A Quasi Experiment to Assess the Consumer and Informational Determinants of Nutrition Information Processing Activities: The Case of the Nutrition Labeling and Education Act

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The author reports a longitudinal quasi experiment that uses the implementation of the Nutrition Labeling and Education Act (NLEA) to examine the consumer and information determinants of nutrition information processing activities. Over 1000 consumers from balanced demographic, geographic, and site categories and across 20 different product categories were observed and surveyed within a supermarket setting. Findings suggest that consumers acquired and comprehended more nutrition information following the introduction of the new labels. The NLEA did not, however, always influence these outcomes irrespective of individual consumer differences. Specifically, the new nutrition labels were comprehensible to consumers with varying levels of motivation and most types of nutrition knowledge. However, the new labels appeared to widen consumer differences in terms of how much nutrition information was actually acquired—more motivated consumers and less skeptical consumers acquired more information after the NLEA was passed. Finally, consistent with the NLEA's apparent ability to reduce comprehension differences, the new labels narrowed comprehension differences across healthy and unhealthy products. In contrast, the NLEA widened differences in nutrition information acquisition in favor of unhealthy product categories. These results have implications for public health gains, as well as for the degree to which nutrition may become the basis for competition in unhealthy product categories.

The Nutrition Labeling and Education Act of 1990 (NLEA) (21 U.S.C. 301) required food manufacturers to provide nutrition information about their products in a truthful and complete manner by the May 1994 deadline imposed by the associated regulation. The goal of this requirement was to reduce the negative effects of untruthful and exaggerated claims as well as improve the accessibility of nutrition information at the point of sale so as to increase the extent to which consumers could process and use it in their choices (58 Fed. Reg. 2065–2964; 58 Fed. Reg. 631–691; Golodner 1993; Ippolito and Mathios 1993). I report a longitudinal quasi experiment that uses the implementation of the NLEA to examine the consumer and information determinants of nutrition information processing activities. Three issues, in particular, are the focus.

First, I examine whether the NLEA has influenced the extent to which consumers process nutrition information at the point of sale. Second, whereas previous research has indicated that various consumer characteristics have an important influence on nutrition information processing, I examine whether these characteristics lose their importance when consumers operate in the more effective information environment created by the NLEA. Third, there is some evidence that consumers are more likely to process nutrition information when it involves product categories perceived to be nutritious (Brucks, Mitchell, and Staelin 1984). This effect may be attributed in part to health claims and nutrition information having been voluntarily disclosed by food manufacturers for primarily "healthy" products or being required on products making health claims (Ippolito and Mathios 1991), thereby cueing consumers to acquire nutrition information on those products. With the introduction of the NLEA, consumers are able to acquire and comprehend nutrition information on almost all products.[1] It is therefore expected that consumers' patterns of nutrition information processing will be altered by the NLEA.

Key Research Questions and Literature Review

Previous research has suggested that information disclosure can be used to influence consumer processing and/or choice activities (Bettman 1975; Bloom 1989; Federal Trade Commission 1979; Houston and Rothschild 1980). In the area of nutrition information disclosure, a full range of cognitive

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[1]The only manufactured products excluded from the NLEA regulations are those produced by small, geographically limited brands.

and behavioral outcomes have been examined, ranging from attention and acquisition of nutrition information (Cole and Balasubramanian 1993; Moorman 1990; Moorman and Matulich 1993) and comprehension, elaboration, and integration of nutrition information (Brucks, Mitchell, and Staelin 1984; Funkhauser 1984; Jacoby, Chestnut, and Silberman 1977; Moorman 1990; Russo et al. 1986; Scammon 1977) to actual changes in choice behavior and choice satisfaction levels (Cole and Balasubramanian 1993; Levy et al. 1985; Moorman 1990; Muller 1985; Russo et al. 1986). I focus on two nutrition information processing outcomes: *nutrition information acquisition,* or the search for nutrition information, and *nutrition information comprehension,* or the encoding of nutrition information in consumer memory.

Question 1: Has the Introduction of the NLEA Increased Nutrition Information Processing at the Point of Sale?

Previous research provides equivocal evidence regarding the effect of information disclosure on information outcomes. In Table 1, I provide a brief summary of 20 years of research on the effectiveness of nutrition information disclosure in marketing and consumer research literature. This summary highlights key points of the articles that are relevant to this research, though it does not cover all aspects of it. On the basis of this review, there is no clear indication of how the NLEA will influence the processing of nutrition information at the point of sale.

In studying the potential impact of the NLEA, it is also important to consider the larger marketing, scientific, and media context into which the new labels were introduced. This context created a consumer who, by all reports, was skeptical of nutritional claims and jaded by the constant influx of conflicting scientific, regulatory, and marketing information regarding nutrition and diet-disease relationships (Bird 1994; Freundlich et al. 1989; Schiller 1989). When consumers are unable to verify nutrition claims, research indicates that they are likely to display a higher degree of skepticism, as opposed to when they can make such determinations through typical information acquisition activities (Ford, Smith, and Swasy 1990).

With this context as a backdrop, there are two reasonable expectations regarding the impact of the NLEA on nutrition information processing at the point of sale. First, the new labels and the more tightly regulated environment may cause consumers to become less skeptical of food manufacturers and marketplace information; paradoxically, this reduction in skepticism could cause consumers to become less vigilant in their processing of nutrition information. In other words, an increased faith in the marketplace may supplant the need for extensive information acquisition.

A reduction in nutrition information processing due to lower consumer skepticism is a reasonable possibility considering recent research suggesting that consumers have implicit theories or beliefs about marketer activities—a state that is termed *schemer schema* (Bousch, Friestad, and Rose 1994; Friestad and Wright 1994; Wright 1986). This research suggests that consumers tend to evaluate the behavior of marketers in light of stored knowledge about marketer tactics and motives (Friestad and Wright 1994). Consumers then adjust their behavior in light of these expectations. Thus, if consumers believe that marketer behavior has been positively influenced by regulatory activity—perhaps by curbing deceptive tactics—it is likely that consumers will be less vigilant in defending themselves against marketer activities, will react with less skepticism toward nutrition information, and will process less nutrition information.[2]

The second possibility is that the new labels may promote greater nutrition information processing by reducing consumers' perceived costs of search (Russo et al. 1986). By presenting information in a more comprehensible and standardized format, consumers should be able to process information more easily and with greater efficiency than before, which in turn should increase the amount of information they acquire and comprehend (Ratchford 1982; Russo 1987; Stigler 1961). The role of reduced costs in facilitating the processing of information disclosures is well established in the literature (for a review, see Russo and Leclerc 1991).

Although a review of the literature provides a tentative suggestion that reduced skepticism may offset the positive effects of the NLEA and result in less nutrition information processing, the literature appears to provide greater support for the view that the NLEA promotes nutrition information processing because of a reduction in information processing costs. Therefore, I hypothesize,

H_1: Nutrition information acquisition is higher in the post-NLEA period than in the pre-NLEA period.

H_2: Nutrition information comprehension is higher in the post-NLEA period than in the pre-NLEA period.

Question 2: Has the NLEA Promoted Nutrition Information Processing Irrespective of Individual Consumer Differences?

Another important set of relationships to examine are those between relevant consumer characteristics and nutrition information processing behaviors. The specific focus in this research is to determine whether several consumer characteristics typically associated with nutrition information processing are less predictive of nutrition information processing when consumers are given more effective information environments in which to operate. The provision of information under the NLEA is viewed as more effective because it mandates disclosure on all food products, standardizes label definitions and metrics, and regulates label placement, size, and other display features. Therefore, the NLEA increases the opportunity to process nutrition information while potentially reducing the required ability and motivation.

[2]In support of this view, there is a long tradition in economic research that discusses how some consumers free ride off the activities of other consumers who absorb the costs of using information, which, in turn, transforms the marketplace (Mazis et al. 1981). Arguably, these free riders could have knowledge of marketplace dynamics—understanding how change occurs (even without their involvement). Likewise, I believe it is likely that consumers can hold beliefs about how government can help and hurt the marketplace. In the case of food products, consumers were likely to believe that food manufacturers needed some policing prior to the NLEA. The popular press' treatment of the issue could have certainly led to this conclusion. In the post-NLEA environment, consumers may feel satisfied with governmental actions and thereby safer and less skeptical of nutrition claims.

The question of whether the information environment can be designed so that consumer characteristics lose their importance as determinants of nutrition information processing has been addressed in other research as well. Cole and Gaeth (1990), for example, examined whether the provision of an information aid would assist elderly consumers in nutrition information comprehension. Likewise, I previously (see Moorman 1990) examined whether several information format improvements (reference and consequence information) could encourage nutrition information acquisition, elaboration, and comprehension independent of several consumer characteristics. Finally, Russo and colleagues (1986) used a variety of nutrition information displays to determine the degree to which the displays could reduce the collection, computation, and comprehension costs consumers experience in processing nutrition information.

Examining the impact of the information environment on the relationship between consumer characteristics and nutrition information processing involves a moderator relationship in which the moderator is the NLEA. I propose that in the pre-NLEA period, consumer characteristics are likely to have determined, to a large extent, the degree to which consumers process nutrition information. However, with the introduction of the NLEA, I predict that the relationships between the consumer characteristics and nutrition information processing will weaken. What this means, practically, is that consumers who do not exhibit these characteristics may still process nutrition information. Statistically, what I expect to see is a positive relationship in the pre-NLEA condition that is weakened in the post-NLEA (i.e., the line becomes flatter). I now turn to the consumer characteristics examined here.

The first consumer characteristic, *motivation to process nutrition information,* is defined as an enduring disposition or willingness to attend to nutrition information reflecting a goal-directed arousal (MacInnis and Jaworski 1989; MacInnis, Moorman, and Jaworski 1991; Moorman 1990; Wilkie 1976). Previous research has linked motivation to increased information processing (Bettman and Park 1980; Celsi and Olson 1988; Petty and Cacioppo 1986), as well as to health motivation to greater health information acquisition and health behaviors (Fletcher et al. 1989; Gelb and Gilly 1979; Moorman and Matulich 1993; Zweig, LeFevre, and Kruse 1988). Therefore, I expect the effect of motivation to be attenuated in the post-NLEA period when the labels provide information that stimulates consumers to acquire and comprehend nutrition information, irrespective of their individual motivation differences. Therefore, I hypothesize,

H_3: The relationship between motivation to process nutrition information and nutrition information acquisition is weaker in the post-NLEA period than in the pre-NLEA period.

H_4: The relationship between motivation to process nutrition information and nutrition information comprehension is weaker in the post-NLEA period than in the pre-NLEA period.

The second consumer characteristic, *ability to process nutrition information,* is reflected in nutrition information knowledge, which is defined as nutrition information familiarity and expertise. Familiarity is the number of nutrition-related experiences, and expertise is the ability to perform nutrition-related tasks successfully (Alba and Hutchinson 1987; Brucks 1985). I investigate three types of nutrition information knowledge. The first, *diet-disease knowledge* (Moorman 1990), reflects the ability to correctly link positive and negative nutrients to physiological effects (i.e., increased calcium builds strong bones). The second, *nutrition label knowledge,* reflects the ability to recall the characteristics of a nutrition label (e.g., label content such as types of nutrients). The third, *diet knowledge,* reflects the ability to recall effective diet elements, such as the number of vegetable servings and food groups that contain various nutrients. This last measure was drawn from U.S. Department of Agriculture (USDA) (1990) guidelines.

Following previous research, the effect of knowledge is expected primarily for nutrition information comprehension and not nutrition information acquisition (Alba and Hutchinson 1987; Johnson and Russo 1984; Moorman 1990). Therefore, if the NLEA provides consumers with an effective stimulus-format in the form of standardized label definitions, metrics, and display of the information in an easy-to-comprehend format, the role of stored nutrition knowledge will become less important to nutrition information comprehension outcomes. Therefore, I hypothesize,

H_5: The relationships among (a) diet-disease knowledge, (b) label knowledge, and (c) diet knowledge and nutrition information comprehension are weaker in the post-NLEA period than in the pre-NLEA period.

The final characteristic, *consumer skepticism,* has been defined in a variety of ways in the literature. For example, it can be operationally defined at the level of specific types of assertions or claims that are based on the extent to which consumers believe they are able to verify a specific product claim (Ford, Smith, and Swasy 1990). Or it can be conceptualized at the product level (i.e., the extent to which consumers can verify the central, performance dimension with that ability varying across search, experience, and credence goods [Ford, Smith, and Swasy 1990; Nelson 1970, 1974]). It also could be conceptualized as a general trust or cynicism toward commercial activities across manufacturers, marketing actions, products, and services (Friestad and Wright 1994; Gaski and Etzel 1986; Obermiller and Spangenberg 1995; Varadarajan and Thirunarayana 1990). Finally, skepticism can be viewed as an enduring personality trait reflecting a general distrust of all others, not just commercial sources. This view reflects the antithesis of Rotter's (1967) "interpersonal trust," which is defined as a learned disposition to trust others.

Here, nutrition information skepticism is viewed as a general tendency to disbelieve nutrition information. This view appears to fall under the third category but is limited to nutrition-related activities. As with all the consumer characteristics included here, nutrition information skepticism varies across people. Moreover, the impact of skepticism would be most evident on nutrition information acquisition as opposed to nutrition information comprehension. By following the logic presented prior to hypothesizing H_1 and H_2, it is reasonable to suggest that in the pre-NLEA condition consumers who are skeptical of nutrition information will acquire more nutrition information than those who are not skeptical, because they have a need to monitor the informa-

tion source carefully. In the post-NLEA condition, however, I expect this positive relationship to weaken and skepticism to have no relationship or a weaker relationship with nutrition information acquisition, because if operating within an effectively structured information environment, consumer skepticism should play a less important role. Therefore, I hypothesize,

H_6: The relationship between skepticism and nutrition information acquisition is weaker in the post-NLEA period than in the pre-NLEA period.

Question 3: Has the NLEA Increased Nutrition Information Processing at the Point of Sale for Both Healthy and Unhealthy Products?

In general, the literature has not provided much insight on the issue of whether nutrition information is more effective for healthy or unhealthy products. Research has either focused on a single product category or dealt with multiple product categories without examining differences between them. For example, research has focused on canned peas (Asam and Bucklin 1973), fresh beef (Miller, Topel, and Rust 1976), peanut butter spreads (Scammon 1977), ready-to-eat cereals (Cole and Balasubramanian 1993; Ippolito and Mathios 1991; Jacoby, Chestnut, and Silberman 1977; Russo et al. 1986), hot dogs, margarine (Moorman 1990), and frozen dinners (Russo et al. 1986) or looked across categories without exploring category differences (Levy et al. 1985; Muller 1985).

Only Brucks, Mitchell, and Staelin (1984) hypothesized and found differences in consumers' attention to nutrition information as a function of the healthfulness of the product category, with more nutritious products receiving more attention to nutrition information than less nutritious products. This effect may be attributed in part to health claims and nutrition information having been voluntarily disclosed by food manufacturers for primarily "healthy" products or being required on products making health claims (Ippolito and Mathios 1991), thereby cueing consumers to acquire nutrition information on primarily healthy products. With the introduction of the NLEA, however, consumers are able to acquire and comprehend nutrition information on almost all products. Therefore, nutrition information processing differences attributable to the healthfulness of the product category should be lessened following the NLEA.

H_7: The relationship between product category healthfulness and nutrition information acquisition is weaker in the post-NLEA period than in the pre-NLEA period.

H_8: The relationship between product category healthfulness and nutrition information comprehension is weaker in the post-NLEA period than in the pre-NLEA period.

Method

Basic Design and Procedure

I use a longitudinal quasi experimental design with evaluations at two points in time (eight months before label introduction—October 1993—and five months following label introduction—October 1994; Campbell and Stanley 1963; Cook and Campbell 1979). I selected this approach for several reasons: First, because the data collection occurred in October of each year, it reduced confounds (e.g., food consumption patterns and store promotion activity) that might have been introduced if the data collection occurred in different times of the year. Second, by collecting data eight months prior to the May 1994 deadline, I also reduced confounding due to firms introducing labels before the May 1994 deadline. Third, because this approach allowed for a sufficient period of time to pass after the introduction of the labels, the possibility that the nutrition information processing effects could be attributed to the novelty of the labels in the stores was lessened.

Three geographically dispersed sites in two states were selected for this evaluation. In one state, the first city was large and urban, with a population of 617,000; the second was smaller, with a population of 195,000. In the other state, the focal city was medium-sized, with a population of 362,700, and less urban than the first city. These sites were selected (1) because they were within working proximity of the principal investigator's location and student teams from the principal investigator's university could be recruited to perform the evaluation and (2) because they represented both urban and nonurban environments, as well as small, medium, and large population centers.

At each site, two centrally located supermarkets were selected in high- and low-income neighborhoods. The evaluation was performed during equal levels of weekend and weekday periods and during equal levels of morning and afternoon or evening time periods. Consumers were selected from 20 different product categories that could be classified by nutrition level: orange juice, cake mix, peanut butter, ready-to-eat cereal, margarine, salad dressing, cheese, oils, crackers, cookies, potato chips, pasta, frozen dinners, ice cream, yogurt, hot dogs, bread, soup, frozen pizza, and corn.

At each site and within these product categories and time periods, 170–200 consumers were randomly selected from supermarket aisles following their brand selection for a total of 554 participants in the pre-NLEA and 558 in the post-NLEA condition. Therefore, only those consumers who selected a brand were eligible for inclusion in the study. Researchers unobtrusively observed consumers making a choice from the category. They then intercepted the consumers and asked them to recall some nutrition information from their last choice and complete a one-page survey (see Cole and Balasubramanian 1993). A $1 incentive was offered to encourage involvement in the study.

The challenges associated with quasi experiments did not excape this research—particularly the lack of a pure control group. However, because the NLEA was implemented nationally, it was not possible to overcome this design concern. However, to limit the internal validity threats associated with other changes occurring in the store environment, the following precautions were taken. First, the same six stores were visited in the pre- and post-NLEA conditions, and data were collected within the same month in the pre- and post-NLEA conditions. Second, data were collected from the same 20 product categories in the pre- and post-NLEA conditions. Third, though it is possible firms changed their packaging in the wake of the NLEA, which in turn promoted greater information acquisition, this is not likely to

have confounded the results, because the data collection occurred five months after the new labels (and potential new packaging) were on the products. Therefore, the novelty would have likely worn off by the time the post-NLEA data collection took place. And fourth, Nielsen data was used to compare mean levels of store promotional activity and special pricing activity between the two time periods, and no significant differences were found.[3]

Sample Characteristics

Table 2 contains demographic information describing the sample and 1994 census information for the three geographic locations. To demonstrate the generalizability of the study results, the samples were compared with the census data for the three geographic locations. Results indicate that measures of age, sex, race, education level, income level, and family size compare well with the census data with two important exceptions. First, census data indicate that relative to the study sample, there are higher levels of men than women in these geographic locations. The undersampling of men is likely because women still perform the majority of food shopping for households (*Progressive Grocer* 1995). Second, in the first site, both the median age and the education levels were influenced by the temporary population of students that attend a large state university located in the city. Because the survey was performed when the university was in session, the median reported age was lower and the number of respondents reporting college educations was higher than those from census indicators that do not include these transient residents.

The second set of comparisons was performed on the pre- and post-NLEA samples to determine that they were not significantly different from one another on any demographic, site, or product category characteristic that might influence nutrition information processing. These comparisons were made between the pre- and post-NLEA samples, with differences in nutrition information processing modeled at that level. As is shown in Table 3, no significant differences were found in the pre- and post-NLEA samples on demographic characteristics (sex, age, education, income, and family size), site characteristics (city, income status of store area, part of week, or time of day), or product characteristics (product category).

Measurement

Table 4 contains descriptive statistics for the seven measures used in the study, and the Appendix contains a listing of the measures. Motivation to process nutrition information was measured with a 2-item scale (adapted from Moorman 1990). The correlation between the items was $\rho = .958$, which indicates a high correlation. Ability to process nutrition information involves three measures. The first, diet-disease knowledge, is a 10-item diet-disease knowledge scale that links nutrients to health outcomes (Moorman 1990). Total correct answers were summed within respondent for a mean number of correct responses of 5.876 (s.d. = 2.831). The second, label knowledge, is a single-item nutrition scale that asks respondents to list all information categories that they have seen on product nutrition labels. Correct answers were summed and redundant answers were deleted, following Brucks (1985), to obtain a mean level of 2.938 (s.d. = 3.045). The third, diet knowledge, consists of three questions derived from USDA diet guidelines asking, for example, consumers to circle the correct number of servings of vegetables that should be eaten on a daily basis. Consumers received one point for each correct answer, resulting in a total score ranging from 0 to 3.[4]

Consumer skepticism was measured on a 5-item scale that reflects consumers' tendency to disbelieve nutrition information. A factor analysis indicated the presence of two separate dimensions, skepticism in food products (e.g., "Food products are, on average, not as healthy today as they were five years ago") and skepticism in food label information (e.g., "I don't trust what most food companies say about their products on their food labels"), reflecting 52% and 20.6% of the variance, respectively. Therefore, two separate scales were formed, with an alpha of .839 and a correlation of .335.

Levels of product healthiness were assigned to each of the 20 categories. Although given brands within a category could be positioned as healthy, my focus was on a more objectively determined approach. There are no definitive guides that categorize products, so an approach derived from the current FDA guidelines was developed. Specifically, using a 2000-calorie diet and assuming that consumers would eat, on average, 12 food products per day (four per meal), it was determined that each food product would average 167 calories. By using the highest level of fat calories considered to be healthy (30%), the average food product (of 167 calories) should not exceed 50 calories from fat, which, when divided by the number of calories in a fat gram (9 calories per gram of fat), produces a level of 5.55 fat grams or less for "healthy" food products. (I do not make the distinction between saturated, monosaturated, and unsaturated fats, because this information was not available in most pre-NLEA conditions and because even "good" fats [monosaturated] should be eaten in moderation and within the 30% level.)

[3]The Nielsen data were provided at the city level, so the comparison is imperfect. However, because the chain of stores used in this study is the dominant chain in the region and in these cities, I am fairly confident that these macroindicators were driven to a large degree by what was happening in the target stores. Grocery stores display a great deal of competitive intensity, and they respond quickly to one another's promotional activities; therefore, performing these comparisons at the city level appears reasonable. Moreover, because Nielsen owns city data for only two of the three cities, I report only these data here. Finally, only the 20 product categories were examined because they are the focus in this research. For City 1, across the 20 product categories, the mean percentage of promotional activity (percentage with any promotion) for 1993 (M = 20.47) was not significantly different from the 1994 level (M = 20.83, $t_{1,28} = -.373$, $p > .10$), nor was the mean percentage of products with a price decrease (percentage with price decrease only) for 1993 (M = 11.59) significantly different from the 1994 level (M = 10.71, $t_{1,28} = 1.024$, $p > .10$). Likewise, for City 2, the mean percentage of promotional activity for 1993 (M = 25.77) was not significantly different from the 1994 level (M = 25.85, $t_{1,29} = -.045$, $p > .10$), nor was the mean percentage of products with price decrease for 1993 (M = 14.18) significantly different from the 1994 level (M = 13.25, $t_{1,29} = .923$, $p > .10$).

[4]Although these questions were developed from the USDA guidelines that were issued prior to the NLEA, correct answers did not change with the introduction of the NLEA and its food pyramid guidelines.

By using the actual consumer purchases made, the mean level of actual fat grams in the product categories was calculated. This approach classified the following products as healthy (followed by the mean number of fat grams): orange juice (0 grams), ready-to-eat cereal (2.8 grams), salad dressing (3.17 grams), crackers (3.66 grams), pasta (2.05 grams), refrigerated yogurt (2.56 grams), bread (.94 grams), soup (4.17 grams), cake mix (5.02 grams), cookies (5.27 grams), and corn (.93 grams). The following products were deemed unhealthy: peanut butter (15.85 grams), margarine (8.51 grams), cheese (5.86 grams), oils (13.71 grams), potato chips (8.26 grams), frozen dinners (10.80 grams), ice cream (7.36 grams), hot dogs (11.94 grams), and frozen pizza (16.85 grams). A key limitation of this approach is that it treats all products as key meal components, even though it is clear that salad dressing, margarine, and oil are obviously closer to condiments.[5]

Turning to the measures of nutrition information processing, nutrition information acquisition was measured as the amount of time searching per brand purchased. Time searching began when the consumer touched the first brand in the category and ended when the last choice (in the category) was placed in the basket.[6] This number was divided by the number of brands ultimately purchased to produce the measure.[7,8] Therefore, the mean time spent searching *per brand* purchased was M = 12.25 seconds (s.d. = 20.444), and the mean number of brands selected was M = 1.49, (s.d. = 1.15). Overall, these levels are reasonably comparable to previous research documenting consumer search activities. Specifically, Hoyer (1984) reports a mean search time of 13.16 seconds before the selection of a single laundry detergent. Likewise, in a search study investigating margarine, cold cereal, toothpaste, and coffee, Dickson and Sawyer (1986, 1990) report an average product category search time of 12.4 seconds. Finally, in a study of rice, pasta, canned meat or fish, and powdered soup, Kendall and Fenwick (1979) report a mean level of 18.9 seconds searched across consumers (see Figure 2 in their work). They do not, however, report the number of brands purchased.[9]

Moreover, similar to Dickson and Sawyer (1990), Hoyer (1984), and Kendall and Fenwick (1979), my results suggest that most consumers do not search or have a mean search time of one second. In fact, the distribution ranged from +1 second to 360 seconds, with 44.5% using 1 second, 10% using 2–5 seconds, 11% using 6–10, 9% using 11–15, 5% using 16–20, 3% using 21–25, 6% using 26–30, 2% using 31–35, 2% using 36–40, 2% using 41–46, 4% using 56–60, and 1.5% using 70+. Therefore, the distribution is skewed to the left and drops off at fairly equal rates until 30 seconds, when it dips to an average of 2% until the sample is depleted.

Nutrition information comprehension was measured as total fat-level recall accuracy. This measure was collected immediately after intercepting the consumer following his or her last selection within the product category. If the respondent selected more than one brand, he or she was asked to recall the total fat level for the last brand selected. After the consumer had completed the survey, actual fat gram information was collected from the last brand selected.

In constructing the comprehension measure, the absolute value of the recalled fat level minus the actual fat level was used because the absolute distance[10] from the actual level was determined to be more important than whether the respondent reported high or low levels.[11] The mean accuracy level for fat-level recall among respondents was M = 5.376 grams (s.d. = 14.390).

Despite fat not being salient in all the product categories included in this study, fat was selected as the focal attribute for several reasons. First, it is important to consumers and therefore would be likely to reflect comprehension effects.

[5]A more systematic analysis of the marketplace may have yielded a different categorization. However, because the consumers in the study selected brands that yielded the current categorization, it seems reasonable to use this approach because the selected brands (and not a census of the marketplace) influenced consumer behavior in this study. Other approaches would have been to use nutrient density (nutrients/total caloric intake) or calories from fat. Yet, both would have required additional nutrition information in the pre-NLEA condition to calculate such metrics.

[6]Another approach to measuring search time is to begin timing when the consumer orients toward the product category. I used the first-touch approach because it provided greater confidence that information search had begun, whereas merely turning toward the category may indicate exposure to product stimuli but not information search.

[7]More controlled and artificial experimental conditions would have allowed for more precision in the nutrition information acquisition measure. In a strict sense, the measure reflects the entire search time, including the acquisition of nutrition information. I selected this approach because it was not possible to observe unobtrusively whether consumers were actually reading the nutrition panel and trying to do so would lead to more errors than a more valid measure. One key concern was in determining when consumers were actually processing nutrition information and when they were not. Because nutrition information can be communicated in a variety of forms and found in a variety of locations, it was thought that more errors of omission would be committed if only nutrition information *panel* processing were counted. Granted, the adopted approach permits the inclusion of search time that may not have been directed toward nutrition information, but it does provide guidelines that could be applied uniformly across subjects. Moreover, several other sources of explanation for these search differences have been eliminated. First, the promotional and pricing activities of the stores were unchanged across the two time periods. Second, the sample was randomly selected and no significant difference on critical consumer characteristics in the pre- and post-NLEA samples were found. Third, the data were collected from the same 20 product categories in the pre- and post-NLEA samples. Fourth, there is some precedent in the literature for this approach, as Dickson and Sawyer (1990) report price search while using a general measure such as the one used here.

[8]Results using total search time in lieu of search time per brand purchased produce an equivalent set of results.

[9]I acknowledge that this is an imperfect comparison, because Dickson and Sawyer (1990) and Kendall and Fenwick (1979) do not provide information on the number of brands selected. Dickson and Sawyer do, however, note that an average of 1.21 brands were inspected, which reflects 10.25 seconds of search per brand inspected and remains reasonably comparable to my findings. Hoyer (1984) does provide information on the number of packages inspected (1.42), which when divided by the total search time produces an 9.27 search per brand inspected. The level of search time per brand inspected in Dickson and Sawyer's and Hoyer's studies and the level of search time per brand purchased in this study are reasonably comparable. They become even more comparable when looking at the pre-NLEA search time per brand purchased level (10.38), which compares well with the others at 10.25 and 9.27. Furthermore, the samples in both Dickson and Sawyer's (toothpaste) and Hoyer's (laundry detergent) studies contain nonfood items that may be more habitually purchased.

[10]I also experimented with percent absolute difference in model testing and found no differences compared with a model using absolute difference.

[11]Additional analysis implies that consumers tend to overreport (66% of the time) more than underreport (33% of the time) fat levels, which suggests that consumers tend to think there is more fat in food products than there actually is.

Table 4. Measurement Information

	Mean	Standard Deviation	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Motivation to process	4.337	1.771	.935*						
(2) Diet knowledge	1.828	.786	.219	—					
(3) Diet-disease knowledge	5.833	2.850	.258	.183	—				
(4) Label knowledge	2.920	3.008	.218	.279	.329	—			
(5) Skepticism in food products	3.461	1.525	–.015	–.162	–.143	–.194	.839		
(6) Skepticism in food label information	4.035	1.306	.096	–.021	.009	–.016	.369	.335*	
(7) Nutrition information acquisition	12.225	20.448	.127	.000	.022	.018	–.029	.005	—
(8) Nutrition information comprehension	5.067	12.618	–.128	–.121	–.088	–.079	.007	–.002	–.012

Note: Coefficient alpha for each measure is on the diagonal, and the intercorrelations among the measures are on the off-diagonal.
*Correlations between the two items in the scale.

Second, fat is a negative nutrient and prior research has shown that consumers process more nutrition information associated with negative than with positive nutrients (Muller 1985; Russo et al. 1986). Third, from a health policy perspective, fat is a major culprit in heart disease and cancer.

Overview of Data Analysis

Two different data analytic approaches were used to test the hypotheses. First, two moderator regression models with follow-up tests were used to test H_1 through H_6. In these models, time was dummy coded to be pre-NLEA = 0 and post-NLEA = 1. Following this, interactions were created by taking the product of each of the six consumer characteristics and the time variable. Prior to forming these interactions, the continuous consumer characteristics were mean-centered to reduce potential collinearity effects that were likely to result from having both main and interaction effects in the same model (Cronbach 1987).

Consistent with the moderator model, both the main and interaction effects were entered into the model. Therefore, with nutrition information acquisition and nutrition information comprehension as the dependent variables, the following variables were entered into the model: time, consumer characteristics, and interaction of consumer characteristics and time. The healthfulness of the product category was also entered as a control variable in this model because of the suggestion (in Question 3) that it may influence nutrition information processing outcomes. Significant interactions were then investigated to determine the nature of the effect under different time periods. In addition to the regression models, a test of robustness was performed by determining the outliers through a residual analysis. These outliers were then held out of the sample, and no significant change in the results of the model outcomes was found.

Second, to test H_7 and H_8, I examined the interaction of product category and time on nutrition information processing using an analysis of variance of model with planned interaction contrasts.[12] Finally, because of the directionality of the specific hypotheses, one-tailed tests were used throughout the model testing.

Results

In Tables 5 and 6, I summarize the results of the data analysis. I address each of the general questions by considering the specific hypotheses.

Considering the question of whether the NLEA influenced patterns of nutrition information processing, results show that, overall, the two models were significant (nutrition information acquisition, $R^2 = .030$, $F_{(8,1027)} = 3.951$, $p = .000$ and nutrition information comprehension, $R^2 = .090$, $F_{(10,678)} = 6.722$, $p = .000$) (see Table 5). Specific results indicate that nutrition information acquisition was positively influenced by the NLEA ($b = 3.11$, $p < .01$), which supports H_1. For the impact on nutrition information comprehension (in which lower scores mean greater comprehension), results are significant ($b = -3.026$, $p < .01$), thereby supporting H_2. These results indicate that nutrition information acquisition and comprehension increased significantly from the pre- to the post-NLEA period.

The second question addresses whether the introduction of the new nutrition labels influenced the relationship between consumer characteristics and nutrition information processing (see Table 5). For the impact on nutrition information acquisition, results indicate that the interaction between motivation to process and time was significant ($b = 1.297$, $p < .05$), as was the interaction between skepticism in food products and time, though it was more marginal ($b = -1.337$, $p < .10$). These significant interactions were then analyzed by examining the relationship between the consumer characteristics and the nutrition information processing outcomes in the pre- and post-NLEA time periods (Cohen and Cohen 1983). Results suggest, contrary to expectations, that the relationship between motivation to process and nutrition information acquisition was stronger in the post-NLEA ($b = 2.050$) than in the pre-NLEA ($b = .751$) time period. Moreover, the relationship between skep-

[12]This second approach was needed because the hypotheses involved comparing whether nutrition information processing was different for healthy and unhealthy products across pre- and post-NLEA conditions (which involved comparing the mean difference in healthy and unhealthy products for pre- and post-NLEA conditions). This is different from what would have been tested in the moderator regression model, which was how the relationship between product category healthfulness and nutrition information processing varied across NLEA periods (which involves comparing the b's for product category healthfulness and nutrition information processing across NLEA periods).

Table 5. The Impact of the NLEA on Nutrition Information Processing Outcomes

Independent Variables	Nutrition Information Acquisition b (standard error)		Nutrition Information Comprehension[a] b (standard error)	
Time (pre-NLEA, post-NLEA)	3.110	(1.273)*	-3.026	(.933)*
Motivation to process	.835	(.475)**	-.872	(.369)**
Motivation to process × time	1.297	(.716)**	.759	(.555)†
Diet-disease knowledge			.279	(.245)
Diet-disease knowledge × time			-.975	(.358)*
Label knowledge			-.468	(.218)**
Label knowledge × time			.648	(.335)*
Diet knowledge			-2.022	(.694)*
Diet knowledge × time			2.474	(1.046)**
Skepticism in food products	.154	(.538)		
Skepticism in food products × time	-1.337	(.830)†		
Skepticism in food label information	-.048	(.668)		
Skepticism in food label information × time	-.491	(1.021)		
Product category healthiness	-.231	(1.266)	-3.987	(.933)*
F =	3.951		6.722	
d.f. =	8,1027		10,678	
p =	.000		.000	
R^2 =	.030		.090	

[a]Comprehension was measured using a comprehension accuracy measure in which lower levels indicate higher levels of comprehension.
*$p < .01$, one-tailed test.
**$p < .05$, one-tailed test.
†$p < .10$, one-tailed test.

ticism in food products and nutrition information acquisition was positive in the pre-NLEA condition (b = .211) but shifted to a negative relationship in the post-NLEA condition (b = -1.066). These results fail to support H_3 and H_6 (see Figures 1 and 2).

For the impact on nutrition information comprehension, results indicate that the following interactions were significant: diet-disease knowledge and time (b = -.975, $p < .01$), label knowledge and time (b = .648, $p < .01$), diet knowledge and time (b = 2.474, $p < .05$), and motivation to process and time (b = .759, $p < .10$). In addition, the main effects of label knowledge (b = -.468, $p < .05$), diet knowledge (b = .307, $p < .01$), and motivation to process (b = -.872, $p < .05$) were significant predictors of comprehension. Investigating these four significant interactions, results suggest that, contrary to expectations, the relationship between diet-disease knowledge and nutrition information comprehension was stronger in the post-NLEA (b = -.460) than in the pre-NLEA (b = -.304), which fails to support H_{5a}.

However, the data do support the view that motivation, diet knowledge, and label knowledge have a weaker relationship in post-NLEA than pre-NLEA conditions. Specifically, the relationship between motivation to process and nutrition information comprehension was weaker in the post-NLEA (b = -.316) than in the pre-NLEA (b = -2.01) condition, which supports H_4 (see Figure 3). Moreover, the relationship between label knowledge and nutrition information comprehension was weaker in post-NLEA (b = -.057) than in the pre-NLEA (b = -1.082) condition, which supports H_{5b} (see Figure 4). Finally, the relationship between diet knowledge and nutrition information comprehension was weaker in post-NLEA (b = -.069) than in pre-NLEA (b = -3.979) condition, which supports H_{5c}.

Finally, for the relationship between product category healthiness and nutrition information acquisition, results indicate a significant interaction between time and product category healthfulness ($F_{(1,1056)} = 4.986$, $p < .05$; see Table 6). Further investigation of the marginal means using interaction contrasts (Keppel 1989) indicates an increase in the difference between nutrition information acquisition for healthy and unhealthy product categories in the pre- and the post-NLEA conditions (-2.76 versus 2.87, $F_{(1,1056)} = 20.196$, $p > .05$), which fails to support H_7. Results indicate that the deviation from prediction was likely due to the large increase in information acquisition in the post-NLEA condition for unhealthy products (see Table 6, marginal means).

For the same question in the context of nutrition information comprehension (in which lower scores are better), results indicate a significant interaction between pre- and post-NLEA conditions and product category healthfulness ($F_{(1,713)} = 2.871$, $p < .10$). Further investigation of the marginal means using interaction contrasts indicate, consistent with predictions and supporting H_8, that the difference between nutrition information comprehension for healthy and unhealthy product categories in the pre-NLEA condition is larger than the difference between healthy and unhealthy product categories in the post-NLEA condition (6.49 versus 3.23, $F_{(1,710)} = 12.446$, $p < .05$).

Figure 1. The Interaction of Motivation to Process and the NLEA on Nutrition Information Acquisition

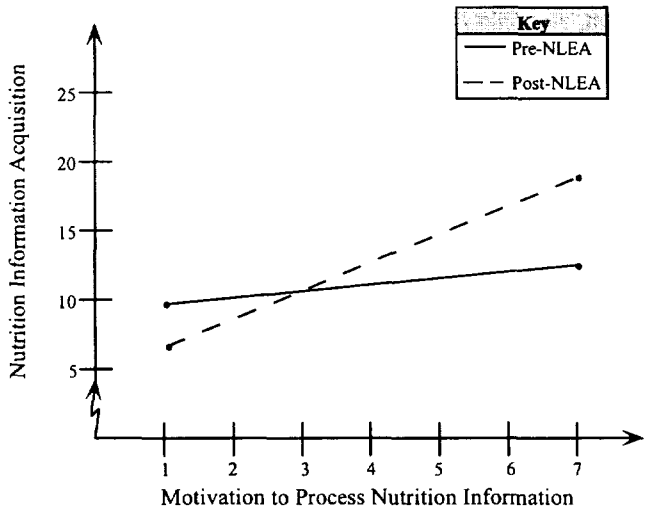


Figure 2. The Interaction of Skepticism in Food Products and the NLEA on Nutrition Information Acquisition

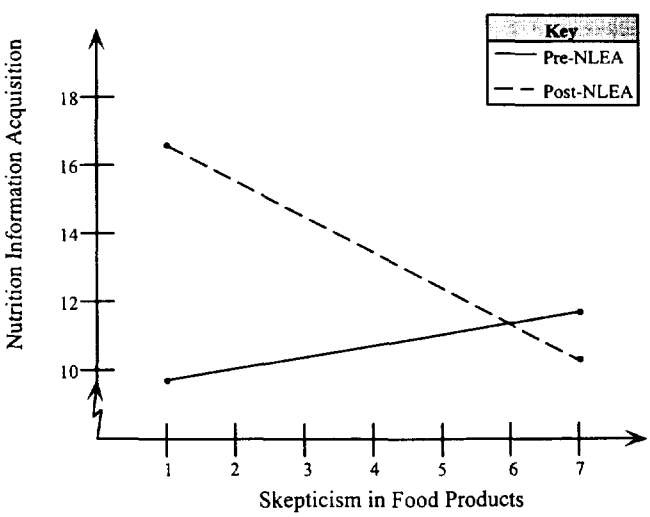


Figure 3. The Interaction of Motivation to Process and the NLEA on Nutrition Information Comprehension

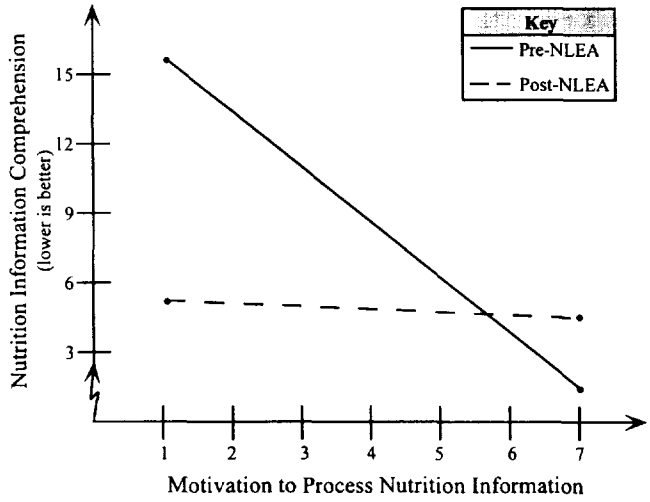
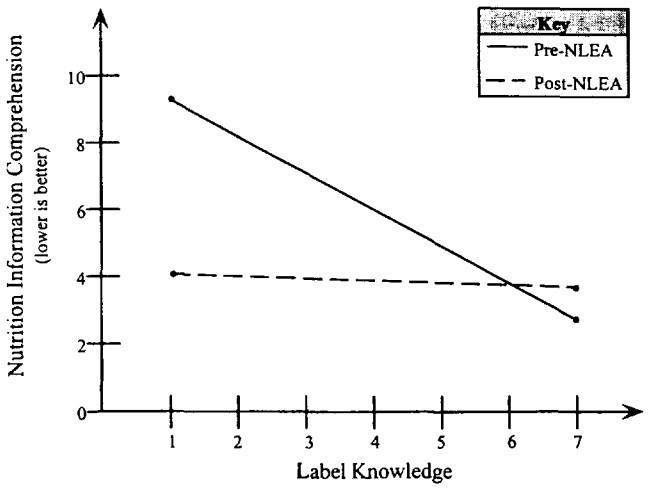


Figure 4. The Interaction of Label Knowledge and the NLEA on Nutrition Information Comprehension



Note: The same relationship holds for diet knowledge.

Discussion

I report a longitudinal field experiment designed to investigate the effects of the NLEA on nutrition information processing. Legislative and regulatory sponsors have assumed that the NLEA will improve nutrition information processing by providing more complete, more comprehensible, and less potentially deceptive information across a wider range of food products. However, this provider view of information provision (Capon and Lutz 1979) has not been exposed to formal testing with regard to its consumer impacts.

I examine several theoretically relevant and practically important questions that reflect a consumer view of nutrition information disclosure: (1) Has the introduction of the NLEA increased nutrition information processing at the point of sale? (2) Has the NLEA promoted nutrition information processing irrespective of individual consumer differences? and (3) Has the introduction of the NLEA increased nutrition information processing at the point of sale for both healthy and unhealthy products?

Has the Introduction of the NLEA Increased Nutrition Information Processing at the Point of Sale?

Although the measures utilized here require some additional qualifications, the data indicate that the NLEA positively influences consumers' acquisition and comprehension of nutrition information at the point of sale. Specifically, consumers spend more time searching in the post-NLEA condi-

Table 6. The Role of Product Category Healthfulness on the NLEA's Impact

Nutrition Information Acquisition			
	Sum of Squares	**df**	**F**
Time	3559.695	1	8.582*
Product category healthfulness	7.264	1	.018
Time × product category healthfulness	2068.317	1	4.986*
Total	442397.520	1056	
Marginal Means	**Pre-NLEA**	**Post-NLEA**	
Healthy products	11.91	12.53	
Unhealthy products	9.15	15.40	

Nutrition Information Comprehension[a]			
	Sum of Squares	**df**	**F**
Time	1829.899	1	12.006*
Product category healthfulness	3457.420	1	22.684*
Time × product category healthfulness	437.663	1	2.871†
Total	113838.499	713	
Marginal Means (lower is better)	**Pre-NLEA**	**Post-NLEA**	
Healthy products	3.96	2.25	
Unhealthy products	10.45	5.48	

[a]Comprehension was measured using a comprehension accuracy measure in which lower levels indicate higher levels of comprehension.
*$p < .01$, one-tailed test.
**$p < .05$, one-tailed test.
†$p < .10$, one-tailed test.

tion than in the pre-NLEA condition. In addition, consumers have greater comprehension of nutrition information in the post-NLEA condition than in the pre-NLEA condition.

When reflecting on the acquisition results, it seems reasonable to suggest that if the nutrition labels were optimally constructed, they might reduce, instead of increase, the amount of time consumers use to make a wise food purchase. However, this explanation is less likely after considering that consumers typically search more when processing costs are lower and the NLEA probably increased the level of comparative shopping because consumers can now compare all products on nutritional attributes. Another view of the impact of the NLEA on nutrition information acquisition is that the positive effects may be reflected only in short-term evaluations of the NLEA and that long-term evaluations may show an inverted U-shaped relationship, with the impact of the NLEA influencing the perceived value of the labels up to a point after which the information is in some way encoded in memory for future use and the labels themselves become less important (Russo et al. 1986). Long-term evaluations may formally examine this possibility.

Has the NLEA Promoted Nutrition Information Processing Irrespective of Individual Consumer Differences?

Despite the positive consumer effects, the data provide mixed support on the issue of whether the NLEA has promoted nutrition information processing irrespective of individual consumer differences. Specifically, the relationship between motivation to process and information acquisition is stronger and more positive in the post-NLEA than in the pre-NLEA condition, thus indicating that motivated consumers are likely to gather more information in the post-NLEA condition. These results suggest that the NLEA does not reduce the effect of motivational differences between consumers but rather increases their differences. This can be explained, in part, by considering that in the post-NLEA condition, motivated consumers potentially could expose themselves to more nutrition information.

However, the NLEA does attenuate the effect of motivation on nutrition information comprehension. These results suggest that comprehension is more likely to occur in the post-NLEA period in the absence of consumer motivation to process than in the pre-NLEA period. Therefore, it appears that in a well-designed information environment, comprehension is not highly dependent on the level of motivation consumers exhibit toward the information processing task.

On a related note, several of the consumer knowledge variables also lose their importance as predictors of nutrition information comprehension in the post-NLEA condition. Specifically, both label and diet knowledge, though significant predictors of nutrition information comprehension in the pre-NLEA condition, become insignificant in the post-NLEA condition. Diet-disease knowledge, however, becomes an even stronger predictor in the post-NLEA condition. This result could be explained by the fact that diet-disease claims, which were used frequently by food manufacturers prior to the NLEA, were restricted in the post-NLEA condition to claims that the FDA believes can be supported by the available scientific evidence. In addi-

tion, these claims remain tightly regulated, with food manufacturers forced to ensure that consumers get a complete picture of the product's overall nutrition in conjunction with the diet-disease claim. This level of regulation, some suggest, reduces the number of such claims being made and therefore reduces the level of diet-disease information available to the public (Ippolito and Mathios 1993). One implication is that consumers must draw on their own diet-disease knowledge in the post-NLEA time period.

To summarize the effects of the NLEA on the relationship between consumer characteristics and nutrition information processing, it appears that the NLEA has influenced some nutrition information processing irrespective of consumer differences but not others. Specifically, because label knowledge, diet knowledge, and motivation are less predictive of comprehension in the post-NLEA than in the pre-NLEA period, it appears that reducing comprehension costs is the easiest way to minimize consumer differences. Following Russo and Leclerc (1991), therefore, an overarching lesson may be that information disclosure programs focusing on lowering effort are more successful than programs trying to motivate consumers to "do the right thing" in purchasing nutritious foods.

Further research might measure comprehension of nutritional attributes other than fat that might be influenced by the introduction of the NLEA. Moreover, although this comprehension approach has been used successfully in other research (Johnson and Russo 1984), it also could be criticized because it is estimated that nearly 40% of all products in the pre-NLEA period did not have nutritional labels (Porter and Earl 1990). Therefore, some may argue that differences in comprehension should be attributed to differences in "exposure."[13]

The final consumer characteristic is skepticism. In the pre-NLEA condition, skepticism of food products had a positive effect on information acquisition. Therefore, as skepticism increased so did information acquisition. This is likely due to the increased vigilance that high skepticism fosters among consumers. It appears that because of this vigilance, consumers are on guard in their purchase behaviors, which results in greater nutrition information acquisition. High skepticism in the post-NLEA condition results in exactly the opposite effect—it reduces consumers' acquisition of nutrition information. Therefore, skepticism in the regulated environment tends to produce less information acquisition, whereas skepticism in an unregulated environment produces more information acquisition. These results suggest a third overarching conclusion: If consumers remain skeptical while operating in a munificent information environment (post-NLEA), they are likely to be pessimistic about the nutritional quality of food products, which in turn reduces their information acquisition activities. On the other hand, if consumers are skeptical while operating in a lean information environment (pre-NLEA), their skepticism is more optimistic and it appears to drive them to acquire more information.

Although there is a significant change across the two time periods in the effect of skepticism in food products, there is no change in the effect of skepticism in food label information. This lack of change in skepticism levels following the introduction of the new labels could suggest, in the short run, that the larger scientific, media, and marketing context keeps consumers second-guessing the trustworthiness of the food label information.

Together, the impact of these two types of skepticism suggest that distinguishing between different types of skepticism and the larger information context in which skepticism occurs provides deeper insight into the impact of skepticism on information processing activities than has been generated in previous research. Further research should extend these findings by experimental studies that allow for the manipulation of information munificence, as well as the manipulation of consumer skepticism.

Has the NLEA Increased Nutrition Information Processing at the Point of Sale for Both Healthy and Unhealthy Products?

Results indicate that the NLEA does reduce comprehension differences for healthy and unhealthy products. However, similar changes in acquisition of nutrition information are not found, and consumers actually search significantly more (though marginally so) for unhealthy products over healthy products. Therefore, though consumers acquire more information for both healthy and unhealthy products, they increase their acquisition of nutrition information for unhealthy products far more than they increase their acquisition of nutrition information for healthy products.

Considering these effects on information acquisition, it could be inferred that the *availability* of nutrition information on unhealthy products enables consumers to act on their desire for negative nutrition information (Heimbach and Stokes 1982; Moorman 1990; Russo et al. 1986). Availability, however, does not seem to account for all of these effects, as only 2 of the 20 product categories (hot dogs and pizza) did not contain some nutritional labeling in the pre-NLEA period. The *quality* of the post-NLEA information—achieved through standardization and adequate reference information (Moorman 1990)—also may be responsible for some of these effects. Finally, it may be possible that one second-order effect of the NLEA is that it raised awareness about the nutritional qualities of food products, thereby increasing the focus on less nutritious food products. One result of this focus is that nutrition may increasingly become a basis for competition in unhealthy product categories.

Conclusions and Public Policy Implications

In conclusion, I provide a set of initial findings of the impact of the NLEA on consumer processing of nutrition information. Findings suggest that consumers acquire and comprehend more nutrition information following the introduction

[13]Although logical, this perspective can be criticized on several grounds. First, if the labeling estimate is correct, it can be assumed that 60% of the responses in the pre-NLEA period potentially could have been informed by label information. Second, because fat exposure comes from sources other than food label information, there is a reasonable chance that consumers would be exposed to nutrition information from other sources, such as government and consumer group sources, friends, family, and so on. Third, results indicate that actual fat levels are available on only 12% more of the post-NLEA products (547) than of the pre-NLEA products (482), which also alleviates concerns about a lack of pre-NLEA labeling.

of the new labels. Therefore, designing more complete, more comprehensible, and less potentially deceptive information across a wider range of food products has increased the level of nutrition information that consumers acquire and comprehend at the point of sale.

A goal that appears to be implicit in the NLEA is to facilitate consumers' use of nutrition information irrespective of their individual processing capabilities. In other words, most consumers should be able to use the new nutrition labels in their food choices. The results of this study suggest that the NLEA was only partially successful on this issue. Specifically, the new nutrition labels were comprehensible to consumers with varying levels of motivation and most types of nutrition knowledge. However, the new labels seem to widen consumer differences in terms of how much nutrition information was actually acquired—more motivated consumers and less skeptical consumers acquire more information in the post-NLEA period. If nutrition and/or health programs strive for greater equity in acquisition, the FDA will need to adopt different approaches in program design. For example, it is not clear that nutrition labels are the appropriate tool to motivate less interested consumers. Fear appeals may be more effective in drawing attention to the critical information contained on nutrition labels (Block and Anand Keller 1995; Moorman 1990). Yet, if equity is not a policy goal, the approach taken in the case of the NLEA appears to fulfill other important objectives, such as making information available in a comprehensible format.

Of more concern appears to be a group of highly skeptical consumers who remain pessimistic about the truthfulness of nutrition information and the healthfulness of food products despite the NLEA and who, as a result, acquire little or no nutrition information. Further research should address the causes of this skepticism. If, for example, this skepticism arises from ignorance or misinformation, education or persuasion programs targeting these consumers may be needed. On the other hand, if this skepticism arises from social structural features, such as not feeling integrated into a well-established business or government system, which might come from socioeconomic status or ethnicity, other types of programs that attempt to form bridges with communities exhibiting such characteristics may be needed.

Finally, consistent with the NLEA's apparent ability to reduce comprehension differences, it narrowed differences across healthy and unhealthy products. It also, however, widened differences in nutrition information acquisition in favor of unhealthy product categories. I attribute some of these differences to nutrition information being available for unhealthy products in the post-NLEA but not in the pre-NLEA period. The gains, however, were large for unhealthy products, which suggests two important implications: First, there is likely to be a public health benefit associated with this gain, and second, nutrition is increasingly likely to become a basis for competition in unhealthy product categories.

Appendix A
Study Measures

Motivation to Process Nutrition Information *Moorman (1990)*
Definition: An enduring disposition or willingness to attend to nutrition information reflecting a goal-directed arousal.
(7-point scale: 7 = very much; 1 = not at all)
•How interested are you in reading nutritional labels?
•I really care about reading nutrition labels.

Ability to Comprehend Nutrition Information
Definition: Nutrition information familiarity and expertise, where familiarity refers to the number of nutrition-related experiences and expertise is the ability to perform nutrition-related tasks successfully.

(1) Diet-Disease Knowledge: *Moorman (1990)*
Definition: The ability to correctly link positive and negative nutrients to physiological effects. *(Correct matches are listed across from one another.)*

Match the nutrient to the correct health outcome.

a. Calcium	_____Builds strong bones
b. Saturated Fat	_____Causes cardiovascular disease
c. Vitamin A	_____Maintains eyes, skin, and hair
d. Iron	_____Carries oxygen in the blood
e. Sodium	_____Causes high blood pressure
f. Vitamin C	_____Fights colds and has anticancer power
g. Vitamin D	_____Helps absorb calcium
h. Carbohydrates	_____Converts to sugar/fuels the body
i. Protein	_____Forms amino acids to build your body
j. Potassium	_____Balances sodium in the body

(2) Nutritional Label Knowledge *Adapted from Brucks (1985)*
Definition: The ability to recall the characteristics of a nutrition label. *(Correct information was summed minus redundancies.)*

Please list all information that you have seen on product nutritional labels.

(3) Diet Knowledge *USDA (1990)*
Definition: The ability to recall effective diet elements. *(Correct answers are in italics.)*

Circle the correct answer for each question below.

Nutrition guidelines recommend that adults eat at least ___ servings of vegetables daily.
1 *3* 6
Which food group contains the most cholesterol?
Breads & Cereals Sugars
Vegetables & Fruits *Meat & Poultry*
Which food group contains vitamins A and C, folic acid, minerals, and fiber?
Breads & Cereals Sugars
Vegetables & Fruits Meat & Poultry

Skepticism in Food Products *New Scale*
Definition: The tendency to disbelieve food product quality.
(7-point scale; 7 = strongly agree; 1 = strongly disagree)
•Food products are, on average, not as healthy today as they were five years ago.

•Food products today contain more negative nutritional qualities than positive nutritional qualities compared with five years ago.
•Food companies seem to be getting by with more unhealthy products in the grocery store today, compared with five years ago.

Skepticism in Food Label Information *New Scale*
Definition: The tendency to disbelieve food label information.
(7-point scale; 7 = strongly agree; 1 = strongly disagree)
•I don't trust what most food companies say about their products on their food labels.
•Most food companies seek to persuade people to buy products that aren't "good" for them.

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