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The Importance of Nutrition Labels and Serving-Size Information in the Context of Overweight and Obesity

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This study provides a framework for describing the profiles of consumers who are more likely to use nutrition labels and to pay attention to serving-size information. In an online survey, food consumers were asked about the importance of nutrition labels and how often they read the serving-size information. Results from ordered logit models indicate that overweight people think that nutrition labels are important but they are less likely to pay attention to serving-size information, which may explain the overweight problem. Based on various demographic characteristics, the findings also show that food consumers do not always link the importance of nutrition labels and the frequency of reading serving-size information.

The epidemic of obesity, the second leading cause of preventable death in the U.S. after smoking, is an important health concern for adults, children, and adolescents in the United States. The CDC (Center for Disease Control and Prevention) estimates that American obesity rates lead the world with 30.5 percent of the U.S. population declared obese and 65.2 percent of U.S. adults and 15 percent of children declared overweight. Of particular concern are the increasing rates of overweight and obese people among all age groups, especially children, over the past three decades. CDC studies show a sharp increase in the rate of overweight and obese people in the 1980s. Reasons for this increase have been investigated by researchers. Young and Nestle (2002) indicated that portion sizes have grown by a factor of two to five since the early 1980s. These portion-size increases are especially true for burger, soft drink, and french fry servings. Additionally, increased consumption of food away from home raised the calorie intake. Variyam (2005) suggests that in 2002 the caloric intake of foods consumed away from home increased from 18 percent to 32 percent. These studies highlight the importance of nutrition labels and particularly of paying attention to serving-size information to decreasing the overweight and obese population rates in the US. This study contributes to the current literature by providing a framework for describing the profiles of consumers who are more likely to use nutrition labels and read serving-size information.

Due to new technologies, which have led to the discovery of the link between diet, health, and lifestyle, most of the production industries have been forced to take action to combat obesity and related health problems such as high cholesterol, heart disease, diabetes, etc. (Caswell and Mojduszka 1996). The most sustainable solution to a decrease in obesity and related health problems could be increasing the awareness of the importance of a healthy lifestyle. Healthy diet plays a crucial role in this lifestyle. People use many different sources, such as magazines, friends, doctors, and dieticians, to gather information about different foods. Nutrition labels and the health claims on the food packages are also an important source of information for consumers while making purchase decisions, especially because they are one of the convenient points of contact for the producer to reach the consumer. Food labels are often used by people who do grocery shopping, who are concerned about nutrition and health, or who are on a special diet. However, price-sensitive buyers and less-educated consumers are less likely to use food labels (Drichoutis et al. 2006). Household size has a positive effect on the use of nutrition labels, and males are less likely to use nutrition information on food packages (Nayga 1996). Consumers who pay attention to labels mostly concentrate on caloric, fat, or sugar content (Godwin, Speller-Henderson, and Thompson 2006). However, these numbers are given for a particular serving size, not for the whole package, so the consumer has to assess this information according to the amount she or he consumes. Serving

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This article is Journal Paper Number 08-04-136 of the Kentucky Agricultural Experiment Station.

size may be the part that is most often missed or ignored when the consumer evaluating the nutrition value of a product.

This research aims to investigate the degree to which consumers are paying attention to serving-size information and to analyze the relationship between label usage and consumers' demographics. Ordered logit models are estimated for the importance of nutrition labels and the frequency of reading serving-size information. The results show that consumers do not always link the importance of labels with reading serving-size information, which may partially explain the overweight problem.

Survey Questionnaire

A web survey was designed to determine the nutrition-label usage attributes of the consumers in Kentucky. The survey was conducted between December 2007 and February 2008. Participants were reached by using e-mail lists of the University of Kentucky. The questionnaire included 25 short-answer questions on nutrition label usage and a set of demographic questions. A total of 437 participants answered the survey. Observations with incomplete information on key variables were deleted, so the final sample includes 370 observations.

Respondents were asked two questions which were answered on a scale of 1 to 5. The first question asked the overall importance of nutrition labels on a personal basis and the second asked how often the respondent reads the serving-size information indicated on nutrition labels. The categories for the importance question were "not important at all," "somewhat unimportant," "undecided," "somewhat important," and "very important." Due to the small number of responses in the "not important at all" and "somewhat unimportant" categories the observations in these two categories were combined with the observations in the third category to form a new combined category, "not important." Therefore the importance of labels is analyzed in only three categories: "not important," "somewhat important," and "very important." The categories for the frequency of reading serving size question were "never," "rarely," "sometimes," "often," and "always." Because only a few participants claimed that they never read serving-size information, these answers were combined with the "rarely" category, so this variable has only our categories in the final analysis.

Table 1 shows the distribution of responses for dependent variables in each category. Table 1 also shows the demographics of the participants in the survey. The survey population is 79 percent female and 21 percent males, with an average age of 44. Possibly due to the high proportion of female participants, 86 percent of the survey sample population does grocery shopping for the household. Seventy-three percent of the participants claim that they are trying to limit calorie, fat, salt (sodium), or cholesterol intake. Twenty-one percent of the participants are on a weight-loss program, and ten percent say they are on a special diet. Sixteen percent have high cholesterol, and 22 percent of the participants are overweight. To the extent that the demographic characteristics in this study differ from those in the general population, the results here may not be representative of the behavior of U.S. consumers.

Model Specification

The importance of nutrition information and the frequency of reading serving-size information are measured on a scale that is discrete and ordinal; ordered multinomial models therefore will be estimated. The ordered logit and ordered probit models have been used extensively in the literature (Greene, 2007). For example, Zepeda and Li (2007) use the ordered probit model to study consumer preferences for organic foods. In this study, the ordered logit model is used with the ordered probit model producing similar results.

The ordered logit model is based on the following implicit function:

$$(1)\quad y_i^* = x_i'\beta + u_i,$$

where y_i^* is the unobserved choice of individual i, β is a vector of parameters, x_i' is a matrix of explanatory variables, and u_i is the error term. In the ordered logit model, u_i has the logistic distribution with a cdf $F(z) = \frac{e^z}{1+e^z}$. Following Cameron and Trivedi (2005), an m-alternative ordered model has $y_i = j$ if $\alpha_{j-1} < y_i^* \leq \alpha_j$, where $\alpha_0 = -\infty$ and $\alpha_m = \infty$. Then the probability that y_i will be classified in a particular category j is:

Table 1. Description and Means of the Variables.

Dependent variables			
Label importance category			
Respondent claims nutrition labels not important (6.22 percent)			
Respondent claims nutrition labels somewhat important (25.95 percent)			
Respondent claims nutrition labels very important (67.84 percent)			
Reading serving size			
Respondent rarely reads serving-size information (13.51 percent)			
Respondent sometimes reads serving-size information (26.22 percent)			
Respondent often reads serving-size information (34.59 percent)			
Respondent always reads serving-size information (25.68 percent)			
Independent variables		**Mean**	**SE**
Calorie[a]	Frequency of reading to calorie information	3.82	0.99
Weight loss	1 if respondent is on weight loss program, 0 otherwise	0.21	0.41
On special diet	1 if respondent is on special diet, 0 otherwise	0.10	0.30
Limitation	1 if respondent tries to limit certain intakes, 0 otherwise	0.73	0.44
Cholesterol	1 if respondent has high cholesterol problem, 0 otherwise	0.16	0.36
Diabetics	1 if respondent has diabetes problem, 0 otherwise	0.03	0.19
Heart disease	1 if respondent has heart disease problem, 0 otherwise	0.03	0.17
Overweight	1 if respondent has overweight problem, 0 otherwise	0.22	0.41
Obesity	1 if respondent has obesity problem, 0 otherwise	0.08	0.28
HH size	Household size	2.55	1.21
Children<18	1 if respondent has child under 18 years old, 0 otherwise	0.36	0.48
Male	1 if respondent is male, 0 if respondent is female	0.21	0.41
Age	Age of the respondent in years	44.48	11.92
Education[b]	Education level of the respondent	1.30	0.84
Income[c]	Annual household income before taxes ($ in thousands)	7.00	3.66
Shopper	1 if respondent does grocery shopping for household, 0 otherwise	0.86	0.33

[a] 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always.
[b] 0 = high school, 1 = BS degree, 2 = MS degree, 3 = PhD degree.
[c] Income information was collected with eight different categories; the average of each category is used.
Number of observations = 370.

$$(2)\quad Pr[y_i = j] = Pr[\alpha_{j-1} < y_i^* \le \alpha_j] = Pr[\alpha_{j-1} < x_i'\beta + u_i \le \alpha_j] = Pr[\alpha_{j-1} - x_i'\beta < u_i \le \alpha_j - x_i'\beta] = F(\alpha_{j-1} - x_i'\beta),$$

where F is the cdf of u_i. The regression parameters β and the $(m-1)$ threshold parameters $\alpha_1,\ldots,\alpha_{m-1}$ are obtained by maximum likelihood methods using Stata (Cameron and Trivedi, 2009). The signs of the regression parameters β can be interpreted as determining whether or not the latent variable y^* increases with the independent variables. The marginal effects are obtained as

$$(3)\quad \frac{\partial \Pr[y_i = j]}{\partial x_i} = \{F'(\alpha_{j-1} - x_i'\beta) - F'(\alpha_j - x_i'\beta)\}\beta,$$

where F' denotes the derivative of F. The term in braces can be positive or negative; therefore the signs of the coefficients do not necessarily correspond to the signs of the marginal effects.

The first model explains the importance of nutrition labels in three ordered categories: "not important," "somewhat important," and "very important." The second model explains the frequency of reading serving-size information in four categories: "rarely," "sometimes," "often," and "always." Descriptions and means of the variables used in the models are presented in Table 1.

Empirical Results

The estimated coefficients from the two ordered logit models are summarized in Table 2, the marginal effects for the label importance are given in Table 3, and the marginal effects for the frequency of reading serving-size information are reported in Table 4. The results indicate that nutrition labels are more important for individuals who read calorie and serving-size information more frequently. Respondents who read serving-size information more frequently are 18 percent more likely to claim that nutrition labels are very important. The marginal effect is only seven percent for people who read calorie information on nutrition labels more often. People who are diabetic need to monitor their food intake more carefully, so they are 24 percent more likely to say that nutrition labels are very important. People who do the grocery shopping for the household are 17 percent more likely to give high importance to labels. In this study, the importance of nutrition labels for women and for men are not significantly different, contrary to findings from previous studies.

Overweight consumers claim that nutrition labels on the packages are important, and they are nine percent more likely to claim that food labels are very important. However, in the second model this variable gives a negative coefficient. Overweight consumers are nine percent less likely to always read serving-size information, and are ten percent less likely to read it often. These two models indicate that overweight participants are more likely to say that nutrition labels are very important but they are less likely to pay attention to the serving-size information. These results can be used as an explanation for the overweight problem due to excess consumption of fat and sugar due to ignoring serving-size information.

The results for the frequency of reading the serving-size information indicate that consumers who read calorie information more frequently and for whom labels are more important generally are more likely to use serving-size guidelines. This is consistent with the previous model for the importance of nutrition labels. Participants who give importance to food labels are 12 percent more likely to always read serving-size information and are 17 percent less likely to sometime pay attention to serving size. Serving-size information is necessary to calculate the calorie intake properly, so consumers who pay attention to calorie content are 19 percent more likely to always read serving-size information and are 27 percent less likely to sometime use it. People who have heart disease need to be more careful about the healthiness of their diet; however, participants who have heart disease problems are 17 percent less likely to sometime pay attention to serving size.

Female consumers typically are more concerned about their diet and calorie intake. The results from this study show no significant difference between genders in their perceived importance of nutrition labels. However, the frequency of reading serving-size information for males has a negative coefficient. Marginal effects show that male consumers are 11 percent less likely to often read serving size and are nine percent less likely to always read it compared to female consumers.

An increase in the household size increases the frequency of using serving-size information. One

Table 2. Ordered Logit Analysis Coefficients

	Label-importance category		Reading serving-size category	
	Coefficients	SE	Coefficients	SE
Label importance	-----	-----	0.9092**	0.1970
Reading serving size	0.8859**	0.1690	-----	-----
Calorie	0.3258**	0.1603	1.4623**	0.0099
Weight loss	−0.0135	0.3386	−0.1080	0.1437
On special diet	0.1833	0.5560	0.1898	0.4313
Limitation	−0.0491	0.2923	0.3226	0.2560
Cholesterol	0.1928	0.3632	−0.364	0.2996
Diabetics	1.9548*	1.2130	−0.1639	0.6364
Heart disease	−0.5704	0.6859	1.1548	0.7222
Overweight	0.5007*	0.3114	−0.7852**	0.2458
Obesity	−0.4104	0.4535	−0.2649	0.3793
HH size	−0.1957	0.1602	0.2521*	0.1414
Children<18	0.4478	0.4181	−0.7409**	0.3463
Male	0.2572	0.3455	−0.8602**	0.3073
Age	−0.0209*	0.0119	0.0064	0.0099
Education	−0.0281	0.1652	−0.0950	0.1436
Income	4.96e-06	3.92e-06	−9.94e-07	3.33e-06
Shopper	0.7862**	0.3743	−0.2235	0.3495
Intercept 1	1.1656		7.0129	
Intercept 2	3.5167		9.3797	
Intercept 3	----		11.658	
N	370		370	
Pseudo R^2	0.1636		0.2490	

* implies statistically significant at 0.10 level.
** implies statistically significant at 0.05 level.

additional person in the household increases the probability of always using serving-size information by three percent. On the other hand, having children less than 18 years old has a negative marginal effect, as these respondents are nine percent less likely to always read serving-size information and 13 percent more likely to sometime use it.

Conclusion

This study was designed to determine the relationship between demographics—in particular, health problems such as overweight, obesity, and heart disease—and the importance of nutrition information and food-label use. The main goal of this study was to draw attention to the frequency of reading serving-size information shown on nutrition labels.

An important result of this study is that participants who consider themselves overweight think

Table 3. Ordered Logit Results for the Importance Level of Nutrition Labels.

	Not important		Somewhat important		Very important	
	Marginal effects	SE	Marginal effects	SE	Marginal effects	SE
Reading serving size	−0.0300**	0.0077	−0.1472**	0.0294	0.1773**	0.0331
Calorie	−0.0110*	0.0058	−0.0541**	0.0269	0.0652**	0.0320
Weight loss	0.0004	0.0115	0.0022	0.0564	−0.0027	0.0680
On special diet	−0.0058	0.0165	−0.0296	0.0873	0.0354	0.1038
Limitation	0.0016	0.0097	0.0081	0.0482	−0.0097	0.0579
Cholesterol	−0.0061	0.0110	−0.0312	0.0574	0.0374	0.0683
Diabetics	−0.0322**	0.0105	−0.2044**	0.0628	0.2367**	0.0701
Heart disease	0.0250	0.0382	0.1012	0.1259	−0.1262	0.1636
Overweight	−0.015*	0.0087	−0.0786*	0.0461	0.0937*	0.0541
Obesity	0.0163	0.0213	0.0715	0.0821	−0.0879	0.1030
HH size	0.0066	0.0055	0.0325	0.0266	−0.0391	0.0319
Children<18	−0.0144	0.0130	−0.0726	0.0659	0.0870	0.0785
Male	−0.0081	0.0103	−0.0415	0.0541	0.0497	0.0643
Age	0.0007*	0.0004	0.0034	0.0019	−0.0041*	0.0023
Education	0.0009	0.0056	0.0046	0.0274	−0.0056	0.0330
Income	−1.68e-07	0.0000	−8.25e-07	0.0000	9.94e-07	0.0000
Shopper	−0.0354	0.0225	−0.1389**	0.0682	0.1744**	0.0890
N	23		96		251	

* implies statistically significant at 0.10 level.
** implies statistically significant at 0.05 level.

that labels on food packages are important, but they are less likely to use the serving-size information on the labels. Drawing consumers' attention to the use of nutrition labels and serving-size information in order to make better decisions regarding a healthy diet may help in decreasing overweight and obesity rates and related health problems.

These findings can provide useful information to policy makers, agribusinesses, manufacturers and marketing professionals. Better understanding of consumer responses to nutrition labels and serving-size information may help niche marketing and thus improve market efficiency. It could lead to further consumer and producer benefits by broadening the communication channel through nutrition labels. Manufacturers, R&D and marketing departments can use the results of this study as a guide to increase the effectiveness of their food label innovations in the market.

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Table 4. Ordered Logit Results for the Frequency of Reading Serving-Size Information.

	Rarely		Sometimes		Often		Always	
	Marginal effects	SE	Marginal effects	SE	Marginal effects	SE	Marginal effects	SE
Label importance	−0.0438**	0.0114	−0.1664**	0.0388	0.0930**	0.0272	0.1173**	0.0265
Calorie	−0.0705**	0.0129	−0.2677**	0.0342	0.1495**	0.0010	0.1886**	0.0227
Weight loss	0.0053	0.0134	0.0198	0.0483	−0.0115	0.0293	−0.0136	0.0325
On special diet	−0.0085	0.0182	−0.0343	0.0770	0.0171	0.0337	0.0257	0.0616
Limitation	0.0166	0.0144	−0.0592	0.0472	0.0364	0.0321	0.0395	0.0298
Cholesterol	0.0017	0.0147	0.0066	0.0550	−0.0037	0.0317	−0.0046	0.0380
Diabetics	0.0084	0.0351	0.0301	0.1174	−0.0185	0.0788	−0.0200	0.0737
Heart disease	−0.0353**	0.0144	−0.1790**	0.0855	0.0071	0.0700	0.2072	0.1638
Overweight	0.0467**	0.0190	0.1417**	0.0435	−0.1012**	0.0386	−0.0872**	0.0247
Obesity	0.0141	0.0223	0.0487	0.0698	−0.0312	0.0504	−0.0316	0.0419
HH size	−0.0121*	0.0070	−0.0461*	0.0262	0.0257*	0.0153	0.0325*	0.0184
Children<18	0.0396*	0.0214	0.1343**	0.0621	−0.0844*	0.0446	−0.0896**	0.0399
Male	0.0526**	0.0245	0.1542**	0.0532	−0.1130**	0.0492	−0.0938**	0.0291
Age	−0.0003	0.0004	−0.0011	0.0018	0.0006	0.0272	0.0008	0.0012
Education	0.0045	0.0069	0.0174	0.0263	−0.0097	0.0148	−0.0122	0.0185
Income	4.79e-08	0.0000	1.82e-07	0.0000	−1.02e-07	0.0000	−1.28e-07	0.0000
Shopper	0.0100	0.0146	0.0404	0.0624	−0.0199	0.0268	−0.0305	0.0504
N	50		98		128		95	

* implies statistically significant at 0.10 level.
** implies statistically significant at 0.05 level.

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