Consumers’ Search and Use of Nutrition Information: The Challenge and Promise of the Nutrition Labeling and Education Act

Four studies investigate the Nutrition Labeling and Education Act’s (NLEA’s) impact on how consumers use nutrition information. Field and laboratory studies compare, but do not detect any changes in, consumers’ search for nutrition information or their recall of this information in the pre- and post-NLEA periods. However, the search activities of a select group (highly motivated and less knowledgeable consumers) benefit more from the NLEA than did other groups. Additional results from the field and lab studies indicate that the NLEA changed attention to negative nutrition attributes (such as fat and sodium, of which less is better) more than it changed attention to positive attributes such as calcium and vitamins. Analyses of scanner databases confirm this trend (with the exception of calories). Focus group results also reflect these findings. The authors discuss implications for public policy, management, academic research, and consumer welfare.

The 1990 Nutrition Labeling and Education Act (NLEA) dramatically changed nutrition labels on packaged foods in supermarkets, thereby increasing the amount of nutrition information available at the point of purchase. This law requires packaged foods to display nutrition information prominently in a new label format, namely, the Nutrition Facts panel. It also regulates serving size (to reflect what people really eat), health claims (that link a nutrient to a specific disease), and descriptor terms (e.g., “low fat”) on food packages.

This legislation’s primary goal is to improve consumer welfare by providing nutrition information that will “assist consumers in maintaining healthy dietary practices” (NLEA 1990, § 2). The underlying hope is that if consumers have reliable nutrition information available at the point of purchase and if they understand how their diet affects their risk of different diseases, they will make risk-reducing food choices. Ultimately, this change in behavior could reduce the costs to society of treating conditions such as heart disease and some cancers.

The food industry incurred significant costs, estimated at more than $2 billion, to comply with the law (Andrews, Nettemeyer, and Burton 1998; Silverglade 1996). Because of the NLEA’s potential benefits and actual costs, we decided to evaluate its impact on consumers with three queries: First, did the NLEA succeed in promoting greater search and attention to in-store nutrition information? Second, given the large amount of point-of-purchase information the NLEA made available, are consumers selectively attending to some information, such as specific nutrition attributes or package descriptors like “low-sodium”? Third, because public policy aims to promote everyone’s health, did the NLEA legislation help consumers who are least likely to help themselves? Potentially, consumers who know less about nutrition may benefit more from the onset of the NLEA than those who know more. If the NLEA homogenized the population so that less knowledgeable consumers behave more like knowledgeable consumers when making nutrition-related choices, the NLEA will have enhanced social welfare. Motivation may also play a vital role here. Whereas highly motivated consumers are likely to find the nutrition-information-rich environment in the post-NLEA phase especially attractive, it is useful to examine the NLEA’s impact on less motivated consumers.

We organize the article as follows: The next section delineates research issues and hypotheses. Subsequent sections present a series of complementary research studies. In a field study, we analyze how grocery shoppers used nutrition information for three food categories, both before and after the NLEA took effect. Next, in a lab experiment, we create different levels of knowledge and motivation in consumers and then ask them to shop for cereal with either the old or the new labels. In our third study, we analyze longitudinal data extracted from scanner databases to assess the NLEA’s impact across a longer period of time than the previous two studies. Our fourth study uses focus groups to

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examine consumers’ views about food labels. Finally, we discuss implications for public policy, management practice, academic research, and consumer welfare.

Theory and Hypotheses

Search, Recall, and Choice

We compare three aspects of in-store behavior by studying three different variables: search intensity, recall efficiency, and food choices. Search intensity refers to the degree of attention and effort consumers direct toward obtaining information about the specific purchase under consideration. We examine whether the NLEA's introduction increased the intensity of consumers' overall search for nutrition information. We also measure recall efficiency for several reasons: First, when assessed immediately after brand selection, recall accuracy is a good measure of how well point-of-purchase information has been evaluated and integrated into memory (Dickson and Sawyer 1990). Second, recall performance on a specific nutrition attribute indicates how important consumers perceive that attribute to be. Third, by adjusting recall performance for search intensity, we can determine if the new label increases the efficiency with which people acquire information. In addition, we assess whether the abundant post-NLEA nutrition information has prompted consumers to choose brands that have desirable nutritional characteristics. By studying sales patterns, we can detect whether consumers' preferences for foods with nutritionally desirable characteristics have changed with the enforcement of the NLEA.

The Impact of the NLEA

The NLEA may not only stimulate consumers to spend more time acquiring nutrition information but also increase the efficiency with which they process it. The post-NLEA labels provide much information in an easy-to-use format (Levy, Fein, and Schucker 1996). For example, the percent Daily Values (%DV) in these labels facilitate comparisons across and within brands. In addition, the NLEA increased the proportion of packaged foods that display nutrition information from approximately 60% to almost 100%. By encouraging nutrition education, the NLEA may also increase the perceived benefits of using nutrition information. Thus, the NLEA may increase consumers' performance on our research variables.

Conversely, it is possible that the NLEA will produce an opposite effect on these variables, because it allows manufacturers to make health claims about diet-disease linkages on food packages. Although consumers can inspect health claim information and the Nutrition Facts panel and integrate the two, recent evidence indicates that they may rely on easily visible nutrition claims and ignore the Nutrition Facts panel (Roe, Levy, and Derby 1999). More important, the strict nutrition regulations in the post-NLEA regime may reduce consumers' urge to verify claims by inspecting the Nutrition Facts panel. Thus, if consumers neglect to gather information from the new food labels, their performance on our research variables may decline.

Both sets of arguments advanced previously appear plausible, which makes it difficult to hypothesize the general direction of the NLEA's impact. Nevertheless, this empirical issue is important for researchers, public policymakers, and practitioners, so we frame it as a research question (RQ):

RQ: Compared with the pre-NLEA period, did the following change in the post-NLEA era: (a) search intensity for nutrition information, (b) recall efficiency for specific nutrition attributes, and (c) choice?

The NLEA, Consumer Characteristics, and Nutrition Information Use

The current model (see Figure 1, Panel A) depicts our hypotheses. It features four consumer characteristics (micro factors) that affect how much consumers search for and how efficiently they process nutrition information. Specifically, we incorporate motivation and knowledge because they emerge as important facilitators in most models of information search and processing. In addition, we include brand loyalty and perceived similarity of brands (along nutrition dimensions) because they serve as perceptual screens that limit search. Although these last variables previously have been identified as important (Putrevu and Ratchford 1997; Urbany, Dickson, and Kalaparakal 1996), they have yet to be incorporated into a model of nutrition-related behavior. The model indicates that the likelihood that consumers will make nutritionally desirable food choices reflects not only how much information they seek out but also the environment (macro factors such as the NLEA legislation) that directly affects the information made available to them. In this model, the NLEA factor interacts with the micro factors (depicted schematically by the curved arrow in Figure 1, Panel A); the dashed arrows represent links that are not addressed in our study.

Attribute-level impact. Logically, consumers might expect to be interested in foods that have (1) lower or no negative nutrition attributes and (2) higher positive nutrition attributes. A negative attribute is a nutritional characteristic that should be reduced, such as fat or sodium, whereas a positive nutrition attribute is a nutritional characteristic that should be increased, such as calcium or vitamins. Several reasons underlie consumers’ tendency to focus more attention on negative attributes than positive ones. They may ascribe greater information diagnosticity to negative than positive attributes (Burton, Garretson, and Velliquette 1999; Garretson and Burton 2000). Also, consumers may realize that a dietary supplement can supply positive nutrition attributes that are missing from their diet, but no pill can effectively subtract negative attributes (Russo et al. 1986). The emphasis on negative attributes is also compatible with prospect theory: People overweight attributes associated with losses rather than those associated with gains (Tversky and Kahneman 1981).

The NLEA is likely to accelerate this bias toward negative attributes. First, health claims allowed under NLEA guidelines (that associate specific nutrients with reduced risk of specific diseases) reinforce the bias. Of the seven health claims approved by the Food and Drug Administration (FDA) at the NLEA's onset, three link negative attributes exclusively with deadly diseases (i.e., dietary fat and cancer, sodium and hypertension, and dietary saturated fat and high cholesterol and heart disease), and only one claim

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features a positive attribute (calcium and osteoporosis). The remaining claims showcase the combined role of several positive and negative attributes (21 C.F.R. 101.72 to 101.78). Second, NLEA regulations on nutrient content claims focus more on negative attributes (calories, sugar, sodium, fat, fatty acid, and cholesterol) than on positive attributes such as fiber (21 C.F.R. 101.54 to 101.62; 105.56). More important, because they are regulated, both health and content claims appear more credible to post-NLEA consumers. The preceding reasons, when combined with consumers’ predisposition to attend more to negative attributes, may steer food manufacturers toward increasing their emphasis on negative attributes as they market their products. Under the circumstances, consumers could absorb more information about negative attributes and therefore be more likely to select brands that tout attractive levels of negative attributes in the post-NLEA era than in the pre-NLEA era.

\[ H_1: \] Compared with the pre-NLEA era, consumers in the post-NLEA era will increase search intensity, recall efficiency, and choice for negative nutrition attributes more than they change behavior related to positive nutrition attributes.

Motivation to process nutrition information. Motivation, defined as consumers’ goal-directed arousal to process nutrition information, increases the effort devoted to search and encode such information (Moorman 1996). Highly motivated consumers will search more intensely and attain greater recall efficiency than will less motivated consumers. However, an intervention such as the NLEA may weaken this relationship in socially beneficial ways.

Specifically, the NLEA may increase how much less motivated consumers search by lowering consumers’ search costs and prompting manufacturers to introduce interesting foods with desirable nutritional characteristics. According to Rothschild (1999), offering low-motivation consumers a broad set of interesting alternatives decreases motivation’s influence on behavior. Thus, when food manufacturers responded to the NLEA by improving the nutrition quality of (1) existing brands by adding positive nutrients and (2) brand extensions by deleting negative nutrients (Moorman 1998), even low-motivation consumers may have discovered that it was relatively easy to eat healthfully. In other words, we predict that motivation will have a less important influ-
ence on both search intensity and recall efficiency in the post-NLEA era. This is a desirable outcome of the NLEA because it implies that the search and recall performance of less motivated consumers has become more similar to those who are highly motivated.

H2: Compared with the pre-NLEA era, consumers' motivation in the post-NLEA era will be a less important determinant of (a) search intensity and (b) recall efficiency.

Nutrition knowledge. Consistent with Moorman (1996), we propose that nutrition knowledge affects recall performance rather than search intensity. For a given level of search effort, high-knowledge consumers will recall nutrition attributes better because they can better interpret, retain, and access domain-related information. However, the easy-to-comprehend nutrition information available on post-NLEA food labels may have weakened the relationship between nutrition knowledge and recall efficiency in socially desirable ways. For example, consumers with low nutrition knowledge are unlikely to absorb unit-specific attribute information readily (e.g., two grams of fiber/serving) from the old food label. In contrast, the unit-free %DV value in the new food label may help them grasp such information quickly by placing it in the larger and more meaningful context of standard daily fiber intake (see the supporting evidence by Levy, Fein, and Schucker [1996]). Recall efficiency of low-knowledge consumers could therefore increase when they use the new label. This increase is less likely to occur for high-knowledge consumers, because they interpret label information easily regardless of how it is presented.

H3: Compared with the pre-NLEA era, consumers' knowledge in the post-NLEA era is a less important determinant of recall efficiency.

Perceived similarity of brands (on nutrition content). When evaluating alternatives on several dimensions, consumers may ignore a dimension if all alternatives appear equivalent on that dimension. As rival brands become more similar on key attributes, the perceived benefits from search diminish progressively (Urbany, Dickson, and Kalaparakal 1996). Thus, the greater the perceived similarity across alternatives, the lower is the effort invested in information search. Intuitively, if a shopper is confident that brands in a given food category are nutritionally similar, he or she is less likely to search and compare brands. Because the NLEA standardized serving sizes and introduced %DV information, post-NLEA shoppers can compare brands more easily and form judgments about nutritional similarity with greater confidence. Therefore, the relationship between perceived similarity of nutrition content (across brands in a category) and search effort will be stronger and more negative in the post-NLEA period.

H4: Compared with the pre-NLEA era, in the post-NLEA era the relationship between perceived similarity across brands and search intensity will be more negative.

Brand loyalty. Szykman, Bloom, and Levy (1997) suggest that experiential prior knowledge may discourage preventive health behavior. In the pre-NLEA era, brand loyalty may act as experiential prior knowledge that reduces consumers' in-store search for nutrition information. People behave similarly for price information: Brand-loyal shoppers who know a lot about their preferred product engage in little in-store price search (Putrevu and Ratchford 1997). In contrast, in the post-NLEA environment, the relatively information-insensitive brand-loyal consumers could initially seek out new information for their preferred brands. When the novelty of the new information wears off, brand-loyal consumers may again stop searching. Initially, though, the NLEA may attenuate the negative relationship between brand loyalty and search intensity.

H5: Compared with the pre-NLEA era, in the post-NLEA era the negative relationship between brand loyalty and search intensity will be weaker.

Table 1 summarizes the research question and five hypotheses that guided our research.

**Grocery Store Field Study**

**Overview**

To assess the impact of NLEA-mandated labels on consumers' search for nutrition information, we observed shoppers in grocery stores both before (early 1993) and after (late 1994) the onset of the new food labels. Participants included 337 randomly selected shoppers in three chain grocery stores in a town located in the U.S. Midwest. We distributed data-gathering occasions evenly across stores, time of day, and day of the week. Trained observers watched, interviewed, and paid all participants $1.00 each.

**Measures**

Consistent with prior in-store research (Cole and Balasubramanian 1993; Dickson and Sawyer 1990), we positioned trained observers in grocery store aisles for three product categories: breakfast cereal, crackers, and packaged bread. Unobtrusively, the observer recorded search intensity (PANTIME), measured as the time in seconds subjects devoted to the Nutrition Facts panel of the first brand chosen. Given the in-store stacking arrangement for packaged foods, this panel, which is located on the side of package, is not observable unless the product is removed from the shelf. By restricting our focus to packages that were picked up by consumers, PANTIME excluded search activities unrelated to the nutrition panel. PANTIME possessed high reliability (interobserver agreement: 92%) and validity (correlated negatively with recall error).

The observer then solicited the consumer's participation in a survey. Most consumers contacted (80.4%) agreed. They initially responded to scales that measured independent variables: motivation (MOTIVPRO), a four-item scale to measure motivation to process nutrition information (e.g., "Today, I was interested in looking at the nutrition information on the cereal package"; alpha = .82); knowledge (KNOWLEDGE), a two-item scale to measure nutrition knowledge (e.g., "I am knowledgeable about the nutrition aspect of cereal"; r = .86); brand loyalty (BRANDLOY), a two-item scale (Cole and Balasubramanian 1993; r = .78) to assess loyalty toward the chosen brand; and perceived nutritional similarity of brands (NUTRISIM), a single-item scale.
(e.g., “All breakfast cereals are similar on nutritional content.”). Data collection also included several background variables: category familiarity (CATEGFAM), purchase frequency (PURCHREG), health status (H.LTHSTAT), consumption frequency (OFTENEAT), age (AGE), and education (EDUC).

For the brand they had just chosen, subjects were asked to recall the content value per serving for each of several nutrition attributes; the observer later recorded actual values for these attributes from a package of the selected brand. Following prior research (Dickson and Sawyer 1990), we derived the respondent’s attribute-specific relative recall error (RRER) for sodium, potassium, protein, calories, cholesterol, fat, and fiber as the absolute of [(actual attribute value – recalled attribute value) × 100/(actual attribute value)]. Finally, we computed a respondent-specific recall error index (REI) to capture the overall difference between recall errors for key negative and positive attributes as follows: [(RRER_{Calories} + RRER_{Fat}) – (RRER_{Protein} + RRER_{Fiber})]/(RRER_{Calories} + RRER_{Fat} + RRER_{Protein} + RRER_{Fiber}). We excluded sodium, cholesterol, and potassium from REI because some respondents confused these

<table>
<thead>
<tr>
<th>Research Question or Hypothesis</th>
<th>Field Study</th>
<th>Lab Experiment</th>
<th>Scanner Data Analyses</th>
<th>Focus Groups</th>
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<tbody>
<tr>
<td>RQ: Compared with the pre-NLEA period, did the following change in the post-NLEA era:</td>
<td></td>
<td></td>
<td></td>
<td>Some consumers (sensitive to weight/health) noticed the new label information.</td>
</tr>
<tr>
<td>(a) Search intensity for nutrition information?</td>
<td>No change</td>
<td>No change</td>
<td></td>
<td>Participants reported more purchase of such foods within taste and budget constraints.</td>
</tr>
<tr>
<td>(b) Recall efficiency for specific nutrition attributes?</td>
<td>No change</td>
<td>No change</td>
<td>Yes</td>
<td>In the post-NLEA period, participants noted frequent checks on negative attributes but did not mention positive attributes.</td>
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<tr>
<td>(c) Choice (for foods that highlight desirable levels of specific nutrition attributes)?</td>
<td></td>
<td></td>
<td></td>
<td>In the post-NLEA period, some motivated consumers remain skeptical about serving-size information and hard-to-verify claims.</td>
</tr>
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<td>H₁: Compared with the pre-NLEA era, consumers in the post-NLEA era will increase search intensity, recall efficiency, and choice for negative nutrition attributes more than they change behavior related to positive nutrition attributes.</td>
<td>Supported for recall error</td>
<td>Supported for search intensity</td>
<td>Supported by changes in category shares of brands that highlight negative nutrition attributes (except calories)</td>
<td>In the post-NLEA period, search diminishes as competing foods are similar in nutrition content.</td>
</tr>
<tr>
<td>H₂₁: Compared with the pre-NLEA era, consumers' motivation in the post-NLEA era will be a less important determinant of search intensity.</td>
<td>No support</td>
<td>Supported for regulated attributes (nutrition claims, serving size)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₂₂: Compared with the pre-NLEA era, consumers' motivation in the post-NLEA era will be a less important determinant of recall efficiency.</td>
<td>No support</td>
<td>No support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₃: Compared with the pre-NLEA era, consumers' knowledge in the post-NLEA era is a less important determinant of recall efficiency.</td>
<td>No support</td>
<td>No support</td>
<td></td>
<td></td>
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<tr>
<td>H₄: Compared with the pre-NLEA era, in the post-NLEA era the relationship between perceived similarity across brands and search intensity will be more negative.</td>
<td>Supported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₅: Compared with the pre-NLEA era, in the post-NLEA era the negative relationship between brand loyalty and search intensity will be weaker.</td>
<td>Supported</td>
<td></td>
<td></td>
<td></td>
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milligram-denominated attributes as gram-denominated ones, thereby inflating recall errors unreasonably. The REI ranges between −1 and +1, where a value of −1 (+1) indicates that positive (negative) nutrition attributes mainly contribute to the consumer's total recall error.

### Analyses and Results

**$RQ_a$ and $RQ_b$.** Within each food category, we first conducted t-tests that compared the pre- and post-NLEA respondent groups on background variables. To investigate $RQ_a$, we conducted analyses of covariance in each food category with PANTIME, our measure of search intensity as the dependent variable, and an NLEA dummy (pre-NLEA = 0, post-NLEA = 1) as the independent factor. Background variables that reflected significant differences between pre- and post-NLEA respondents were entered as covariates. For all three categories, the analysis of covariance results indicated that the NLEA had no statistical effect on PANTIME (breakfast cereal: pre- versus post-NLEA: .50 versus .44, $F_{1,112} = .01, p < .93$; crackers: pre- versus post-NLEA: 1.75 versus .94, $F_{1,102} = .26, p < .61$; bagged bread: pre- versus post-NLEA: .00 versus .77, $F_{1,106} = 2.49, p < .12$).

To study $RQ_b$, we estimated regression models for each product category, with RRER for various nutrition attributes as dependent variables and with the NLEA dummy, PANTIME, and other background variables as independent variables. Standard regression diagnostics pointed to a variance-stabilizing transformation or weighted least squares (Neter and Wasserman 1974), with all models estimated after weighting by $1/[\text{CATEGFAM}]^2$. Although we attempted to collect recall data on several nutrition attributes in each category, data were unavailable for all attributes in both the pre- and the post-NLEA era. Given this constraint, only eight weighted regressions could be estimated. The NLEA dummy was not significant in seven of these eight regression equations. That is, only one regression (with RRER as a dependent variable for the crackers data) indicated a significant increase in recall efficiency ($p < .00$) after the onset of the NLEA. Overall, therefore, we did not detect much evidence that the new food labels significantly changed either the intensity of consumers' search for nutrition information or their recall efficiency.

**$H_1$.** We tested $H_1$ using a weighted regression model (weight = $1/[\text{NUTRISIM}]^2$) on data pooled across the three product categories. The dependent variable was the NLEA dummy, NUTRISIM, and HLTHSTAT were independent variables (see the left-hand part of Table 2). The negative and significant coefficient for the NLEA dummy reflects a greater post-NLEA decrease in recall errors for negative than for positive nutrition attributes, thus supporting $H_1$. A different operationalization of REI (using only calories and protein, the top negative and positive attributes, respectively) yielded more observations for analysis but did not materially alter the results.

**$H_2$ through $H_5$.** To test the hypotheses predicting interaction effects between the NLEA dummy and motivation, perceived similarity, and brand loyalty, we first ran a regression using PANTIME as the dependent variable (see the right-hand part of Table 2). Contrary to $H_2$, the NLEA variable did not interact with motivation. Consistent with $H_4$,

<table>
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<th>Table 2: Field Study: Regression Results</th>
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<tr>
<td><strong>Test for $H_1$:</strong></td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
</tr>
<tr>
<td>NLEA dummy</td>
</tr>
<tr>
<td>NUTRISIM</td>
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<tr>
<td>HLTHSTAT</td>
</tr>
<tr>
<td><strong>Dependent Variable</strong></td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>$-2.03 ( .61)$</td>
</tr>
<tr>
<td>$-0.51 ( .15)$</td>
</tr>
<tr>
<td>$-0.10 ( .05)$</td>
</tr>
<tr>
<td>$-12.0 ( .05)$</td>
</tr>
<tr>
<td><strong>Tests for $RQ_a$, $RQ_b$, $H_2$, $H_3$, $H_4$, and $H_5$:</strong></td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
</tr>
<tr>
<td>PANTIME</td>
</tr>
<tr>
<td>RRER (Fat)</td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>$-2.75 (2.03)$</td>
</tr>
<tr>
<td>$-0.53 (2.27)$</td>
</tr>
<tr>
<td>$-0.16 (18.07)$</td>
</tr>
<tr>
<td>$7.54 (9.71)$</td>
</tr>
<tr>
<td>$-16.89 (11.34)$</td>
</tr>
<tr>
<td>$16.03 (22.58)$</td>
</tr>
<tr>
<td>$13.75 (26.04)$</td>
</tr>
<tr>
<td>$5.10 (20.30)$</td>
</tr>
<tr>
<td>$-2.57 (7.91)$</td>
</tr>
<tr>
<td>$-52.54 (12.07)$</td>
</tr>
<tr>
<td>$-54.65 (16.20)$</td>
</tr>
<tr>
<td>$48.73 (14.05)$</td>
</tr>
<tr>
<td>$1.59 (4.06)$</td>
</tr>
<tr>
<td>$0.30 $</td>
</tr>
</tbody>
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R²: .49
N: 28

H²: .08
N: 321

Notes: Standard error is in parentheses.

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there was a significant interaction between nutrition similarity (NUTRISIM) and the NLEA dummy on PANTIME (b = -.71, p < .05). Using Cohen and Cohen’s (1983) approach to analyze this interaction, we found that as the hypothesis predicted, the impact of NUTRISIM on PANTIME was more negative in the post-NLEA era (b = -.096) than in the pre-NLEA era (b = .279). Consistent with H3, the interaction between brand loyalty (BRANDLOY) and the NLEA dummy on PANTIME was also significant (b = .55, p < .05).

As predicted by this hypothesis, the impact of BRANDLOY on PANTIME was more negative in the pre-NLEA era (b = -.310) than in the post-NLEA era (b = .009).

To be consistent with Moorman (1996), and because fat consistently ranks high among consumers’ nutrition concerns, we used RRERFat as the dependent variable in a second weighted regression analysis (weight = 1/[CATEGFAM]^2). Contrary to H2a and H3, the NLEA dummy did not significantly interact with motivation or knowledge.

Summary

The evidence did not support the view that the NLEA changed search intensity, defined as the time devoted to the Nutrition Facts panel. This finding supplements results from a prior study (Moorman, 1996), which reported that the NLEA increased nutrition information acquisition, measured as elapsed time between the consumer accessing the first brand in the category and making the final brand choice divided by the number of brands purchased. Given the different measures of information search in the two studies, a plausible integrative insight emerges: The NLEA may have increased attention to nutrition information found outside the Nutrition Facts panel on food packages, such as nutrition claims or descriptor terms such as “low fat.” This is consistent with the findings of Roe, Levy, and Derby (1999) who observe that respondents who truncate their search or view claims allocate greater weight to information in claims than to the information in the Nutrition Facts panel.

Our work also shows that the NLEA did not change recall efficiency for most nutrients. Such attribute-specific information is available only in the Nutrition Facts panel, so the poor recall results suggest that people do not consult this panel much. When they do, evidence indicates that they are influenced more by negative than positive nutrients.

We found interactions involving the NLEA and two consumer characteristics: perceived nutritional similarity and brand loyalty. In the post-NLEA era, there is a stronger negative relationship between the perceived nutritional similarity of brands and consumers’ search for nutrition information. The post-NLEA era provides better access to nutrition information than ever before, so consumers are likely more confident about judgments of nutrition similarity across brands. Our findings also show that brand loyalty is less negatively related to search intensity in the post-NLEA period, though this pattern may hold only as long as the information about the preferred brand remains new.

Our remaining studies overcome several limitations. First, we may not have detected changes in consumer behavior because of a lack of awareness about NLEA-mandated changes in food labels. In line with other surveys (e.g., Silverglade 1996), only 65% of our subjects in the post-NLEA sample were aware of the new food labels. Our longitudinal scanner data analysis (reported subsequently) overcomes this limitation by studying purchase behaviors over extended periods. Second, in the field setting, we were unable to track search intensity for positive and negative attributes. Third, the lack of interaction effects for motivation and knowledge with the NLEA are tempered by the finding that many field study respondents had low scores on our motivation and knowledge measures. These limitations motivated our laboratory experiment, described next.

Computerized Shopping Lab Experiment

Overview

In this experiment, we manipulate three factors: knowledge about nutrition information, motivation to process this information, and the nutrition label format (pre-NLEA versus post-NLEA) to investigate the RQ, H1, H2, and H3. Because the computer recorded the specific information that consumers inspected during a shopping task, we could examine whether the post-NLEA labels changed the type of information our subjects used.

Design, Procedure, and Independent Variables

We used a 2 (knowledge) x 2 (motivation) x 2 (label format) between-subjects design. We randomly assigned 190 students at a major university to one of several computers in a research lab (and thereby to one of the experimental treatments) equipped to run the Search Monitor program (Brucks 1988). Subjects completed a short questionnaire assessing their familiarity with a practice product and breakfast cereals. They read a handout describing the information accessible on the computer for each product. To make the shopping task realistic, we announced that 20% of the participants would receive a free sample of the selected practice product and selected breakfast cereal. Then they completed the shopping task for each product and, in a postchoice survey, recalled the fat content per serving of the cereal they selected.

We manipulated knowledge about nutrition information through education. One-half of the subjects (high-knowledge condition) studied an informative brochure on the topic, which was adapted from FDA (1994) publications. To manipulate motivation to process nutrition information, we instructed high-motivation subjects to follow a physician’s recommendation: Select a cereal that is low in fat, sodium, and cholesterol. By using the adjective “low” (instead of, say, a ceiling criterion such as less than three grams of fat per serving), we encouraged information search rather than satisficing behavior. Low-motivation subjects did not receive this instruction. We manipulated label format by making information about each of 12 cereal brands accessible on the computer to subjects in the format of either the old or the new nutrition label. The attribute values, obtained from actual brands, were the same in both label conditions. We also used brand names because they provide important information.
Dependent Variables

All measures were derived from computer records of subjects’ search activities. As in our field study, we measured RRERFat from the postchoice survey and PANTIME as the time spent to inspect the nutrition panel for the brand selected. In addition, we obtained usage measures for specific attributes, calculated as the percentage of search requests devoted to brand name (BRND%), nutrition claims (NC%), serving size (SS%), and information from the nutrition panel (PAN%). The use of percentages facilitates relative comparisons in search effort across nutrition attributes and helps control for individual differences in the extent of search. Finally, we calculated the CAPRO% index using one negative attribute (calories) and one positive attribute (protein) as follows: (number of search requests about calories – number of requests about proteins) × 100/total number of search requests. We excluded other attributes from the numerator because the motivation manipulation focused on those attributes.

Results

Manipulation checks. We assessed knowledge with a 12-item multiple-choice test about nutrition. High-knowledge subjects obtained significantly higher test scores than low-knowledge subjects (low versus high knowledge: 4.52 versus 7.18, F1,145 = 108.2, p < .01). Consistent with others who manipulated knowledge in experimental settings, we excluded from our remaining analyses high-knowledge participants who scored below the median on the knowledge test as well as low-knowledge participants who scored above the median on the same test.

To check the effectiveness of the motivation manipulation, we compared high- and low-motivation subjects on the percentage of information accessed about the three physician-specified attributes. Consistent with the manipulation, high-motivation subjects accessed a higher percentage of the three physician-specified attributes than did low-motivation subjects (F1,138 = 25.53, p < .01).

Effects of new labels. With respect to RQ, we found that the new food label format neither increased the amount of time spent inspecting information contained in nutrition panels nor affected recall efficiency (PANTIME: F1,132 = .58, p < .45; RRERFat controlled for PANTIME: F1,132 = .93, p < .33). Both these findings are consistent with the field study. For PANTIME, a significant knowledge × motivation interaction (F1,132 = 3.74, p < .05) indicated that high-knowledge subjects spent the same amount of time inspecting information contained in nutrition panels (approximately 33 seconds) regardless of motivation levels, whereas low-knowledge subjects spent more time when their motivation levels increased (from 27 to 55 seconds).

H1, H2, and H3. Consistent with H1, we found a significant label effect: With the new label, there was a larger relative difference between search activity devoted to negative and positive attributes than with the old label (CAPRO% index: new versus old label 2.15% versus .68%, F1,136 = 6.36, p < .02). Contrary to H2 and H3, but again consistent with the field study, we did not find any significant interactions between label format and motivation on PANTIME or RRERFat, nor was the interaction between the label and knowledge on RRERFat statistically significant.

However, other interactions suggest that the new label changed the relationships between motivation and the type of information used. First, the significant label × motivation interaction (F1,136 = 6.0, p < .02) on NC% occurred because in the old label condition, motivation influenced nutrition claim usage: High-motivation consumers used nutrition claim information more than low-motivation consumers (HM 16% versus LM 3%, t = 2.87, p < .01). In the new label condition, motivation did not affect nutrition claim usage, which averaged approximately 4% for both motivation groups (t = .90, p < .30). Second, we found a significant three-way interaction among motivation, knowledge, and label format on SS% (F1,136 = 4.21, p < .04). This interaction occurred, in part, because of a significant effect of motivation on SS% under the old label (HM 2.1% versus LM 3%, t = 2.78, p < .05) and a nonsignificant effect of motivation on SS% under the new label (HM 1.4% versus LM 2.2%, t = 1.41, p < .16). Third, a marginally significant label × motivation interaction on PAN% (F1,136 = 2.8, p < .1) indicates that the impact of motivation on PAN% is stronger with the new label than with the old label (new label: HM 55% versus LM 25%, t = 3.9, p < .01; old label: HM 38% versus LM 28%, t = 1.54, p < .12).

Summary

In both our field study and lab experiment, we did not detect any effect of the NLEA-mandated change in the food label on (1) the relationships between motivation and search intensity and between motivation and recall efficiency or (2) the relationship between knowledge and recall efficiency. However, we did find that consumers rely more on negative than positive attributes. These consistencies emerged regardless of whether motivation was measured or manipulated and whether knowledge was assessed through self-report or quiz scores.

Our findings offer new insights about how the new food label altered the relationship between motivation and the type of information inspected. On the one hand, high-motivation consumers using the new label (compared with those using the old label) shifted focus away from nutrition claims and serving sizes toward the nutrition panel. This behavior was particularly pronounced for low-knowledge consumers. On the other hand, low-motivation consumers, who were relatively insensitive to label format, relied mostly on brand names. From a social welfare perspective, we conclude that in the post-NLEA era, at least one group (high-motivation, low-knowledge consumers) depended less on nutrition claims, benefited more from standardized serving sizes, and devoted a larger proportion of search effort to the nutrition panel.

Longitudinal Scanner Data Analyses

Overview

To develop additional insights about the NLEA, we analyze changes in longitudinal sales data. Such a study has several...
advantages over the previous ones. First, people’s food choices may be a more useful gauge of their nutrition-related concerns than is search or recall. Second, analyzing sales trends across a relatively long time horizon may provide insights about NLEA that are unavailable from comparisons of data collected immediately before and after the effective date of NLEA. Third, instead of relying on the Nutrition Facts panel, post-NLEA consumers may use descriptor nutrition information, such as “low fat,” “low sodium,” and “calcium added,” that may appear on food packages. As discussed during the development of H1, products featuring descriptor terms in the post-NLEA period needed to conform to prescribed NLEA guidelines. Such products often represent line extensions, and the corresponding descriptor is effectively integrated into the brand name for display purposes (e.g., Keebler Hydrox Reduced Fat Cookies). For such foods, the descriptor is prominently featured on the front package panel to aid prepurchase exposure (in contrast, the Nutrition Facts information appears on the side panel). Within a given category, comparing the relative sales performance of products with and without a specific set of descriptors across pre- and post-NLEA periods may shed new light on the influence of nutrition information outside the Nutrition Facts panel. Finally, by studying descriptors across multiple food categories, we can assess the generalizability of results.

Data and Model Characteristics

To address the preceding research issues, we analyzed longitudinal data on variables derived from scanner databases for several packaged food categories. The database in any given category comprised sales transactions at each of several store locations in a large city’s major grocery chain over an extended period (September 14, 1989, through May 14, 1997).

Within each category, we initially examined universal product code (UPC)-level product descriptions to identify descriptors of potential research interest. Note that NLEA regulations (21 C.F.R.) allow a choice of several descriptors for a given nutrient. With respect to fat, the set of available descriptors includes “low fat,” “reduced fat,” and “fat free”; for calories, applicable descriptors range from “light,” “lite,” and “diet” to “low calorie.” To qualify for the use of a descriptor, a food must satisfy stringent content criteria on the nutrient associated with that descriptor. Given our interest in studying the NLEA’s impact on consumers’ choice for foods with healthy characteristics (i.e., more [less] of a positive [negative] nutrient), we compiled a list of UPCs representing healthful levels of each nutrient in food category in the database. For sodium-heavy canned soups, this included soups associated with one of two descriptors (“low sodium” and “lower salt”) that represent nutritionally attractive sodium levels.

Sales transactions were aggregated across stores to derive the weekly category share for the healthy UPCs associated with a given nutrient. We excluded from analysis any descriptor/category combination in which (1) classification problems stemming from incomplete product descriptions at the UPC level could not be resolved after consultations with food manufacturers and/or retailers, (2) data were unavailable in both the pre- and post-NLEA eras, or (3) any string of missing data exceeded ten contiguous weeks. We then estimated the following regression model for each descriptor/category combination available for analysis:

\[
CS(t) = a + b \times \text{NLEA Dummy} + c \times CS(t-1) + \text{error}(t),
\]

where

\[
CS(t) = \text{category share (percent) of dollar sales volume at week } t \text{ (aggregated across stores) for all UPCs featuring a specific descriptor, and}
\]

NLEA Dummy = 0 for the pre-NLEA phase, defined as \( t = 1 \) (week beginning September 14, 1989) through \( t = 255 \); 1 for the post-NLEA phase representing \( t = 256 \) and beyond.

Results

Table 3 summarizes regression results for eight descriptor set/category combinations, organized by the valence of the nutrient in the descriptor (positive or negative). It is useful to compare results for descriptors featuring positive nutrition attributes (vitamin C and calcium; see the first two rows in Table 3) with the next three rows, which highlight negative nutrients (sodium-heavy and fat-heavy). The R-squared values indicate a much better model fit for the latter. For descriptors with positive nutrition attributes, the estimate for the NLEA dummy indicates either a decline in post-NLEA category share (vitamin C–added bottled juices) or no impact on post-NLEA category share (calcium-added refrigerated juices). In contrast, the corresponding estimates for models in the next three rows reflect an increase in post-NLEA category share. Interpretively, post-NLEA consumers increased purchases of descriptor sets featuring negative nutrients (for a visual overview of the category share data for sodium-heavy UPCs, see Figure 2); however, their purchases of descriptor sets featuring positive nutrients either decreased or remained unchanged after the onset of the NLEA. This pattern of results lends support to H1 from a choice perspective.

Nevertheless, an important difference emerges when we compare the preceding results for fat-heavy and sodium-heavy descriptors with the next three rows, which feature calorie-heavy foods. Although all six regression models involve a negative nutrient, those featuring calorie-heavy foods consistently show a negative estimate for the NLEA dummy; that is, the relative sales performance of such items decreased after the onset of NLEA. The longitudinal time-series analysis detected this post-NLEA decline in the appeal of calorie-heavy descriptors compared with other descriptors. Post-NLEA consumers may find it more attractive to consume fat-heavy foods, which afford control over both fat and calorie intake, than low-calorie foods, which afford control over calorie intake only. In addition, con-

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1We also estimated this model equation without the lagged dependent variable. The results for this model version were consistent (in terms of the sign and statistical significance of the NLEA dummy) with the results reported in Table 3.

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<table>
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<tr>
<th>Attribute Valence</th>
<th>Common Descriptors</th>
<th>Category</th>
<th>Dependent Variable (Category % Share of)</th>
<th>Intercept</th>
<th>NLEA Dummy</th>
<th>Lagged Dependent Variable</th>
<th>R²</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Vitamin C fortified</td>
<td>Bottled juices</td>
<td>Vitamin C-added UPCs</td>
<td>3.071***</td>
<td>-.685*</td>
<td>.156**</td>
<td>.05</td>
<td>284</td>
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<td>(.310)</td>
<td>(.059)</td>
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<tr>
<td>Positive</td>
<td>Plus calcium/calcium added</td>
<td>Refrigerated juices</td>
<td>Calcium-added UPCs</td>
<td>3.323***</td>
<td>.428</td>
<td>4.01E-3</td>
<td>.01</td>
<td>396</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>(.228)</td>
<td>(.259)</td>
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<td>Negative</td>
<td>Low sodium/lower salt</td>
<td>Canned soup</td>
<td>Sodium-healthy UPCs</td>
<td>.652***</td>
<td>.544***</td>
<td>.702***</td>
<td>.72</td>
<td>378</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(.090)</td>
<td>(.100)</td>
<td>(.037)</td>
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<td></td>
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<tr>
<td>Negative</td>
<td>Low fat/reduced fat/fat free</td>
<td>Cheese</td>
<td>Fat-healthy UPCs</td>
<td>1.216***</td>
<td>.512***</td>
<td>.705***</td>
<td>.63</td>
<td>340</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(.172)</td>
<td>(.141)</td>
<td>(.038)</td>
<td></td>
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<tr>
<td>Negative</td>
<td>Low fat/reduced fat/fat free</td>
<td>Cookies</td>
<td>Fat-healthy UPCs</td>
<td>2.402***</td>
<td>3.037***</td>
<td>.597***</td>
<td>.73</td>
<td>266</td>
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<td></td>
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<td></td>
<td></td>
<td>(.372)</td>
<td>(.529)</td>
<td>(.051)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>Low calorie/diet/light/lite</td>
<td>Bottled juices</td>
<td>Calorie-healthy UPCs</td>
<td>4.167***</td>
<td>-1.538***</td>
<td>.368***</td>
<td>.44</td>
<td>392</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>(.302)</td>
<td>(.191)</td>
<td>(.047)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>Light/lite</td>
<td>Frozen entrees</td>
<td>Calorie-healthy UPCs</td>
<td>5.291***</td>
<td>-2.601***</td>
<td>4.74E-4</td>
<td>.12</td>
<td>396</td>
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<td></td>
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<td>(.341)</td>
<td>(.373)</td>
<td>(.051)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>Light/lite</td>
<td>Frozen dinners</td>
<td>Calorie-healthy UPCs</td>
<td>9.092***</td>
<td>-4.507***</td>
<td>-7.75E-3</td>
<td>.10</td>
<td>232</td>
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<td></td>
<td></td>
<td>(.890)</td>
<td>(.963)</td>
<td>(.066)</td>
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</table>

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

Notes: Standard error is in parentheses.
consumers may have increased attention to fat and lowered attention to calories because NLEA mandated that, where applicable, calorie information on the label must be presented in the context of fat (i.e., calories from fat). The NLEA also allows this calorie information to be linked to saturated fat (i.e., calories from saturated fat). Thus, consumers can manage calories efficiently by attending to fat content and without pursuing low-calorie foods. Moreover, although the NLEA allows health claims on several negative attributes, calories represent a negative attribute that is not featured in an allowable health claim under NLEA. In conclusion, with regard to RQ2, our results indicate a post-NLEA increase in category share of fat-healthy cheese and cookies and sodium-healthy canned soups.

Summary

Our analyses of scanner data show that the onset of the NLEA is associated with a change in consumer food choices, unlike the results involving search and recall variables. The nature of this change depended on the valence of the nutrient involved (with the exception of calories).

Some methodological and data limitations remain. Our models do not incorporate explanatory variables such as price or other types of deals. Although our models were estimated on data aggregated across all stores, these variables are more appropriately modeled at a disaggregate level of analysis. We tried to analyze the data within the constraints imposed by the pervasive problem of missing data. Moreover, the data analyzed pertain to stores within one grocery chain in a major city. So insights about the total market (i.e., including competing store chains) are precluded by the nature of the data.

Our research efforts thus far broadly focused on what nutrition attributes consumers explore; the analyses supporting our hypotheses highlighted several reasons they might do this. Because these reasons are largely inferential (they were deduced from quantitative analyses), it is useful to seek qualitative insights from consumers directly about when and why they use (or do not use) nutrition information. To do this, we conducted a series of focus groups.

Focus Group Research

This section integrates findings from six focus groups. Each focus group was limited to approximately eight primary food shoppers. To facilitate the comparison of comments across focus groups, the moderators used a common set of discussion questions for each group but allowed minor variations to accommodate unique member characteristics. In addition, the moderators structured the discussion to ensure active involvement of participants and a clear topic emphasis on nutrition labels. Each participant received $10.00. Five focus groups were conducted in a medium-sized university town (identified in protocols as City A). Participants included 35 women and 5 men, representing university staff members or spouses of students. Another focus group, in a different university town, included 6 women and 2 men (identified in protocols as City B) who responded to a newspaper advertisement soliciting participation from community members.

Method and Results

Two coders classified statements in focus group transcripts into several categories (intercoder reliability was 83%). Our discussion organized participants’ comments around three questions: (1) When/why do consumers use food labels? (2) When/why do they not use labels? and (3) What trade-offs do they perceive between using and not using nutrition information?

When/why do consumers use food labels? Several participants reported that they began using nutrition information after becoming more health conscious. A representative observation follows: “Lately I’ve been watching what I eat. So I’ve been fixing more, watching fat gram intake, and try to stay away from fatty high-calorie foods” (woman, City A). When asked what prompted them to become health conscious, many participants reported a concern about weight gain: “I became health conscious when I gained extra weight. It was part of a diet—exercise routine” (woman, City B).

Because of this weight consciousness, shoppers limit attention to a few negative nutrients: “The only thing I really notice is the total fat grams and the calories…. I’m just starting to pay attention to sodium” (woman, City A). The attention bias toward negative nutrition attributes in these statements about post-NLEA shopping behavior is consistent with H1.

When/why do consumers not use food labels? Consumers do not consider nutrition when shopping for foods described as “fun” or “bad.” Typical comments follow: “If I think it’s ‘fun,’ I don’t look at nutrition” (woman, City A). “The only time I probably don’t care is when I’ve decided that I’m going to have something really ‘bad.’ I don’t give a hoot what it’s got in it or how much it costs” (woman, City A). “If I want a candy bar anyway, a couple grams of fat isn’t going to make a difference and I’ll just get the kind that I like. But, if I were looking at cereal, I would look for something that was lower in fat” (woman, City A). Con-
consumers avoid search on a nutrition attribute if the alternatives considered do not vary on that dimension: "[The search] depends on what you're buying. Soup is soup. Even healthy soup is salty" (woman, City B).

Consumers may not use the information in food labels because of skepticism toward several aspects of the new label: claims that are hard to verify, serving size information, and disclosure of information that is not meaningful. Regarding the claims that were hard to verify, "If they say 'no' cholesterol, 'no' fat, it's pretty easy to tell (from the label) whether it is or not. But with 'lower' or 'light,' it's hard to tell" (woman, City A). Several participants conveyed their distrust of serving size: "Serving sizes are a joke" (woman, City B). Others noted healthful claims on products they considered unhealthy (disclosure of nonmeaningful information): "Like salad dressing. It may say 'low fat,' but it's not especially good for you anyway" (woman, City A). Some focus group members complained about nonpackaged foods without labels: "My husband likes the store's low-fat potato salad; it's easy for me, but there isn't any information" (woman, City A).

What are the trade-offs? Nutrition versus budget versus taste constraints. Grocery shoppers act as purchasing agents for their households. This role imposes significant budget and taste constraints on food choices that potentially undermine nutrition value. Some participants mentioned a price/nutrition trade-off: "But I don't think I would pay extra for something that was more nutritious" (woman, City A). Other participants described a taste/nutrition trade-off: "[Nutrition content] doesn't matter because if it doesn't taste good, you're not going to buy it again" (woman, City A). "I look for the low-sodium stuff too, as well as low fat.... Of course, [my husband and children] are so finicky, it's hard to get anything in them sometimes" (woman, City A).

Summary

Four themes emerged from the focus groups: First, consumers' search for nutrition information in a given food category depends on how they perceive that category. Consumers may ignore nutrition information for fun foods such as candy because these foods meet hedonistic (as opposed to health-related) needs. Shoppers may use a variation of the "psychophysics of price" heuristic (Grewal and Monroe 1994) in matters related to nutrition. That is, they may be willing to search more for some foods because of a nutritionally desirable payoff (e.g., compare cereal brands to save three grams of fat per serving). But for other fun foods—say, cheesecake—consumers may be unwilling to undertake a similar search effort for a larger payoff (e.g., to save ten grams of fat per serving). In such cases, participants believed that time and other costs (such as loss of taste) do not justify a search for better nutrition value.

Second, consumers who are motivated by a desire to lose weight may limit attention to a few negative nutrition attributes. Third, we found a general distrust for information such as serving sizes and hard-to-verify nutrition claims that appeared on food packages. Remarkably, the distrust was not attenuated even after the moderator noted that the NLEA had standardized serving sizes and nutrition claims. Fourth, food shoppers view themselves as purchasing agents responsible for managing constraints imposed by the budget, taste preferences, and nutrition needs of their families.

Discussion

Have the benefits of the NLEA outweighed the costs incurred by the government, food manufacturers, and consumers? Although the implementation costs were substantial, our research indicates that only a few benefits have been realized. In response to the first query raised in the introductory section of the article, we did not detect any general effect by the NLEA on (1) consumers' search for information from the Nutrition Facts panel or (2) their efficiency in processing that information. But we found evidence that the onset of the NLEA has increased the sensitivity of consumers' search, recall, and choice activities to negative nutrients compared with positive nutrients. More specifically, in response to the second query asked previously, in the post-NLEA era, we found an increase in consumers' sensitivity to some negative nutrition attributes, such as sodium and fat, but not to calories. Regarding calories, post-NLEA consumers may consume low-fat foods to manage both fat and calorie intake rather than consume low-calorie foods to manage just calorie intake. Finally, regarding the third query, in the laboratory study we found that one group (low-motivation, low-knowledge consumers) benefited in socially desirable ways under the new food labels.

We organize our discussion around ways that public policy and management practice can help achieve the key normative nutrition goals listed in Table 4. Goal 1 in Table 4 represents the key objective of the NLEA: to promote healthy dietary practice through nutritionally wise food choices. Goals 2, 3, and 4 stem from the widespread recognition that unless a consumer's attention to nutrition includes all foods, all eating occasions, and all nutrients, efforts to control dietary intake will remain ineffective (Scarborough 1995). Goal 5 emphasizes the importance of having all consumers focus on the benefits of nutrition information processing. Unfortunately, our research suggests that progress toward these goals is slow: Consumers possess a greater predisposition to attend to negative nutrition attributes over positive ones, and they attend more to nutrition in certain food categories. Moreover, it is unlikely that access to NLEA-mandated information is available over all eating occasions (consumers may not have the same degree of nutrition information access when eating at home and when dining in a restaurant), so consumers may attend to nutrition on limited occasions. Finally, from the NLEA perspective, results appear mixed with regard to Goal 5. Our lab study indicates that only some consumers benefited from the new labels. Nevertheless, our analyses of people's food choices in selected categories over several years before and after the onset of NLEA suggest a growing realization that (1) some nutrients (fat and sodium) are more important than others (calories) and (2) desirable outcomes associated with one nutrient (caloric reduction) can be by-products of managing another nutrient (fat). Many of our proposed remedies rely on a simple message from cost/benefit models of information search; that is, search outcomes can be improved by decreasing search costs or by enhancing search benefits.
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<th>Research Findings</th>
<th>Managerial Implications</th>
<th>Public Policy Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consumers should make nutritionally desirable food choices in the store.</td>
<td>• Amount of in-store nutrition search low.</td>
<td>• Decrease search costs (e.g., in-store computer terminals).</td>
<td>• Enhance education about different diet–disease links.</td>
</tr>
<tr>
<td></td>
<td>• Poor recall accuracy for nutrition information.</td>
<td>• Promote benefits of healthy diet in-store (e.g., “eat 5 a day” program).</td>
<td>• Link descriptors/claims to Nutrition Facts panel.</td>
</tr>
<tr>
<td></td>
<td>• Food choices influenced more by descriptors/claims than by Nutrition Facts panel.</td>
<td>• Include diet–disease links on packages.</td>
<td></td>
</tr>
<tr>
<td>2. Nutrition focus should include all food products.</td>
<td>• Little search done for “fun” foods compared with “non-fun” foods.</td>
<td>• Use claims to leverage competitive advantage.</td>
<td>• Label restaurant menus with nutrition information.</td>
</tr>
<tr>
<td>3. Nutrition focus should include all purchase/eating occasions.</td>
<td>• Low search when brands are perceived as similar in nutrition content.</td>
<td>• Explore opportunities to market foods that are differentiated on nutrition attributes.</td>
<td>• Educate consumers to use %DV information.</td>
</tr>
<tr>
<td></td>
<td>• Consumers may not consider nutrition information for nonpackaged foods.</td>
<td>• Educate consumers to combine packaged and nonpackaged foods to enhance nutritional value.</td>
<td>• Educate consumers about nutritional balance.</td>
</tr>
<tr>
<td>4. Nutrition focus should include all nutrition attributes.</td>
<td>• Consumers rely on a few negative nutrition attributes.</td>
<td>• Educate consumers about links between different attributes and disease.</td>
<td>• Expand consumers’ focus from diet/weight toward nutrition/health issues.</td>
</tr>
<tr>
<td></td>
<td>• Consumers are attracted to descriptor terms featuring negative nutrients.</td>
<td>• Explore opportunities for brands with multiple descriptor terms.</td>
<td>• Educate consumers about benefits of positive nutrients.</td>
</tr>
<tr>
<td>5. All consumers should focus on nutrition information.</td>
<td>• Some distrust of claims and information on food packages.</td>
<td>• Assure consumers of reliability of nutrition information.</td>
<td>• Educate consumers that nutrition claims are regulated.</td>
</tr>
<tr>
<td></td>
<td>• Brand loyalty is negatively correlated with search.</td>
<td>• Educate loyal consumers about nutrition value of brand.</td>
<td>• Develop simple tests of nutrition knowledge.</td>
</tr>
<tr>
<td></td>
<td>• Highly motivated low-knowledge consumers benefited from new label.</td>
<td>• Improve motivation and knowledge of all consumers through education.</td>
<td>• Educate all consumers about benefit of label.</td>
</tr>
</tbody>
</table>

**Public Policy Challenges and Remedies**

To improve progress toward these goals, public policy officials can increase education and increase availability of information.

*Education.* Our focus group participants reported that their attention to nutrition is not uniform for all foods consumed. New education initiatives should emphasize the dysfunctional consequences of not focusing on all the foods consumed. For example, Ippolito and Mathios (1994) describe an impressive decline in fat consumption between 1977 and 1985 in the meat category, based on national food consumption surveys. However, a large part of this reduction in fat intake was lost because of increased fat consumption in other categories.

A converging result across our studies is that the onset of the NLEA has increased consumers’ sensitivity to negative nutrients. The analysis of category share of healthy foods from our scanner database indicates that in the post-NLEA era, sales of brands touting descriptor terms for positive nutrients decreased or remained unaffected; at the same time, post-NLEA sales of brands featuring descriptors for negative nutrients (except calories) increased significantly. It is plausible that the NLEA increased consumers’ awareness and knowledge about diet–disease links involving a disproportionate number of negative nutrients. Other literature
suggests that consumers who possess knowledge about diet-disease links use packaged goods nutrition information (Andrews, Netemeyer, and Burton 1998; Szykman, Bloom, and Levy 1997). As a result, to encourage consumers to direct their attention to all nutrients, more information should be made available about diet-disease relationships involving other nutrients. In addition, education efforts could encourage consumers to integrate information contained in brand names and claims with Nutrition Facts panel information, a task that prior research shows consumers can perform but often fail to (Ford et al. 1996; Garretson and Burton 2000; Roe, Levy, and Derby 1999).

Three constraints impinge on this recommendation: First, as our focus groups indicate, distrust of hard-to-verify diet-disease claims could present a communications barrier. Second, the NLEA may unwittingly constrain the educational value of diet-disease claims by placing limits on what types of claims are allowed. More specifically, restricting the scope of claims significantly undermines the roles of knowledge and motivation in dietary management tasks (Moorman 1996). For example, the NLEA prohibits health claims for cooking oils because their fat content exceeds a threshold value. Despite evidence from a heart disease perspective that cooking oils lower in saturated fats are superior to other oils, Mathios (1998) concludes after analyzing scanner data that the elimination of health claims in the post-NLEA phase has led consumers to shift purchases to cooking oils with higher saturated fats.

Third, education efforts need to reach a variety of consumers, including those with low motivation. Our lab study shows that after the onset of NLEA, low-motivation consumers continued to rely heavily on qualitative signals such as brand names and nutrition claims instead of the data presented in the Nutrition Facts panel. In contrast, high-motivation (and low-knowledge) consumers made a successful transition to increased reliance on the Nutrition Facts panel. These and other results reveal the difficulty faced by certain groups of consumers (nonwhite, less educated, and over 55 years of age) in using nutrition information. Taken together, they suggest that the ultimate success of the NLEA rests on reaching different groups of consumers with different needs and abilities.

Availability. In some cases, consumers do not search because nutrition information is simply unavailable. For example, restaurants are exempted from the NLEA mandate unless they make a specific nutrition claim, but almost a third of consumers’ meals are at restaurants (Shapiro 1995). Similarly, nutrition labels are not required for traditionally nonpackaged foods (e.g., vegetables). Finally, only limited nutrition information appears in advertising (Andrews, Burton, and Netemeyer 2000; Andrews, Netemeyer, and Burton 1998). Remedies include increasing the amount of nutrition information on nonpackaged goods, on menu items, and in advertising.

It is helpful to recognize the constraints on implementing these suggested remedies. The restaurant industry has “opposed the requirement of nutrition labeling, citing the variability of recipes and portion sizes from day to day” (Scarborough 1995, p. 38). Furthermore, unless education efforts accompany any increase in information, consumers are unlikely to use it effectively.

Management Practice

Grocery retailers. From the retailer’s perspective, an effective way to attack search costs associated with using food labels is to shift the entire burden of search and processing tasks from consumers to computers. Internet-based technologies such as electronic search agents enable computers to handle complex information search tasks accurately with little or no human effort. For example, online grocers (e.g., Peapod.com) allow a single, unified, Web-based search on nutrition attributes in each of several food categories. A logical extension of this technology to in-store nutrition information search may feature computer terminals that enable grocery shoppers to generate individually tailored lists of brands available in the store that satisfy prespecified nutrition criteria.

We capture this idea in Figure 1. Whereas the current model of human nutrition information processing (Figure 1, Panel A) reflects the conceptual underpinnings of our research, Figure 1, Panel B, offers a futuristic model that relegates the bulk of nutrition information processing to computers. Although the current and futuristic models share the same end goal (desirable nutrition behavior), consumer motivation and knowledge play different roles within each model. Whereas motivation and knowledge are critical in Figure 1, Panel A, they are less critical in Figure 1, Panel B. In the latter case, consumers only need to recognize the importance of good nutrition behavior and demonstrate a willingness to use computers to achieve this goal.

Although computers effectively perform search and information processing tasks at which consumers are remarkably inefficient, several concerns emerge. Using computers of any kind for even routine nutrition-related tasks is not costless for consumers or retailers. For consumers, the learning curve may be steep, and they may be susceptible to misinterpreting information here as in the supermarket aisles. Also, retailers and manufacturers can deliberately or inadvertently enter deceptive information. Finally, retailers may find a technology-based system expensive.

Therefore, in the short run, retailers could develop simpler nutrition information management tools. For example, they could launch special programs to broaden consumers’ nutrition focus beyond packaged foods. Examples include quizzes about general nutrition, simple point-of-purchase reminders in the fresh vegetable and fruit sections to “eat five a day,” and free recipes showing consumers how to combine foods in nutritionally balanced ways.

Food manufacturers. Manufacturers of packaged foods can contribute to consumers’ awareness of nutrition through product development (Moorman 1998), repositioning, or promotion efforts. Regarding repositioning, new market opportunities may arise by recasting “fun” foods in a nutritious light. From a promotion perspective, food manufacturers can rely on brand-specific shelf markers and interactive point-of-purchase materials to deliver tailored information about changes in the nutrition content of their products to health-aware segments.

However, both our field study and focus groups suggest caveats. Given the concerns in the focus groups about nutri-
tion/taste trade-offs, food manufacturers need market research to explore whether these strategies enhance the appeal of their brands to chosen target markets. In addition, our field study shows that in the post-NLEA era, any perceived nutritional similarity across brands discourages consumers' search for nutrition information. To break through the competitive clutter, a food manufacturer wishing to position a brand on a nutrition attribute should first change any perception among consumers that all brands are equivalent in terms of nutrition content.

Implications for Further Research and Consumer Welfare

Further research in this area can focus attention on how and why consumers process nutrition information from different package locations in different ways. Consumer characteristics and situations that motivate the use of relatively accessible descriptors and nutrition claims on food packages may differ markedly from those that motivate consumers to use the Nutrition Facts panel. Also, future studies could employ multiple methods and multiple outcome variables. A key strength of our study is its focus on discovering convergent findings across multiple research methodologies. In general, pursuing multiple research methods helps balance the strengths and weaknesses of specific methods and better enables researchers to highlight the complexities that direct and constrain the use of nutrition information. We also gained unique insights by studying outcome variables such as search, recall, choice, and unstructured comments.

Our studies collectively enhance understanding about the NLEA's overall impact. If we focus only on the Nutrition Facts panel, the NLEA's onset did not change in-store search and recall of nutrition information. Although the new food labels successfully improved the availability of relevant nutrition information, they failed to stimulate consumers' search and use of this information. However, if we focus beyond the Nutrition Facts panel (e.g., NLEA-sanctioned descriptors such as "low sodium"), our scanner results show that the NLEA stimulated desirable food choices by encouraging consumers to minimize their intake of negative nutrients. Combined, these results provoke questions about the NLEA and its net effect on social welfare. On the one hand, consumers' failure to use the Nutrition Facts panel information as intended undermines the benefits of the NLEA; on the other hand, consumers' willingness to increase purchases of foods without undesirable nutritional characteristics has positive welfare benefits. More important, if the results pertaining to calories in our longitudinal time-series analyses signal the widespread emergence of consumers' ability to discriminate reasonably among negative nutrients in nutrition management tasks, the onset of the NLEA holds considerable promise for the future. Obvious next steps for enhancing consumer welfare will be to build greater consumer sensitivity for health benefits that stem from positive nutrients.

However, if we restrict the interpretive time horizon for our findings to the immediate past by integrating them with results from other recent work (e.g., Roe, Levy, and Derby 1999), the following insight emerges: Consumers care about nutrition information, but with two important nuances: First, they appear to rely on simple heuristics to collect nutrition information, that is, using the easy-to-digest information in descriptor terms or nutrition claims rather than the more comprehensive information in the Nutrition Facts panel. Because the former are regulated in the post-NLEA era, this approach may be defensible. Second, they appear to care more about certain types of nutrition information (negative nutrients). Both nuances may yield suboptimal nutrition choices and reflect new and complex challenges unleashed by the onset of the NLEA. Optimally, the richer information in the Nutrition Facts panel will guide most consumer food choices when the transition from Panel A to Panel B of Figure 1 is complete.

REFERENCES


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