FOOD LABEL READING HABITS OF LOW-INCOME WOMEN AND WOMEN FROM THE GENERAL POPULATION

by

Patricia Marie Michel

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APPROVED:

Mary K. Korslund, Chairman

Amelia Finan

Janet Johnson

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(ABSTRACT)

The National Labeling and Education Act of 1990 (NLEA) mandates that the Food and Drug Administration overhaul existing food labeling regulations and provide the consumer with a standardized, informative food-labeling policy. The intended benefit is the elimination of the confusion currently surrounding food labeling and an improvement in the dietary practices of the American public.

The aim of this study was to measure the differences in the food-label reading habits, attitudes, and understanding of low-income women participating in the Supplemental Food Program for Women, Infants, and Children (WIC) and of women from the general population. All subjects were the primary household food shoppers.

In both groups, 90% "almost always" or "sometimes" read a food label. The food label influenced a purchase decision "a great deal" for 47% of the WIC group and 56% of the control group. Of the two groups, a significant number of WIC participants found the food label significantly easier to understand yet scored significantly lower on the test of nutrition knowledge and label understanding than the control group, particularly on the subject of dietary fat. In addition to calories, the WIC group looked for iron, vitamins, calcium, and protein information, while the control group was more interested in fat, sodium, and cholesterol. Both groups relied upon the media, doctors and food labels for nutrition information.

This study suggests that the education component of the NLEA must address the nutrition needs of low-income WIC participants (who are pregnant or have small children). This nutritionally at-risk population would greatly benefit from the education portion of the forthcoming labeling reform.

ACKNOWLEDGEMENTS

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Thanks also are due to the participants of the study, who graciously and selflessly gave their time and ideas, and to the helpful and friendly staff at the Arlington and Reston WIC clinics and at Giant Food, Inc.

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INTRODUCTION

The original Food and Drug Act of 1906 prohibited adulterated or misbranded foods, drinks and drugs. In the same year, the Meat Inspection Act was enacted to prevent the sale of meat and meat products which were unhealthful, unwholesome or unfit for human consumption. The Federal Food, Drug and Cosmetic Act of 1938 expanded upon the original Food and Drug Act to include several new provisions, namely coverage of cosmetics and medical devices; standards of identity, quality and fill; and authorization of factory inspection. This act also included several regulations regarding food labels, specifically that food labels must not be false or misleading; food labels must contain the name and address of the manufacturer, weight and count, and any artificial coloring or flavoring used; and any imitation products must be labeled as such. The Fair Packaging and Labeling Act of 1966 required that consumer products sold interstate must have labels which are both honest and informative. In 1973, a Federal Food, Drug and Cosmetic Act was passed, requiring full disclosure of nutrient content of processed foods that are fortified or for which nutrition claims are made. Label information must include number of servings per container; calories, protein, carbohydrate, and fat content; and percent of adult US Recommended Dietary Allowance of protein and several vitamins and minerals.

Very little additional legislation involving food labeling was enacted during the 1970s and 1980s. During this period, confusion over nutrition information, misleading statements, health claims and healthful dietary practices continued to grow. The passage of the Nutrition Labeling and Education Act of 1990 (NLEA) heralded a new era in nutrition information and food choices for the American public. This act empowered the Food and Drug Administration (FDA) with the regulation of mandatory nutrition labeling, nutrient and health claims, and uniform food labeling policy for all food products except meat and poultry. The Department of Agriculture (USDA) agreed to cooperate with FDA to produce comparable labeling policy for meat and poultry.

The Nutrition Labeling and Education Act is certain to have a far-reaching impact on nutrition knowledge and practices for years to come. The overall goal of the NLEA is to improve the health and well-being of the American public by providing regulations to ensure that food labels contain accurate and useful nutrition and health information (1). The act, which will significantly revise nutrition label formats and information, is being carried out by the Food and Drug Administration. Mandatory nutrition labeling is extended to most foods, and the current nutritional requirements guide, the US Recommended Daily Allowance (USRDA), is replaced by Reference Daily Intakes (RDI) for protein and 26 vitamins and minerals. The NLEA calls for voluntary use of Daily

Reference Values (DRV) for fat, unsaturated and saturated fatty acids, cholesterol, carbohydrates, dietary fiber, sodium and potassium. Also covered in the NLEA is the standardization of serving sizes, a request for voluntary labeling of the twenty most frequently consumed fruits, vegetables and seafood, a standardized nutrition labeling format, and regulations regarding the use of health claims and descriptors such as "low fat" and "high fiber".

Public response to the preliminary regulations published in the *Federal Register* of November 27, 1991 was collected in early 1992. Following the consideration of 47,000 comments received from industry, academia, health professionals and consumers, FDA prepared the final regulations, which were to became law on November 8, 1992. However, a last minute impasse between USDA and FDA regarding the presentation of dietary fat information. This feud was resolved by President Bush in favor of the FDA's food label format and corresponding regulations.

The NLEA mandates a program to educate the consumer on the nutrition label and its importance in healthy dietary practices. The proposed consumer education program has several components (1):

- identification of educational needs and target populations;
- design of appropriate educational strategies and messages;

- development of education materials; and
- formation of a network of health professionals, health educators, consumers and food industry representatives to disseminate educational materials and implement the program.

The federal government, as well as private industry, has conducted studies with both focus groups and large consumer groups to identify the target populations of the new labeling reform along with the educational needs of these populations. These studies, reviewed in the next section, indicate that less-educated consumers tended to be less knowledgeable than better-educated consumers about the relationship between diet and disease. The less-educated also were found to use food labels less often and to have made fewer healthful diet and lifestyle changes than better-educated consumers (3). The elderly and those with less education had a greater need than others for diet and health information, yet both groups had difficulty applying food label information in determining product differences, and perceived differences where there are none (4).

While income is often closely correlated with education, few studies have specifically examined the food-label reading habits, attitudes and understanding of the low-income population in order to assess its educational needs. A subset of this population -- pregnant and lactating women, infants, and young

children -- has special nutritional needs and is at an especially high risk for a number of nutrient deficiencies.

REVIEW OF LITERATURE

The role of dietary modifications in reducing the risk of several chronic diseases is emphasized in two landmark reports -- the Surgeon General's *Report on Nutrition and Health* (5) and the National Research Council's *Diet and Health: Implications for Reducing Chronic Disease Risk* (6). Both reports provide dietary recommendations and encourage healthful dietary practices, since diet is a key factor in five of the ten leading causes of death in the United States. In the same vein, the Joint Nutrition Monitoring Evaluation Committee, established by USDA and the Department of Health and Human Services (DHHS) to monitor the nutritional status of Americans, claims that overconsumption of fat, saturated fatty acids, cholesterol, and sodium is the primary cause of nutrition-related health problems (7). The National Academy of Sciences suggests that diets which are high in plant food are associated with a lower risk of coronary heart disease, colon cancer, diabetes mellitus, diverticulosis, and hypertension (6). Mounting scientific evidence of the diet-disease connection, and the public's growing awareness of this relationship, points to the importance of the nutrition information provided on food products.

Since the 1980s, many studies have been conducted in the area of consumer use, knowledge, and understanding of nutrition labeling. The findings of these federally- and industry-sponsored studies indicate that although consumers read food labels, their understanding of the labels and their nutrition knowledge is poor. The majority of food shoppers today read the nutrition and ingredient label at least occasionally: about 80% of American consumers have read a food label in the last month (8, 9), and 3 of 5 consumers read labels fairly often (10). The American Meat Institute (AMI) found that 70% of shoppers read the label when purchasing a product for the first time (11), while the National Food Processors Association (NFPA) found that 40% of shoppers "always" and 39% of shoppers "sometimes" read the label when purchasing a product for the first time (12).

The consumer most likely to read a food label when purchasing a product for the first time generally displays one or more of the following characteristics (11):

- female
- 50 years of age or older
- educated
- income of $28,000 or more
- special dietary restriction(s)

- nutritional concerns
- good nutrition knowledge
- influenced in purchase decision by ingredient and nutrition information

These observations are confirmed by FDA studies, which indicate that women, older consumers, those with formal education and/or those on special or restricted diets tend to be concerned about health and diet and therefore read food labels more often than others (2).

While 90% of food shoppers consider taste to be a very important factor when selecting groceries, 75% also consider nutrition to be very important (10), up from 72% in 1990 (13). Subgroup characteristics of those who view nutrition as very important parallel the subgroup which reads nutrition labels. Again, these shoppers are most likely to be:

- female
- aged 40 to 64
- people who consider their diet healthful
- people who have a household member on a restricted diet

Likewise, shoppers who are very concerned about the nutritional content of their food either belong to one of the above subgroups, are college-educated, or have no children (10).

Based on the characteristics of label reading frequency, understanding and influence, most food shoppers may be classified into one of two categories: the ***nutritionally responsive*** shopper and the ***nutritionally indifferent*** shopper (11). The nutritionally responsive shopper "almost always" or "sometimes" reads a food label when purchasing a product for the first time, understands the information "very" or "somewhat" easily, and is influenced "a great deal" or "somewhat" by the label. A small subgroup of the nutritionally responsive are ***nutritionally committed*** shoppers who "almost always" read the label, understand the information easily and are greatly influenced by the label information. In the second category is the ***nutritionally indifferent*** shopper who "rarely" or "never" reads the label, finds the information "hard" to understand, and is not influenced by label information. According to the AMI survey, the nutritionally responsive category accounts for 33% of all shoppers, the nutritionally committed for 6%, and the nutritionally indifferent for 39% of all food shoppers (11).

Of the many nutrition issues of today, dietary fat is at the forefront, probably surpassing sodium and dietary fiber as the major nutrition concern in America. Food shoppers surveyed by the Food Marketing Institute (FMI) express the most concern about fat content (42%) and cholesterol (37%), with 62% viewing fats and 58% viewing cholesterol as serious health hazards (10). By way of comparison, 22% of shoppers are most concerned about sodium, and 32% view it as a serious hazard. Findings from the 1990 NFPA survey are somewhat different: 35% of shoppers are concerned about fat content, 31% about cholesterol, and 30% about salt (12). According to the Institute for Science in Society, surveys conducted by Gordon S. Black, Gallup, and I.C.R. Survey Research verify that the majority of Americans are making a sincere effort to eat less fat (14). In just three years, there are 15% more food products on the market which have been reformulated to be lower in fat or cholesterol (14). Clearly, fat and cholesterol content are nutritional concerns of food shoppers, and the food industry has recognized this.

These two groups -- the nutritionally responsive and the nutritionally indifferent -- also differ socio-economically (12). About half of the nutritionally responsive group have some college education and about half have incomes of at least $30,000. Most of the nutritionally indifferent shoppers have a high school degree or less and have incomes under $28,000. Consumers in the lower

socio-economic group more frequently report elevated cholesterol levels, hypertension and other diet-related diseases and therefore have a great need for diet and health information. In non-institutionalized elderly populations, low socio-economic conditions are strongly correlated with poor nutritional intake and status (15). The nutrition label, then, could be a very effective tool for disseminating nutritional information. Clearly, some populations tend to use food labels more than others, and the nutritional information may not be reaching those who need it most -- the elderly, the less-educated, and minorities.

Analysis of data from the second National Health and Nutrition Examination Survey (NHANES II) indicates a need for public campaigns aimed to increase diversity of foods in the US diet in general. Specific target groups include minorities and those with less education and limited income (16). Other studies of the dietary practices and nutrition consumption patterns point to the need for nutrition education programs directed towards minorities, the elderly, and the less educated (15, 17, 18, 19).

A critical factor envelops the food labeling issue -- the understanding of label information. Although many food shoppers read food labels and express a concern for health and nutrition (10, 21), most do not understand or correctly

apply the nutrition information provided (2, 4, 9, 22, 23). As observed in the 1990 AARP study of people over the age of 50, blacks and Hispanics have a poorer understanding of label descriptors than whites (4). Minorities in particular often do not correctly understand the nutritional labeling information (4).

The American public's nutrition knowledge is low overall, especially in the elderly, minorities, and less-educated. Two studies of the elderly confirmed poor nutrition knowledge in this population. A positive relationship between nutrition knowledge and education, ethnicity, and income has been established (24, 25). A survey of nearly 3,000 US Navy personnel confirmed that women, whites, officers and/or highly educated personnel had a greater nutrition knowledge than did men, blacks and other ethnic groups, enlisted personnel, and those with a high school diploma or less than twelve years of schooling (26). Nutrition knowledge was most likely to be strong in vitamins, minerals, and fiber, but weak in calories and carbohydrates.

The American public scores poorly in other areas of nutrition and health knowledge as well. A study of over 2,300 people including health care workers, - university students and health club attendees -- a segment expected to have good understanding of dietary guidelines -- found that over 90% did not know

the recommended intake for calcium, sodium, vitamin A and fiber (27). Eighty percent did not know the recommendation for daily dietary fat intake, and 95% could not calculate the percentage of fat in a food product when supplied kilocalories/serving and fat content in grams. The majority also was unaware of the relationship between diet and the risk of coronary heart disease and cancer. A survey of over four hundred aerobic dance instructors expressed a high level of interest in nutrition yet displayed a relatively poor knowledge of nutrient requirements and nutrient sources, correctly answering only half of the knowledge questions (28).

Few studies have been published specifically on the low-income population's food-label reading habits and understanding. This group is more likely to suffer from diet-related chronic diseases such as cardiovascular disease, cancer, diabetes, hypertension, and obesity. In addition, the nutritional demands of pregnancy and rapid growth early in life places both women of child-bearing years and their small children at a high risk for nutritional deficiencies.

The hypothesis of the present study is that the low-income women who are pregnant or have small children use food labels less often and have a poorer understanding of the information provided than do women from the general population. This study will examine the food label reading habits, attitudes and

levels of understanding of the low-income women receiving food assistance through the Supplemental Food Program for Women, Infants and Children (WIC) and compare these characteristics to those of women from the general population. This information should be instrumental in the development of the forthcoming education programs for the new labeling reform.

MATERIALS AND METHODS

This study examined the food label reading habits, attitudes and understanding of two populations: women participating in the federally-funded Supplemental Food Program for Women, Infants and Children (WIC) and women from the general population. The WIC group in this study consisted of 69 female food shoppers who were pregnant, lactating or had small children. These subjects were also considered "low-income", that is, they had a total household income of less than $22,000, which represents the maximum income level for a family of four to participate in the WIC program. The control group consisted of 55 female food shoppers from the general population. All subjects in the control group had total household income greater than $22,000. Other demographics factors included education, race, age, adherence to a special diet by a household member, and existence of a chronic diet-related disease (heart disease, hypertension, diabetes or obesity). All subjects were:

1) the primary family food shopper,
2) female,
3) 18 years of age or older, and
4) literate.

On three separate days over a one-month period, WIC group subjects were recruited in the waiting area at WIC clinics in Fairfax and Arlington County, Virginia. On two days during the same period, control group subjects were recruited upon entrance and exit of Giant Foods supermarkets in the same counties. The researcher introduced herself as a graduate student studying health and nutrition issues and asked the potential subject if she would be willing to participate in food labeling survey for her thesis. If the individual agreed, the interviewer asked three screening questions to ensure the above criteria would be met, and the subject was given the questionnaire, a pen, clipboard and, if not already seated, a chair. The participant answered the remainder of the survey herself, taking approximately five to twenty minutes to finish.

This study was designed to gather information on:

1) food label reading habits
2) attitudes about food labels
3) knowledge of nutrition
4) knowledge of nutrition labels

The survey, which may be found in Appendix A, consisted of eight questions regarding food label reading habits and attitudes (parts 1 and 2) and nine true/false questions on nutrition knowledge and understanding of food labels

(parts 3 and 4). A "don't know" response to the true/false questions was recorded as incorrect since this response displayed insufficient knowledge to answer the question correctly. Demographical data on diet and health history, age, education, income and ethnicity were also collected.

The survey questions were modified from survey instruments used by the American Association of Retired People, the Food Marketing Institute, and the National Food Processors Association. Each question was selected on the basis of its potential insight into food label reading habits and attitudes, covering topics such as label reading frequency, food products, nutrients, attitudes, food-label influence, and the ease of understanding of the label. The nutrition test consisted of of nine questions on knowledge of dietary fat, fiber, and calcium, as well as interpretation of the label. The researcher also developed several questions as needed to contribute to the understanding of these issues. The survey was validated by nutrition professionals and a behavioral psychologist. In addition, since WIC has a large Hispanic clientele, a Spanish version of the survey was also available. A pilot test was conducted on the English version of the survey using five low-income women and five women from the general population.

The study was approved by the Human Subjects Review Board of Virginia Polytechnic Institute. Statistical analysis was performed using SYSTAT (29) software on a Macintosh computer. The Chi-Square Test of Independence was calculated to determine statistical significance of any differences between the WIC and control group, as well as subgroups formed as part of the analysis.

RESULTS

Complete demographic information is presented in Table 1. Over half (51%) of the WIC group was of Hispanic origin, while three-quarters (75%) of the control group was white. Most subjects in the WIC and control groups were under 40 years of age (97% and 57%), and the WIC group was largely (70%) in the 20 to 29 years of age range. Due to the small number of subjects, the ethnic groups analyzed were "Hispanic", "White", and "Other", and the age groups analyzed were "18-29", "30-39", and "40+".

Of the 165 subjects approached, 126 (76%) agreed to participate in this study. Nearly every woman approached at the WIC clinics was willing to participate, while about half of the women asked at supermarkets participated. Reasons cited for refusal included not enough time, lack of interest, someone waiting, inability to see or read well enough, and poor English.

Ninety percent of all participants reported that they "almost always" or "sometimes" read the food label when purchasing a food product for the first time. This information is presented in Figures 1a and 1b (Appendix B). There were no statistically significant differences in food label reading frequency

TABLE 1: Demographic Information

	WIC (*n=69*)		CONTROL (*n=55*)	
ETHNICITY				
White	16	(24%)	41	(75%)
Black	8	(10%)	6	(11%)
Hispanic	36	(51%)	3	(5%)
Asian	8	(12%)	5	(9%)
Other	0	(3%)	0	(0%)
EDUCATION				
Grade School	12	(17%)	0	(0%)
High School	35	51%)	6	(11%)
College	15	(22%)	37	(67%)
Post Graduate	6	(9%)	12	(22%)
Missing	1	(1%)	0	(0%)
AGE				
18-29	48	(70%)	8	(15%)
30-39	19	(28%)	23	42%)
40-49	2	(3%)	17	(31%)
50-59	0	(0%)	4	(7%)
60+	0	(0%)	3	(5%)
SELF OR HOUSEHOLD MEMBER ON SPECIAL DIET	11	(16%)	8	(15%)
SELF OR HOUSEHOLD MEMBER WITH DIET-RELATED DISEASE	24	(35%)	9	(16%)

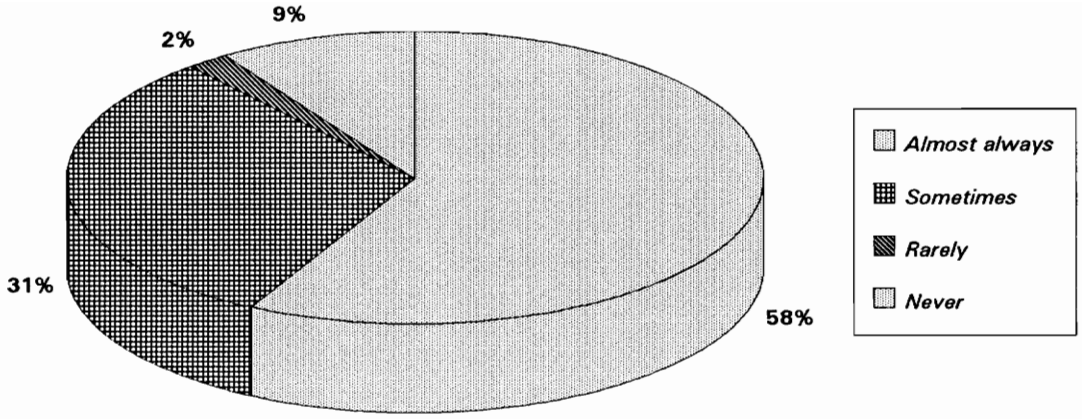

FIGURE 1a: *Frequency with which WIC subjects read food labels for first-time product purchases*

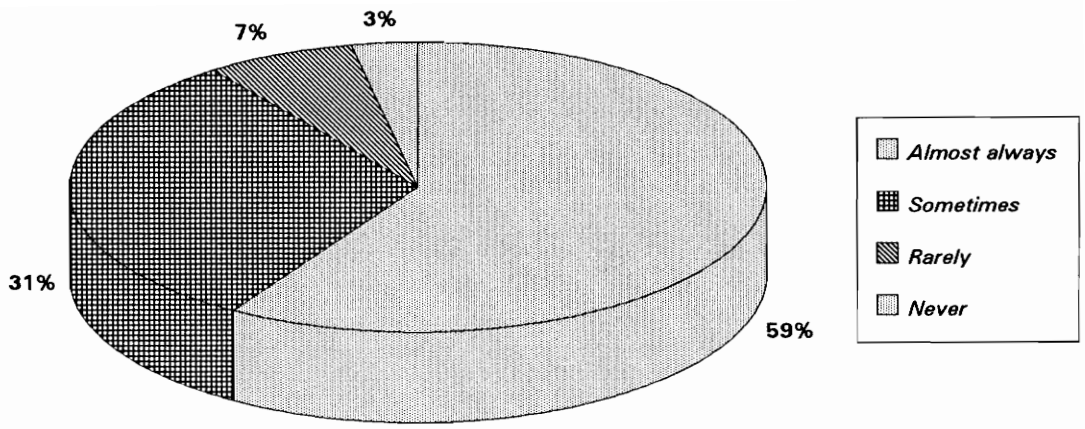

FIGURE 1b: *Frequency with which control subjects read food labels for first-time product purchases*

between the two groups: when purchasing a product for the first time, 90% of the shoppers in the WIC group and 91% in the control group "almost always" or "sometimes" read the food label. Shoppers who "rarely" or "never" read the label either purchased the cheapest or sale item, always bought their favorite brand, or already knew the information. Lack of time, interest or understanding was rarely given as a reason.

There was no statistically significant difference between frequency of food-label reading and other demographic variables, namely age, education or ethnicity. However, as indicated in Appendix C, there was a tendency for those in a household with a member on a special or restricted diet to "almost always" read a food label ($p = .07$).

Attitudes towards the ease of understanding food labels is illustrated in Figure 2 (Appendix D). Three-quarters of all shoppers felt that food labels were either "easy to understand" (27%) or "somewhat easy to understand but could be improved" (52%). More subjects in the WIC group than in the control group considered food labels easy to understand (32% vs. 19%), whereas more in the control group felt the labels were only "somewhat easy to understand" (65% vs. - 48%) These differences were statistically significant ($p<.05$), but there were no

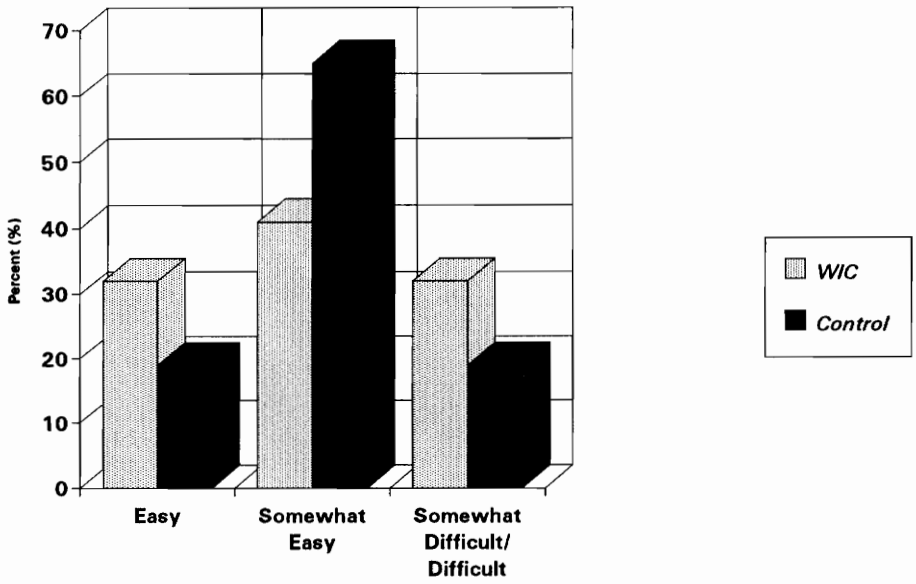

FIGURE 2: *Comparison of WIC and control subjects' attitude towards ease of understanding food labels (*p < .05)*

statistically significant differences in attitudes towards food labels when age, education, ethnicity or nutrition knowledge were examined.

As illustrated in Figure 3, 88% of all subjects claimed that a product's food label had "a great deal" or "some" influence on their decision to purchase that product. There was no significant difference between the two groups when considering the influence of a food label on a purchasing decision (Appendix E).

Many subjects in both groups displayed a particular concern for health and nutrition, and thus a subgroup, the ***nutritionally concerned***, was examined. The nutritionally concerned individuals viewed it as extremely important that a food product was healthful or contained nutrition information. The food label had a great deal of influence on the purchasing behavior of this subgroup: the food label had a significantly greater influence on the nutritionally concerned than those less nutritionally concerned *($p<.001$)*. The food label was not a significant influence on purchase decisions of those for whom brand name or taste was an extremely important factor. However, the food label was a significant influence on those for whom nutrition information *($p<.001$)*, a *"No cholesterol"* label ($p<.05$), or a *"Low-Fat"/"Fat-free"* label *($p<.01$)* was extremely important.

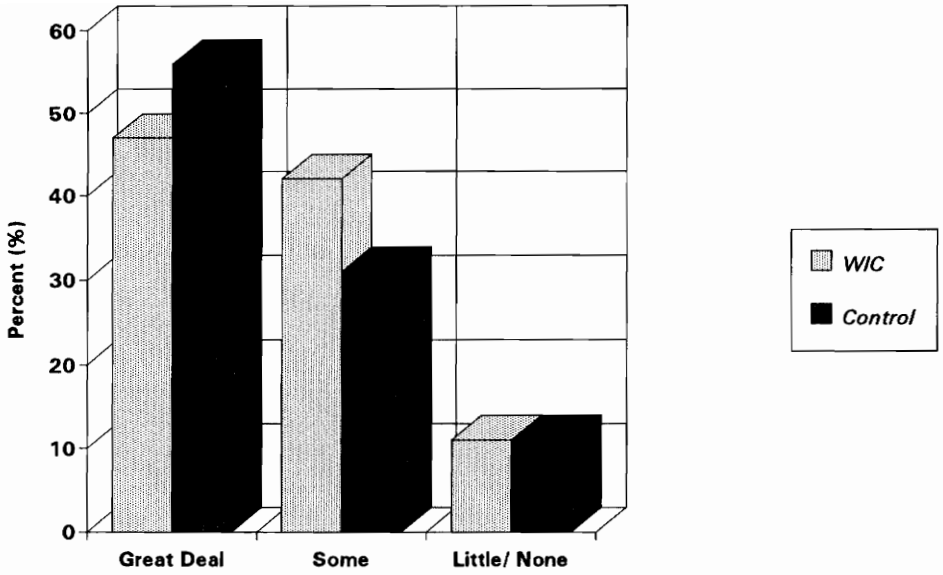

FIGURE 3: *Comparison of the influence of food labels on purchasing decisions of WIC and control subjects*

Eighty-one percent of all the respondents considered taste extremely important when purchasing a food product, while 65% believed that healthfulness, or "being good for me", was extremely important. Sixty-four percent said the nutritional information was extremely important. Over half felt that a *"No Cholesterol"* or *"Low-Fat"/"Fat-Free"* label was also very important. This information is detailed in Figure 4 (Appendix F).

Food energy (kilocalories) was the primary item which shoppers looked for on a food label (65%). In addition, at least half of all respondents read a food label for fat, vitamins, iron, and cholesterol. Figure 5 details the nutrients looked for on a food label. The WIC subjects looked for iron, vitamins, calcium, and cholesterol, while the control subjects named fat, sodium, and cholesterol most often. These differences were all statistically significant, as were the differences when ethnicity was considered (Appendix G).

Analysis of the nutrition knowledge test provided some revealing insights into the knowledge and understanding of the WIC and control group, as well as the other subgroups. Figure 6 displays a fairly normal distribution of the test scores. In order to avoid having more than one-fifth of the fitted cells with a frequency of less than 5, the score results were divided into three subgroups of reasonably equal numbers. Those in the high nutrition knowledge group -- the

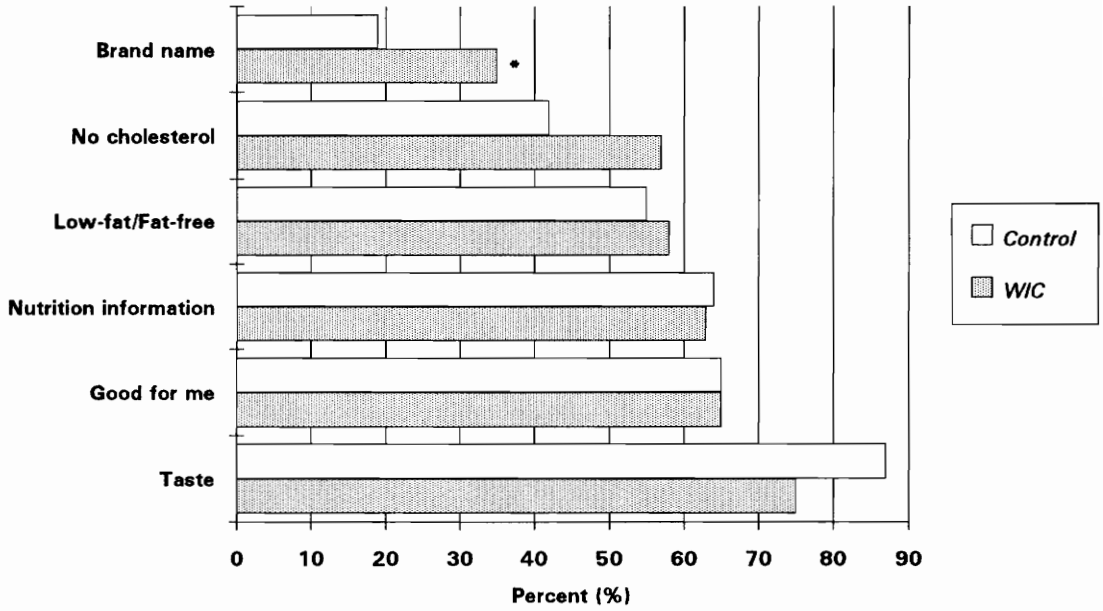

FIGURE 4: *Comparison of factors considered important in food product purchases by WIC and control subjects (*p < .05)*

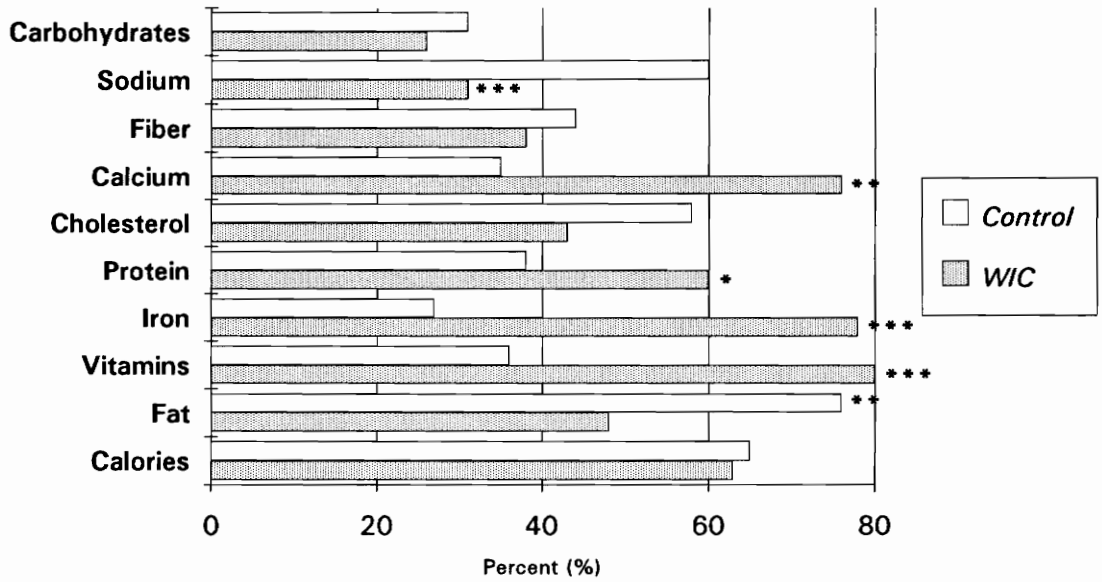

FIGURE 5: *Nutrients which WIC and control subjects consider important on a food label (*p < .05, **p < .01, ***p < .001)*

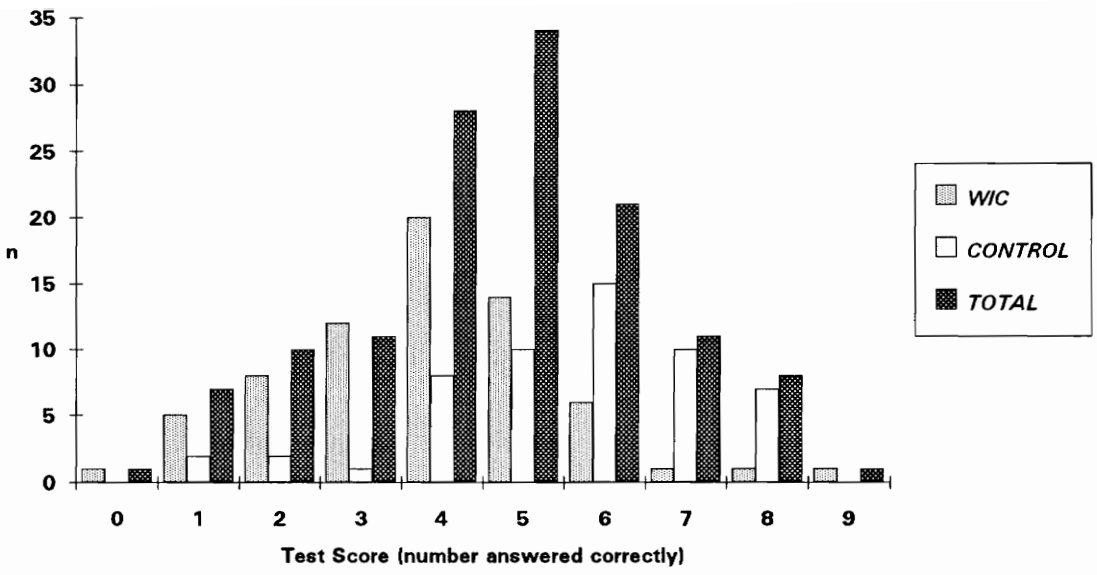

FIGURE 6: *Distribution of nutrition knowledge test scores*

nutritionally knowledgeable -- answered at least 6 of the 9 nine questions correctly (n=41). The ***nutritionally less knowledgeable*** subgroup was comprised of those with a moderate nutrition knowledge (4 to 5 correct answers, n=52) and those with a low nutrition knowledge (3 or fewer correct answers, n=31).

Although the subjects in both the WIC and control groups considered food labels to be at least "somewhat easy to understand", the nutrition knowledge and understanding of label information, as presented in Figure 7, varied considerably between the two groups (Appendices H and I). Within the control group, 58% had a high nutrition knowledge and understanding of food labels, 33% were moderately knowledgeable, and the remaining 9% had low knowledge. The WIC group displayed a particularly poor nutrition knowledge. While there was a comparable percentage of WIC clients who were moderately knowledgeable (39%), there was a striking difference between the number with a high or low nutrition knowledge: only 13% of the WIC group were considered to have high nutrition knowledge, and 39% had low knowledge. The differences in nutrition knowledge between the WIC and control group were highly significant *($p<.001$)*. In addition, the differences in nutrition knowledge and ethnicity *($p<.001$)* and age *($p<.01$)* were highly significant.

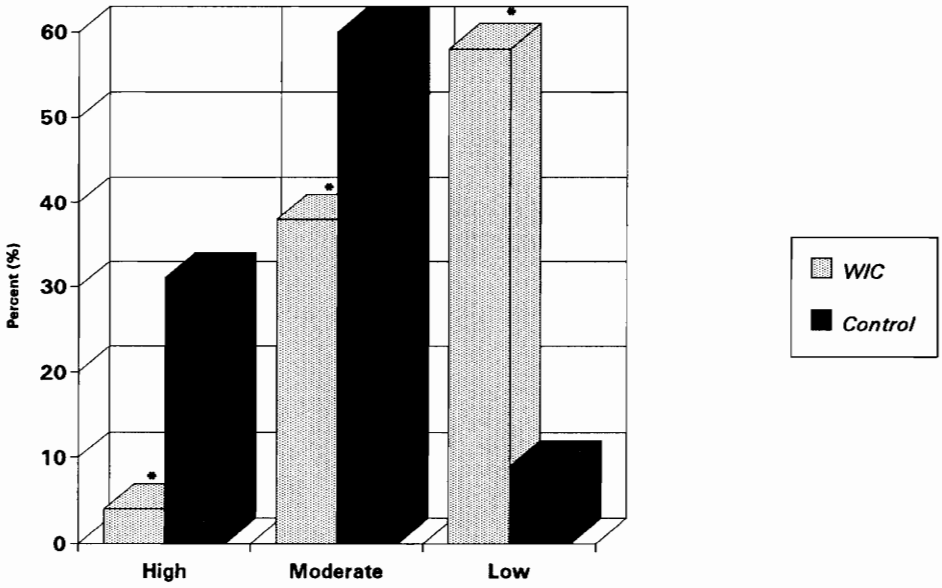

FIGURE 7: *Comparison of level of nutrition knowledge of WIC and control subjects (*p < .001)*

There was no statistical difference between nutrition knowledge and attitude towards food labels: those who felt food labels were "easy" or "somewhat easy" to understand did not necessarily score better in the nutrition knowledge and label understanding test. This was true for all shoppers as well as when the WIC and control groups were considered individually. However, when the analysis included the 8 subjects who did not respond to this attitude question, all of whom fell into the low nutrition knowledge category, this difference became highly significant *($p<.001$)* (Appendix J).

Seventy-one percent of the subjects with a high nutrition knowledge "almost always" read a food label when purchasing a product for the first time, compared to 57% of the moderately knowledgeable and 44% of those with low nutrition knowledge. One-quarter of the low nutrition knowledge group "rarely" or "never" read a food label. These differences, presented in Figure 8, were also significant ($p<.05$) (Appendix K). There was no significant difference between a shopper's nutrition knowledge and tendency to consider the factors taste, healthful, nutrition information, or a "No cholesterol" or "No-fat"/"Low-fat" label extremely important. Shoppers from either group who were concerned with dietary fat were categorized as ***fat vigilant***. This subgroup usually looked for fat or cholesterol on a label or believed that a label with a "No Cholesterol" or "Low Fat/"Fat Free" claim was "extremely" important. The fat vigilant scored

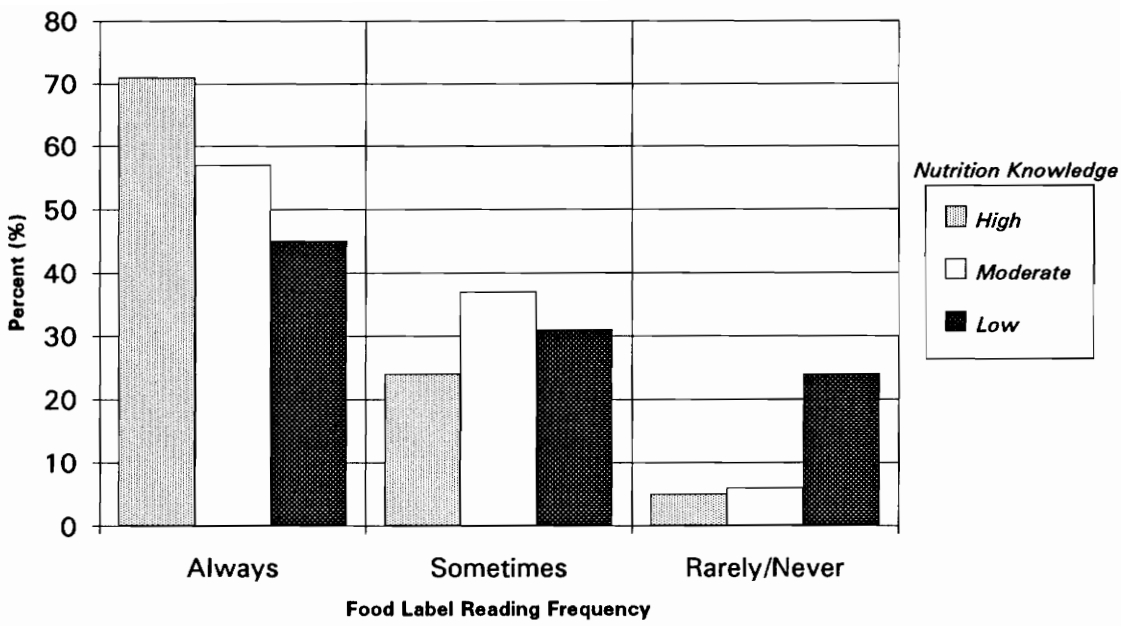

FIGURE 8: *Relationship between frequency of food label reading and level of nutrition knowledge ($p < .05$)*

moderately well on the six questions related to fat or cholesterol. Forty-four to 54% answered three or four of the six questions correctly. Only eight to 15% of this subgroup answered five or all six questions correctly.

Those subjects who could correctly answer four or more of the six fat-related questions were considered to have a "good" knowledge of dietary fat, while those who could correctly answer three or fewer had a "poor" dietary fat knowledge. The difference in understanding of dietary fat was highly statistically significant when the WIC and control groups were compared *($p<.001$)*, as well as when ethnicity *($p<.001$)* and age *($p<.01$)* were considered. Likewise, there was a highly significant difference in fat knowledge among the nutritionally knowledgeable and the nutritionally less knowledgeable *($p<.001$)*: those who scored high on the nutrition knowledge test were also more likely to do well on the fat-related questions.

Some subjects in the fat vigilant subgroup demonstrated a good knowledge of dietary fat. Within this subgroup, those who looked for fat or cholesterol on a food label scored significantly better than those who did not *($p<.05$)*, yet those for whom a *"No cholesterol"* or *"Low-fat/Fat-free"* label was an extremely important factor in a food purchase, the difference in fat knowledge was not significant. Only 2 of the 29 subjects (7%) who had a good fat knowledge

considered taste an extremely important factor, whereas 37% of those with a poor fat knowledge considered taste extremely important. This difference was highly significant *($p<.001$)* (Appendix L).

The most frequently-cited source of nutrition information was the media -- TV, newspapers, articles, and books. A comparison of the sources of nutrition information is presented in Figure 9 (Appendix M). The control group tended to rely most upon the media, other people (friends, relatives and others), doctors, and the food label, whereas the WIC group used WIC counselors, the food label, doctors, and other people most often. There was a statistically significant difference between each group's usage of the media and WIC counselors. The information sources typically used by the control group and the WIC group were similar to those used by the nutritionally knowledgeable and nutritionally less knowledgeable, respectively (Appendix N). The nutritionally knowledgeable most often mentioned the media, other people, doctors, and nutrition classes as their source of nutrition information. WIC counselors, doctors and food labels were the most commonly specified nutrition sources among those who scored low on the nutrition test.

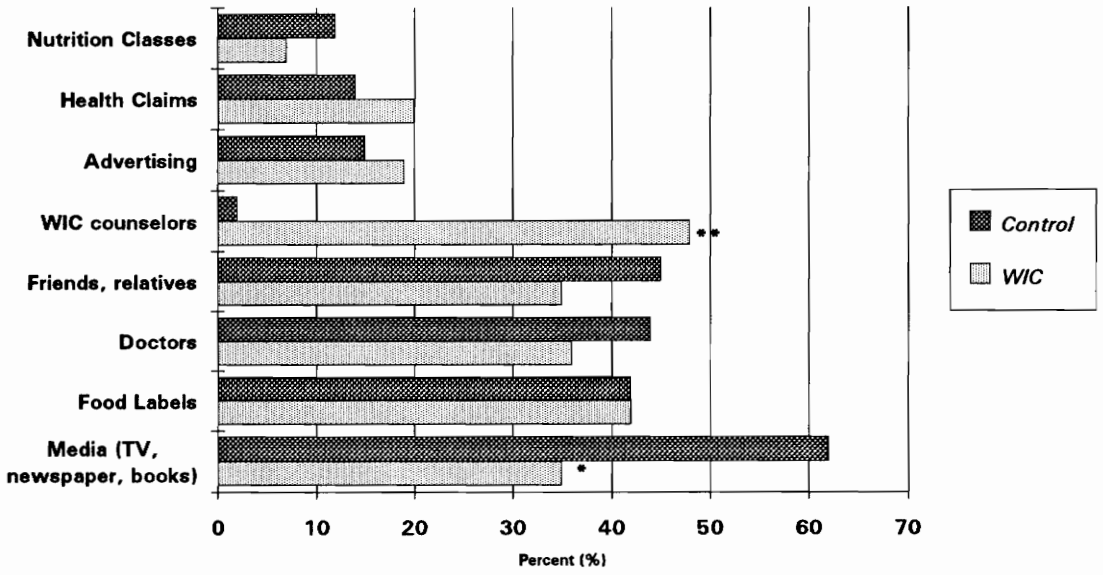

FIGURE 9: *Sources of nutrition information frequently cited by WIC and control subjects (*p < .01, **p < .001)*

The food products for which all subjects most often read a food label were cereals (71%) and milk, yogurt and other dairy products except cheese (63%). Figure 10 illustrates the frequency of label reading by food category. Comparing the two groups, the WIC participants read the food label more often for milk, yogurt and dairy (70% vs. 54%), meat, poultry and seafood (65% vs. 25%), and cheese (58% vs. 36%). The control group, on the other hand, read the food label more often than the WIC group for snacks (73% vs. 36%) and frozen entrees (67% vs. 46%). These differences were all highly significant (Appendix O). Hispanics read the label on meat, seafood and poultry *($p<.001$)*, milk and dairy *($p<.01$)*, and cheese *($p<.05$)* more often than did whites or other ethnic groups; however, there was not a significant difference among the groups for label reading of snacks or frozen entrees.

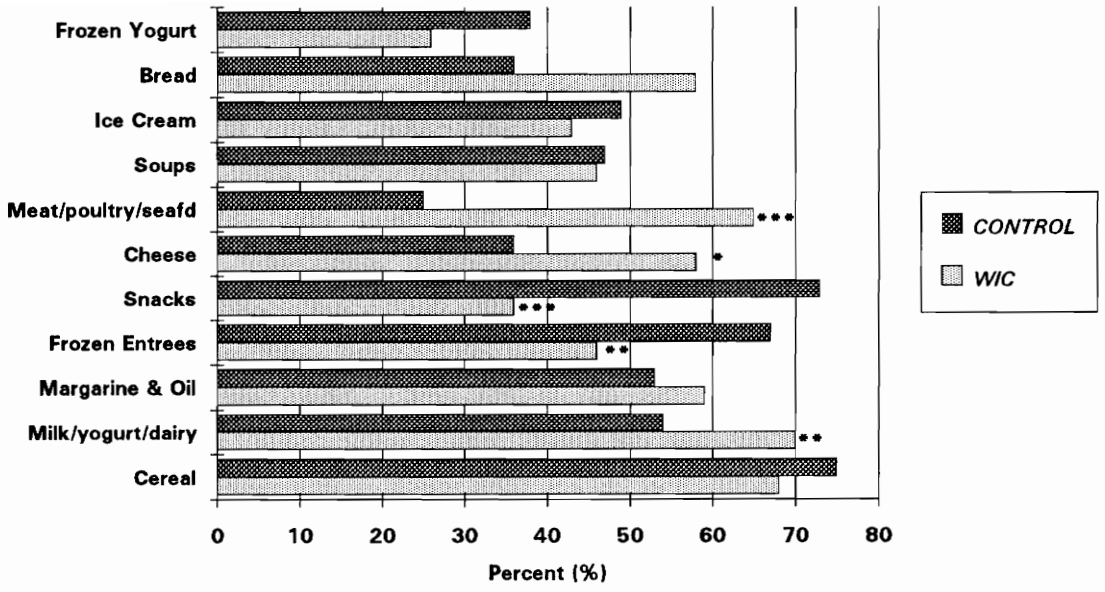

FIGURE 10: *Food products for which WIC and control subjects most often read food labels (*p < .05, **p < .01, ***p < .001)*

DISCUSSION

The results of this study reveal some important behavioral and knowledge differences between women receiving supplemental food assistance through the WIC program (the WIC group) and women from the population at large (the control group). Observed characteristics of the study sample's food label reading habits, attitudes, and nutrition knowledge permits the formation of several subgroups. Therefore, in addition to the measurement of the similarities and differences between the WIC and control populations, this discussion also examines those who were perceived as ***nutritionally concerned***, ***nutritionally knowledgeable*** (or ***less knowledgeable***), and ***fat vigilant***. Additionally, this study points out some noteworthy observations and trends among American women as a whole.

Ninety-one percent of all shoppers in this study reported "almost always" or "sometimes" reading a food label when purchasing that product for the first time. This is a slightly higher percentage than comparable studies performed in 1989 through 1991. The American Meat Institute found that 71% of food shoppers in general "always" or "sometimes" read a food label (11); the National Food Processors Association reported 81% for female food shoppers (12); and the Food Marketing Institute found that 87% claim to "always" or

"sometimes" read the food label for a first-time purchase (10). A 1990 study of over 2,300 individuals found that only 40 to 56% read a food label at least half of the time; however, the relevant question posed in this survey did not specify first-time purchases only (27). Upon examination of the breakdown of those who "almost always" and "sometimes" read a food label, the data in this study corresponded closely to both the FMI *Trends 1991* report and the NFPA *What Americans Want* report. Of the shoppers polled in the FMI study, 49% reported that they "always" read a food label for a first-time food purchase, and 38% "sometimes" read the label. In this study, 59% "almost always" read a food label for a first-time purchase, and 31% "sometimes" read the label. These results were also very similar to the NFPA report.

Examination of other demographic variables indicated no statistical differences between label reading frequency and age, education or ethnicity. Frequency of food label reading could be correlated only with those subjects who had a household member on a special or restrictive diet (refer to Appendix C).

The frequency of label reading observed in this and similar studies -- 71 to 91% -- might be considered rather high. Given the nature of the questionnaire, which was described to the potential subjects as a "study of food labeling and nutrition issues", it is possible that those who agreed to participate were

The food label reading habits of the WIC and control groups thus far seem rather comparable. However, each group displayed a tendency to examine certain nutrients listed on the food label more than others. Although equal proportions of both groups mentioned kilocalories (the most frequently cited) and fiber as items usually sought on a label, the differences among other nutrients varied greatly (Figure 5, Appendix G). For instance, more than twice the percentage of the WIC group compared to the control group looked for vitamins (80% vs. 36%), iron (78% vs. 27%), and calcium (76% vs. 35%). Many subjects in the WIC group may have been pregnant or lactating, a condition which increases the need for many nutrients, particularly vitamins, iron and calcium. It is heartening to see that this nutritionally at-risk population is, at the minimum, attempting to meet their nutritional needs through healthy dietary practices. Since these are the nutrients which pregnant and lactating women and rapidly-growing infants and children are at most risk for, this is also strong evidence that the counseling and nutrition education provided to WIC clients is effective.

WIC clients reported reading the food label for different products more than women from the general population did. For instance, while both groups reported reading a cereal label nearly equally, the labels on meat, seafood, poultry, milk, yogurt, cheese and other dairy products were more frequently

read by WIC subjects than by the control group. The high degree of reading labels on dairy products is likely to be a reflection of the WIC program. A dairy component (milk and cheese) is part of WIC supplemental food assistance, and in order to purchase certain food products with a WIC check, those products must meet specific criteria. Why such a large percent of WIC clients claimed to read labels on meat, seafood and poultry products is unclear since a number of these fresh, unprocessed products often do not have food labels. The control group, on the other hand, read the food label on frozen entrees and snacks much more often than the WIC group. These product types are likely to be considered more expensive than food staples, and it is possible that WIC clients do not often make such purchases and therefore do not read the labels on these products. These observations merit further study into which food products consumers read the food label for and how that information is used.

Compared to the WIC group, a much larger percentage of the control group was interested in fat (76% vs. 48%), cholesterol (58% vs. 43%) and sodium (60% vs. 31%). These differences were statistically significant (Appendix G). This is additional support to the speculation that the lower socioeconomic population, which is more likely to suffer from diet-related chronic disease, has a poorer understanding of the relationship between dietary habits and chronic disease. In this study, 35% of the subjects in the WIC group had a household

member with hypertension, heart disease, diabetes, or obesity, compared to 16% in the general population. Yet within the WIC group, those who had a household member with any of the mentioned conditions did not look any more frequently for fat, cholesterol, sodium or fiber than those without chronic disease.

The attitudes towards ease of understanding the food label were somewhat different from the findings of the NFPA and AMI surveys. In this study, 27% of all subjects (32% in the WIC group and 19% in the control group) reported that food labels were easy to understand. By comparison, AMI reported 20% and NFPA stated 47% of shoppers found the label easy to understand. Approximately 40% of subjects in both surveys found labels "somewhat easy to understand", compared to 52% in this study.

As the present study demonstrates, attitudes towards ease of understanding food labels did not correlate with nutrition knowledge: subjects who reported the food label was "easy" or "somewhat easy" to understand did not have a significantly better knowledge of nutrition. With respect to nutrition knowledge and understanding of food label information, both groups performed poorly on the knowledge test, with a mean score of 4.6 out of 9. This lack of knowledge and understanding has serious consequences, for it hinders the efforts of the

individual who wishes but may not know how to follow the recommended dietary guidelines by consuming less fat, sodium and sugar and more fiber. Confusing, conflicting and often inaccurate food labels only adds to the frustration.

The data support the hypothesis that WIC clients have a significantly poorer knowledge of nutrition than the control group. This is a matter of grave significance, since not only do these women have special dietary needs themselves, they also are the caretakers of another high-risk population -- their rapidly-growing infants and children. Considering also the fact that these women are of low socioeconomic status and therefore more likely to suffer from diet-related disease, it appears that WIC clients are in great need of nutrition education, particularly as it relates to the nutrition label reform.

Many of the subjects in the WIC group were non-English speaking, and a Spanish version was available for the Spanish-speaking WIC clients. It is conceivable that some may have had difficulty with the questionnaire due to a language barrier or poorer reading skills, as judged by the casually-observed longer time WIC subjects took to complete the survey. This may help to explain lower scores on the nutrition knowledge test, but does not by any

means lessen the extent to which this population would require nutrition education.

Consumer education is an important component of the National Labeling and Education Act. Both FDA and USDA are collaborating with public health organizations, consumer groups, and the food industry to develop food labeling and nutrition education initiatives. This study identifies a segment of the American population where nutrition education efforts must be directed: low-income women who are pregnant, nursing or have small children. Many such women can be reached through the WIC program. WIC is a highly effective program: for every dollar spent on the program, the federal government saves three dollars in medical expenses (30). Another indication of the efficacy of the WIC program is that, as this study shows, the message of increased nutrient needs, particularly in terms of vitamins, iron, and calcium, is reaching these women. Whether these individuals truly know how to use this information remains to be determined through future research. From this study, it appears that while these women, as well as the population at large, may look for nutrition information on a food label, they may not necessarily know how to apply the information.

The women in both the WIC and control group had poor knowledge of the role of dietary fat. Again, the fact that many of the individuals in this sample *look for* fat and cholesterol on a food label does not necessarily imply that they *understand* and can *apply* that information to their dietary practices. The overwhelming number of incorrect responses to the fat-related questions, even for the fat vigilant subgroup, shows that in fact most people do not have a clear understanding of how to utilize label information on fat in order to practice healthful dietary habits. Therefore, educational initiatives which focus on dietary fat and cholesterol are also necessary for the population at large.

A strategy for food labeling and nutrition education can include several approaches. Any nutrition education initiative undertaken must accomplish several goals. The program should create a motive to change one's dietary habit and clearly specify the desired outcome, while stressing positive reasons for changing. The major thrust of a nutrition education program should be to improve and build upon, rather than drastically change, the public's established eating patterns.

Supermarkets and restaurants are prime locations for such efforts, since food is the major focus of these institutions. The setting of supermarkets and restaurants is an excellent opportunity for point-of-purchase education programs

because the customers are a captive audience and food is their primary concern at that moment. Within supermarkets, possible tactics may include printed materials, videotapes, taste-testing, and food preparation demonstrations. Over 50% of supermarket chains employ some form of nutrition education program; while expensive, they are popular and promote customer loyalty (14).

Shopper tours, signage over targeted food types, and shelf labeling are additional possibilities. A recent cooperative study by FDA and a Washington-based supermarket chain, Giant Food, Inc., found that when brand-specific products were displayed with nutrition shelf-tags and a supplementary explanatory booklet, sales increased for those products with the most flagged nutrients (30). The use of this program correlated with shoppers' nutrition and health concerns more than education, income or age.

One serious shortcoming of this possible approach is that low-income people may perceive the larger supermarket chains, which are more likely to sponsor such costly programs, as more expensive. These supermarkets may also be less accessible, as owners are often reluctant to locate in low-income, urban areas, and many low-income people lack the transportation to easily access suburban markets.

Restaurants can also contribute to a nutrition education initiative by offering menu labeling. Recent studies have found that when nutrition information is listed on a menu, patrons are aware of and receptive to the program (32, 33), particularly women and older patrons. While the effectiveness of this approach may be influenced by age and gender (32), it is still a valid method of encouraging healthful dietary changes. Fast-food restaurants, which are frequented by many different categories of people, are an excellent opportunity to begin testing of nutrition and labeling education.

The food label itself is another obvious instrument of nutrition education and has the advantage of being accessible to all food shoppers. The data clearly show that the food label is read by both low-income women and women in the population at large. Within the WIC group, 40% report using the food label itself as a source of nutrition information, so here is an excellent opportunity to transmit nutrition and health messages to low-income women.

This study found that the media were the most commonly mentioned source of nutrition information: food labels, doctors, and other people (friends and relatives) were also cited. These results support a 1991 study by Medeiros *et al.* which cited the media and doctors as regularly used, but not equally effective, sources of nutrition information (34). In the present study, the control

group, the media, friends and relatives, and doctors were the leading information sources, compared to WIC counselors, doctors, and food labels in the WIC group. Although the nutritionally knowledgeable seemed to learn the most from the media, other people, food labels and doctors, due to the small number of subjects in this study, it is difficult to make a definitive correlation as to the actual impact of such sources on nutrition knowledge. The Medeiros study surveyed over 1500 households and found that television and doctors or nurses were the most frequently used sources of nutrition information (34). In this instance, the researchers were able to determine that these sources actually had a negative impact on nutrition knowledge, while extension home economists, nutritionists and dieticians, and books, magazines, and newspapers had a positive impact. This study concluded that not all sources of nutrition information are equally effective.

Of the 69 subjects in the WIC group, all of which were WIC clients, less than half (n=33) used WIC counselors as a nutrition information source. This is somewhat disturbing because the WIC counselors are such a relevant, accessible resource for their clients, yet they are seemingly under-utilized. Perhaps many WIC clients do not consider WIC counselors a usual source of nutrition information because they only visit the clinic once a month to pick up checks and meet with a nutritionist every six months to be recertified. Despite

these occasional visits, counselors at WIC clinics can be an effective vehicle for transferring nutrition information and instruction on the new labeling reform.

CONCLUSIONS

Today's food shoppers are interested in the foods they purchase. However, although the American consumer's nutrition awareness and perhaps knowledge is greater than ever, the confusion is even more pervasive (3). The public is daily bombarded with complex messages, misleading health claims, and often conflicting information and dietary recommendations from the government, public health organizations, consumer advocacy groups, and food producers. This barrage of information gives the consumer little basis upon which to make an appropriate, meaningful decision.

The public stands to benefit significantly from the National Labeling and Education Act. The Act pledges a uniform, informative nutrition labeling policy, a standardized collection of label descriptors, and a set of health claims based on a minimum acceptable level of scientific evidence. Since most food shoppers read the food label, the new labeling reform holds great promise as a tool to transmit nutrition education information. As this study and others indicate, label nutrient information currently contributes only minimally to the purchaser's nutrition knowledge and label understanding. Label information regarding fat, cholesterol, fiber and calcium is critical in the avoidance of diet-

related disease, yet this information is clearly under-utilized in dietary practices today.

A strategy for improving the nation's dietary habits and overall health must include several simultaneous approaches. Comprehensive nutrition education, as discussed earlier, is mandatory. This program must necessarily address those at risk for nutritional deficiencies -- infants, children, and pregnant or lactating women -- and those likely to suffer from diet-related chronic diseases -- the elderly, less-educated, low-income and minorities. A nutrition education component must also be added and emphasized for those in the health-care industry. Health care providers, particularly doctors, nurses and counselors, must learn to stress the importance of diet and its relationship to the development of chronic disease. And finally, the food label information must be communicated in such a way that the consumer can accurately apply that information when purchasing and consuming food. These approaches will help the consumer better understand and adhere to the recommended dietary guidelines.

SUMMARY

The results of this survey are supportive of other research findings which indicate that while most consumers at least occasionally read a food label, their understanding of the nutrition information is generally poor. The limited sample size and geographical location of the present study should not be discounted. However, despite the modest nature of this study, some striking observations and trends regarding food labeling and nutrition awareness are apparent.

Low-income women receiving supplemental food assistance through the WIC program read the food label as frequently as women from the general population and are similarly influenced by the label. Both groups have a similar attitude toward the food label, finding them generally easy to understand. However, women from the WIC group have a significantly lower knowledge of nutrition and understanding of food labels as measured by a nutrition knowledge test. These women have an especially poor understanding of dietary fat, despite the fact that they seem concerned with this nutrient when shopping for food.

There is a significant relationship between the two populations with respect to the sources of nutrition information used. While both groups equally use the media, doctors and other people for to learn about nutrition, women from the WIC program also rely heavily on food labels and WIC counselors. The products for which each group uses the food label are also significantly different: WIC women tend to read the food label on meat, seafood, cheese, milk and dairy products and look for the nutrients vitamins, iron, calcium, and protein. Women from the population at large, however, read the label more often for snacks and frozen entrees and look for fat, sodium and cholesterol. Further study is warranted regarding the food products for which consumers read a food label, which nutrients are most often sought, and how that information is used.

The data are suggestive of further, more comprehensive research in the area of nutrition knowledge of high-risk populations, in this instance, low-income women who are pregnant, nursing, or have small children. Additional understanding of the dietary patterns and nutrition knowledge of this population is needed.

The data also call for nutrition education programs aimed at those most in need. A focused, collaborative effort is necessary in order to effectively improve the dietary practices of low-income Americans and other high-risk

groups. This necessitates a nationwide commitment on the part of the federal government, health professionals, and the food industry. The nutritionist in particular will play a crucial role in providing the motivation and guidance for successful dietary modification.

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APPENDIX A

NUTRITIONAL LABELING SURVEY

Pats Michel
Virginia Polytechnic Institute and State University

SCREENING QUESTIONS (asked by the interviewer)

1. Are you the person who is most responsible for the food shopping in you household, or is that someone else, or do you share that responsibility fairly equally with someone else?
   __ Most responsible
   __ Someone else
   __ Share responsibility

2. Are you 18 years of age or older?
   __ Yes
   __ No

3. Will you agree to take five minutes of your time to fill out this questionnaire on your food labeling reading habits?
   __ Yes
   __ No (Reason if given _____)

NUTRITION LABELING SURVEY

My name is Patricia Michel, and I am a graduate student at Virginia Tech. I am conducting a survey about health and nutrition issues for my thesis.

- *THIS IS A **CONFIDENTIAL** SURVEY.*
- ***YOU WILL NOT BE IDENTIFIED** BY NAME OR OTHERWISE IN ANY REPORTS OF THIS SURVEY.*
- *PARTICIPATION IN THIS SURVEY **WILL NOT AFFECT YOUR WIC STATUS***

NUTRITION LABEL READING HABITS (answered by the participant)

1. When you buy a food product for the *first time*, how often do you read the label?
   __ Almost always
   __ Sometimes
   __ Rarely (GO TO QUESTION 1a)
   __ Never

   1a. *If you rarely or never read the nutrition labels* on food products, why? (CHECK ALL THAT APPLY)
   __ Not interested
   __ Already know the information
   __ Don't understand the information
   __ Usually buy the cheapest brand/what's on sale
   __ I usually buy my favorite brands and products
   __ Don't have the time

2. *When you DO read food labels*, what type of food products do you usually read the labels for? (CHECK ALL THAT APPLY)

__ Cereals	__ Soups
__ Cheese	__ Milk/yogurt/dairy
__ Bread	__ Frozen entrees
__ Ice Cream	__ Frozen yogurt
__ Meat, poultry, seafood	__ Snacks
__ Margarines and oils	__ Other (specify_____)

3. How much influence does the nutrition information (for example, calories, fat, vitamins) printed on food labels have on your decision to buy a food product?

__ Great deal
__ Some
__ Only a little
__ No influence

4. How do you usually learn about eating a healthy diet? (CHECK ALL THAT APPLY)

__ Food Labels
__ Health Claims on products
__ Advertising
__ TV/radio/newspapers/books
__ Nutrition classes
__ WIC counselors
__ Doctors
__ Friends/relatives/other

5. How important are each of the following when you buy a food product?

	Extremely	Somewhat	Not Important
Brand name			
Taste			
Being good for me			
Nutrition information			
"No Cholesterol"			
"Low-Fat"/"Fat-Free"			

6. What do you usually look for when you read a food label? (CHECK ALL THAT APPLY)
   __ Calories
   __ Carbohydrates
   __ Protein
   __ Fat
   __ Cholesterol
   __ Sodium
   __ Fiber
   __ Vitamins
   __ Iron
   __ Calcium
   __ None of the above
   __ Other (please specify _____)

7. In general, what is your attitude about understanding the information on food labels?
   __ Food labels are easy to understand
   __ Food labels are somewhat easy to understand, but could be improved
   __ Food labels can be confusing
   __ I find it difficult to use the information printed on food labels

PLEASE ANSWER TRUE OR FALSE FOR THE FOLLOWING STATEMENTS:

1. "***No cholesterol*** means ***no fat***"
   __ TRUE
   __ FALSE
   __ Don't know
2. "Health experts recommend that a maximum of **40%** of your daily calories comes from fat"
   __ TRUE
   __ FALSE
   __ Don't know
3. "As far as health is concerned, there is a difference between saturated and unsaturated fat"
   __ TRUE
   __ FALSE
   __ Don't know
4. "When a food label says ***'95% Fat Free'***, it means 5% of the calories in the product come from fat"
   __ TRUE
   __ FALSE
   __ Don't know
5. "If a food product is called 'Low Fat', that means no more than 10% of its calories can come from fat"
   __ TRUE
   __ FALSE
   __ Don't know
6. "Chicken is a good example of a complex carbohydrate"
   __ TRUE
   __ FALSE
   __ Don't know
7. "Wheat bran and oatmeal are good sources of dietary fiber"
   __ TRUE
   __ FALSE
   __ Don't know
8. "Dairy products are good sources of calcium"
   __ TRUE
   __ FALSE
   __ Don't know
9. "Some vegetable oils are higher in cholesterol than others"
   __ TRUE
   __ FALSE
   __ Don't know

BACKGROUND INFORMATION

1. Is any member of your household (including yourself) on a special or restrictive diet?
   __ Yes
   __ No

2. Does anyone in your household have any of the following conditions?
   __ Yes
   __ High blood pressure
   __ Heart trouble
   __ Diabetes
   __ Obesity
   __ No

3. What was the last grade of regular school that you completed?
   __ No schooling
   __ Grade school
   __ Some high school
   __ High school graduate
   __ Some college
   __ College graduate
   __ Post Graduate

4. Please indicate your age group:
   __ 18 - 29
   __ 30 - 39
   __ 40 - 50
   __ 50 - 59
   __ 60 +

5. Please indicate your total household income (wages and tips only):
   __ Under $22,000
   __ $22,000 to $40,000
   __ Above $40,000

6. Please check one:
   __ White __ Black __ Hispanic __ Asian __ Other

APPENDIX B

Frequency With Which Shoppers Report Reading Food Labels

	WIC (n=67)	CONTROL (n=54)	TOTAL (n=121)
ALMOST ALWAYS	39 (48%)	32 (59%)	71 (57%)
SOMETIMES	21 (31%)	17 (31%)	38 (31%)
RARELY/NEVER	7 (10%)	5 (9%)	12 (10%)

APPENDIX C

Comparison of Food Label Reading Frequency Between Households with Members on a Special Diet and No Special Diet

	NO SPECIAL DIET	SPECIAL DIET
ALMOST ALWAYS	56 (55%)	15 (83%)
SOMETIMES	35 (34%)	2 (11%)
RARELY/NEVER	11 (11%)	1 (1%)

p=.075

APPENDIX D

Attitude Towards the Ease of Understanding Food Labels

	WIC (n=63)	CONTROL (n=54)	TOTAL (n=117)
EASY	20 (32%)	10 (19%)	30 (27%)
SOMEWHAT EASY	26 (41%)	35 (55%)	61 (52%)
SOMEWHAT DIFFICULT/ DIFFICULT	17 (27%)	9 (17%)	26 (22%)

p<.05

APPENDIX E

Influence of Food Labels on Purchasing Decision

	WIC *(n=66)*	CONTROL *(n=55)*	TOTAL *(n=121)*
GREAT DEAL	31 (47%)	31 (56%)	62 (51%)
SOME	28 (42%)	17 (31%)	45 (37%)
LITTLE/NONE	7 (11%)	7 (11%)	14 (11%)

APPENDIX F

Factors Considered Important When Purchasing a Food Product

	WIC	CONTROL	TOTAL
BRAND NAME			
Extremely Important	19 (35%)	10 (19%)	29 (27%)
Somewhat/Not Important	36 (65%)	44 (81%)	90 (83%)
TASTE			
Extremely Important	41 (75%)	47 (87%)	88 (81%)
Somewhat/Not Important	14 (25%)	6 (13%)	20 (19%)
HEALTHFUL			
Extremely Important	34 (65%)	34 (65%)	68 (65%)
Somewhat/Not Important	18 (35%)	18 (35%)	36 (35%)
NUTRITION INFORMATION			
Extremely Important	38 (64%)	33 (63%)	71 (64%)
Somewhat/Not Important	21 (36%)	19 (37%)	40 (36%)
"No Cholesterol" label			
Extremely Important	33 (57%)	22 (42%)	55 (50%)
Somewhat/Not Important	25 (43%)	30 (58%)	55 (50%)
"Low-Fat"/"Fat-Free" label			
Extremely Important	32 (58%)	29 (55%)	61 (56%)
Somewhat/Not Important	23 (42%)	24 (45%)	47 (44%)

* $p<.001$
** $p<.01$
*** $p<.05$

APPENDIX G

Nutrients Considered Important on a Food Label

	WIC *(n=69)*	CONTROL *(n=55)*	TOTAL *(n=124)*
CALORIES	44 (64%)	36 (65%)	80 (65%)
CARBOHYDRATES	18 (26%)	17 (31%)	35 (28%)
PROTEIN***	42 (61%)	21 (38%)	63 (51%)
FAT**	33 (48%)	42 (76%)	75 (60%)
CHOLESTEROL	30 (43%)	32 (58%)	62 (50%)
SODIUM*	17 (25%)	33 (60%)	50 (40%)
FIBER	26 (38%)	24 (43%)	50 (40%)
VITAMINS*	55 (80%)	19 (35%)	74 (60%)
IRON*	54 (80%)	15 (27%)	69 (56%)
CALCIUM**	42 (61%)	19 (35%)	61 (49%)

* $p<.001$
** $p<.01$
*** $p<.05$

APPENDIX H

Nutrition Knowledge and Understanding of Food Labels
WIC and Control Groups -- Responses to Questions

	WIC (n=69)	CONTROL (n=55)	TOTAL (n=124)
"***'No cholesterol'*** means ***'no fat'***"*	31 (45%)	48 (87%)	79 (64%)
"Health experts recommend that a maximum of **40%** of your daily calories comes from fat"***	26 (38%)	32 (58%)	58 (47%)
"As far as health is concerned, there is a difference between saturated and unsaturated fat"*	40 (58%)	49 (58%)	89 (72%)
"When a food label says ***'95% Fat Free'***, it means 5% of the calories in the product come from fat"***	13 (19%)	21 (38%)	34 (27%)
"If a food product is called ***'Low Fat'***, that means no more than 10% of its calories can come from fat"**	26 (38%)	9 (16%)	35 (28%)
"Chicken is a good example of a complex carbohydrate"*	11 (16%)	35 (64%)	46 (37%)
"Wheat bran and oatmeal are good sources of dietary fiber"	58 (84%)	51 (93%)	109 (88%)
"Dairy products are good sources of calcium"***	52 (75%)	50 (91%)	102 (82%)

"Some vegetable oils are higher in cholesterol than others"	10 (14%)	22 (18%)	22 (18%)

*$p<.001$
**$p<.01$
***$p<.05$

APPENDIX I

Nutrition Knowledge and Understanding of Food Labels
WIC and Control Groups

	WIC *(n=69)*	CONTROL *(n=55)*	TOTAL *(n=124)*
HIGH KNOWLEDGE (6-9 Correct)	9 (13%)	32 (58%)	41 (33%)
MODERATE KNOWLEDGE (4-5 Correct)	34 (49%)	18 (33%)	52 (42%)
LOW KNOWLEDGE (0-3 Correct)	26 (38%)	5 (9%)	31 (25%)

$p<.001$

APPENDIX J

Nutrition Knowledge and Understanding of Food Labels
Attitude Towards Understanding Food Labels

	EASY *(n=30)*	SOMEWHAT EASY *(n=61)*	SOMEWHAT DIFFICULT/ DIFFICULT *(n=26)*	MISSING *(n=8)*
HIGH KNOWLEDGE (6-9 Correct) *(n=41)*	10 (33%)	26 (43%)	5 (19%)	0 (0%)
MODERATE KNOWLEDGE (4-5 Correct) *(n=52)*	13 (43%)	26 (43%)	13 (50%)	0 (0%)
LOW KNOWLEDGE (0-3 Correct) *(n=32)*	7 (23%)	9 (15%)	8 (31%)	8 (100%)

$p<.001$

APPENDIX K

Nutrition Knowledge and Food Label Reading Frequency

	Frequency of Food Label Reading		
	ALWAYS	SOMETIMES	RARELY/ NEVER
HIGH KNOWLEDGE (6-9 Correct) *(n=41)*	29 (71%)	10 (24%)	2 (5%)
MODERATE KNOWLEDGE (4-5 Correct) *(n=51)*	29 (57%)	19 (37%)	3 (6%)
LOW KNOWLEDGE (0-3 Correct) *(n=29)*	13 (45%)	9 (31%)	7 (24%)

p<.05

APPENDIX L

Degree of Dietary Fat Knowledge vs. Factors Considered In Purchasing Food Products
All subjects

	GOOD KNOWLEDGE *(n=29)*	POOR KNOWLEDGE *(n=96)*
TASTE***		
Extremely Important	2 (7%)	31 (37%)
Somewhat/Not Important	27 (93%)	53 (63%)
HEALTHFUL		
Extremely Important	18 (62%)	50 (67%)
Somewhat/Not Important	11 (38%)	25 (33%)
NUTRITION INFORMATION		
Extremely Important	18 (64%)	45 (65%)
Somewhat/Not Important	10 (36%)	24 (35%)
"No Cholesterol" label		
Extremely Important	14 (48%)	15 (51%)
Somewhat/Not Important	15 (52%)	40 (49%)
"Low-Fat"/"Fat-Free" label		
Extremely Important	18 (63%)	43 (54%)
Somewhat/Not Important	10 (37%)	37 (46%)
LOOK FOR FAT ON A LABEL*		
Yes	24 (82%)	51 (53%)
No	5 (18%)	45 (47%)
LOOK FOR CHOLESTEROL ON A LABEL**		
Yes	19 (66%)	43 (45%)
No	10 (34%)	53 (55%)

* *p<.001*
** *p<.01*
*** *p<.05*

APPENDIX M

Frequently Cited Sources of Nutrition Information

	WC *(n=69)*	CONTROL *(n=55)*	TOTAL *(n=124)*
MEDIA (TV/Newspapers/Books)**	24 (35%)	34 (62%)	58 (46%)
FOOD LABELS	29 (42%)	23 (42%)	52 (42%)
DOCTORS	25 (36%)	24 (44%)	49 (39%)
FRIENDS, RELATIVES	24 (35%)	25 (45%)	49 (39%)
WIC COUNSELORS*	33 (48%)	1 (2%)	34 (27%)
ADVERTISING	13 (19%)	15 (27%)	28 (22%)
HEALTH CLAIMS	14 (20%)	14 (25%)	28 (22%)
NUTRITION CLASSES	10 (7%)	12 (22%)	22 (18%)

* $p<.001$
** $p<.01$

APPENDIX N

Nutrition Knowledge and Sources of Nutrition Information

	LOW *(n=32)*	MODERATE *(n=52)*	HIGH *(n=41)*
MEDIA (TV/Newspapers/Books)*	9 (28%)	21 (40%)	28 (68%)
FOOD LABELS	11 (34%)	22 (42%)	19 (46%)
DOCTORS	10 (31%)	20 (38%)	18 (44%)
FRIENDS, RELATIVES	9 (28%)	18 (35%)	22 (54%)
WIC COUNSELORS**	14 (44%)	20 (38%)	6 (15%)
ADVERTISING	3 (9%)	13 (25%)	12 (29%)
HEALTH CLAIMS	4 (13%)	14 (27%)	10 (40%)
NUTRITION CLASSES	4 (13%)	7 (13%)	11 (27%)

* $p<.001$
** $p<.01$

APPENDIX O

Food Labels Most Frequently Read *by Food Product*

	WIC *(n=69)*	CONTROL *(n=55)*	TOTAL *(n=121)*
Cereal	47 (68%)	41 (75%)	88 (71%)
Milk, yogurt, dairy**	48 (70%)	30 (54%)	78 (63%)
Margarines, Oils	41 (59%)	29 (53%)	70 (56%)
Frozen entrees**	32 (46%)	35 (67%)	67 (54%)
Snacks*	25 (36%)	40 (73%)	65 (52%)
Cheese***	40 (58%)	20 (36%)	60 (48%)
Meat, poultry, seafood*	45 (65%)	14 (25%)	59 (48%)
Soups	32 (46%)	26 (47%)	58 (47%)
Ice Cream	30 (43%)	27 (49%)	57 (46%)
Bread	30 (58%)	26 (36%)	56 (45%)
Frozen Yogurt	18 (26%)	21 (38%)	39 (31%)

* $p<.001$
** $p<.01$
*** $p<.05$

VITA

Patricia Michel received a B.A. in Biological Sciences from Wellesley College in 1981. She was a research assistant at the Nutrition Department of the Massachusetts Institute of Technology, under the supervision of Drs. Richard and Judith Wurtman. A career opportunity brought her into the computer field in the metropolitan Washington DC area. Her work in the many technical and marketing capacities was challenging, but as her keen interests in health, nutrition and athletics continued to grow, further study seemed the appropriate direction. In 1989, she entered the graduate program in Human Nutrition and Foods at Virginia Polytechnic Institute, where many of her studies have focused on public health policy and sports nutrition. She expects to receive a Masters of Science from Virginia Tech in December, 1992.