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A Critical Review of the Literature on Nutritional Labeling

A comprehensive overview and critique of the nutrition labeling literature is provided. Studies examining the design and features of label formats and their impact on consumers being better informed and engaging in healthier behaviors are examined to summarize available knowledge in the field. The review suggests that while the extant literature has provided worthwhile critiques of the Nutrition Labeling and Education Act in terms of meeting its stated goals, as well as other general insights, it allows only for very tentative and conditional statements about factors related to the “bottom line” effectiveness of nutritional labeling. The outcome of the review suggests that a more holistic view of nutritional labeling is needed. Suggestions for future research that focus on both conceptualizations of the studies as well as methodology are made.

INTRODUCTION

Labels can help some people sometimes in some cases, if they have the knowledge or motivation to use the information, which may or may not be in a format they can understand. (Rotfeld 2009, p. 375)

The above quote, while full of qualifications and “mays,” provides a concise summary of the state of research on the topic of nutrition labeling, and its (possible) effects on consumer attitude and evaluation. Yet the quote itself illustrates the complexity of the issue and the cryptic nature of some of the findings on the impact of labeling on consumer behavior. Research on nutrition labeling, its design and the potential effects on food choice and subsequent health behavior has been extensive—due in part to the complexity of the issue, but mostly because of

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the importance of the issues of consumer information, education and protection.

Taking into account modern dietary behavior and its resulting weight issues, it should come as no surprise that the food industry has been taken to task over who is to blame for any (unwanted) changes in consumption trends (Dooley, Deshpande, and Adair 2010; WHO 2004). Marketing, public policy and consumer behavior researchers have shown a strong interest in this topic, generating a high volume of publications with work dating back to the late 1960s (Baltas 2001; Cowburn and Stockley 2003; Drichoutis, Lazaridis, and Nayga 2006). The marking or labeling (i.e., the provision of any kind of information) of food products has received by far the most attention. Though originally intended to prevent consumer misperception and general fraud, the concept of information provision has been widened and has become one of the pillars of general consumer protection and regulation (Cheftel 2005; Ippolito 1999). Consumer empowerment and, more specifically, the consumer's right to information are seen as important contributory factors in helping people make choices in their nutritional diet (e.g., Ippolito 1999; Wansink and Huckabee 2005). Consequently, foodstuffs are labeled, ingredients are listed and nutrients have to be indicated. With the introduction of the Nutrition Labeling and Education Act (NLEA) in 1990, Congress provided a regulatory framework which has spurred even more research.

Currently, even with the additional research, controversy over the effectiveness of food labeling remains. It is far from agreed upon whether the provision of information and the regulation thereof is really effective in communicating the information to the consumer and, even more, whether it can actually change people's dietary habits (Garde 2008; Seiders and Petty 2004). Behavioral change is especially difficult to demonstrate because the consumer behavior is not only highly complex, with many external and internal influences on perception, attitude and action, but also the information provided is often deliberately ignored by some consumers (Rotfeld 2008a, 2008b; Rotfeld 2010).

To date, only a few systematic reviews of past research have been conducted (Baltas 2001; Caudill 1994; Drichoutis, Lazaridis, and Nayga 2006; Tyebjee 1979), two of which are now clearly dated. The most recent review undertaken by Drichoutis et al. (2006) provided an important update and extension of these older versions, and developed a promising conceptual framework for examining the factors that affect the use of on-package nutrition information. However, the study has a relatively narrow focus on the precursors of label use as opposed to providing a broader look including the antecedents, consequences

and relationship moderators associated with nutrition label usage. In their evaluation of current literature reviews including that of Drichoutis et al. (2006), Grunert et al. (2010, p. 177) even go as far as stating that “when analyzing determinants of use of nutrition information, most studies have been restricted to an analysis of demographic determinants.” The very fragmented nature of this research, however, with its multiple antecedents, consequences and relationship moderators, calls for a systematic and structured review to provide new insights for policymakers and managers alike. Consequently, the review provided by Drichoutis et al. has been an important step toward analyzing the broad range of empirical findings, but was not comprehensive in terms of covering all aspects relevant to understanding the complexity of nutrition labeling, consumer use and understanding of such labels.

Thus, the purpose of this paper is to provide an extensive and systematic qualitative literature review, based on the direct provision of information about nutrition and health claim labeling on pre-packaged food products, as well as consumer characteristics that are known to influence understanding and use of such information. Given the focus, this review does not include economics studies such as Mathios (1996)¹ which draw from secondary (scanner) data and were not designed to study the direct effects of labeling and information provision on consumer understanding and use. As such, these studies fall out of the stated scope of this review. However, it should be noted that readers who are generally interested in the labeling topic are likely to find these studies to contain important findings on how nutritional labeling influences behavior at a macro level and thus are advised to examine these studies as well.

The present review provides an important update on the latest findings in nutrition labeling research. First, label characteristics will be examined in detail, focusing on the two major areas of literal content: label format and label wording. Both the question of “what to put on a label” (format) as well as the provision of numerical vs. verbal nutrition information (wording) have stirred considerable debate among researchers and practitioners. Second, to address the issue of consumer characteristics, sociodemographic factors will be looked at in more detail as specific age groups, female consumers (gender analysis), and/or people

1. The following studies provide a strong overview of the work that has been done in the economics field in analyzing nutrition labeling effects on purchases, using scanner data and various techniques of regression analysis: Teisl, Bockstael, and Levy (2001), Mojdzuska and Caswell (2000), Ippolito and Mathios (1995), as well as Ippolito and Mathios (1990).

of higher education and income are assumed to show significant differences in understanding and using such labels. Additionally, personal factors, including enduring motivation (involvement with health issues) and ability (general health and nutrition knowledge), will be assessed due to their prevalent role as impact factors on consumer (consumption) behavior.

As such, we formulate the following research questions that will be dealt with in the present review:

- In general, what aspects of the literal content of labeling are more effective in aiding consumers to understand and process the information communicated?
- Specifically, how do format and wording of nutrition labels affect consumer understanding of the information provided? Do the extent and/or complexity of the message influence its effectiveness with consumers?
- What personal/individual and/or sociodemographic factors have an impact on the processing and comprehension of nutritional labeling information?
- To what extent has the regulation of nutritional labeling helped consumers to become better informed and to change behaviors?

It is the objective of the present article to assess key questions of nutrition labeling on pre-packaged food products as part of an effort to both illustrate and evaluate consumer and regulatory issues in this sector (cf. Kopp and Kemp 2007). In analyzing the findings of these research questions, the article provides suggestions for how to advance this stream of research in order to inform managers and policymakers of relevant findings and implications. As such, following a detailed description of the review procedure, the authors present a broad introduction to the literature on the topic of nutrition labeling, and a comprehensive analysis of the findings of empirical studies that have been conducted. Results are then discussed at length in order to provide analysis on the research questions posed. Finally, avenues of further research are offered and an overall outlook on the topic is given.

METHODOLOGY

By means of a literature review, previous empirical research is compiled, categorized and critically evaluated. The general goal is to “compare and combine” (Hall and Rosenthal 1995, p. 396) research findings for an overview of the empirical results and compare the studies in order

to identify moderators, such as research design, sample characteristics and time periods (Franke 2001). More than 30 years of empirical research on nutrition labeling, label characteristics, and effects of personal and sociodemographic factors on label usage have been identified and synthesized in this study.

The review procedure was initiated in spring 2009, with updates occurring throughout 2010, following suggestions by Franke (2001), Rosenthal (1995) and Hunter and Schmidt (1990). For the purpose of identifying relevant articles, the authors first carried out a general keyword search in the EBSCO databases examining the extant literature. The list of articles was iteratively supplemented as the analysis continued. Keywords included meta-analysis, food advertising, food marketing, food, obesity, overweight, health, health claim(s), nutrition information, nutrition claims, nutrition labels, nutrition labeling, nutrition, calorie(s) and caloric intake.

To ensure the inclusion of articles that had not been covered by the keyword search, the authors identified a list of relevant consumer research journals that served as a base for an issue-by-issue search of articles. Concerning this exhaustive search, a focus was put on the top-ranked marketing and consumer research journals. Furthermore, with the focus of this analysis representing a substantial part of classic behavioral consumer research, the following journals were chosen to account for the core of the review procedure: *Journal of Marketing Research*, *Journal of Marketing*, *Journal of Consumer Research*, *Journal of Applied Psychology*, *Journal of the Academy of Marketing Science*, *Marketing Letters*, *Journal of Advertising*, *Psychology & Marketing*, *Advances in Consumer Research*, *Journal of Consumer Affairs*, *Academy of Marketing Science Review Online*, *Journal of Public Policy & Marketing* and *International Journal of Advertising*.

An extension of the literature review into related fields, such as sociology, communication sciences, human medicine and the general health sciences, using additional databases, was also undertaken by examining additional databases, such as ABI/Inform and Psychlit. It was regarded as particularly important to identify those authors and their respective communities that had been identified as valuable and long-term contributors to this field of research. However, much work from the medical area was found to focus only on consumption effects, measuring various food choice and intake situations and their effects on BMI (height and weight), as well as more general health issues. Keeping the focus on effects of information provision and influential consumer characteristics in mind, the area of effects on consumption

behavior was excluded as actual nutrition labels are one of many factors involved.

Having identified the main base of empirical work, the reviewers undertook an iterative search throughout the references of the existing articles in order to account for important contributions that may have been overlooked in the first steps of the review. Articles resulting from this search included working papers, dissertations and conference papers. Due to the nature of these sources, evaluation of the quality of these studies was assured in order to eliminate possible opinion pieces, as well as non-empirical, evaluative commentaries.

The review process resulted in 47 studies that met the above criteria. These studies are included in the review presented below.

Systematization

The goal of the review is to gather and systematize the empirical findings, as well as the methods used, in order to give a structured overview on existing research and any gaps that need to be filled by further studies. To this end, an additional selection criterion for the articles under review was the content of at least one empirical study and the reporting of test statistics in order to ensure the quality and traceability of the results. The core of the studies had to be on nutrition label characteristics and/or consumer characteristics influencing the use of these labels. Our focus of analysis lies with the effectiveness of food and nutrition labeling in communicating certain information related to nutritional content and dietary value to the consumer. In addition, we want to investigate the influence of certain consumer characteristics that have been found to moderate many effects that nutrition labeling has on consumer behavior: knowledge (on general health as well as nutrition issues) and motivation (personal commitment to maintaining a healthy diet and accounting for a proper nutritional intake). A look at the empirical literature has shown that the main emphasis of research is focused on the presentation and information provision on a food product (Seiders and Petty 2004).

ANALYSIS AND RESULTS

Defining Labeling

New food labeling requirements resulting from the 1990 NLEA not only have accounted for the most comprehensive change in food marketing practices in recent history in the United States, but have

also been the catalyst for a large proportion of subsequent research on the topic.² Labeling is defined as involving all forms of information disclosure on a product, ranging from mere nutrition fact panels to daily reference values, recommendations, health claims and disclaimers.

We now turn our attention to reviewing the studies of the characteristics of nutritional information disclosure and health claims. Research on the format and wording of such labels is reviewed to set up an outline for further aspects of the functional chain. Subsequently, we will focus on the use of nutrition information. Moderators of this usage are reviewed to achieve better understanding of the prerequisites of labeling effects on consumer food choices and behaviors.

Characteristics of Nutrition Labeling and Health Claims

Research on the characteristics and corresponding success factors of nutritional labeling and health claims can be divided into the two broad categories of format and wording (i.e., the type of information and the way it is presented). A summary of the studies reviewed on this topic and their methods, key findings and limitations appear in Table 1.

Label Formatting

The format and design of nutrition labels and health claims involve: (1) the literal content of the labels; (2) the complexity of the information displayed; and (3) the amount of product-related information on the package. Regarding information content, most studies have focused on the empirical analysis of different label formats in terms of stated consumer preferences, comprehension of information and effects on product ratings and purchase intentions.

Regarding the amount of information a label should contain, some research has found that consumers show distinct preferences for certain nutrition information formats over others (Muller 1985). Labels containing detailed nutrient content information have generally been found to be preferred by consumers over summary ratings (such as average

2. The NLEA of 1990 as implemented by the Food and Drug Administration (FDA) was the result of an ongoing debate over labeling requirements for food products in the United States (Hackleman 1981; Klopp and McDonald 1981; Tyebjee 1979). Since its introduction, numerous studies have focused on the consequences of this act, both in terms of economic welfare and consumer protection. For a good overview, see Ghani and Childs (1999), Silverglade (1996) and Petruccielli (1996). An excellent discussion of the longitudinal effects of the implementation of the NLEA on consumer processing of nutritional information, including an established scale on general nutrition knowledge, can be found in Moorman (1996).

TABLE 1
Studies on Characteristics of Nutritional Labels (Format and Wording)

Study	Subject of Study	Method/Design	Results	Limitations
Format (content, complexity and amount) Viswanathan, Hastak, and Gau (2009)	Effects of levels of consumer literacy on comprehension and usage of nutrition labels	Experimental study with one-on-one data collection; participants had various levels of literacy (tested)	Significant differences in understanding and usage of nutrition label information due to literacy level	Use of nutrition labels only → no actual product packages were employed (risk of distortion of findings)
Block and Peracchio (2006)	Effects of nutrition information label formats on consumer comprehension	Three studies (laboratory and mail); manipulation of label format and information type (full vs. simplified)	Difficulty of consumers to interpret daily values (%DV); easy-to-use information → increase in usage	Narrow sample focus (pregnant women → different decision making than other consumers)
Wansink (2003)	Effects of front- and back-sided health claims on consumer processing/belief	Controlled study (undergraduates and adults); manipulation of packages	Short front and full back package health claim → most effective	Focus on one product category (→ extension to different product types)
Kozup, Creyer, and Burton (2003)	Health claims and nutrition information: interaction effects on consumer evaluation of packaged food products	Three studies (survey and field) with panel members and mall shoppers; manipulation of health claims	Favorable health claims and nutrition information → independent effects on consumer evaluation	Examination of mock product; focus only on one single and well-known health claim (different claims needed)
Burton, Andrews, and Netemeyer (2000)	Disclosure information and nutrition claims: interaction effects on consumer evaluations and purchase intentions	Quasi-experiment with mall shoppers; manipulation of information label formats (disclosure and claim)	Information disclosure → strong effect on product evaluation (reduction of perceived healthiness)	Focus only on few specific claims (→ further analysis of negative carryover effects for different claims)
Mitra et al. (1999)	Effects of implied health claims on consumer interpretation of nutrition facts panel (interaction effects)	Field experiment (representative nationwide sample); manipulation of label formats (health claim and nutrition facts panel)	No misleading effects by implied health claims; independent effects of health claim and nutrition information on product evaluation	Narrow focus on one single health claim (→ generalizability); usage of black and white copies (as opposed to realistic product packages)

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Study	Subject of Study	Method/Design	Results	Limitations
Andrews, Netemeyer, and Burton (1998)	Effects of nutritional information on the misleading potential of generalizing health claims	Study with mall food shoppers; manipulation of health claim and nutrition disclosure	Nutrition disclosure → reduction effects on nutrient content generalizations falsely evoked by claims	Solely print media used (ad copy tests); only effects on processing factor "nutrition knowledge" studied
Burke, Milberg, and Moe (1997)	Effects of broader (category-defined) claims vs. narrow (brand-specific) claims on consumer education	Three studies (experimental); manipulation of nutrition labels and product attributes (inherent to the category)	Broad (nutrient free) claims → less deceptive, more informative for low-knowledge consumers	Focus on brand comparison in specific product categories → extension, also in terms of claims studied
Keller et al. (1997)	Effects of nutrition claims on nutrition and product evaluation: interaction effects of health claim and nutrition information disclosure	Mail survey with household panel; manipulation of package design in terms of label format (99% fat free, "low in fat/cholesterol")	Health claims → no single effect on product nutrition beliefs; dominant effect of nutrition information over health claims	Data collection in a non-store environment; low external validity; limited researcher control over respondents answering behavior
Mazis and Raymond (1997)	Interaction effects of nutrition information and health claims	Laboratory study with mall shoppers; manipulation of information source	Only health claims → more positive effect on product evaluation	Brand loyalty as a potential, non-examined moderator
Burton and Andrews (1996)	Effects of full vs. simplified label formats on consumer comprehension	Mail survey with consumer panel; manipulation of label formats	Full (simplified) label formats → effects on consumer comprehension	Low external validity (mail survey); general issues with panel respondents
Ford et al. (1996)	Interaction effects of nutrition labels and health claims on consumer interpretation and comprehension	Laboratory study with (under-) graduates; manipulation of format (health claims, favorableness)	Nutrition information/health claim → independent effects on consumer judgment of health-related beliefs	External validity questionable due to forced exposure; potentially distorting time effects on decision making
Levy, Fein, and Schucker (1996)	Performance characteristics of label formats: effects of stated preference	Experiment (shopping mall intercept method); manipulation of product nutrition label formats	Increase in information level → increase in consumer preference, but decrease in usage performance	Narrow research focus (relative performance of different labels); further analysis needed on their actual effects

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Study	Subject of Study	Method/Design	Results	Limitations
Burton, Biswas, and Netemeyer (1994)	Effects of alternative nutrition label formats on consumer perception, comprehension and product evaluation	Experiment (nationally recruited); manipulation of label format, reference values, and nutrition values	High (low) nutrition value condition: reference values → increase (decrease) in consumer attitudes and purchase intention	General shortcomings of non-store environment-studies; further analysis needed on relevant in-store purchase factors
Venkatesan, Lancaster, and Kendall (1986)	Alternate formats of nutritional information disclosure: effects of format on comprehension and nutritional concern	Survey with purchasing panel members; repeated measure with manipulation of label format and product	Highest ratings for detailed RDA index label; yet simplified formats preferred for actual usage	No reporting on processing measures (→ info recall), only policy measures (→ usage, attitude change, purchase)
Muller (1985)	Structural success factors: effects of label format (presentation and brand variation) on purchase behavior	In-store experiment; manipulation of information label formats and brand signs; analysis of sales data	Effects of general information format on purchases; no effects of the amount of information displayed	Observational method (→ no inference on other reasons for purchase, for example: brand loyalty)
Brucks, Mitchell, and Staelin (1984)	Effects of nutritional information disclosure on product evaluation and purchase intention	Experiment (at local women organization); development of information processing model; label manipulation	Increase in nutritional information → decrease in usage; nutritional knowledge needed to process info	One-sided sample (just women) → questionable generalizability
Freiden (1981)	Effects of nutrition information on brand rating: consumer preference for product information	Experiment (laboratory study with mall shoppers); manipulation of label format (disclosure of information)	More detailed information formats → increase in favorable consumer attitudes toward those products	Sample consistency (only female shoppers); very homogeneous product information used
Jacoby, Chestnut, and Silberman (1977)	Consumer use and comprehension: effects of label formats on consumer understanding of nutrition information	Six studies (collection of previous research → no procedures are reported in the article)	Consumer state preference for nutrition information; however, no actual usage/comprehension of it	Research collection (no detailed information on the single studies)

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Study	Subject of Study	Method/Design	Results	Limitations
Format (content, complexity and amount) Scammon (1977)	Effects of nutrition label formats on consumer information processing and comprehension of product nutritiveness	Experimental study (voluntary participants); manipulation of nutrition information labels (adjectival vs. numerical, simplified vs. full format)	Simplified information formats → increase in consumer comprehension; same effects for adjectival information (vs. numerical)	Only one exposure time to nutrition information (six seconds) examined; no usage of multivariate analyses of the data
Asam and Bucklin (1973)	Nutrition labeling for canned goods; effects of labeling on consumer perception and purchase intention	Study with mall patrons (post-purchase interviews); examination of perceptions and purchase intentions	Consumer preference for detailed nutrition labels; promotional terms able to obscure any effects	Narrow study focus (product: canned peas); additional aspects need to be examined → actual comprehension
Lenahan et al. (1973)	Consumer reaction to nutritional labels; effects of alternate label formats on consumer perception and information usage	Two studies (national sample in-depth interviews and mall shopper interviews); manipulation of nutrition label formats	Large consumer preference for RDA index formats; however, small percentage in comprehension and actual usage of such labels	Almost exclusively reporting of descriptive data; no critical evaluation of the findings; poorly supported derivation of explanations
Wording (quantitative and qualitative information) Howlett, Burton, and Kozup (2008)	Effects of information on trans-fat on consumer comprehension and purchase intention	Two online surveys with Internet panel members; manipulation of nutrition label and level of trans-fat contained	High trans-fat products → decrease (vs. sharp increase) in purchase intention, moderated by knowledge	Low external validity (outside retail environment) → more situational variables with potential influence
Geyskens et al. (2007)	Effects of "low-fat" nutrition labels on consumer association with health references	Two studies (laboratory) with panel members and undergraduates; manipulation of label formats (health vs. neutral messages)	"Low-fat" → increase in consumption due to association with health references; obscures subjects' perceived weight gain	External validity due to laboratory setting; focus on one specific and very explicit claim; further analysis of health reference—product link

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Study	Subject of Study	Method/Design	Results	Limitations
Kemp et al. (2007)	Effects of "low-carbohydrate" claims vs. "low-fat" claims on consumer disease risk perception and purchases	Mail survey (household research panel members); manipulation of nutrition information and claims	"Low-carbohydrate" claims → increase in purchase intention for subjects low in nutrition motivation	Extension of the analysis of moderators: not just motivation, but also ability and opportunity to process info
Wansink and Chandon (2006)	Effects of "low-fat" nutrition labels on consumption behavior	Three studies (laboratory); development of effect-model for consumption	Low-fat labels → increase in consumption and serving size/decreased guilt	Focus on Fat-Label → extension to calorie and cholesterol label
Viswanathan and Hastak (2002)	Effects of summary information vs. daily values on nutrition evaluation	Four studies (laboratory); manipulation of nutrition label format	Summary information (average values) → larger effect on consumer comprehension (than %DV)	Usage of fictitious brand packages (incomplete front and back panels); relative ratings instead of absolute
Li, Miniard, and Barone (2000)	Effects of daily value (%DV) reference information on consumer comprehension and usage	Experiment with undergraduates; manipulation of nutrition label format and label understanding (education)	Increase in subjects' label knowledge (education) → increase in comprehension/accurate usage	Narrow focus (one product, isolation from other brands), low external validity (non-shopping environment)
Garretson and Burton (2000)	Effects of "fat"- vs. "fiber"-label information on disease risk perception and product evaluation	Quasi-experiment (between-subject design); manipulation of the wording of nutrition labels	"Fat" information → increase in negative disease risk perception; no effect on product evaluation	Usage of mock packages → external validity; paper-pencil survey; no assessment of package search behavior
Bushman (1998)	Effects of warning labels vs. pure information labels on consumer preference and actual consumption	Experiment with undergraduates; manipulation of label conditions and type of product consumed	Warning labels → increase in preference for full-fat products; actual behavior did not increase with either warning or information labels	No inference possible on the source of the warning or the perceived personal risk to the consumer as a contributor to consumer reactance

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Study	Subject of Study	Method/Design	Results	Limitations
Viswanathan (1996)	Comparison of numerical vs. verbal nutrition information on usage	Experiment (within-subject design); manipulation of nutrition information	Verbal nutrition information → increase in accuracy/comprehension	Artificial setting of study; strict separation of numerical and verbal info
Barone et al. (1996)	Daily values (%DV) vs. average-brand values: effects of reference information on health evaluations	Experiment with undergraduates; manipulation of label format (%DV, average-brand value or none)	Average-brand values → better facilitate consumer comprehension of nutritiousness (than %DVs)	Examples were given for average-brand values, but not for %DVs → influence on subjects evaluations
Viswanathan (1994)	Summary description: effects of reference information on consumer usage of nutrition information	Two studies (laboratory) with undergraduates; manipulation of numerical nutrition label information	Higher usage of summary information when presented with numerical information	Generalizability of results due to artificial nature of the experiment (→ more nutrition attributes in reality)
Moorman (1990)	Consequence information: effects of negatively evaluated nutrient info on consumer utilization of information	Experiment with university staff personnel; development of effect-chain model; alternative label formats	Specific and arousing negative consequence information → increase in consumer information processing	No extension of results onto actual health-related purchase and consumption behavior
Russo et al. (1986)	Neutral vs. negative information: effects of nutrition information on consumer purchase behavior	Two studies (both field); manipulation of alternative nutrition label formats (neutral vs. negative information)	Negative component (sugar) nutrition information → increase in low-sugar products of same category	Potential interviewer bias due to non-rotation between the supermarkets

values or ranges of a nutrient in a specific product category) or adjectival descriptors (such as “high/low in”) in terms of information processing comprehension (Asam and Bucklin 1973; Freiden 1981; Lenahan et al. 1973; Scammon 1977; Viswanathan and Hastak 2002).

However, the actual cognitive processing of such information has been found to occur differently. In line with this, Venkatesan, Lancaster, and Kendall (1986) examined alternative nutrition labels that included the Recommended Daily Allowances (RDA) Index, a simplified nutritional index and a basic nutrition scoreboard stating a nutritional score for the food product, and discovered that all were seen as very informative, especially the more comprehensive RDA Index. But when asked whether they would use such nutrition labels for choosing food products, subjects reported a sharp drop in the usage evaluation (p. 41).

Using these findings as a baseline, Viswanathan, Hastak, and Gau (2009) further advanced insights on label format when they distinguished between high, medium and low levels of consumer literacy. Testing for summary information, the authors found the helpfulness for high-literate participants to hold true while those low in literacy could not benefit from this type of formatting (p. 143). Thus adding to the complexity of the matter as there is no clear result on what ought to be called the “right format.”

It can be assumed that stimulating concern among consumers to pay attention to nutritional information and subsequent dietary importance may best be served by illustrating detailed nutritional indices as well as recommended daily values on the product’s package. In relation to using nutritional information to influence consumers’ actual choice of food products, it appears that consumers prefer the more simplified, easy-to-use labels, and nutrition facts panels (cf. Burton and Andrews 1996, p. 82). These findings are in line with other empirical studies concerning stated preferences of label formats: subjects indicate a preference for the largest amount of information offered, but further tests reveal that a surplus of information can result in poorer performance regarding comprehension and ease of use in making food choices (Block and Peracchio 2006; Burton, Biswas, and Netemeyer 1994; Hackleman 1981; Jacoby, Chestnut, and Silberman 1977; Levy, Fein, and Schucker 1996; Scammon 1977).

It has also been shown that a relatively large amount of nutritional information can even deter test subjects from using this information in food choice, purchase or consumption decisions (Brucks, Mitchell, and Staelin 1984). However, generalized claims such as “no cholesterol” can lead to significant nutritional misunderstandings when presented either

on a package (Burke, Milberg, and Moe 1997) or as a promotional claim in advertising (Andrews, Netemeyer, and Burton 1998).

Closely related, substantial research has focused on the potential interactions between nutritional information and (general and/or specific) health claims displayed on food products. Ford et al. (1996, p. 24) showed that nutrition information and health claims on a product had independent effects, with health claims not influencing the processing of nutrition information when both sources of information were available (Keller et al. 1997, p. 265; Kozup, Creyer, and Burton 2003, pp. 31–33). When presented alone, health claims had significant effects on health-related beliefs (Ford et al. 1996; Mazis and Raymond 1997). As concluded by Ford et al., the independent-effects model of nutrition information and health claim is only favorable if the health claim is accurate (Ford et al. 1996; also cf. Keller et al. 1997).

Building on this research, Burton, Andrews, and Netemeyer (2000) examined interaction and mediation effects of nutrient information disclosure and health claims in an advertising context on consumer evaluations and found that information disclosure had a strong single effect on health perceptions; it even dominated any effect of the claim or the claims by disclosure interaction: nutritional information by itself was capable of substantially altering the perceptions of a subject. These findings underpin the results of a prior study in which the same authors had shown that nutrition information could help reduce misleading general claims, bringing about significant changes in product evaluation (Andrews, Netemeyer, and Burton 1998; also cf. Mitra et al. 1999).

Facing the already mentioned dilemma of excessive information deterring consumers and too little information potentially misleading them, Wansink (2003) undertook additional research concerning the optimal level of nutritional information and health claims on a product. When using both front and back package labels, the author showed that short claims on the front of the package combined with larger, more detailed claims and nutritional information on the back, led consumers to significantly better process and belief of the claims.

Label Wording

The wording of nutrition labels and health claims involves qualitative information concerning the nature of the messages conveyed as well as quantitative information such as summary facts and reference values. As for the qualitative information, considerable research has focused on the framing of health messages. Russo et al. (1986) examined nutrition information displays in supermarkets by comparing lists of vitamins and

minerals with lists of added sugar. They found that neutral information on nutrient contents did increase consumer nutrition knowledge but did not influence actual purchases, whereas the disclosure of negative food components (sugar) led to higher purchases of same-category foods low in sugar (pp. 65–68).

Similar findings were shown by Moorman (1990), who developed a framework for the nutrition information utilization process. Analyzing the effect of negative consequence information (information on the relationship between product-level and consumer consequences) on consumer comprehension and use of nutrition information, she found that as negative consequence information became more arousing and specific in instruction, subjects were more motivated and able to process the information. Bushman (1998) later obtained similar results by comparing the effects of pure information labels stating nutritional content of foods with labels containing an additional warning (statements regarding risks for disease-related conditions). He found that participants in the warning label condition were more inclined to sample the full-fat products than participants in the information label condition. However, contrasting results between preference and actual behavior were also displayed. Bushman concluded that “warning labels can have considerable influence on behavior (. . .) if the risk is credible and well-known” (p. 100).

In relation to the general tone of message contents, further research has focused on the usage of additional specifications such as “low in.” Wansink and Chandon (2006) examined the impact of “low-fat” nutrition labels on consumption behavior and conducted an experiment in which it was found that such claims increased food intake during a single consumption occasion, both for hedonic and utilitarian snacks (also cf. Geyskens et al. 2007). These findings are in line with previous research undertaken by Garretson and Burton (2000), which showed that health-related information on fat affected consumer evaluation and perception of disease risks whereas information on fiber did not. This difference in influence has been attributed to a lack in consumer nutrition knowledge (Howlett, Burton, and Kozup 2008), which showed that the effects of trans-fat labels on consumer risk perception and product evaluation were highly moderated by knowledge on this nutrient, leading to significant misinterpretations of such products for subjects in the low-knowledge condition. These results are in line with similar research on the effects of “low-carbohydrate” claims whereby consumers with a low motivation to process nutrition information were more likely to be affected by the “low-carb” claims and, in effect, be more prone to increase their purchase intentions (Kemp et al. 2007).

Besides analyzing qualitative information displayed on nutrition labels and health claims, considerable research has focused on quantitative information disclosure. Numerical nutrition information includes reference values such as percent daily values (%DV) and summary information in the form of average-brand values. Viswanathan (1994) examined the impact of summary information on the use of nutrition labels. He showed that providing summary information facilitated consumer usage of numerical nutrition information (Viswanathan 1994, p. 58). Building on these preliminary findings, Barone et al. (1996) compared reference values (%DV) with average-brand values regarding their effects on consumer product evaluation and showed that average-brand values were better at enhancing consumer discernment between healthy and less healthy products (Barone et al. 1996; cf. Viswanathan and Hastak 2002, p. 315). A common explanation for the disappointing performance of recommended daily values³ in reducing overconsumption is findings that indicate consumers' comprehension of such nutritional information being highly dependent on their knowledge of how to use these percentage values in evaluating dietary recommendations (Li, Miniard, and Barone 2000). Interestingly, Block and Peracchio (2006) showed that even physicians were not able to transform %DV from the nutrition facts panel into milligrams.

When comparing numerical and verbal nutrition information, studies indicate that qualitative information such as "(very) high" or "(very) low" has several advantages in terms of weight attributed to the product information over quantitative information when evaluating and judging food products. These advantages are due to the descriptive nature of such information and even persist if numerical information is presented with summary information to facilitate consumer interpretation (Burton, Biswas, and Netemeyer 1994; Scammon 1977; Viswanathan 1994, 1996).

Consumer Factors Associated with Use of Nutrition Information

As Jacoby, Chestnut, and Silberman (1977) noted, there is a marked difference between the effectiveness of merely providing nutrition information and actual consumer use of such information. It is therefore of critical importance to examine that usage as an intermediate step in assessing the effects of nutrition labels and health claims on product evaluation, purchase behavior and actual consumption. On the basis of

3. The NLEA requires the provision of daily value reference information on food labels to improve consumer comprehension and evaluation of product nutritiousness (Barone et al. 1996).

the structural factors of nutrition labels and health claims (format and wording) described in more detail in the previous section, researchers have analyzed additional influences on consumer use of nutrition information. The literature has focused on two main aspects: personal and sociodemographic factors. Table 2 provides a summary of these studies, detailing the variables included, the method(s) chosen, as well as key results and limitations.

Personal Factors

As is the case with format and wording influence, consumer comprehension of nutrition information is influenced by personal factors (e.g., ability, motivation, knowledge levels). Comprehension is seen as an important factor when assessing enduring motivation (involvement) and enduring ability (nutrition knowledge) to process nutrition information. Moorman (1990) examined the impact of both stimulus and consumer characteristics on the use of nutrition information and found that negative consequence information displayed on products led to higher consumer motivation and ability to process nutrition information. This result is consistent with prior research showing that nutrition label format changes improve consumers' processing ability of nutrition data (Muller 1985), which in turn has a significant impact on the use of such information when evaluating disease risk perceptions and making purchase decisions (Kemp et al. 2007, p. 68).

Wang, Fletcher, and Carley (1995a) found the superordinate concept of the enduring importance of nutrition (a personal characteristic comprising both motivation and ability) to be a significant positive predictor for consumer search and use of nutrition information. Previously, Feick, Herrmann, and Warland (1986) had shown that the importance of food consumption on future health significantly affected consumer nutrition information search and use. In a proposed model of the use of package claims and nutrition labels, Szykman, Bloom, and Levy (1997) found significant effects of increased consumer nutrition knowledge regarding blood pressure, heart disease, and cancer on both self-reported label use and recent situations in which subjects had changed their purchase decision after exposure to the nutritional label (also cf. Klopp and McDonald 1981). However, in contrast, studies by Nayga (2000) and Nayga, Lipinski, and Savur (1998) could not demonstrate any direct effects of nutrition knowledge on the probability of label use, with the conclusion that either nutritional knowledge did not adequately measure consumer ability to evaluate nutrition information found on labels (Nayga, Lipinski, and Savur 1998, p. 116) or consumers simply

TABLE 2
Studies on Consumer Characteristics (Personal and Sociodemographic) Associated with Nutritional Label Use

Study	Subject of Study	Method/Design	Results	Limitations
Moorman et al. (2004)	Effects of subjective knowledge (SK) on consumer search locations and use of nutrition information	Three studies (laboratory and field); manipulation of subjective knowledge; observation of shopping behavior	Subjective knowledge influences consumer search behavior (→ self-consistency theory)	No analysis of possible conflicts (→ behavior due to subjective knowledge vs. health-related goals)
Nayga (2000)	Effects of nutrition knowledge and gender on consumer use of food labels	Consumer survey with supermarket shoppers; analysis of nutrition knowledge and food label usage	No effect of nutrition knowledge on label use; weak linkage between knowledge and behavior	Poor model specification (operationalization); student interviewers (→ bias, subjective sample selection)
Nayga, Lipinski, and Savur (1998)	Effects of sociodemographic factors and nutrition/health-related factors on consumer use of nutrition labels	Consumer survey with supermarket shoppers; analysis of factors predicting the use of nutrition labels	Income, education, and health status → predictors for use of nutrition labels	Narrow focus (→ consumer use of labels, no analysis of comprehension of nutrition information provided)
Szykman, Bloom, and Levy (1997)	A proposed model on the use of package claims and nutrition labels	Development of model; hypothesis testing with FDA Food Label Use and Education Survey-data	Increase in consumer knowledge → increase in use of nutrition labels and health claims	Provisionary database (→ further testing of the established model in an experimental condition)
Wang, Fletcher, and Carley (1995a)	Effects of sociodemographic factors on consumer use of nutrition information sources	Analysis of Nationwide Food Consumption Survey data regarding predictors for use of information sources	Food expenditure, family size, age, education and enduring importance of nutrition predict use of info sources	Broad focus (→ all sources for nutrition information used by consumers); outdated database (1988)
Wang, Fletcher, and Carley (1995b)	Effects of consumer health awareness, economic and sociodemographic factors on food label usage	Estimation of logit-model; analysis of Nationwide Food Consumption Survey data	Consumer health awareness, household income, food expenditure and education → significant predictors	Data originates from 1988 → reproduce with newer survey data; no accounting for heterogeneity in data

(continued)

TABLE 2
(Continued)

Study	Subject of Study	Method/Design	Results	Limitations
Cole and Balasubramanian (1993)	Effects of age on consumer search for information	Two studies (laboratory and field); analysis of nutrition information search for different consumer age groups	Increase in age → negative effects on search intensification and selection appropriateness	No complete consideration of possible explanations for differences in the age categories (education, etc.)
Cole and Gaeth (1990)	Effects of age, cognitive style, and perceptual aid on consumer usage of nutritional information	Two studies (laboratory); manipulation of perceptual aid; analysis of age and cognitive style on information usage	Changes in general perceptual ability (not merely age) → effects on use of nutrition information	Unrealistic display of product attributes (matrix); simplified version of real-life shopping experience
Moorman (1990)	Effects of consumer characteristics on the utilization of nutrition information	Experiment (university staff personnel); development of effect-chain model (motivation and ability)	Enduring motivation → positive effect on ability to process information (and vice versa)	Mixed results for the evaluation of decision quality (both by consumers and experts)
Feick, Herrmann, and Warland (1986)	Probit analysis on the use of different sources in consumers' search for nutrition information	Nationwide telephone interviews; analysis of data on food choice, nutrition knowledge and info search	Enduring importance of nutrition, education, health status and age → predictors for use of nutrition info	Self-reported measures on nutrition information seeking behavior → questionable accuracy
Muller (1985)	Effects of structural success factors on consumer use of nutrition information	Field experiment in supermarkets; manipulation of label presentation format; analysis of sales data	Presentation format of nutrition information → increase in information use (→ increased sales)	Model for consumer ability, but not motivation to process information; no clear analysis of brand loyalty
Klopp and MacDonald (1981)	Exploratory study of consumer reasons for non-use of nutrition labels	Mail survey (voluntary mall shoppers); exploring on usage, self-reporting on nutrition knowledge	(Self-reported) nutrition predictor for label use; education also found significant	Potential bias in self-reported nutrition knowledge; narrow sample of random food shoppers; study design

were not able to translate their knowledge into adequate behavior (Nayga 2000).⁴

With the above results in mind, Moorman et al. (2004) examined the process of consumer search and use of information in more detail and found that subjective knowledge significantly affected search locations as it increased the likelihood of subjects to locate them proximate to consistent stimuli. These results further elucidate underlying influences that take place during the use of nutrition information, suggesting that consumers may only read and process the kind of information that corresponds with their personal belief systems.

Sociodemographic Factors

Sociodemographic factors have been used to extend the range of possible predictors for nutrition information use. Factors include age, gender, family size and living situation (demographics) as well as education, income and occupation (socioeconomic aspects).

Findings regarding age as an influencing factor on nutrition information use have been somewhat controversial. Nayga (2000), Wang, Fletcher, and Carley (1995b) and Klopp and McDonald (1981) all reported that the age of a household head is not a major determinant in consumer use of food labels, whereas Cole and Balasubramanian (1993) showed a negative relationship between age and the success of information use, stating that elderly consumers tend to search less intensely and less accurately than a younger demographic (cf. Wang, Fletcher, and Carley 1995a). This finding was in line with Moorman (1990), who found that aging may increase consumer perception of the ability to process information but actually worsens levels of comprehension.

Cole and Gaeth (1990) showed that perceptual ability and not merely age was responsible for the decrease in choice task accuracy. Both factors, however, were seen as closely related. Gender as a socioeconomic predictor has not received a great deal of research attention; to the extent that it has, conflicting results have been reported. Nayga (2000), Nayga, Lipinski, and Savur (1998) and Klopp and McDonald (1981)

4. The relationship between prior (nutrition) knowledge and preventive health behavior has been a controversial debate for some time (Szykman, Bloom, and Levy 1997, p. 229). Some studies show that higher levels of health knowledge have a significant positive effect on information search and use (Moorman and Matulich 1993). Other articles report that prior knowledge and experience decrease preventive health behavior: consumers engage in maladaptive behavior—coping behavior that reduces one's fear without actually reducing health-related dangers (Tanner, Hunt, and Eppright 1991, pp. 42–43). A good overview on research in this field can be found in Szykman, Bloom, and Levy (1997, p. 229).

did not detect any differences between male and female shoppers in the likelihood of their using nutrition labels. This serves as a contrast to the area of economic studies where the analysis of scanner data typically reveals significant coefficients for female shoppers and label use (cf. Mathios 1996)—a correlation that may not necessarily be one of causality, too, as the behavioral studies mentioned above show.

Similarly, family or household size has also not been researched intensively as a predictor for consumer use of nutrition labels. Results that do exist, however, show consistency in effects of the number of family members living together on the use of label information in a shopping environment: larger households, especially in the presence of small children, are more prone to use food labels than smaller households (Feick, Herrmann, and Warland 1986; Wang, Fletcher, and Carley 1995a, 1995b).

With regard to the socioeconomic aspects, there has been a vast research emphasis on education and income as major predictors of nutrition information use. In a variety of settings, education has been found to be associated with information acquisition and healthy behavior. Klopp and McDonald (1981) were among the first to report that food label users tended to be more highly educated than non-users. A higher level of education is seen as a predictor in nutrition information usage as better educated consumers tend to be more aware of nutritional value and may also have a higher ability to comprehend this kind of information in general terms (Nayga, Lipinski, and Savur 1998; Feick, Herrmann, and Warland 1986; Wang, Fletcher, and Carley 1995a, 1995b).

Adding to this coherence between education and label usage, in 2009, Viswanathan et al. further detailed analysis of consumer ability by focusing on the concept of literacy. The authors could show that only high-literate participants found summary information on food labels helpful, stating that “literacy level has a significant effect on consumers’ ability to process and understand the Nutrition Facts panel” (Viswanathan, Hastak, and Gau 2009, p. 142). In light of these findings, Moorman’s (1990) finding that education negatively influenced consumers’ motivation to process nutrition information as they perceived their knowledge to be sufficient, as well as her suggestion that information campaigns should target consumer groups differently based on educational level showed considerable foresight.

In contrast to education, studies of income have provided mixed results. Nayga (2000) found income to affect only consumer nutrition knowledge but not label usage (cf. Feick, Herrmann, and Warland 1986). There does seem to be evidence, however, of a tendency for some positive

effects of income on food label use: Nayga, Lipinski, and Savur (1998), and Wang, Fletcher, and Carley (1995a, 1995b) all found consumers with larger incomes to be more likely to use and compare nutrition information labels while shopping. Food expenditure level has also been positively linked to household use of nutrition labels in shopping decisions (Wang, Fletcher, and Carley 1995a, 1995b).

In addition to these socioeconomic factors, employment status has been examined as a possible predictor of food label use in shopping situations. Contradictory results exist, however, Klopp and McDonald (1981) did not find a significant effect of employment on the use of nutrition labels, whereas Nayga (2000) and Nayga, Lipinski, and Savur (1998) found it to predict food label use in these studies. Unemployed subjects were more likely to use nutrition information labels to compare food products as they had fewer time constraints while shopping.

DISCUSSION

Summary of Key Findings

In summarizing key findings it is worth invoking Rotfeld's earlier quote regarding the vague nature of the collective findings of this stream of research; i.e., that labels have been found to be helpful to some people sometimes and under some circumstances. The following paragraphs summarize a bit more specifically what is known about when labeling can help people, but clearly support Rotfeld's thesis.

Label Formatting

In a laboratory setting characterized by heightened attention, studies have found that subjects respond best to nutritional information when high levels of details (e.g., recommended daily values) are provided. However, it is not at all clear that these findings carry over to actual choice and purchase decisions in a shopping environment, where the best available evidence suggests that consumers prefer more simplified, easy-to-use labels and nutrition facts panels. Although consumers do seem to prefer more simplified claims, it has also been found that very simple claims such as "fat free" and "no cholesterol" can lead to misunderstandings. As a result, to the extent that there is an optimal level of information that could help more consumers make better nutritional decisions, it has not yet been clearly delineated. Furthermore, the influence of different levels of consumer literacy has been an important contributor to these findings.

Wansink's (2003) findings that short claims on the front of a package combined with more detailed claims on the back enhance processing and believability of the claims (albeit in a forced exposure setting) are intriguing. Moreover, there is some compelling evidence that qualitative information such as "(very) low" has advantages in terms of weight attributed to the product information being evaluated by the consumer. These findings are particularly important in what has become a new topic in nutrition labeling—Front of Panel (FOP) labels, i.e., specifically designed excerpts of the original label which are put front-of-pack. As the informational content does not change, this new approach is rather a question of consumer perception and awareness and whether these can be increased by displaying nutritional information (more) prominently on the front of a package. As such, more behavioral research is needed to establish this finding as having a measureable impact on consumers.

In terms of the effectiveness of disclosures vs. health claims, there is strong evidence that the two have independent effects. In laboratory settings, disclosures of nutritional information have a more powerful impact on consumer perceptions than health claims or the interaction between the two. Thus, the research suggests that disclosures may have more impact than health claims, but whether this applies in a grocery shopping situation where multiple factors influence the purchase decision has yet to be clearly established.

Label Wording

With regard to framing, a majority of studies suggest that negative framing focusing on consequences is more effective than positive framing in terms of believability of the nutritional information and information comprehension. However, the impact on actual behavior has been found to be dependent on involvement, which raises the possibility that framing effects only operate for the highly motivated who may already have high knowledge levels.

Personal Factors

With respect to moderating variables, a majority of studies agree that motivation and ability to process information do play a role in using nutritional information. However, the superordinate concept of "enduring importance of nutrition" seems to explain a lot in terms of who is motivated to process the information. Additionally, there are conflicting findings on the degree to which this influences behavior, with some studies finding that this factor does have an influence while others do not.

Sociodemographic Factors

For demographic factors, the only general statement that can be made is that there have not been many widely agreed upon findings. Age has been found to not be a determinant of successful label use while perhaps being negatively related to comprehension. Research on gender has produced mixed findings, with some evidence that females are more likely to use nutritional information on labels more than males. Findings on income and employment status are also mixed. Household size, on the other hand, appears to be a demographic variable where a consistent positive relationship with label use is found. The findings for education are similar, as most studies find education level to be positively associated with label use. Further results are only contradictory at first view: with certain consumer strata—especially those short on time—higher education can lead to a decrease in actual label use as the general engagement in healthy dieting and nutrition intake is already high and consumers feel they know “by heart” which products to pick in the supermarket.

NLEA Regulatory Effects

Regarding direct critiques of the NLEA, several authors have compared the performance of different label formats, finding that certain NLEA-required format features do not necessarily lead to the best outcomes in terms of consumer understanding and effective use of information provided (cf. Block and Peracchio 2006). Furthermore, it has been found that label format might have little effect on overall product nutrition ratings and reported purchase intentions (Burton, Biswas, and Netemeyer 1994). As a result, several studies have been suggestive of the NLEA needing improvements. While this assessment appears valid, at least on some level, the need to look at the law in a more holistic sense may be more important, and will be discussed shortly.

What Is Needed to Advance the Literature Further—Conceptual Issues

Although prior areas of inquiry have clearly been worthwhile, much more needs to be discovered about the variables related to effective nutritional labeling. The complexity of consumer behavior ultimately makes this a very difficult problem that is destined to see decades of intense study in order to provide a better understanding. However, there are some areas where there is a pressing need for research.

As part of the effort to balance accurate information that is also possible for consumer to comprehend, appearance of FOP labeling is one key area in need of additional research. As has been discussed, issues

related to placement of facts on the back of the package, time constraints, limited motivation to read the information and the volume and complexity of information have raised questions about the effectiveness of facts panel information. Although some studies conducted in laboratory settings (e.g., Mitra et al. 1999) have indicated that facts panel information can be processed appropriately, it also appears that FOP information may have stronger effects in real-world settings.

At the present time, the Grocery Manufacturers Association and Food Marketing Institute are jointly developing a voluntary FOP labeling system that will likely be adopted by many manufacturers within the next year. Meanwhile, the FDA and Institute of Medicine are considering the requirement of a standardized FOP format (see Institute of Medicine 2010 and FDA 2009 for a discussion).

What would be of particular interest at the present time are studies of the most effective way to present FOP information. The trade-off between conciseness and completeness is of particular interest. Thus, testing the effectiveness of graphical illustrations and other such “shorter” formats can play an important role in understanding how to enhance consumer comprehension and intent to make healthier choices. An experimental study by Andrews, Burton, and Kees (2011) is a good example of this type of research. Here, the authors compared different FOP labels including single healthy eating (Smart Choice) symbols and graphic enhancement via traffic lights in a controlled setting. The study finds some complexity in the effects in that the Smart Choice symbol led to more positive, but potentially misleading nutrient impressions and perceptions of product healthfulness on the part of consumers.

Observational studies in test and real supermarkets could yield additional insights on the effects of different FOP labels on consumer search behavior, perception and understanding of label information, and purchase decisions (cf. Grunert, Wills, and Fernández-Celemín 2010). Extending previous research by Wansink (2003) and Wansink et al. (2006), it is of further interest whether there are synergistic effects associated with having concise, possibly graphical FOP information combined with more detailed facts panels back of package. To conclude, greater insight on the trade-off between ease of processing and providing sufficient information to help consumers improve knowledge is needed. Such research currently may provide the most hope for facilitating the best possible labeling program for enhancing improvement in consumer knowledge on the nutritional value of food products.

At a macro level, it would be worthwhile for researchers, companies and policymakers to acknowledge going into these studies that labels

can only work on a “bottom line” to the extent that members of the public are concerned with making better nutritional decisions and interested in receiving and processing such information. On one hand, the public’s right to know and corporate ethics perspectives provide compelling arguments for putting the most accurate and effective labeling information possible. On the other, labeling certainly should not be viewed as a panacea for widespread obesity problems as members of the public need to want to use the information, i.e., increase consumer motivation to attend to nutrition information and then actually use it for it to be effective on this level. Part of the goal should clearly be for regulators to ensure that information is provided in the most accurate manner possible for consumers to comprehend and use effectively.

Although not the focus of our review, the rollout of the FDA’s new restrictions on calorie labeling for restaurants and vending machines point out the need for additional research on labeling of restaurant items. If nutrition is to be viewed at a macro level, it is important to acknowledge that during the last ten to twenty years, new forms of consuming have emerged ranging from more convenient ready-made food and a wider variety of fast food to frequent dining away from home, all of which have contributed to a sharp decrease in home-cooked meals (cf. Kniazeva and Venkatesh 2007). Clearly, more research on how to effectively communicate the information in a restaurant and other out-of-home consumption settings and the degree to which such programs increase nutritional knowledge is needed.

Technological advances and the degree of effort are other important factors in nutritional choices. Often, time constraints and “hurry” dominate food choices, thus leading to many situations in which (food) decisions are made that are neither informed nor health-motivated. Present and future research must take these changed circumstances into account when designing studies in order to allow for potential new influencing variables and to boost new insights on a topic that has already been investigated heavily. Specifically, the costs of obtaining a nutritious diet may have become more important than ever in choosing food products (cf. Wilde and Llobrera 2009).

As Botti et al. (2008) observe in their paper examining choice under restrictions, the process by which people react to restrictions is very complex and involves many factors. One influential factor that warrants more investigation is whether the source of a restriction is externally imposed or internally imposed. In the case of dietary habits, while it can be argued that the social environment in general, including labeling regulations, is externally imposed on consumers, the decision is ultimately influenced

by internally imposed influences including the degree of desire to achieve the benefit of a healthy diet and the willingness to process a message. When drawing policy implications, researchers would be well served to keep the framework proposed by Botti et al. (2008) in mind; consumer behavior involving restrictions is highly complex and it is problematic to look at narrow research findings in a study related to a law such as the NLEA in isolation in making broad recommendations when compared with general consumer behavior.

It would also be beneficial to have more law and policy experts directly involved in the research process. This may not only be important when correctly stating and interpreting legal text, but also their expertise will be necessary in developing realistic implications. While, for instance, this was successfully undertaken with an article published by Roe, Levy, and Derby (1999), many more of these cross-functional author studies should be advocated. Such interdisciplinary study could prove important in light of the argument that many research limitations can be attributed to the lack of comprehensive knowledge in the respective research field (Rotfeld and Taylor 2009).

What Is Needed to Advance the Literature Further—Methods

Clearly, in order to better understand the impact of labeling, more behavioral research looking at whether consumers operating in everyday life have made improved decisions due to nutritional labels is needed. With market research technologies continuously advancing, test markets (e.g., the German town Hassloch, located in Rhineland-Palatinate which has been used for this purpose, or commonly used US test markets) can enable parallel field studies both at home and in store, offering comprehensive investigation on the relationship between various label formats and types, as well as information search behavior, choice and consumption. Test markets in which a company voluntarily examines the impact of different label formats or characteristics and shares this information with the public and regulators could do much to advance the knowledge on this topic. Also, much like syndicated studies for manufacturers, market research companies can undertake contract research for public institutions, examining the effectiveness of different regulations or proposed regulations (e.g., requiring “shorter” FOP information) of information provision on consumer behavior. Involving academicians in such studies would be beneficial.

Additional in-depth interview studies probing consumers on their thoughts and observations about how they use labels would also be

valuable in that they could yield insights on the cognitive processes that consumers go through when searching for, reading, and using such information—to an extent much greater than current testing of (often self-reported) consumer nutrition knowledge. Such research may provide important leads in answering some of the “why” questions pertaining to consumers’ choice to be attentive to labeling information, how such information is used, and whether it is likely to make a difference in consumption decision.

Clearly, experimental research conducted in laboratory settings will continue to serve as an asset to this stream of research in that the artificial setting can help control for unwanted disruptive factors. As a result, the authors strongly encourage future research to include multiple studies in order to account for both controlled experimental findings and other, more “real-world” oriented results from studies taking place in more naturalistic settings.

In terms of providing guidance for future research, three general methodological critiques about this research stream can be made. It should be remembered that most of the studies reviewed here had very specific objectives and often met their own stated goals. However, these general criticisms should be taken into account in future research, particularly with respect to assessing the possible contribution to the literature.

One recurring theme is that many studies are very narrow in their research focus. Several examined only one or two specific claims and their impact on the test subjects. Thus, only a subset of possible formats and claims has been tested. While this is typical for experimental studies because most factors need to be controlled for in order to test single causal effect-chain relationships and achieve a high internal validity, external validity is often compromised by means of poorly selected samples. This is not dissimilar to some issues in experimental research in advertising, in which tests of just one or two ads may provide insight, but which in isolation do not justify sweeping managerial or policy recommendations. Thus, the generalizability of the specific conditions tested to other settings should be considered.

A second major methodological issue relates to the types of samples used in many of the studies. The excessive use of undergraduate students as representatives of the overall population may distort some empirical results due to a missing comparability in levels of education, motivation and knowledge. Moreover, generalization of results from an all-female sample population should be considered potentially problematic as some studies have shown that significant gender effects exist in the general context of nutrition and healthy dieting (cf. Hassan, Shiu,

and Michaelidou 2010). However, when adequately applied, non-student and study-specific sample populations, such as an all-female sample, can greatly improve the quality of findings. In their 2006 article on calcium intake, Block and Peracchio used people at risk for osteoporosis (seniors age 55 and over), physicians and pregnant and lactating women in three consecutive studies to show that consumers have difficulty using %DV from the Nutrition Facts panel to determine their required calcium intake.

Accounting for the amplitude of consumer strata, such multistudy designs using relevant samples can offer an excellent way to draw general conclusions from a specific research question. Also, with technology and software programming advancing at a high pace, the availability of online experiments/surveys makes larger designs with non-student panels more feasible than they have been previously, simply because the cost of obtaining data has fallen substantially.

A third point concerns the sometimes vague measurements of nutrition knowledge and usage (behavior). While both constructs undoubtedly have their place within this field of research, comparability of results would be enhanced if there was a more uniform understanding of what exactly is measured. As such, the items used, direct vs. indirect measurement, and (a priori) explanations to the test persons on the meaning of these constructs should be unified in order to account for more generalizability of results. As an example, for testing nutrition knowledge of respondents, substantial contributions have been made by Parmenter and Wardle (1999), Burton and Andrews (1996) and Moorman (1996), and future researchers, would be well advised to use the same measurement instrument for comparability.

As a general rule, whether the variable is nutrition knowledge or another of interest in line of research, it is important to have some assurance that measures of the same construct are comparable when comparing study results. The use of standardized measures goes a long way toward remedying this issue. While difficult to achieve, one possibility might be a team of leading researchers on nutritional labeling jointly publishing an article that suggests standardized measures for key constructs relevant to this stream of literature and delineates the situations/settings in which a particular measure is appropriate.

These criticisms have been selective in that each applies to a significant number of studies, but not to all. Moreover, it must also be acknowledged that the question of sampling is one easily criticized, but often difficult to improve. Nevertheless, to maximize the value of such studies to policymakers, testing of more statements/claims need to be made and more care should be taken to ensure and draw representative samples.

While this study has focused on the limitations of laboratory studies, this type of basic research is needed to help better understand how the public responds to nutritional labels and is especially useful in forming hypotheses that can be used in behavioral studies. With respect to the variety of variables that have been reviewed, quantitative meta-analyses of effects would be very valuable once a large enough number of studies on a specific variable's impact have been conducted. Such studies bring the possibility of making more definitive statements about the findings for a specific variable, even if the effect size is modest.

Drawing on the previous discussion of avenues for further research, there are certain limitations to this study that can be used when designing extensions of such review work. First, not all aspects of the studies under review have been mentioned. A detailed listing of each single empirical result was not feasible due to the variety of different research questions posed in the context of the full set of studies. Furthermore, the thematic complexity of the review did not allow for greater detail to be provided on each individual study due to the need to make general observations about outcomes of the studies. Still, with all sections in mind and based on the tabular and graphic overviews, to date there is no comparable review available that contains a similar number of studies while providing this level of detail.

Second, and more important in terms of future streams of research, our focus has been on (pre) packaged food products that are bought and used for consuming at home and does not cover labeling issues pertaining to dining away from home. With the steady rise in eating out, however, the specific context of restaurant dining has gained in importance (cf. Burton and Creyer 2004; French, Story, and Jeffery 2001), and more research on nutritional labeling in this context is needed. A good introduction into research on this topic can be found with Chandon and Wansink (2007), Binkley (2006), Kozup, Creyer, and Burton (2003) and Burton and Creyer (2004).

CONCLUSION

Our review has indicated that while some useful findings have resulted from research on nutritional labeling, a more holistic view is needed if the research is to be more helpful in framing policy. With a complex topic like consumer behavior, there may be limits to the extent of control that regulatory authorities can exert in order to "regulate" the relationship(s) between the consumer and the market. Similar to findings of a review of regulatory and consumer issues in the death care industry (Kopp

and Kemp 2007), one can state that although regulation of nutrition labeling was intended to increase consumer protection, changes in the marketplace, as well as in consumption trends, have led to a different landscape in which existing directives are less helpful than originally intended in protecting and guiding the consumer.

Going further, we have seen a number of times that effects on consumer behavior are highly moderated by consumer knowledge, motivation and education. Apart from general legislation, it is also the role of government, as well as of consumer protection organizations, to target improvements in consumer health information and education (Ippolito 1999). Most consumers evidently do not have the nutritional knowledge to comprehend information on certain nutrients, let alone the effects that specified nutrients have on biological processes such as fat burning vs. fat deposition. Especially with the use of unchallenged and potentially misleading health claims on product packages, it is important to radically alter consumer understanding of food stuffs.

When viewed in a research context, the multilayered structure of decision-making processes in terms of food choice does not lead to the ability to apply simple theoretical models pertaining to the influence of nutritional labeling. Consumer health orientation and many other factors beyond the necessity for nourishment come into play. It has been illustrated that post-modern food consumption is affected by various factors such as living situation and personal status, social environment and peer group influences, as well as quickly changing trends portrayed by the media. Taking these insights into account, the following quote sums up quite nicely the post-modern dilemma of food consumption, nutrition knowledge and societal norms:

If you are what you eat and you don't know what you're eating, do you know who you are? (Claude Fischler, sociologist with the French National Research Centre for Scientific Research 2004)

While this quote does not provide answers pertaining to the impacts of nutritional labeling, it does reinforce the need for additional understanding of the issue.

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