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Is Simpler Always Better? Consumer Evaluations of Front-of-Package Nutrition Symbols

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Is Simpler Always Better? Consumer Evaluations of Front-of-Package Nutrition Symbols

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Consumers of packaged goods products in the United States recently have faced an onslaught of front-of-package (FOP) nutrition symbols and icons, including the controversial "Smart Choices" single summary indicator. In a between-subjects experiment with 520 adult consumers, the authors compare effects of the Smart Choices (SC) icon, the more complex Traffic Light–Guideline Daily Amounts (TL-GDAs) icon, and a no-FOP icon control for a nutritionally moderate food that qualifies for the SC icon. Drawing from principles of heuristic processing and halo effects, the authors predict and find that the SC icon can lead to positive (and potentially misleading) nutrient evaluations and product healthfulness when compared with the TL-GDA icon or no-FOP icon control. When the Nutrition Facts Panel is not available, the TL-GDA icon results in substantially greater nutrition accuracy scores than with the SC icon or control. The authors also find that nutrition consciousness is more likely to moderate effects related to the Nutrition Facts Panel than the FOP nutrition icon information. Implications are offered for public health officials, nutrition researchers, and food manufacturers, as the Food and Drug Administration considers FOP nutrition alternatives for use in the United States.

Keywords: nutrition labeling, front-of-package symbols, nutrition consciousness, U.S. Food and Drug Administration

Consumers of packaged food products in the United States now face a dizzying array of front-of-package (FOP) nutrition symbols and icons, including Kraft's "Sensible Solution," PepsiCo's "Smart Spot," Unilever's "Eat Smart" logo, the American Heart Association's "Heart Check," General Mills' "Goodness Corner," the "Guiding Stars" from Hannaford Bros., Kellogg's use of the Guideline Daily Amounts, and, until recently, the Keystone Group and Nutrition Roundtable's "Smart Choices" icon (Center for Science in the Public Interest 2006; Childs 2008; Fooducate 2008; Institute of Medicine 2010; Sebolt 2008). Other FOP icons include a simple symbol from Wal-Mart (Skiba 2011) and the "Nutrition Keys" (Grocery Manufacturers Association 2010, 2011), which displays per serving nutrition information on icons for calories, saturated fat, sodium, and sugars.

To combat confusion created by the many symbols in the U.S. market, the Smart Choices (SC) icon was developed by the Keystone Group (a large industry, government, and academic coalition), and it appeared on packages from firms such as Unilever, Kraft, Coca-Cola, Pepsi, and Kellogg, from August through October 2009 (Lupton et al. 2010). In general, the intent of the FOP symbols and icons is to help consumers make better choices in constructing a balanced diet, because of their simplicity and suggested ease of use (Food Standards Agency 2008, 2009b; Sebolt 2008). Consumer testing by the Keystone Group indicates that the simplicity of summarizing the diverse nutrition information in the Nutrition Facts Panel into a single indicator to classify products is a highly desirable attribute for consumers (Lupton et al. 2010). Similarly, research in the European Union has indicated that consumers generally like and prefer simpler, "healthy choice tick" FOP icons (Feunekes et al. 2008). However, work by the Food Standards Agency in the United Kingdom also suggests that more complex FOP icons, such as Multiple Traffic Lights with percentages and levels based on the Guideline Daily Amounts, may help with the evaluation of several nutrients for a given food (Food Standards Agency 2008).

It is within this context that the U.S. Food and Drug Administration (FDA) recently issued several requests for further research (FDA 2009; *Federal Register* 2010) to answer important questions of exactly how consumers will interpret and use different FOP symbols, especially in the presence and absence of the Nutrition Facts Panel. Moreover, a recent critical review of food labeling practices indicates that "appropriate consumer research [on FOP nutrition labels] in the United States is vitally important" (Center for Science in the Public Interest 2009, Part III, p. 10). Thus, the primary purpose of our study is to test a simpler summary

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icon (i.e., Smart Choices [SC]), a more complex icon (i.e., Traffic Light–Guidelines Daily Amounts [TL-GDAs]), and a no-FOP icon control for their effects on nutrition evaluations, nutrient use accuracy, product attitudes, and purchase intentions. In addition, using prior nutrition labeling research (Burton, Biswas, and Netemeyer 1994; Howlett, Burton, and Kozup 2008; Keller et al. 1997; Kemp et al. 2007), we examine consumers' "nutrition consciousness" as a potential moderator of effects of FOP nutrition icons relative to Nutrition Facts Panel information. These study objectives focus on the recent FDA call for research (*Federal Register* 2010, p. 22605) in determining exactly how consumers will evaluate FOP summary icons versus nutrient-specific symbols.

Summary and Nutrient-Specific Front-of-Package Symbols

One viable option for providing simplified front-of-package (FOP) nutrition information is a summary symbol, such as the Smart Choices (SC) icon. Yet, when introduced in late August 2009, the SC icon met with an immediate, negative reception from a variety of sources in the public health community (e.g., Nestle 2009; Neuman 2009; Pinkston 2009; Ruiz 2009; State of Connecticut 2009). For example, the inclusion of the SC icon for Froot Loops cereal became a focal point of much of the criticism. Although initially it did not qualify for the icon, Froot Loops was reformulated to reach standards set by the Smart Choices Program by (1) meeting the required levels of positive nutritional attributes of fiber and vitamins A and C and (2) not exceeding limits set for negative attributes on fat, sodium, and sugar. Criticism focused on the fact that the cereal contained the maximum amount of sugar allowed in the cereal category, 12 grams per serving, which for Froot Loops accounted for more than 40% of the product when measured by weight. Without an examination of the specific information in the Facts Panel, this high concentration of sugar is not evident to consumers. In August 2009, the FDA submitted a letter addressing its concern with the Smart Choices Program and decided to undertake an independent evaluation of various FOP systems (Neuman 2009; Taylor and Mande 2009). Michael R. Taylor, Senior Advisor to the FDA Commissioner, noted that there would be concerns with any FOP system that may "in any way be based on cherry-picking the good and not disclosing adequately the components of a product that may be less good" (Neuman 2009). Of importance to the current study, certain allowable levels of cholesterol (60 mg per serving) and sodium (480 mg per serving) that meet the criteria for the SC icon (Smart Choices Program 2009, p. 2) are at levels determined to be *high* by the Food Labeling Rules set by the FDA (*Federal Register* 1993, p. 2411).

In contrast with the single summary indicator of relative healthfulness, another viable option for providing FOP nutrition information is with a nutrient-specific symbol, such as the Traffic Light–Guidelines Daily Amounts (TL-GDAs). The FOP TL-GDA format offers a nutritional snapshot of information from the Facts Panel that covers the attributes generally of greatest interest to consumers. In March 2006, the United Kingdom's Food Standards Agency (2009a) recommended voluntary use of the FOP "traffic light" labeling approach in conjunction with the European Union's Guideline Daily Amount (GDA) system. Such an approach has several voluntary options that are being used, including simple colored traffic lights with absolute GDA information, colored traffic lights with absolute GDAs and percentages of their dally amount, and monochrome traffic lights with absolute GDAs and percentages but in a smaller font size. For example, the Multiple Traffic Light system with absolute GDAs and percentages identifies the specific levels of sugar available in a single serving of Froot Loops (12 g), as well as other important attributes, such as calories, fat, and saturated fat, and the percentage of the recommended daily amount contained in one serving. Thus, although it offers specific absolute and percentage amounts of calories and important nutrients, it does not condense and simplify these various attributes into a single indicator of relative healthfulness. The current study tests the colored traffic lights (i.e., red, amber, and green) with absolute and percentage GDA information and is based on icons in use in Avondale and Marks & Spencer food stores in the United Kingdom (Food Standards Agency 2010). Percentages of the GDA information are based on the Daily Values in use on Nutrition Facts Panels in the United States.

Supporting Rationale and Hypotheses

Favorable effects of simplified indicators of health are consistent with the tenets of *heuristic* or peripheral route processing (e.g., Eagley and Chaiken 1993; Petty and Cacioppo 1986). When faced with a complex decision environment, peripheral cues or heuristics can reduce the effort needed in processing nutrition information and allow the consumer to make judgments and evaluations based on the simplified cue or heuristic (Eagly and Chaiken 1993, p. 330). In addition, *halo effects* (Nesbett and Wilson 1977) are likely, in that the presence of the FOP nutrition symbol can lead consumers to generalize that the product is more favorable on other nutrition elements not explicitly identified in the FOP symbol (Roe, Levy, and Derby 1999, p. 91). Such halo effects have occurred in the case of health claims (Roe, Levy, and Derby 1999) and nutrient content claims in advertising (Andrews, Netemeyer, and Burton 1998). In contrast, and in terms of evaluation of product nutrition *quality*, the Nutrition Facts Panel offers a myriad of nutrition attributes (e.g., calories, calories from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrates, sugar, fiber, protein, vitamins and minerals). The most appropriate way to integrate this information (and nutrient and health claims) into a single summary assessment of quality can be a very difficult task often accomplished by only the most knowledgeable, nutrition-conscious consumers (i.e., "the nutrition elite," Andrews, Netemeyer, and Burton 2009). So, for such a problematic judgment task, a summary indicator (e.g., the SC icon) ideally can act as a heuristic cue that reduces the complexity and noise within the package environment, thus minimizing consumer effort. As noted previously, however, it also may result in a halo effect for other nutrients that are not as favorable. Though not as simplistic as the SC icon, the TL-GDA format reduces Facts Panel information into a set of nutritional criteria relevant to most consumers and places the information on the front of the package where it is easy to see and access. The recognizable color coding in the traffic lights offers an

important heuristic of tiered information on the levels of calories and specific nutrients, but it does not provide a summary recommendation on the overall or aggregated nutritional value of the product. Thus, the TL-GDAs require some effort from consumers for evaluation and therefore are not as likely as the SC icon to halo or generalize to key negative nutrients. However, because TL-GDAs focus on a more limited but highly accessible set of nutrients than the Facts Panel, there remains some opportunity for the haloing of nondisclosed nutrition elements and evaluations.

Effects Related to Front-of-Package Nutrition Icons

In this study, we make use of a "mixed" (i.e., moderate) nutrition value food that meets the requirements for inclusion of the Smart Choices (SC) icon on the front of the package (see Appendixes A and B). For a nutritionally mixed (moderate) product such as this, we anticipate that any simplified FOP information (i.e., for both the SC and the TL-GDA icons) will strengthen the perceptions of overall product healthfulness and specific nutrient evaluations versus a no-FOP control condition (H_{1a}). In addition, we predict that the single, simplified summary (SC) icon will lead to greater healthfulness and more favorable evaluations than the TL-GDAs that explicitly report the absolute nutrient attribute levels and percentage of the recommended daily values (H_{1b}). Differences between the icons should be most evident for nutrients that meet the requirements for the Smart Choices Program but have values that are relatively high and at the maximum of the required SC icon limits for this nutritionally moderate food.[1] Thus, we predict the following:

H_{1a}: Consumers exposed to FOP nutrition icons (i.e., Smart Choices or Traffic Light–Guideline Daily Amounts) will have more favorable nutrient and overall healthfulness evaluations than those not exposed to FOP nutrition icons.

H_{1b}: Consumers exposed to less complex FOP nutrition icons (i.e., Smart Choices) will have more favorable nutrient and overall healthfulness evaluations than those exposed to more detailed FOP nutrient level icons (i.e., Traffic Light–Guideline Daily Amounts).

Prior nutrition research shows that package information that affects nutrition perceptions also extends to overall product attitudes, purchases intentions, and perceptions related to disease risk from consuming the product (see Burton et al. 2006; Ford et al. 1996; Kozup, Creyer, and Burton 2003). From this body of work, we predict that easy-to-access and easy-to-understand FOP nutrient information for the mixed (moderate) nutrition value food item will have a favorable effect on overall product attitudes, evaluations, and purchase intentions. Specifically, we predict the following:

H_{2a}: Consumers exposed to FOP icons (i.e., Smart Choices or Traffic Light–Guideline Daily Amounts) will have more favorable product attitudes and purchase intentions and lower perceptions of the likelihood of heart disease and weight gain than those not exposed to FOP nutrition icons.

H_{2b}: Consumers exposed to less complex FOP nutrition icons (i.e., Smart Choices) will have more favorable product attitudes and purchase intentions and lower perceptions of the likelihood of heart disease and weight gain than those exposed to more detailed FOP nutrient level icons (i.e., Traffic Light–Guideline Daily Amounts).

Effects Related to Consumer Nutrition Consciousness

Several studies have shown that individual difference variables, such as nutrition consciousness, motivation to process nutrition information, and nutrition knowledge, may affect consumers' perceptions, processing, and evaluations of nutrition information offered on product packages (Andrews, Netemeyer, and Burton 2009; Burton, Biswas, and Netemeyer 1994; Keller et al. 1997; Key et al. 1996; Moorman 1996). According to principles of the Elaboration Likelihood Model, when a consumer's motivational intensity and knowledge level are both high, he or she is more likely to engage in effortful processing to evaluate information (Andrews and Shimp 1990; Petty and Cacioppo 1979, 1986; Petty, Unnava, and Strathman 1991). In general, nutritionally conscious consumers exhibit substantial concern with, interest in, knowledge of, and ability in their interaction with and use of information from the environment related to nutrition (Newman 2000). Nutritionally conscious consumers are willing to spend more effort processing and elaborating on information viewed as central and most relevant to a judgment task (Kemp et al. 2007). Thus, based on the Elaboration Likelihood Model and other two-factor theories of persuasion (see Chaiken 1980), these consumers have a greater level of concern, knowledge, desire, and ability needed to evaluate relevant nutrition information. Keller et al. (1997) show that favorable nutrient values have a positive effect on product attitude and purchase intentions for motivated, nutritionally conscious consumers, but there is a substantially reduced effect for less nutritionally conscious consumers. As a result of greater in-depth processing of Nutrition Facts Panel information at the attribute level, these nutritionally conscious consumers are more likely to recognize and integrate favorable levels for focal nutrients (e.g., very low levels of fat, saturated fat, or calories), and they may be somewhat less likely to overgeneralize from negative nutrients that reach the *minimum* level that qualifies as "high" for the TL-GDA icon (e.g., 20% of the daily value for sodium). Thus, for a nutritionally mixed food item, we anticipate that consumers' nutrition consciousness will affect nutrient evaluations, general product attitudes, disease risk perceptions, and purchase intentions (H_{3a} and H_{3b}). We expect the following:

H_{3a}: Consumers with higher nutrition consciousness will have more favorable nutrient and overall healthfulness evaluations than less nutrition conscious consumers.

H_{3b}: Consumers with higher nutrition consciousness will have more favorable product attitudes and purchase intentions and lower perceptions of the likelihood of heart disease and weight gain than less nutrition conscious consumers.

Perhaps a more conceptually important question is the relative effect of nutrition consciousness in moderating

[1]We examine a range of nutrients in the study. According to the Daily Values in the Nutrition Facts Panels in the United States, several nutrition attributes shown in the TL-GDA are low (e.g., fat, saturated fat), others are moderate (e.g., calories, sugar), and others are high (e.g., cholesterol, sodium) for the category. In addition, we assess nutrition attributes that are *not* available in the TL-GDA condition (e.g., trans fat, total carbohydrates) but are available in the Facts Panel. For specific levels, see the package stimuli in Appendixes A and B.

nutrition information presented on the front (with more simplified FOP icons) and on the back (with the Nutrition Facts Panel) of the package. Findings from several studies suggest that higher levels of motivation and knowledge are needed to interpret and use the assortment of information in the Nutrition Facts Panel (Burton, Biswas, and Netemeyer 1994; Howlett, Burton, and Kozup 2008; Keller et al. 1997). For example, Kemp et al. (2007) report interactions between a measure of nutrition-related motivation and nutrient values in a Facts Panel on dependent measures of disease risk and purchase intentions. When nutrition-related motivation was low, the authors found little effect of the nutrient values on the dependent variables. However, when nutrition-related motivation was high, the differences in nutrient values had an impact. This suggests that for the more complex information environment presented within the Facts Panel, a higher level of nutrition consciousness enables the consumer to more appropriately use the information in evaluations. In contrast, the FOP nutrition symbol is designed with the aim to enhance the simplicity and ease of understanding the nutrition information. As such, the relative need for enhanced nutrition consciousness should be reduced, suggesting that any interaction between FOP information and nutrition consciousness is less likely than it is for the more detailed Facts Panel information. Thus, we anticipate an interaction of nutrition consciousness with the Facts Panel, but not for FOP nutrition information, such that

H_4: The effects of Facts Panel information on nutrient and overall healthfulness evaluations will be stronger (i.e., more favorable) for consumers who are more nutritionally conscious than for those who are less nutritionally conscious; however, nutrition consciousness will be less likely to moderate the effects of FOP information.

The FDA has long been interested in how various types of nutrition package information affect consumers' use and interpretation of product healthfulness within the context of a total daily diet in helping promote healthy dietary practices (*Federal Register* 1993, 2010). Consistent with this objective, the Nutrition Facts Panel was designed to be standardized, unambiguous, and useful in daily dietary decisions, regardless of consumer demographics or nutrition knowledge. An extensive body of literature suggests that consumers are somewhat suspicious of health claims and nutrition information presented on the front of the package because they view this as information controlled by the manufacturers in an attempt to sell more of their product (e.g., Keller et al 1997; Levy 1995). However, in general, consumers are more confident about nutrition information presented in "Facts" Panels because of its perceived credibility from government oversight in helping reduce manufacturer manipulation (Levy 1995). Thus, consumers are likely to view nutrition icons on the front of the package as less diagnostic than the Facts Panel.

Several experimental studies show that when exposed to both FOP nutrition/health claims and Facts Panel information, consumers can use the information appropriately in judgment and evaluations of product alternatives (Ford et al. 1996; Mitra et al 1999). For example, Mitra et al. conclude that regardless of educational level, consumers can use information in the Facts Panel to evaluate a product appropriately, even when presented with a FOP health claim that is potentially misleading. These results suggest that FOP nutrition information should not have as strong an effect on the use of nutrient information in evaluating a product in the context of a daily diet *when* the Facts Panel is accessed.

However, when the Facts Panel is *not* accessed, FOP icons that vary in their diagnosticity (i.e., perceived usefulness) for evaluating daily product nutrient levels are likely to affect consumer judgments, thus suggesting an interaction between FOP and back-of-package information. A summary icon, such as the SC symbol, does not offer any direct information related to the specific nutrient levels or any direct information related to the performance of specific individual nutrients (unless consumers are aware of the criteria needed to qualify for the symbol within a specific category). Thus, given the lack of specific diagnostic information, the summary symbol might lead to inferences that are not always correct. In contrast, the TL-GDA icon offers diagnostic information for judgments on specific nutrients crucial to the daily diet of most consumers. Thus, it should lead to more accurate judgments than the SC summary icon and should not differ substantially from assessments made based on the Nutrition Facts Panel.

In addition, we propose that in evaluating nutrients for their daily diet, consumers with higher levels of nutrition consciousness will be better able than those with lower levels of nutrition consciousness to use more detailed, diagnostic information from the front of the package or in the Nutrition Facts Panel. That is, these more nutrition conscious consumers have the necessary interest and knowledge to be able to use the detailed information more effectively and accurately, suggesting that nutrition consciousness moderates the nutrition information available on the front or back of the package. From this rationale, we predict the following interactions:

H_{5a}: When the Nutrition Facts Panel is accessed, FOP nutrition information will not have an effect on nutrient use accuracy, but when the Nutrition Facts Panel is not accessed, the Traffic Light–Guideline Daily Amount icon will have a more favorable effect on nutrient use accuracy than the control or Smart Choices icon condition.

H_{5b}: Nutrition consciousness will have a more favorable effect on nutrient use accuracy when more nutrition information is available (Traffic Light–Guideline Daily Amounts and Nutrition Facts Panels) than when less nutrition information is available.

Method

Sample and Procedure

Members of a professional, nationwide, online research panel served as study participants and ranged in age from 18 to 83. The sample was designed to balance gender, and four age quotas (18–31, 32–44, 45–57, and 58+) were used to match U.S. Census data for the United States. As such, 51% of the participants were female, and the mean and median ages were 47 years. The median household income category was $35,000–$50,000, and the modal education level was "some college." Approximately 35% of the participants had a college degree. The total number of participants across the

experimental conditions was 520. All participants were screened to ensure they had used the product category in the past six months. In addition, all data were collected before the appearance of the SC icon in the marketplace.

After displaying instructions encouraging participants to examine both the front and the back of the mock package and respond to all questions, we randomly assigned them to the mock package conditions (with realistic front and back panels in full color; see Appendixes A and B). Because the frozen chicken dinner category on the mock package represents a complete meal, it has been used in previous studies examining health and nutrient claims and nutrition information in the Facts Panel (e.g., Burton, Biswas, and Netemeyer 1994; Ford et al. 1996; Kemp et al. 2007; Mitra et al. 1999; Roe, Levy, and Derby 1999). The front and back panels were removed from view when participants provided initial nutrition evaluations, overall healthfulness ratings, and disease risk ratings (see the dependent measures). The panel stimuli were shown a second time to aid in a nutrient use accuracy task. The panels were not presented again for the reminder of the study questions, and respondents then provided demographic information.

Experimental Design and Stimuli

The study used a 3 (FOP icon: no-FOP icon control, SC FOP icon, TL-GDA FOP icon) × 2 (Nutrition Facts Panel: control with no Facts Panel available, Facts Panel available) × 2 (nutrition consciousness: high, low) design. Two of the three FOP conditions appear in Appendix A, and the Nutrition Facts Panel conditions appear in Appendix B. We designed the no–Facts Panel control to address the situation in which shoppers examine and use FOP information without examining the Facts Panel nutrient levels (and the inferences from FOP information that might be drawn when the Facts Panel is not used). All nutrient values are consistent across all experimental conditions. When nutrient values are shown on the front of the package for the TL-GDA condition, they match the values in the Facts Panel. Thus, the experimental conditions are consistent with current FOP information in the marketplace. In the TL-GDA icon condition (see Appendix A), absolute nutrient amounts are given, as well as their corresponding percentages of the Daily Values. For low nutrient levels (e.g., fat, saturated fat), a green light is shown. In the case of moderate nutrient levels (e.g., calories, sugar), an amber light is present. Finally, for high nutrient levels (e.g., cholesterol, sodium), a red light is displayed. These three color conditions are based on nutrient-level classifications drawn from the FDA's Food Labeling Rules (*Federal Register* 1993). Near the end of the survey, and as a check on the manipulations, we asked respondents to report their awareness of the FOP nutrition icons and Facts Panel. When the Facts Panel was present on the back of the package, 98% reported seeing it; when it was not present, 15% reported seeing it ($\chi^2 = 372.9$; $p < .0001$). The check measuring awareness of the SC and TL-GDA FOP icons showed that when an icon was present, 86% reported seeing the FOP icon, while 28% claimed they saw nutrition information in the FOP control ($\chi^2 = 234.6$; $p < .0001$). This pattern of findings indicates relatively high levels of awareness of the FOP and back-of-package nutrition information when present.

Nutrition consciousness mirrors the "health consciousness" construct, but focuses directly on nutritional aspects of health and its role in product evaluations and choices. This is a measured construct consisting of three items with seven-point scales drawn from prior research that tap nutrition interest, knowledge, and motivation (e.g., Andrews, Netemeyer, and Burton 2009; Burton, Garretson, and Velliquette 1999; Keller et al. 1997; Moorman 1996). The items include the following: "I usually am interested in looking for nutritional information on food packages" ("strongly disagree/strongly agree"); "Compared to other people, how much do you feel you know about nutrition" ("almost nothing/a lot"); and "I would like to see additional nutritional information on food packages" ("strongly disagree/strongly agree"). Coefficient alpha for this three-item measure is .80. For use in subsequent analyses, we perform a median split and use this recoded measure as an independent variable. In the low nutrition consciousness condition, the mean level is 3.9; in the high nutrition consciousness condition the mean level is 6.0 ($F(1, 518) = 918.4$, $p < .0001$).

Dependent Measures

Consistent with the recent FDA request for information (*Federal Register* 2010), we use three different sets of dependent measures to test the hypotheses: (1) perceptions of overall healthfulness and specific nutrient levels, (2) product evaluations, and (3) the accuracy of using nutrition information. More specifically, the first set of dependent measures examines perceptions of the overall healthfulness of the product, as well as specific calorie and nutrient evaluations. The calorie and nutrient evaluations include all six items shown in the TL-GDA FOP condition (i.e., calories, fat, saturated fat, sodium, cholesterol, and sugar; see Appendix A). Two of these nutrients, sodium and cholesterol, are of particular interest because their levels are low enough to qualify for the SC icon, yet are at the high level of the nutrient (20% Daily Values) according to the FDA's Food Labeling Rules (*Federal Register* 1993). The other values are either at moderate (calories, sugar) or low (fat, saturated fat) levels. We also examine two nutrients, trans fat and total carbohydrates, which are not offered in the TL-GDA condition, but are available in the Facts Panel. From prior research, and for each of these calorie and nutrient items, participants responded to seven-point, single-item scales with endpoints ranging from "high"' to "low." Overall healthfulness also is measured on a seven-point scale from "unhealthy for you" to "healthy for you." We recoded all items so that higher values indicated more unfavorable levels of the nutrients (e.g., high calories, fat, sodium) and a less healthful product.

The second set of dependent measures assesses product evaluations that extend beyond nutrient and healthfulness evaluations. Consumers responded to long-term disease risk and weight gain perceptions based on regular consumption of the product. Single-item, seven-point, Likert-type scale measures for these perceptions are drawn from prior research (Andrews, Netemeyer, and Burton 1998; Burton et al. 2006; Kozup, Creyer, and Burton 2003) and ask participants to answer the following items: "Regularly eating Blue Ribbon chicken dinner may contribute to the risk of coronary heart disease;" and "Regularly eating Blue Ribbon chicken dinner may contribute to the risk of gaining

weight" (endpoints of "strongly disagree" [1] and "strongly agree" [7] for both). The set of measures beyond nutrient and healthfulness evaluations included attitude toward the product and purchase intentions. Drawing from prior attitude research, we measure attitude toward the product with three items using scale endpoints of "unfavorable/favorable," "negative/positive" and "bad/good." Coefficient alpha is .99 for this summated measure. We measure purchase intention with response to the following item: "If available, how likely is it that you would buy the Blue Ribbon chicken dinner product on one of your shopping trips this month?" Endpoints include "unlikely/likely" and "not probable/probable." The Pearson correlation between these two items is .97 ($p < .0001$). For these multi-item dependent measures, we sum the items and then divide them by the number of items; we use the means in subsequent analyses.

The third type of dependent measure uses a nutrient information usage task to determine how accurately participants can use nutrient information available on either the front or the back of the package in answering six nutrient attribute questions. In line with the original objectives of the Nutrition Labeling and Education Act (*Federal Register* 1993, p. 2118), this measure is designed to evaluate how well consumers understand the relative significance of nutrition information in the context of a total daily diet. The task occurs after all nutrient evaluations are completed and thus is distinct from the preceding dependent variable evaluations. In this nutrient use accuracy task, participants are asked: "If you were to consume six servings of the product in a day (and nothing else), would you consume more or less than the recommended amount for each of nine different nutrients and vitamins?" The targeted nutrient items include fat, saturated fat, cholesterol, calories, sodium, sugar, and sodium. Data on these attributes are all available in the TL-GDA condition and in the Facts Panel. Percentage nutrient task "accuracy" scores are computed by summing the number of correct responses for the six attributes, dividing by six, and then multiplying by 100. Scores ranged from 16.7% to 100%. The mean accuracy score is 70%, and the modal score is 67%.

Results

Effects Associated with Front-of-Package Nutrition Icons

H_1 examines the effects of the FOP nutrition icon information on consumers' nutrient and overall product healthfulness evaluations. Table 1 (Panel A) shows the results of analysis of variance (ANOVA) tests for the independent variables of FOP icon information, availability of the Nutrition Facts Panel, and nutrition consciousness. Mean values for evaluations of overall product healthfulness, calories, and various nutrients also appear in Table 1 (Panel B).

As Table 1 shows, the general pattern of results indicates significant effects of the FOP icon information across the product healthfulness and nutrient evaluations. H_{1a} assesses differences between packages with any FOP nutrition icon information and packages without any FOP nutrition information (i.e., the no-FOP control). Planned contrasts comparing the SC icon with the FOP nutrition control show that across all nutrition-related dependent variables, the package conditions displaying the Smart Choices (SC) icon are significant ($p < .05$ or better) and are perceived as lower in negative nutrients (e.g., calories, fat, sodium) and more healthful. The pattern is similar, but somewhat less strong, for the packages displaying the Traffic Light–Guidelines Daily Amount (TL-GDA) icon information. Here, the contrasts show significant differences from the no-FOP control for six of the nine dependent variables. As Table 1 (Panel B) shows, when the TL-GDAs are present, in general, the product nutrient levels are perceived more favorably than the FOP control (in which no nutrition information is presented). Note that these significant differences extend to nutrients that are *not* listed on the TL-GDA icon (i.e., trans fat, total carbohydrates). The overall pattern of findings for FOP nutrition information compared with the no-FOP nutrition information control provides substantial support for H_{1a}.

H_{1b} examines differences between the provision of the SC icon versus the TL-GDA information on the front of the package. The pattern of means across the dependent variables in Table 1 (Panel B) shows that the means are significantly lower ($p < .05$) for the SC icon, indicating greater healthfulness and lower "negative" nutrient evaluations, for three of the nine variables.[2] Of particular interest are the sodium and cholesterol nutrients. For these attributes, the TL-GDAs and Facts Panel reveal that the levels are in the highest range of those allowed to qualify for the SC summary icon (20% of the Daily Value; see stimuli in Appendix A), yet low enough to still qualify. Importantly, for each of these nutrients, the SC means indicate that the product is perceived as significantly more favorable ($p < .05$) than the TL-GDA package information. The other measure for which there is a statistically significant difference is for the overall healthfulness of the product. Thus, we find partial support for H_{1b}, and it can be argued that these results are significant for the measures of greatest concern for policy, in which potentially questionable inferences made from the SC icon are of particular interest.

H_{2a} and H_{2b} extend questions regarding the effects of FOP nutrition information to the more general measures of product attitude, purchase intentions, and disease risk likelihood. Table 2 provides the results of ANOVAs for these dependent variables. As Table 2 (Panel A) reveals, there are significant main effects ($p < .05$ or better) of the FOP information on each of the four dependent variables, offering general support for H_2. (Interactions with the FOP information are nonsignificant.) Table 2 (Panel B) provides tests of a priori contrasts for H_{2a} and H_{2b}. Comparisons of the SC icon with the no-FOP control are all significant ($p < .05$ or better). As we predicted, the presence of the SC icon leads to more favorable product attitudes and purchase intentions than for those in the control, and perceptions of the risk of heart disease and weight gain are reduced. Comparisons of the TL-GDA condition with the control show that purchase attitudes and purchase intentions are higher, but there is no difference for heart disease and weight gain risk. These findings offer strong support for H_{2a} for the SC summary icon and mixed support for the TL-GDA information. (As we discuss subsequently, this pattern of results for the SC summary icon raises some concern given the high levels of sodium and cholesterol for this product.)

H_{2b} examines product evaluation differences between the SC icon and the TL-GDA information. The differences for

[2]Main effect means relevant to predictions appear in the tables. Cell means for each of the 14 dependent variables are available on request.

Table 1. Effects of Front-of-Package Nutrition Information, Nutrition Facts Panel, and Nutrition Consciousness on Nutrient and Product Healthfulness Evaluations

A: ANOVA Results

Independent Variables	Univariate F-Value								
	Overall Healthfulness	Calories	Fat	Saturated Fat	Cholesterol	Sodium	Sugar	Trans Fat	Total Carbohydrates
Main Effects									
FOP icon	3.29**	9.08***	1.73	2.91*	6.41***	3.89**	4.12**	2.93*	4.57*
Nutrition Facts Panel (NFP)	.00	1.64	8.64***	2.82*	.01	.84	.02	4.48**	.49
Nutrition consciousness (NC)	5.78**	12.73***	9.13***	14.84***	18.62***	4.59**	21.09***	24.33***	14.51***
Interaction Effects									
FOP × NFP	.04	1.41	.28	.75	.32	.32	.37	.85	.01
NFP × NC	1.68	.50	4.22**	8.03***	7.71***	5.18**	2.82*	2.96*	3.43*
FOP × NC	.27	2.25	.87	.27	.23	.17	1.80	1.46	6.01***

B: Means

Dependent Variables	FOP Information			NFP Condition		Nutrition Consciousness (NC)	
	No-FOP Icon (a)	SC FOP Icon (b)	TL-GDA FOP Icon (c)	NFP Absent (a)	NFP Present (b)	Low NC (a)	High NC (b)
Healthfulness	2.64[b]	2.25[a,c]	2.60[b]	2.48	2.53	2.66[b]	2.34[a]
Calories	3.21[b,c]	2.54[a]	2.76[a]	2.9	2.77	3.08[b]	2.56[a]
Fat	3.03[b]	2.74[a]	2.81	3.05[b]	2.70[a]	3.06[b]	2.63[a]
Saturated fat	3.19[b,c]	2.84[a]	2.87[a]	3.06	2.87	3.22[b]	2.66[a]
Cholesterol	3.45[b,c]	2.86[a,c]	3.15[a,b]	3.14	3.17	3.45[b]	2.82[a]
Sodium	3.82[b]	3.34[a,c]	3.63[b]	3.51	3.68	3.76[b]	3.41[a]
Sugar	3.06[b,c]	2.65[a]	2.77[a]	2.81	2.83	3.11[b]	2.50[a]
Trans fat	3.09[b,c]	2.72[a]	2.83[a]	2.99	2.78	3.19[b]	2.52[a]
Total carbohydrates	3.51[b,c]	3.08[a]	3.23[a]	3.19	3.33	3.54[b]	2.97[a]

*$p < .10$.
**$p < .05$.
***$p < .01$.

Notes: The numbers shown in Panel A are univariate F-values for ANOVAs. Degrees of freedom for NFP, NC, and NFP × NC = (1,508). Degrees of freedom for FOP, FOP × NC, and NFP × FOP = (2,508). All three-way interactions are nonsignificant. Means shown in Panel B are based on seven-point scales. Higher values indicate higher perceptions of calories, fat, and other nutrients and a less healthful product. Superscripts adjacent to the means indicate significant differences ($p < .05$ or better) according to contrasts based on predictions. For example, the superscript for the "b" cell (SC icon) indicates that the product healthfulness mean is significantly different from the means for the cells labeled "a" and "c." A complete set of cell means for all dependent variables is available on request.

product attitudes and purchase intentions between the SC and the TL-GDA conditions are nonsignificant. However, exposure to the SC summary icon results in lower disease risk perceptions than in the TL-GDA information condition ($p < .05$), offering mixed support for H_{2b}. Because disease risk perceptions are more directly related to nutrition evaluations than are product attitudes and purchase intentions (which can be affected by taste, price, brand name, and so on), greater sensitivity to differences between two icons would be anticipated for the disease-related measures.

Effects Related to Nutrition Consciousness and the Nutrition Facts Panel

H_3 and H_4 test effects of consumers' level of nutrition consciousness and the presence of the Nutrition Facts Panel. As H_{3a} predicts, Table 1 shows consistent effects of nutrition consciousness on the nutrition perception variables; nutritionally conscious consumers perceive the product's nutrient and overall healthfulness more favorably for this moderately healthy product.[3] These results support H_{3a}. In addition, as Table 2 shows, nutritionally conscious consumers have more favorable product attitudes and purchase intentions than less nutritionally conscious consumers. However, in terms of weight and heart disease risk perceptions, no differences occur between more and less nutritionally conscious consumers. The pattern of findings offers mixed support for H_{3b}.

[3]Because there are significant or marginally significant interactions between nutrition consciousness and the Nutrition Facts Panel, several of these main effects should be interpreted with caution. The pattern of the interactions are discussed subsequently and shown in Figure 1.

Table 2. Effects of Front-of-Package Nutrition Information, Nutrition Facts Panel, and Nutrition Consciousness on Product Attitude, Purchase Intentions, and Risk Perceptions

A: ANOVA Results

Independent Variables	Univariate F-Values: Product Attitude	Purchase Intentions	Likelihood of Heart Disease	Likelihood of Gaining Weight
Main Effects				
FOP information	4.96***	3.02**	4.99***	5.55***
Nutrition Facts Panel (NFP)	4.91**	3.05*	.48	3.29*
Nutrition consciousness (NC)	8.20***	6.56**	.00	.14
Interaction Effects				
FOP × NFP	.59	.66	.92	.22
NFP × NC	.45	1.28	1.02	.71
FOP × NC	.91	.02	.56	.10

B: Means

	FOP Information			NFP Condition		Nutrition Consciousness (NC)	
Dependent Variables	No-FOP Icon (a)	SC FOP Icon (b)	TL-GDA FOP Icon (c)	NFP Absent (a)	NFP Present (b)	Low NC (a)	High NC (b)
Product attitude	4.96[b,c]	5.50[a]	5.23[a]	5.10	5.34	5.05[b]	5.43[a]
Purchase intention	4.54[b,c]	5.08[a]	4.74[a]	4.64	4.90	4.58[b]	5.00[a]
Heart disease	3.29[b]	2.73[a,c]	3.19[b]	3.12	3.05	3.08	3.09
Weight gain	3.26[b]	2.69[a,c]	3.18[b]	3.19	2.95	3.08	3.05

*$p < .10$.
**$p < .05$.
***$p < .01$.

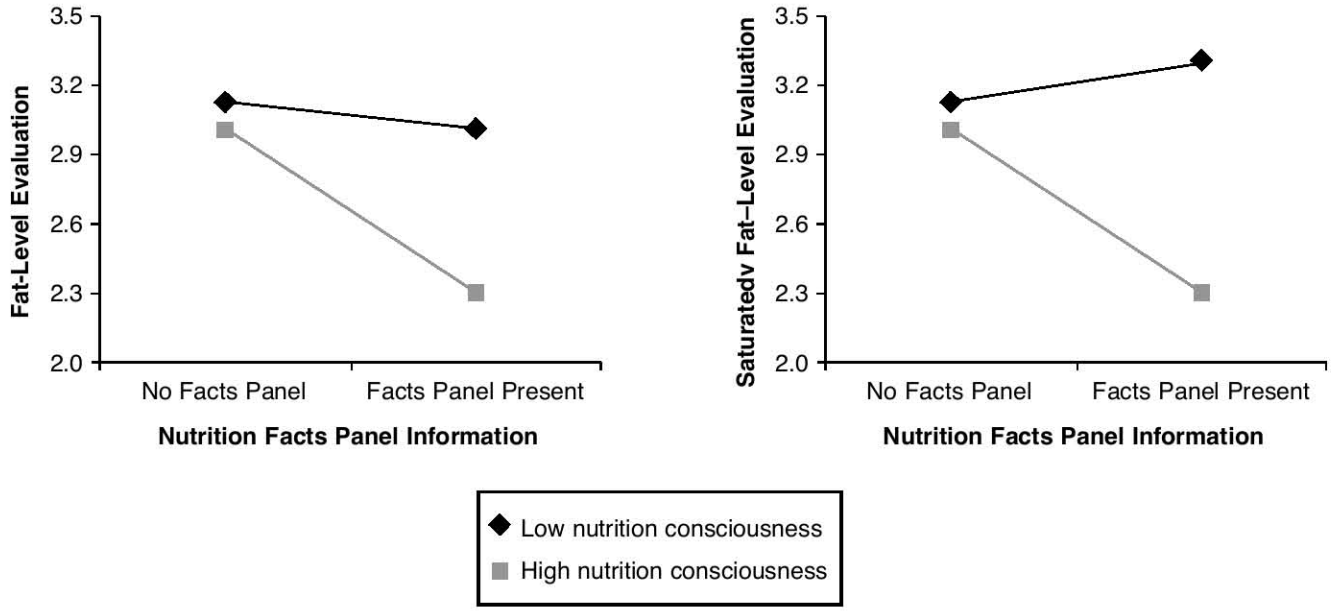
Notes: The numbers shown in Panel A are univariate F-values. Degrees of freedom for NFP, NC, and NFP × NC = (1,508). Degrees of freedom for FOP, FOP × NC, and NFP × FOP = (2,508). All three-way interactions are nonsignificant. Means shown in Panel B are based on seven-point scales. Higher values indicate more favorable product attitudes and stronger purchase intentions. Higher means for weight gain and heart disease indicate a stronger likelihood of developing the disease. Superscripts adjacent to the means indicate significant differences ($p < .05$ or better) according to contrasts based on predictions. For example, the superscript for the "b" cell (SC icon) indicates that the product attitude mean is significantly different from the mean for the cell labeled "a." A complete set of cell means for all dependent variables is available on request.

The purpose of H_4 is to provide a test of the (relative) moderating role of nutrition consciousness for the FOP nutrition icon information versus the Nutrition Facts Panel on the back of the package. Because of the amount and relative complexity of information in the Facts Panel, we predict that nutrition consciousness is more likely to moderate effects of the exposure to the Facts Panel than the reduced and more simplistic nutrition information offered on the front of the package. The results in Table 1 (Panel A) show that there are either significant ($p < .05$) or marginally significant ($p < .10$) interactions between the Facts Panel and nutrition consciousness for seven of the nutrition attribute variables. In contrast, there is only one significant interaction (for carbohydrates) between the FOP nutrition information and nutrition consciousness. Figure 1 shows examples of the plots of mean values for the significant interactions between the Facts Panel and nutrition consciousness. In both plots (i.e., for the evaluations for fat and saturated fat), and when there is no Facts Panel available, there is no difference ($p > .20$) in the evaluations. However, when the Facts Panel is present, and for consumers with higher levels of nutrition consciousness, the evaluations are significantly lower (Fs = 11.2 and 9.5, respectively, all $p < .01$), indicating more favorable perceptions of the fat and saturated fat levels. These findings offer support for the pattern predicted in H_4 for the nutrient and healthfulness evaluations.

The results for the predicted interactions between nutrition consciousness and the nutrition information presentation for the attitude, intentions, and disease risk measures appear in Table 2 (Panel A). For these variables, nutrition consciousness does not moderate either the front or the back of the package nutrition information, offering no support for the moderating influence of nutrition consciousness for Nutrition Facts Panel information. Across the range of dependent variables, the data offer mixed support for H_4.[4]

[4]We also performed a series of 14 hierarchical regressions (one for each dependent variable across all analyses) using nutrition consciousness as a continuous variable and the interaction terms among the (continuous) nutrition consciousness, FOP, and Facts Panel condition measures. The results of these regressions were almost identical to the ANOVA results. We also performed analyses that included only the upper- and lower-quartile scores for the nutrition consciousness measure in an analysis, and again we did not find any interaction between the nutrition consciousness and FOP condition for any of the dependent variables. These findings indicate that consumers use the FOP information similarly regardless of the nutrition consciousness level, but nutrition consciousness is more likely to interact with Facts Panel information.

Figure 1. The Moderating Impact of Nutrition Consciousness on the Effect of Facts Panel Information on Nutrient Evaluations



Effects of Front-of-Package Nutrition Icons and Nutrition Consciousness on Usage Accuracy

To test the predicted effects on the accuracy of nutrient usage in the context of a daily diet, we perform a $3 \times 2 \times 2$ ANOVA with factors consisting of the FOP nutrition icon information, presence of the Nutrition Facts Panel, and nutrition consciousness. As Table 3 shows, the results indicate significant main effects for both FOP information ($F(2, 508) = 27.0$, $p < .01$) and Facts Panel availability ($F(1, 508) = 26.8$, $p < .01$) manipulations. However, as H_{5a} predicts, the influence of FOP information interacts with the availability of the Facts Panel ($F(2, 508) = 12.4$, $p < .01$). Figure 2 provides a plot of the means. When the Facts Panel is available, the increase in accuracy associated with exposure to more detailed FOP nutrition information is nonsignificant ($F = 1.4$, $p < .10$). However, when the Facts Panel is *not* available, exposure to more detailed FOP nutrition information has a significant effect on accuracy in the nutrient usage task ($F = 41.3$, $p < .001$). Follow-up contrasts show that more detailed TL-GDA information results in a mean accuracy level (80%) that is substantially greater than either the SC (62%) or the control (56%; $p < .001$ for both) conditions. The contrast for the modest increase from the addition of the SC icon (62%) compared with the no information control condition (56%) is also significant ($p < .05$). This pattern of findings offers support for H_{5a}, and it suggests an advantage of exposure to more detailed nutrient information on the front of the package, if the Facts Panel of the back of the package is not accessed.

H_{5b} predicts that more nutritionally conscious consumers will be better able to use more detailed information available from the front or back of the package in the accuracy task, suggesting a moderating role of nutrition consciousness. However, the results did not support this prediction. As Table 3 (Panel A) shows, both the interactions between nutrition consciousness and the FOP icon and the Facts Panel information are nonsignificant (Fs = .26 and .02, all $p > .50$). Similarly, the three-way interaction is nonsignificant, suggesting that for this nutrition usage task, there is no moderating role of nutrition consciousness. Importantly, this finding also indicates that the stronger effects for the TL-GDA icon versus the SC summary icon and control condition on nutrition utilization accuracy hold regardless of the consumer's level of nutrition consciousness.

Discussion and Implications

Given the dramatic increases in obesity rates and health-related consequences in the United States (Centers for Disease Control and Prevention 2010), efforts to provide consumers with easy-to-use nutrition symbols to aid dietary evaluations are certainly welcome (*Federal Register* 2010). However, consumers have faced a confusing array of different front-of-package (FOP) symbols and icons, including the simpler Smart Choices (SC) icon in the United States and the more detailed Traffic Light–Guideline Daily Amount (TL-GDA) icon in the United Kingdom. Thus, with the recent FDA call for consumer research on FOP symbols (*Federal Register* 2010, p. 22605), the primary purpose of this study was to assess how the SC and TL-GDA icons affect U.S. consumers' perceptions of nutrient levels, overall healthfulness, nutrient use accuracy, as well as more general assessments of product attitude, disease risk perceptions, and purchase intentions. Secondary objectives included examining the moderating influence of nutrition consciousness on FOP nutrition icon information relative to the Facts Panel and interactions between the FOP icon and the Facts Panel information. We address the results for each of these objectives next.

Table 3. Effects of Front-of-Package Nutrition Information, Nutrition Facts Panel, and Nutrition Consciousness on Nutrient Use Accuracy

A: ANOVA Results

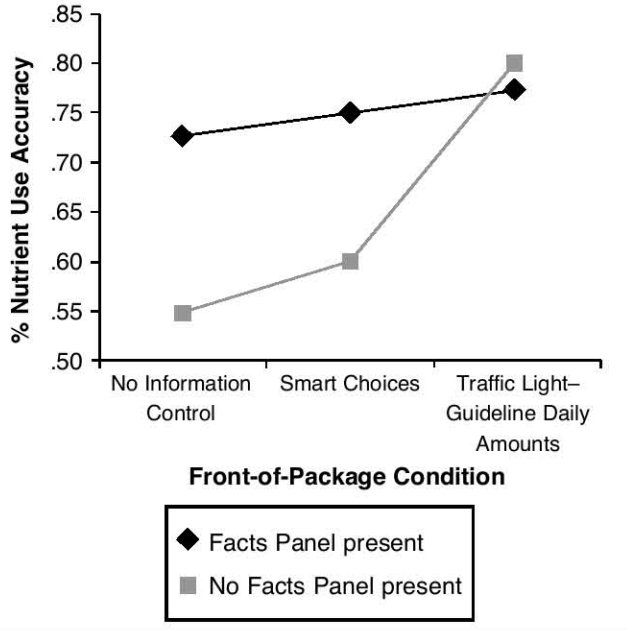
Independent Variables	Univariate F-Values
Main Effects	
FOP information	27.0*
Nutrition Facts Panel (NFP)	26.8*
Nutrition consciousness (NC)	.6
Interaction Effects	
FOP × NFP	12.4*
NFP × NC	.26
FOP × NC	.02

B: Mean Percentages for Nutrient Use Accuracy

	Nutrition Facts Panel Absent		Nutrition Facts Panel Present	
Front-of-Package Condition	**Low NC**	**High NC**	**Low NC**	**High NC**
Control (no-FOP icon)	58.7%	52.7%	70.6%	74.1%
Smart Choices FOP icon	61.9	61.4	77.0	71.8
Traffic Light–Guidelines Daily Amount FOP icon	78.8	80.8	78.1	76.5

*$p < .01$.
Notes: The three-way interaction is nonsignificant.

Figure 2. Nutrient Use Accuracy in the Context of a Daily Diet: Interaction of Front-of-Package Nutrition Icons and Availability of the Facts Panel



Smart Choices Versus Traffic Light–Guideline Daily Amount Icons

The SC icon met with a critical reception from several sources on its introduction into the U.S. market (e.g., Center for Science in the Public Interest 2009; Nestle 2009; Neuman 2009; Ruiz 2009; State of Connecticut 2009). This criticism focused primarily on products that met the nutritional criteria for the icon, but were not necessarily low in all values for all negative nutrients (e.g., the high sugar level in Froot Loops and other cereals). The focal concern was that inferences about the product for some nutrients and its overall healthfulness would be based on the presence of this dichotomous, summary icon (i.e., any brand either qualifies or does not qualify). The results from this study offer evidence that this can occur. The moderately healthy product used in our study met all criteria to qualify for the icon; nonetheless, it contained 20% of the Daily Value for sodium and cholesterol. For these attributes, the evaluations of the SC summary icon are significantly more favorable (i.e., perceived lower levels of sodium and cholesterol) than either the TL-GDA icon or the no-FOP icon control condition. In addition, when the product contains the SC summary icon, it is perceived as healthier overall than with either the TL-GDAs or the FOP control. These results suggest that the summary icon can at times act as an implicit health claim from which positive consumer inferences can occur. Thus, to the extent that the nutrition criteria used to qualify for the SC icon are *not* as restrictive as some nutritionists believe are appropriate, it can be argued from these findings that some consumers may be potentially misled in their evaluation of certain nutrients and overall product healthfulness. Similarly, when the Facts Panel is not accessed, the accuracy with which consumers can draw conclusions about product nutrient levels in the context of a daily diet is lower for the SC summary icon than for the TL-GDA.

The presence of the TL-GDA icon also has a positive influence on consumer evaluations of several nutrients (e.g., saturated fat, calories, cholesterol) compared with the con-

trol. Perhaps most importantly, both product attitudes toward and purchase intentions for the products displaying *either* nutrition icon are significantly higher than the no-FOP nutrition control. These findings suggest a potentially favorable role for any FOP information; that is, in the context of the current study, purchase intentions increased when either of the nutrition icons was present on the front of the package. These findings support the potential usefulness of FOP nutrition icons (in a nonmisleading way) in communicating useful information to consumers that may affect judgments and decisions. Moreover, our findings strengthen the relevance of Institute of Medicine and FDA evaluations of various FOP alternatives (Taylor and Mande 2009).

Overall, the pattern of the results supports arguments made for the strengths and weaknesses of more simplistic versus somewhat more complex FOP alternatives. As the Keystone research and other studies (Fuenkes et al. 2008; Lupton et al. 2010) indicate, most consumers place substantial value on simplicity. When consumers attempt to evaluate scores of brand alternatives on the shelf, comparing the array of diverse and "piecemeal" calorie and nutrient information in the Facts Panels can be an extremely challenging task. Summarizing the information into a single, dichotomous icon allows use of simple generalized conjunctive or satisficing heuristics that may be sufficient for many consumers. The downside of this simplicity is that by *not* evaluating detailed information on various attributes (e.g., without examining the Facts Panel or the TL-GDA information), consumers may overgeneralize the favorability of the product from nutrient content in some instances (Andrews, Netemeyer, and Burton 1998). Similarly, to make accurate evaluations about products in the context of a daily diet, the summary icon does not approach the level of the TL-GDA icon when the Facts Panel is not accessed. In general, we argue that the information disclosed by the TL-GDA icon offers the most critical nutrient attributes for most consumers, while offering a more simplistic information environment than the Facts Panel. Compared with the SC summary icon, the TL-GDA icon reduces the likelihood of overgeneralization for the specific nutrients contained in the TL-GDA. Yet, for TL-GDAs, the consumer has five or six distinct pieces of nutrition information to integrate, and the simplicity of using a satisficing heuristic for a given attribute may be less obvious, unless the consumer focuses on a single attribute (e.g., calories, saturated fat) to drive evaluations. In summary, from a consumer perspective, the desire for icon simplicity is critical. Yet, from a nutrition policy perspective, icons such as the TL-GDAs that offer concrete values that are not open to debate or criticism seem to be a key feature.[5]

Moderating Influence of Nutrition Consciousness

In this study, although there was not an interaction between the front and back panel nutrition conditions, we encourage further research to address the likelihood of search truncation of the Facts Panel data (e.g., Roe, Levy, and Derby 1999) based on use of various types of FOP alternatives. However, we predicted that nutrition consciousness was more likely to moderate the Facts Panel information usage than the more simplistic FOP information. The results offered partial support for this prediction. Although there was not any evidence of a moderating influence of nutrition consciousness for FOP information, we found fairly consistent support for the moderating influence of nutrition consciousness on the Facts Panel in the case of several nutrients (e.g., fat, saturated fat, cholesterol, sodium). However, for the more general evaluations of product attitudes and purchase intentions (i.e., evaluations beyond the nutrients conveyed in the Facts Panel), there was no support for moderation. In general, the pattern of findings suggests that consumers are more likely to use FOP information similarly regardless of their level of nutrition consciousness; however, consumers with a higher level of nutrition consciousness are more likely to use the more detailed information in the Facts Panel.

Implications for Public Health Policy and Food Manufacturers

More simplistic summary icon systems (e.g., Smart Choices) would allow manufacturers to frame their products in a more favorable light (i.e., either the product is a relatively healthy option or the package offers no icon). However, this can present problems for consumers and raise scrutiny from public health advocates and/or regulatory agencies, if criteria for the icon are set too loosely. In addition, with a simple, summary icon system, the product would never be presented with an unfavorable frame or nutrient information/color coding signaling that the product is not healthy. For relatively unhealthy categories, with high levels of a negative nutrient coupled with minimal nutritional value (e.g., candy bars high in sugar, calories, and fat), major brand competitors would simply be devoid of the icon in a summary system. In this scenario, there might be little stigma associated with any particular brand or the category as a whole. Although proactive manufacturers may attempt to obtain some differential advantage by becoming eligible for displaying the healthy icon by fortifying their product in terms of its positive nutrients (added fiber), this approach has been criticized as a way to meet criteria for nonnutritious products (Center for Science in the Public Interest 2009, Part III, p. 4). For example, Froot Loops, the target of much of the criticism of the SC icon, increased its fiber level, though its sugar level remained at the maximum permitted for cereal. (Ironically, this attempt to improve the nutritional benefits of the product resulted in embarrassment for the parent company and led to the vocal criticism and ultimate demise of the Smart Choices Program.)

Conversely, for less healthful categories, TL-GDAs offer concrete values and color-coded evaluations (e.g., green, red) that visually signal both nutritional strengths and weaknesses. Thus, the framing presented to the consumer for a given brand or category may be positive or negative, because both favorable and unfavorable nutritional aspects of the product are more easily scrutinized. Importantly,

[5]However, determining specific nutrient levels most appropriate for the color coding used in the Traffic Light system (indicating low, moderate, or high levels) for the disclosed nutrients potentially would remain an issue for public health policy. Current food labeling rules (*Federal Register* 1993), in conjunction with Daily Values, could serve as one possible guide.

manufacturers might be able to boost their credibility with consumers by providing both positive and negative attribute levels, similar to the effects found with the use of two-sided claims in advertising (see Kamins and Assael 1987). Alternatively, in situations in which a product lacks any noticeable positive nutritional benefits, a consumer may become aware of the low level of desirability of an *entire* category, and health-oriented consumers also may choose to lower their evaluations and purchases in this entire category. For major manufacturers with diverse portfolios of brands across both more healthful and less healthful categories, this potentially becomes a rather challenging market environment. To attract the health-conscious consumer, product modifications and improvements across several nutrients may be required (similar to the period following the implementation of the Nutrition Labeling Education Act), and research and development to reformulate products without compromising taste becomes critical. This potentially creates a highly competitive environment for manufacturers working to improve the nutrition profile of their brands, relative to their competitors. Thus, the simplicity of a singular and rigorous "healthy for you" icon presents a market environment that may minimize risks (e.g., positive cues only) for food manufacturers, though it may lack the opportunities and uncertainty associated with a highly competitive TL-GDA labeling program. It also should be noted that, regardless of the final FDA ruling on FOP icons, the need for maintaining consistency with existing nutrition labeling regulations is an important issue (Institute of Medicine 2010).

Future Research and Conclusions

The issue of FOP nutrition symbols is clearly not going away. For example, the Grocery Manufacturers Association and the Food Marketing Institute have launched a new FOP symbol this year, called the "Nutrition Keys" (Grocery Manufacturers Association 2010, 2011). In addition, Wal-Mart has announced plans to introduce a summary seal/icon for its private-label brand (Skiba 2011). Yet, as noted in the recent FDA request for further consumer research on FOP nutrition symbols (*Federal Register* 2010), *numerous* research questions remain unanswered. For example, the FDA has raised many issues on the most appropriate FOP symbol *design characteristics* (e.g., color, contrast, and location; number of nutrients; competing package information; shapes; sizes; formats to aid consumer understanding), *consumer processing issues* (e.g., exposure, notice, comprehension, attitudes, use, literacy, other demographic effects), and the *influence of other nutrition information* (e.g., presence/absence of Nutrition Facts Panels, nutrient content, health claims). Unfortunately, no one study will be able to assess all these issues, especially in the context of an experimental design, which provides relatively strong causal insight into the effects of many of these issues. As such, our controlled, experimental study focused on consumer evaluation of specific nutrient levels, overall healthfulness, disease perceptions, nutrition comprehension (accuracy), product evaluations, and purchase intentions. We also examined variations of realistic FOP icons used in practice (with controls) and the effect of the presence/absence of Nutrition Facts Panel information. We also studied an important moderator—namely, nutrition consciousness. Yet, given the multitude of issues raised by the FDA, this leaves considerable room for additional research. For example, research may be needed on spontaneous consumer inferences and cognitive responses about nutrients, as compared with the structured nature of questions used in this and most experimental studies. Consumer field testing conducted in home or retail environments that assesses package search behaviors, food selection, and choice also may be warranted (see Balasubramanian and Cole 2002; Institute of Medicine 2010; Roe, Levy, and Derby 1999). In addition, research is needed to move closer to an "optimum" FOP format and values to be considered and tested across different product category stimuli using varying nutrition levels (McLean, Hoek, and Mann 2010). No doubt, different variations of the TL-GDA FOP icon (e.g., adding adjectival descriptors to colors, other color options, or no color versions, such as the "Nutrition Keys") might warrant future research attention (Center for Science in Public Interest 2009, Part III, p. 10). Finally, literacy and processing challenges from vulnerable populations certainly come into play in assessing the ultimate effectiveness of the FOP symbols and icons (Gau et al. 2010).

To our knowledge, this study is among the first to provide a controlled test of FOP nutrition symbols, such as the Smart Choices (SC) icon, against the more complex Traffic Light–Guidelines Daily Amount (TL-GDA) icon and an FOP control condition (Taylor and Mande 2009). We believe that it can contribute to a better understanding of how icons of different levels of complexity may affect consumers' evaluations and purchase intentions. From a public policy standpoint, the results suggest that there are potential benefits of more detailed, FOP nutrition icons, as well as cautionary findings for simple, summary icons that are of potential concern. Taken in sum, the findings indicate that continued examination of possible FOP systems by the FDA, food manufacturers, and/or public health community is warranted (Taylor and Mande 2009). We hope that our findings, in conjunction with future FOP research, will eventually lead to standardized FOP labeling that best communicates important nutrition information in improving the long-term health of consumers.

Appendix A. Front-of-Package Conditions

A: Smart Choices Front-of-Package Condition

B: Traffic Light–Guideline Daily Amount Front-of-Package Condition

Appendix B. Back-of-Package Conditions

A: Back Panel Nutrition Facts Panel Condition

B: Back Panel No–Facts Panel (Control) Condition

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