | | | | | |
| < \$15,000 | 155 | 2.11 | 154 | 1.97 | 154 | 2.33 |
| \$15,000 - \$24,999 | 120 | 1.98 | 120 | 2.00 | 120 | 2.18 |
| \$25,000 - \$34,999 | 120 | 1.86 | 120 | 1.94 | 120 | 1.99 |
| \$35,000 - \$49,999 | 134 | 1.93 | 134 | 1.98 | 133 | 2.11 |
| \$50,000 - \$74,999 | 99 | 1.73 | 99 | 1.76 | 99 | 1.91 |
| \$75,000 - \$100,000 | 28 | 1.61 | 29 | 1.62 | 28 | 1.55 |
| > \$100,000 | 25 | 2.04 | 25 | 1.92 | 25 | 1.64 |

^a Based on agreement scale, where strongly agree=1, highly agree=2, agree=3, neither agree nor disagree=4, disagree=5, highly disagree=6 and strongly disagree=7.

Table 3 presents results of the ANOVA for the level of agreement with the importance of information on the nutritive content of meat products. The variable race did not significantly explain variation in the level of agreement for any of the three types of meat. Education and income were significant variables in explaining variation in agreement for finfish. The respondent's location was the most important variable explaining variation in agreement for all types of meats. For red meats, poultry and finfish, rural respondents had higher levels of agreement with the statement than urban respondents.

For finfish, households with high school or less education had lower levels of agreement with the statement than any higher educational grouping. Likewise, respondents with income levels lower than \$50,000 gave lower importance to the nutritional content of finfish than any higher income group.

Table 3. ANOVAs^a of the Level of Agreement with the Statement "Information on the Nutritive Content of Fresh Red Meats, Poultry or Finfish is Important" by Household Characteristics, Louisiana, 1994.

| Variable | N | MS | F | Pr>F |
|-------------------------------------|-----|---------|------|---------|
| Agreement on Red Meats ^b | | | | |
| Race | 720 | 1.0803 | 0.73 | 0.3916 |
| Education | 720 | 2.0645 | 1.41 | 0.2188 |
| Income | 681 | 2.1889 | 1.49 | 0.1797 |
| Location | 720 | 10.5419 | 7.24 | 0.0073* |
| Agreement on Poultry ^b | | | | |
| Race | 720 | 0.0977 | 0.07 | 0.7921 |
| Education | 720 | 0.9275 | 0.66 | 0.6546 |
| Income | 681 | 1.1910 | 0.85 | 0.5319 |
| Location | 720 | 5.6999 | 4.27 | 0.0391* |
| Agreement on Finfish ^b | | | | |
| Race | 717 | 5.5154 | 3.47 | 0.0630 |
| Education | 717 | 4.4621 | 2.83 | 0.0153* |
| Income | 679 | 3.5163 | 2.25 | 0.0374* |
| Location | 717 | 11.5290 | 7.29 | 0.0071* |

^a Using General Linear Model (GLM) procedure.

^b Based on agreement scale where 1=strongly agree and 7=strongly disagree.

* Significant at 5 percent level.

Ranking of Descriptor Terms

To measure understanding of terms used to describe the fat content of fresh meats, respondents were asked to rank, in increasing order of fat con-

tent, the USDA-approved terms low fat, extra lean and lean. Low fat describes products containing 3 grams or less of fat per 100 grams. The term extra lean describes meat products with less than 4.9 grams of fat and less than 1.8 grams of saturated fat per 100 grams. The term lean describes meat products with less than 10.5 grams of fat per 100 grams (Anderson, Lange and Calingaert, 1992). The appropriate ranking, in increasing order of fat content, is low fat, extra lean and lean.

Approximately 75 percent of respondents (550) ranked the three descriptors incorrectly for fat content, 18 percent (129) ranked them correctly and the remaining 7 percent did not respond to the question (Table 4). Respondents who either did not answer the question or did not rank the three descriptors correctly represented 82 percent of total respondents. These results indicate a low level of knowledge of these terms. However, 68 percent of the respondents appropriately ranked the terms extra lean and lean.

Table 4. Household Ranking of the Descriptive Terms Low Fat, Extra Lean and Lean with Respect to Fat Content, 1994.

| Source | Number | Percentage |
|-----------------------|--------|------------|
| Did Not Answer | 55 | 7.49 |
| Inappropriate Ranking | 550 | 74.93 |
| Appropriate Ranking | 129 | 17.58 |
| Total | 734 | 100.00 |

Other studies have reported higher levels of correct ranking of nutritionally descriptive terms. Anderson, Lange and Calingaert (1992) reported that 34 percent of consumers were able to rank the descriptors lean, extra lean, low fat and fat-free correctly. However, they stressed that for the majority of the consumers the meaning of the four common descriptors was very confusing.

An ordered logit procedure, using maximum likelihood estimation, was chosen to assess the effect of household location and the socioeconomic characteristics on the probability that households could appropriately rank the three fat descriptive terms: low fat, extra lean and lean.

Following Judge, et al. (1988), binary choice models can be used to model the choice behavior of individuals when two alternatives are available and one must be chosen. Since the logit is inher-

ently heteroskedastic, the most suitable technique for estimating the logit model is maximum likelihood. It also assures the large-sample properties of consistency and asymptotic normality of the parameter estimates (Capps and Kramer, 1985).

The maximum likelihood coefficients estimated through the logit analysis have no direct interpretation, other than indicating a direction of influence on probability. Instead, the user turns to the calculated changes in probabilities, which indicate the magnitude of the marginal effects (Maddala, 1991, White, 1993). Changes in probability refer to the partial derivatives of the nonlinear probability function evaluated at the zero and one values of the independent variables (Pindyck and Rubinfeld, 1991).

The statistical model was specified as:

$$\text{APPROP} = f(\text{RACE}, \text{GENDER}, \text{STRU}, \text{EDUC}, \text{INC}, \text{LOC}, \varepsilon)$$

where,

- APPROP = 1 if ranked appropriately, 0 if ranked inappropriately.
- RACE = Race of respondent, 1 if white, 0 otherwise.
- GENDER = Sex of respondent, 1 if female, 0 otherwise.
- STRU = Family structure, 1 if children present, 0 otherwise.
- EDUC = Level of education, 1 if more than high school, 0 otherwise.
- INC = Household annual income, 1 if >\$50,000, 0 otherwise.
- LOC = Household location, 1 if urban, 0 otherwise.
- ε = Stochastic error term.

Five of the six independent variables were hypothesized to have a positive influence on the respondent's ability to appropriately rank the three descriptor terms. Bass (1991) and Anderson, Lange and Calingaert (1992) found a positive relationship between education and satisfaction with the information and terminology employed on food labels. Income and education have also played a positive role on the use and understanding of nutrition labels (Zarkin et al., 1993). Individuals buying foods for the household, especially females with children,

were expected to be more concerned about nutrition. Urban households were expected to be more concerned with the nutritional issue than rural households because of faster adoption and diffusion of innovations. The literature does not offer information on the expected relationship between race and nutritional awareness, hence, the expected sign was unknown.

Empirical Results

Since multicollinearity is often associated with the use of cross-sectional data in logistic estimation, the Principal Component Analysis, as suggested by Belsley, Kuh and Welsch (1980), was used to evaluate the 632 observations used in the analysis. The largest condition number was 19.8. Serious problems with multicollinearity exist if this number is over 30 (Maddala, 1980).

Based on the Likelihood Ratio Test, the model was significant at the 1 percent level of probability, with 6 degrees of freedom (Table 5). Therefore, the six independent variables have a jointly significant effect on the probability that respondents could rank appropriately the descriptors lean, extra lean and low fat. As expected, the correlation coefficient (McFadden R^2) was low (Maddala, 1988). The percentage of correct predictions was 81 percent.

Race and income were the only significant variables. White respondents were significantly more likely than non-white respondents to rank the descriptors in the appropriate order. White respondents were 19 percent more likely to rank the descriptors appropriately than non white respondents. Given that multicollinearity was not found in the data, some cultural factor external to the model, but associated with race, may be responsible for this relationship.

Households with incomes exceeding \$50,000 were significantly more likely to rank the descriptors appropriately than those with lower incomes. High income respondents had a ten percent higher probability of ranking the descriptors appropriately than low income respondents. Zarkin, et al (1993) found a comparable relationship during a previous study.

Four of the independent variables were not important in explaining the respondents knowledge

of fat content of these descriptor terms: family structure, education, location and gender. Education was expected to have a larger impact on the respondent's ability to rank the descriptor terms correctly with respect to fat content. Sample bias on education level may have helped explain the lack of explanatory power of the education variable.

The variable family structure did not behave as hypothesized, suggesting that households with children were not as knowledgeable of these descriptors as households without children. Families with children may place a higher emphasis on price and concern with fat may be of lesser importance.

Table 5. Logistic Regression Coefficients, T-Ratios and Changes in Probabilities, for Appropriate or Inappropriate Ranking of Terms Used to Describe Fat Content in Fresh Meats, Louisiana, 1994.

| Variable | Estimated Coef. | T-Ratio | Change in Probability ^a |
|-------------------------|-----------------|----------|------------------------------------|
| Constant | -3.3053 | -6.0531* | |
| Race | 1.3544 | 2.8516* | 0.2053 |
| Gender | 0.2394 | 0.9651 | 0.0486 |
| Family Structure | -0.0207 | -0.0961 | -0.0044 |
| Level of Education | 0.0728 | 0.3406 | 0.0153 |
| Annual Income | 0.5182 | 2.1975* | 0.0986 |
| Location | 0.3350 | 1.3124 | 0.0666 |
| N | | 632 | |
| McFadden R ² | | 0.0377 | |
| % of Right Predictions | | 81.33 | |
| Likelihood Ratio Test | | 22.9562* | |
| Degrees of Freedom | | 6 | |

^a Evaluated at zero and one values of the independent variables.

* Significant at 1% level.

Implications

In general, the responding Louisiana households appeared to be aware of the importance of nutrition and the nutritional labeling of red meats, poultry and finfish. They also favored the complete nutritional labeling of fresh meats.

With the exception of finfish, household socioeconomic characteristics had little influence on the respondents' perception of the importance of nutritional content of fresh red meats and poultry. Therefore, the targeting of households on the nutrient content of specific red meats or poultry products may not be very effective.

Only two of the six independent variables used in the logit model to assess respondent knowledge of fat in three descriptive terms used for fresh meats were significant. Since fat content is the primary factor described by these terms, their use may result in consumers having inaccurate perceptions of the actual fat content of the labelled products.

The "low fat" descriptor term appears to have confused the respondents. That conclusion is supported by the fact that 75 percent of respondents ranked the three descriptors incorrectly, while 68 percent ranked the terms lean and extra lean correctly. White or higher income households appear to have higher knowledge of the meaning of these terms.

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