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Food Marketing Policy Center

Identifying Consumer Preferences for Nutrition Information on Grocery Store Shelf Labels

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Abstract Nutrition labels can potentially benefit consumers by increasing product knowledge and reducing search costs. However, the global increase in obesity rates leads one to question the effectiveness of current nutrition information formats. Alternative formats for providing nutrition information may be more effective. Shoppers at a major grocery chain participated in choice experiments designed to identify preferences for nutrition information provided on grocery store shelf labels. Shoppers demonstrate a strong affinity for shelf label nutrition information and the presentation of the nutrition information significantly affects their preferences as well. Several demographic variables help to explain differences in preferences.

Keywords: nutrition information, grocery stores, labels, consumer preferences

1. Introduction

Nutrition labels are intended to inform shoppers of the nutritional content of the food items they purchase. Most shoppers are unable to identify the nutritional content of packaged food without nutrition labels. The provision of nutrition labels increase shopping efficiency and make shoppers better off (Golan et. al., 2001). The U.S. Nutrition Labeling and Education Act (NLEA) of 1990 standardized the provision of nutrition information in the United States and led to the creation of nutrition facts panels found on all manufactured food items. Since implementation of the NLEA, shoppers have been provided an increasing amount of alternative nutrition labels by manufacturers, grocery stores, and other interested parties. For example, Kraft Foods uses its *Sensible Solution* label to identify healthy food items, while the American Heart Association has a heart-check mark label to identify foods that are good for one's heart.

Previous research generally suggests that nutrition labels and nutrition information are effective at altering consumer behavior. Derby and Levy (2001) report that nutrition information leads consumers to alter their purchasing decisions. Shoppers demonstrate a higher willingness to pay for cookies with nutrition labels (Loureiro, Gracia and Nayga, 2006) and change their purchases of cereals after being informed of their various health benefits via advertising and health claims (Ippolito and Mathias, 1993). Shine, O'Reilly, and O'Sullivan (1997) find that shoppers use nutrition labels to avoid specific nutrients, and both Burton and Biswas (1993) and Russo et. al. (1986) find that information on undesirable nutrients such as fat and cholesterol decreases the likelihood of purchase. More recently, Variyam (2009) finds a modest but significant impact of nutrition facts panels on dietary intake after accounting for expenditures on food consumed away from home.

There may be limitations to the effectiveness of certain types of nutrition labels. Consumers must be capable of processing the nutrition information, suggesting that labels requiring calculations may not be useful (Levy and Fein, 1998). Eves et. al. (1994) find that strong interest in labels is not always matched with an understanding of the quantitative information, and that shoppers may be influenced by qualitative information more than quantitative. Although Derby and Levy (2001) find evidence that nutrition labels alter behavior, they still find that consumers experience difficulty distinguishing between nutrient claims and health claims.

The consumer's cost of processing nutrition labels limits their effectiveness. Shoppers facing time constraints, an extensive list of items to purchase, or a broad range of products to evaluate may find it too costly to examine nutrition facts panels. Given that the benefits of a healthy diet are generally realized over time with consistent effort, shoppers may be likely to prefer the immediate gratification of unhealthier foods with more preferred taste (Drichoutis et al., 2006; Teisl et al., 2001).

Clearly the format used to present nutrition information influences its effectiveness as well. Concurrent with the introduction of nutrition facts panels (NFP), extensive research was conducted examining the effectiveness of different label formats. Levy et al. (1996) compared the presentation of seven label formats and their influence on consumer ability to evaluate nutritional content. They find that the way information is presented on labels as well as the type of information had an effect on comprehension of the information and preferences for the presentation of information.

The long-term trends in obesity lead one to question the effectiveness of nutrition facts panels and other nutrition labels at motivating shoppers to make healthier choices. Alternative

formats for providing nutrition information that is easier for shoppers to use may be preferred and more effective. Grocery store shelves may be an ideal location to provide shoppers with nutrition information. Grocery store shelf labels typically display product name, price and unit price and are already utilized by shoppers. Viswanathan (1994) notes that summary information facilitates the use of nutrition labels and visual presentations lead to a greater degree of use than numerical presentations. Wansink (2003) shows that claims on the front of packages combined with longer, more detailed claims on the back of packages increases the credibility of message and consumers ability to process the message. Wansink et al (2004) find that short health claims on the front of packages help communicate positive product attributes. The provision of nutrition information on store shelf-labels may complement nutrition facts panels or be used by shoppers to screen a large number of choices. Feunkes et al. (2008) also suggest that simple labels may be more useful in quick decision environments as consumers need less time to evaluate simpler, front-of-pack labels versus more complex labels. In addition, Levy et al. (1996) note that although people claim to want large amounts of information, this leads to poor comprehension and usage of information. Simpler nutrition labels provided on grocery store shelf labels could provide useful information to shoppers.

Recently, a regional U.S. grocery chain began to include on their shelf labels a scoring of the nutritional quality of the food item. The grocer reports that their shelf label nutrition information has been successful in directing consumers to healthier choices (Martin, 2007). Previous studies examining similar types of shelf label nutrition information also suggest an effect on consumers. Levy et al (1985) find an increase in the sales of items marked with labels identifying low sodium, cholesterol, fat, and calories. Teisl et al, (2001) use consumer expenditure data from a store experiment in which nutrition information was provided on

grocery store shelf labels. Their analysis suggests that nutrition information on shelf labels influenced shoppers to increase their purchases of healthy foods but also to substitute across food categories, maintaining some level of consumption. Consumers appear to use nutrition information to maintain an overall level of health risk while increasing satisfaction from other food attributes. These studies were conducted prior to the introduction of the NLEA. As such, current shoppers face a different shopping environment.

The United Kingdom recently adopted a voluntary traffic light system (TLS) labels for the front of food product packages. Food products with TLS labels indicate with minimum consumer processing time whether the food has high, medium or low amounts of fat, saturated fat, sugars and salt. While there has been some criticism of the TLS as being overly simplistic, a recent study finds that consumers were more likely to identify healthier foods using the TLS (Kelly et al., 2009). At the same time, Gracia et al (2009) compare Spanish shoppers' willingness to pay for a box of breakfast cookies with a nutrition facts panel and box with a single nutritional claim. While shoppers have a positive willingness to pay for both types of nutrition information, they are willing two pay nearly twice as much for the box with a nutrition facts panel. Clearly, more research is required regarding nutrition labels.

The current article examines shopper preferences for nutrition labels provided on grocery store shelf-labels. Considering the increased awareness of nutrition and the advocacy for healthier choices, it is likely that grocery store nutrition labels will become more widespread. It is important to understand how consumers respond to such information. To our knowledge, this is the first study that examines consumer preferences for this type of nutrition label since the introduction of nutrition facts panels.

For the purposes of this analysis, several grocery store shelf labels were designed with varying displays of product price, unit price, and nutrition information. Consumer preferences for the different label attributes were elicited with choice experiments. The responses are analyzed by estimating a random parameters logit (RPL) model. The results highlight the importance of identifying specific market segments, especially when it comes to providing product information. Providing shoppers with nutrition information in a preferable format may lead to higher likelihood of use. Offering nutrition information on shelf labels may also be strategic for stores to lead to store loyalty. Grocery stores interested in using shelf label nutrition information should consider targeting specific demographic groups with labels on specific products.

2. Material and methods

2.1 Shopper Preferences

The use of nutrition information by shoppers is determined by the tradeoff of gaining product knowledge versus expending time acquiring and processing nutrition information. Shoppers face different costs to acquiring and processing information. As such, shelf label nutrition information will not appeal to every shopper but may be very useful to specific market segments. A person who shops for a large household faces different constraints than a single person or an occasional shopper. Additionally, consumers have different abilities which may determine their consumption of nutrition information. Based on the literature, we attempt to identify specific demographic characteristics that influence shopper preferences for nutrition information.

Shoppers who perform the majority of the household shopping are expected to prefer nutrition labels since they reduce time and effort. In the literature, however, it is interesting to note that while consumers who perform the majority of grocery shopping tend to use nutrition information (Kim et al., 2001), the major meal planner is found to use nutrition information less (Drichoutis et al., 2005). Drichoutis et al. (2006) argue that meal planners may be more interested in taste than nutrition.

The research findings on the effect of household size on nutrition label use are also mixed. Govindsamy and Italia (1999) and Drichoutis et al. (2005) suggest a negative relationship, while Nayga (1996) and Wang et al. (1995) find a positive relationship. In terms of nutrition information on shelf labels, one might expect that the larger the household, the more positive the response to nutrition labels since larger households are more likely to have members with dietary restrictions. Additionally, larger households consume more food items, and therefore must make a larger number of decisions, possibly contributing to more diverse tastes. At the same time, consumers from larger households with larger shopping lists may grow tired of looking at shelf label nutrition information. Shoppers with extensive shopping experience may rely more on their accumulated product knowledge.

There are mixed findings on the effect of income on the search for nutrition information as well. Kim et al. (2001),, McClean-Meyinsse (2001) and Wang et al. (1995) find a positive effect, whereas Schupp et al. (1996) find a negative effect. From a theoretical perspective, it is not clear how income should affect the acquisition of product information. High-income consumers have a greater opportunity cost and therefore might use nutrition labels to reduce search efforts. Alternatively, given a large opportunity cost of time, high income earners may avoid nutrition labels altogether. Some studies show that females are more likely to search out

nutrition information (Kim et al., 2001a and 2001b); McClean-Meyinsse, 2001; Govindsamy and Italia, 1999). However, Nayga (2000) finds that after accounting for nutrition knowledge, there are no differences between males and females concerning the use of nutrition labels.

Older consumers may have a greater incentive to monitor their health, which would positively influence use of shelf label nutrition information. Many studies support this claim (Coulson, 2000; Govindsamy and Italia, 1999; Nayga, 1996). If older consumers also work less, they may be able to allocate more time to acquiring label information. Difficulty in processing new or additional information, however, may come with age, leading to reduced use of shelf label nutrition information (Burton and Andrews 1996). Further, older consumers may be more inclined to remain with certain purchasing habits, resulting in a decreased probability of using nutrition labels (Kim et al., 2001).

Diet-health awareness has been found to positively affect the search for nutrition information (Kim et al., 2001; Szykman et al., 1997; Nayga, 2000). At the same time, nutritionally conscious shoppers may already have enough product knowledge to be able to identify healthier choices. Additionally, nutritionally conscious shoppers may purchase more fresh foods, and therefore have little need for shelf labels identifying processed foods.

Previous research finds higher levels of education associated with a greater use of nutrition labels (Drichoutis et al., 2005; Kim et al., 2001; McClean-Meyinsse, 2001; Wang et al., 1995). This does not, however, indicate that shoppers with less education do not use nutrition labels (Drichoutis et al., 2006). For one, educational attainment does not always imply nutritional knowledge although the two are undoubtedly correlated to some degree. Additionally, taste preferences often trump nutrition and health considerations.

2.2. Choice Experiments

Choice experiments were administered in order to estimate shoppers' preferences for nutrition information provided on shelf labels. While most choice experiments examine preferences for physical attributes, the focus of this analysis is on preferences for information. Specifically, three sources of label information are examined: price, unit price, and nutrition information. In conducting the choice experiments, color images of shelf labels were displayed below a picture of a food product. On the shelf label images, the variations include the presentation of price information (low and high prominence), unit price (low and high prominence), and nutrition information (not present, low and high prominence). High prominence refers to a larger, bold font and low prominence refers to a smaller sized, standard font. The nutrition information describes the product using the terms *Fat Free, Saturated Fat Free,* and *Cholesterol Free*. These claims are based on NLEA standards for characterizing levels of total fat, saturated fat, calories, cholesterol, sugar, and sodium; however, survey participants were not explicitly informed of the source of the nutrition claims.[1]

There are 12 total possible labels (2x2x3) which are used to create the choice experiments. Three labels with varying attributes are shown in Figure 1. Selecting from the 12 different labels, our survey has 16 choice experiments comprised of four labels per experiment.[2] The fourth choice is the same in all of the experiments: a label with high prominence price and unit price information and no nutrition information. The constant choice label closely resembles

1. Since survey participants were not explicitly informed of the source or reliability of the nutrition claim, preferences may include individual levels of trust. These choice experiments are designed to test preferences for nutrition information provided on shelf label information, and not a specific source of information. If these labels cause survey participants to be skeptical, then preferences may be biased downward.
2. Based on pre-study trials conducted with 100 undergraduate marketing students, 16 experiments was short enough to avoid fatiguing participants while still providing an adequate number of observations for analysis.

the current label of the store where the survey was conducted and provides survey participants the option of selecting no change in label appearance. The choice experiments were created by maximizing the D-efficiency score which is a function of the information matrix used to calculate variance. Maximizing the D-efficiency score minimizes the variance of the estimates and improves efficiency. Survey participants were asked to view each set of four labels and select the one label they prefer most from each set.

[Insert Figure 1 about here.]

Pre-tests were conducted with masters of business administration (MBA) students to identify appropriate shelf label designs in which unit price information and nutrition information could be effectively manipulated. In the first pre-test, a sample of participants (N = 363) rated a series of eight shelf labels, which were developed for the purpose of this research and based on current shelf labels at a national grocery chain. Based on results, label designs were revised and then pre-tested again (N = 97) to ensure that the prominence manipulations could be detected by consumers.

The data was collected over a three-day period in November 2006 in the East San Francisco Bay area of California.[3] The participants were solicited outside a national grocery store chain at three different locations as they entered or exited. This is a convenience sample of consumers who were shopping for food while they were approached. No randomization procedure was used to select participants. By collecting data from consumers at the same time and place where actual purchase decisions are made, we hoped to better elicit consumers' true preferences about the products. As in all studies utilizing sample data, representativeness of the

3. Interviewers took care to prevent participants from taking the survey more than once. The full survey included more than just the choice experiments and therefore took about 15 minutes to complete. The time requirement also acted as a deterrent to shoppers from taking multiple surveys. The choice experiment alone took less than five minutes to complete.

sample is a concern. In order to achieve better sample representation of the population, we worked with the retail chain to choose the store locations where the data would be collected. The survey locations were a low income area (location 1), a medium income area (location 2) and a high income area (location 3).

Upon completion, participants were given a $10 grocery store gift card. A total of 600 surveys were administered and 403 surveys were completed.[4] The majority of the surveys were administered at the medium income location, to U.S. citizens, and to California residents. The respondents were predominantly female, had an average age of 40.6 years and did the majority of household shopping (Table 1). Just over one fourth of the sample had some college education, and the percentages in each annual household income range were uniformly distributed.

[Insert Table 1 about here.]

We collected self-reported levels of nutrition consciousness for each participant. We define nutrition consciousness in terms of how likely a person is to pursue a healthy diet. Survey respondents are asked nine seven-point Likert scale questions (see the Appendix). The value of each question is then summed to arrive at a nutrition consciousness score. If more than two nutrition questions were not answered, the nutrition score was not included. If two or fewer questions were unanswered, the mean value of the answered questions was used to fill in the blank responses.[5] The Cronbach alpha score, which identifies how well a set of questions identify a latent construct, was 0.93 indicating that the 9 questions offer a fairly consistent measure of the survey participants' perceptions of their own nutrition consciousness.

4. Only 13 surveys were not fully completed. However, far more surveys had incomplete demographic information. These experiments were removed to avoid biasing the results.
5. In calculating the nutrition consciousness score, 45 surveys participants left one of the nine questions blank and twelve participants left two of the nine questions blank.

Using the Likert scale items to form the nutrition consciousness score treats the ordered responses as interval responses, therefore implying a linear latent variable. While this is a common procedure, it assumes more information than is actually provided by the Likert responses. Alternative formations could be used instead. For example, one could combine responses into nominal groups, such as agree and disagree responses to reduce the data.[6] For the purpose of this study, we use the summed Likert scale as an approximation to the latent variable, nutrition consciousness. The primary reason is that while our measurement of nutrition consciousness may not be an interval, the underlying latent variable is an interval. The difficulty is that while respondents have varying levels of nutrition consciousness, they are not able to identify themselves using an interval scale. We choose to approximate their level of nutrition consciousness using a summation of Likert scale questions. The summation does not perfectly correspond to the ordinal values, but the ordinal values are at least monotonically increasing. Additionally, since all the Likert items used the same scale and provided a visual reference to the scale, we do not expect the interval approximation to be overly ambitious. This does highlight a need in this type of research to develop methods to measure underlying values such as nutrition consciousness more effectively.

3 Theory and Estimation

We assume that each consumer selects his or her most preferred label from the group of four labels based on the different label attributes. The attributes being studied are the presentation of price, unit price, and nutrition information.[7] We also examine how different

6. We thank an anonymous reviewer for offering this alternative.
7. Dummy variables are used to code the label attributes price and unit price (0 for high prominence, 1 for low prominence). A negative coefficient for price or unit price implies a

demographic variables identify preferences for the presentation of nutrition information. To this end, we specify the following non-stochastic utility to identify consumer preferences for the label attributes:

$$V_{njt} = \beta_1 price + \beta_2 unit\ price + \beta_3 low\ prom\ nutr + \beta_4 high\ prom\ nutr \quad (1)$$

$$+ \begin{pmatrix} low\ prom\ nutr \\ + high\ prom\ nutr \end{pmatrix} \times \begin{pmatrix} \beta_5 + \beta_6 age + \beta_7 education + \beta_8 gender + \beta_9 household\ size \\ + \beta_{10} income + \beta_{11} nutrition\ conciousness + \beta_{12} shopping\ \% \\ + \beta_{13} household\ size \times shopping\ \% \end{pmatrix}$$

$$+ \beta_{14} price \times low\ prom\ nutr + \beta_{15} price \times high\ prom\ nutr$$

$$+ \beta_{16} unit\ price \times low\ prom\ nutr + \beta_{17} unit\ price \times high\ prom\ nutr\ .$$

Where V_{njt} is the non-stochastic utility that person *n* derives from the attributes of label *j* at time *t*. The first four terms in Equation 1 capture main effects of the specific types of label information. The coefficients $\beta_5 - \beta_{13}$ capture the differences in preferences based on specific demographic variables.

The coefficient β_{13} is estimated to determine whether shopper preferences for the shelf label nutrition information are affected by costs of time. Shoppers from large households who must perform a large amount of shopping may have little time to allocate for acquiring nutrition information. If this is indeed the case, we might expect estimates of β_{13} to be significantly

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negative preference for the low prominence presentation. The nutrition information was coded using effects coding: low nutrition information was coded 1 and 0; high nutrition information was coded 0 and 1; no nutrition information was coded -1 and -1. Effects coding allows the recovery of the base value of the attribute by multiplying the marginal value for low and high by -1 and adding the two values together. Further, effects coding separates out the value of the dummy variable from the constant term.

negative. Alternatively, large households often include children, and parents may be more concerned about their children's nutritional intake.

Four coefficients $(\beta_{14},\ldots,\beta_{17})$ are estimated to determine if the different types of information provided on shelf labels compete with each other. For example, it may be that the presentation of high prominence nutrition information detracts from the presentation of price information and is therefore not preferred. As such, β_{15} would be significantly negative. Alternatively, the presentation of unit price, for example, may complement the presentation of high prominence nutrition information, and therefore β_{17} would be significantly positive.

To estimate the model described in Equation 1, we implement a random parameters logit (RPL) model. In the RPL, a person's utility is described with a random utility function, which is comprised of both a stochastic and non-stochastic component, such that: $U_{njt} = V_{njt} + \varepsilon_{njt}$. The non-stochastic utility (equation 1) is comprised of person *n*'s preferences (β_n) for the choice attributes (x_{njt}). The random component of utility (ε_{ij}) is assumed to be independently and identically distributed with a type 1 extreme value distribution (which allows for the characterization of the logit formula). Utility can then be specified as: $U_{njt} = \beta_n' x_{njt} + \varepsilon_{njt}$. To estimate the RPL model, a distribution of preferences must be specified. The result is an estimate of preferences described by a population mean *b* and an estimate of stochastic difference in taste η_n such that $\beta_n = b + \eta_n$. The RPL model can be usefully expressed as: $U_{nij} = x_{nij}' b + x_{nij}' \eta_n + \varepsilon_{nij}$. Improved performance in terms of the RPL comes from separating individual deviations from the population mean from the random errors. In contrast, the standard logit combines both types of errors into one term, losing explanatory power. Additionally, with

the RPL, it is not necessary to make the assumption of independence of irrelevant alternatives (IIA).

To investigate possible correlation among preferences for attributes we specify β_n to be distributed (b,Ω) so that $\beta_n = b + L\mu_n$ where L is a lower-triangular Choleski factor: $LL' = \Omega$. Accounting for any correlation should improve the estimates and provide additional insight into consumer preferences.

3.1 *Estimation Procedures*

Three alternative specific constants (ASCs) are included to ensure that the model error, ε_{njt}, has a mean of zero. An ASC is designated for each of the four choices in a set to capture the average effect on utility of factors not explicitly included in the model. Since only differences in utility matter in a random utility framework, the three ASCs are calculated relative to one constant choice, in this case, the fourth label. The estimated coefficients of the three ASCs represent the average affect of utility of a given choice relative to the fourth label.

The surveys were collected at three different locations. If there is a systematic difference in the unexplained utility between the locations, this can be accounted for using a scaling parameter. The scaling parameter is not identifiable for any location, but it is estimated as a relative value (Swait and Louviere, 1993). This is accomplished by setting the scaling parameter to one for a base group and estimating the scaling parameters of the other groups relative to the base group using an artificial nested logit (Adamowicz et al, 1998). Location 1 is designated as the base location and has a scaling parameter of 1. Location 2 has a scaling parameter of 0.99, suggesting that the unexplained variance in locations 1 and 2 are fairly similar. Location 3, the largest sample population, had more unexplained variance than location 1 as indicated by the

scaling parameter of 0.84. Once the scaling parameters are estimated, they are used to scale the data from each location before all of the data are pooled together.

4. Results

As an initial step, a multinomial logit was used to estimate our model. The mean coefficients of the RPL model were larger than the multinomial logit values, suggesting the RPL performs better by explaining more of the stochastic error term. Consequently, only the RPL results are discussed.[8] A base RPL model is estimated specifying just the four label attributes: *price, unit price, low prominence, and high prominence nutrition information* (see Table 2, columns 1 and 2). The results of the base model RPL indicate a relatively large dispersion of preferences for price, unit price, and the low prominence information.

The low-prominence price information has a negative mean value of -0.8 and an estimated standard error of 1.86. Assuming normally distributed preferences, these values indicate that approximately 33 percent of the population has positive preferences for the low prominence price information. Similarly, the mean estimate for unit price is -0.97, and the standard error is 1.84. This indicates that roughly 30 percent of the population has positive preferences for low prominence unit price information. The estimates for the low-prominence nutrition information (the mean is -0.4, and standard deviation is 0.92) indicate that 33 percent have positive preferences. Alternatively, the estimate for the high prominence nutrition information indicates a relatively low dispersion of preferences with only 19 percent of the population having negative preferences, assuming a normal distribution with a mean of 2.52 and standard error of 2.93. Demographic characteristics are included in an attempt to explain some

8. For this article, the models were estimated with Limdep's NLOGIT 3.0.

of the variation of the preferences. With a 16 income levels and eight education levels, it is difficult to solve the RPL model with a dummy variable for each category. To facilitate convergence, we group income into three groups. Income group 1 includes household income from $0 to $25,000, group 2 includes household income from $25,001 to $70,000 and group 3 includes income from $70,001 to $120,000. The base income group represents households with income over $120,000. Similarly, education group 1 includes high school graduates and some college, group 2 includes two-year and four-year college graduates, and group 3 includes some graduate school and graduate degrees. The base education group contains respondents with some high school or less.

The full model, which includes several demographic variables interacting with the low and high-prominence nutrition label indicators (see Table 2, columns 3 and 4), identifies much of the dispersion of preferences found in the results of the base model. The price and unit price variables are still statistically significant with relatively similar magnitudes compared to the base model. The low and high-prominence nutrition information main effects terms both switch signs. Including the calculated effects of the interaction terms, however, results in similar findings as the base model. For instance, the high-prominence nutrition information has a significant positive interaction with the following variables: shopping percentage, household size, gender, nutrition consciousness score, and some of the income groups. This dominates the negative sign of the main effect term. Similarly, many of the low-prominence nutrition information interaction terms are negative, suggesting that most individuals derive negative or zero utility from the low prominence information.

[Insert Table 2 here.]

In this study, we find that consumers who perform a greater percentage of shopping have positive preferences for the high prominence nutrition label. Those who perform a large percentage of shopping may not be the primary income provider, thus their time restriction may be less binding. We find a positive interaction with household size as well. Large households have a large grocery list and therefore may benefit from more efficient search procedures. The three-way interaction of high-prominence nutrition information, percentage shopping, and household size is significantly negative, indicates a diminishing utility to the high prominence information. This may indicate that there is a time restriction that affects consumer preferences for acquiring nutrition information. However, the three-way interaction with the low-prominence nutrition information is significantly positive, suggesting that consumers in large households who shop a lot prefer less prominent information. It may be the case that frequent shoppers rely on their accumulated knowledge and habits for their nutrition information. Nutritional content of food changes infrequently, while product prices change often due to promotions/sales and price increases/inflation.

The interaction of both low and high-prominence nutrition labels with some income groups was significant. However there is no clear indication of how preferences for the nutrition labels increases or decreases with household income. This could be due to the fact that survey respondents are often unaware of their true household income. The literature also has mixed findings on the impact of income. The interaction of gender with the high-prominence nutrition label is significant. In previous analyses (not included) gender differences disappear after accounting for nutrition consciousness, consistent with other findings in the literature. The overall effect of age is not significant.

We find that nutritionally conscious shoppers have positive (negative) preferences for the high (low)-prominence nutrition information (the low-prominence interaction is significant at p=.10). The finding that shoppers who identify themselves as nutritionally conscious also have positive preferences for prominent nutrition information is fairly intuitive. The negative effect of low-prominent nutrition information suggests that nutritionally conscious consumers also pay attention to the display of information provided. It is important to note that the measure of nutrition consciousness does not explicitly measure actual nutritional knowledge or motivation for health maintenance. As such, the nutrition consciousness term only reflects how survey participants perceive themselves, or perhaps how they want to be perceived. Further, preferences for nutrition information may be moderated by nutritional knowledge or other characteristics which are not included in this analysis.

None of the education groups are statistically significant. The majority of the literature suggests that higher levels of education correspond with increased use of nutrition labels. Our results highlight the difference between preferences for information and the use of information. In this case, the level of educational attainment does not seem to matter. The effect of the interaction of low prominence unit price information with low prominence nutrition information suggests possible complementarity between the two types of information. None of the other price or unit price interaction terms were significant.

The correlation between parameters estimates were calculated based on the covariance matrix of the full model (see Table 3). Of primary interest is the correlation between the low-prominence nutrition information and the high-prominence nutrition information. The negative correlation suggests that a share of the consumers who derive positive utility from the high prominence label also have disutility from the low prominence label. This provides more

evidence that not only does the type of information matter, but the presentation of the information as well.

[Insert Table 3 about here.]

The correlation estimates also reveal positive correlation between preferences for high prominence nutrition information and the high prominence unit price information and a positive correlation with preferences for high prominence price information. Similarly, preferences for the low prominence nutrition information are positively correlated with low prominence unit price information and high prominence price information. This may suggest two different types of survey respondents: those who are primarily interested in price information and derive low utility from the other types of shelf label information and those that prefer more prominent and useful product information and derive utility from the high prominence nutrition information and the unit price information, the latter being a more useful measure of product cost than price.

The results highlight the importance of the presentation of nutrition information, contrasting easier to read information with more difficult to read information. Additionally, significant demographic variables reveal the importance of the presentation of nutrition information for certain demographic groups. Specifically, those shoppers who are constrained for time (i.e. shop a lot, have larger households) prefer easier to read nutrition labels. The effect of time constraints on the use of nutrition labels is intuitive. These results demonstrate one example of time constraints impacting preferences for nutrition information as well. While the nutrition consciousness score is limited, the significant effect emphasizes the importance of identifying consumer motivation and awareness of health and nutrition.

5. Conclusions

This article finds positive consumer preferences for the provision of nutrition information on grocery store shelf labels. The results suggest that stores and shoppers can both benefit from the provision of shelf-label nutrition information. Store and shopper incentives may be aligned in that grocery stores providing nutrition information on shelf labels may increase their sales of healthy items by directing shoppers who are seeking healthy items to those products with shelf label information. Additionally, given the presence of shelf labels that identify specific product attributes, consumers may effectively signal their preferences for nutritional quality through their purchases; therefore stores may also be able to identify consumer preferences for different types of food products. For example, if purchases of low-sodium products increase after shelf-labels are affixed identifying low sodium products, stores may choose to increase their product offering of low sodium foods.

There are concerns that this type of advertising can lead to price discrimination. That is, if quality specific products which are identified by shelf labels appear to be preferred by shoppers, stores may have an incentive to raise prices. There could be a first-mover advantage for stores who take the initiative and begin displaying shelf label nutrition information. Shelf labels may add value to the shopping experience and therefore be useful in generating store loyalty. Stores offering nutrition information may appear to be interested in shopper well-being and thus may elicit more purchases. Of course, the nutrition information must be credible and not just a strategic move to direct consumers to specific products. Reliability of shelf label nutrition information is an important consideration. Ultimately, stores that do not provide shelf label nutrition information may be at a disadvantage.

The distribution of preferences for shelf-label nutrition information across demographic groups reveals how important it is for stores to understand the composition of their cliental as well. Certain consumer segments may derive greater value from certain types of shelf label labels. In our sample, for example, we were able to identify that nutrition conscious consumers prefer the high-prominence nutrition labels. Given such shoppers, it may be advantageous to label high quality or healthy food products; that is, those foods that nutritionally conscious consumers purchase.

From a policy standpoint, it is important to note that we only examine the positive provision of information. Products that have low fat could also have excessive salt or sugar, but the detailed nutrition label format used in this study only provides positive information. Shoppers might react differently to nutrition labels that provide negative claims such as 'high in fat' or 'high in cholesterol'. Since shelf labels are voluntary, however, stores will not post negative information about products they are trying to sell. In the extreme, unhealthy foods could be required to have warning labels such as those on cigarette packages.

In the future, this type of labeling could be an effective tool for addressing health issues in the food away from home (FAFH) category. Providing short nutrition claims on fast-food wrappers or on restaurant menus could be a relatively unobtrusive method of informing consumers of healthy choices. Already many restaurants identify healthy menu items. Nutrition information provided on FAFH based on FDA standards could offer a greater sense of reliability.

There are several limitations to this study. The method for measuring nutrition consciousness in this study was employed because the venue for collecting data required an easy to perform procedure. Measuring and understanding individual levels of nutrition consciousness can be difficult. This is especially so with surveys or quasi-experiments which are restricted by

time and other resources. Future research may benefit from improved measures of latent demographic variables such as nutrition consciousness. In terms of the experiment, there are at least two important limitations. First, the influence of the nutrition facts panels was not included. Although this was intentionally done to isolate the effect of the grocery store label, it may have been instructive to include a treatment with nutrition facts panels included. Second, this analysis was performed using one product. Certain products may elicit different responses to nutrition labels. For example, shoppers may have negative preferences for nutrition labels on treats such as ice-cream or candy. Future research on a variety of products under different circumstances would be beneficial.

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7. TABLES

Table 1.

Characteristics of Survey Respondents

demographic	mean	st. deviation
age (years)	40.6	16.2
gender (female)	64.5%	--
household size	3.31	1.67
household shopping performed	65.0%	32%
nutrition conciousness score	44.1	12.7

educational level	percentage	educational level	percentage
grade school	3.0%	2-year associate degree	10.4%
some high school	8.2%	4-year bachelor degree	15.6%
graduated from high school	16.4%	some graduate school	6.7%
some college	29.0%	graduate degree	10.7%

annual household income (gross)	percentage	annual household income (gross)	percentage
$0-5,000	6.7%	$50,001-60,000	6.7%
$5,001-10,000	5.5%	$61,001-70,000	5.0%
$10,001-15000	4.0%	$70,001-80,000	5.2%
$15,001-20,000	3.0%	$80,001-90,000	6.9%
$20,001-25,000	4.5%	$90,001-100,000	5.5%
$25,001-30,000	6.7%	$100,001-111,000	6.9%
$30,001-40,000	11.4%	$110,001-120,000	3.2%
$40,001-50,000	9.7%	over $120,000	9.2%

Table 2.

Base and Full Model Parameter Estimates

	Base Model		Full Model	
variable	mean	standard error	mean	standard error
alt specific constant 1	0.07	--	-0.27	--
alt specific constant 2	0.44**	--	0.14	--
alt specific constant 3	0.47**	--	0.11	--
price: low prominence: mean	-0.8**	1.86**	-0.92**	1.73**
unit price: low prominence: mean	-.97**	1.84**	-1.22**	2.05**
low prominence nutrition label: mean	-0.4**	.92**	1.54**	1.14**
high prominence nutrition label: mean	2.52**	2.93**	-1.79*	2.73**
low prom nutr x shopping %	--	--	-0.74	--
high prom nutr x shopping %	--	--	1.65*	--
low prom nutr x household size	--	--	-0.22*	--
high prom nutr x household size	--	--	0.60**	--
low prom nutr x household size x shopping %	--	--	0.23	--
high prom nutr x household size x shopping %	--	--	-0.66**	--
low prom nutr x income group 1	--	--	-0.61**	--
high prom nutr x income group 1	--	--	0.45	--
low prom nutr x income group 2	--	--	-0.76**	--
high prom nutr x income group 2	--	--	0.94**	--
low prom nutr x income group 3	--	--	-0.60**	--
high prom nutr x income group 3	--	--	0.54	--
low prom nutr x gender (female)	--	--	-0.08	--
high prom nutr x gender (female)	--	--	0.54**	--
low prom nutr x age	--	--	-0.01	--
high prom nutr x age	--	--	0.01	--
low prom nutr x nutrition score	--	--	-0.01	--
high prom nutr x nutrition score	--	--	0.04**	--
low prom nutr x education group 1	--	--	0.11	--
high prom nutr x education group 1	--	--	-0.22	--
low prom nutr x education group 2	--	--	-0.08	--
high prom nutr x education group 2	--	--	-0.09	--
low prom nutr x education group 3	--	--	-0.30	--
high prom nutr x education group 3	--	--	-0.17	--
price prom x low prom nutr	--	--	-0.06	--
price prom x high prom nutr	--	--	-0.1	--
unit price prom x low prom nutr	--	--	-0.45**	--
unit price prom x high prom nutr	--	--	0.2	--
LRI		0.46		0.478

number of surveys = 403; * p<.05; **p<.01

Table 3.

Correlation of Parameter Estimates

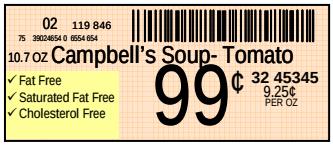
	1: price	*2: unit price*	*3: low prominence nutrition*	*4: high prominence nutrition*
1		-0.13	-0.35**	-0.10*
2			0.70**	-0.4**
3				-0.52**

* p<.05; **p<.01

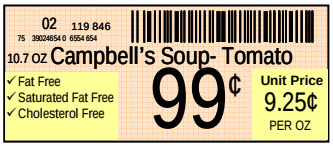
8. FIGURE

Figure 1.

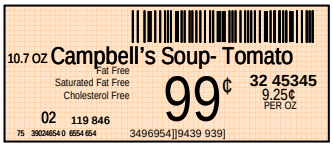
Examples of Shelf Labels Used in Choice Experiments



High price prominence, low unit price prominence, high nutrition information prominence



High price prominence, high unit price prominence, high nutrition information prominence



Low price prominence, low unit price prominence, low nutrition information prominence

9. Appendix

Survey Questions Used to Calculate Nutrition Consciousness Scores

1. My diet is nutritionally balanced.

2. I try to monitor the number of calories I consume daily.

3. I try to consume a healthy amount of calories each day.

4. I try to avoid high levels of fat in my diet.

5. I try to avoid high levels of saturated fat in my diet.

6. I try to avoid high levels of cholesterol in my diet.

7. I try to avoid high levels of sodium in my diet.

8. I try to avoid high levels of sugar in my diet.

9. I am interested in nutritional information about the food I eat.

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