**October 2013**

# WORKING PAPER SERIES

2013-MARK-07

# From Nutrition Label to Nutrition Path: An Integrative Review of Consumer Nutritional Information Processing

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# From Nutrition Label to Nutrition Path: An Integrative Review of Consumer Nutritional Information Processing

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**Abstract**

Existing research focuses on consumer information processing of food nutrition labels at the point of purchase and on the most efficient nutrition label formats to promote healthier food choices. However, the nutrition label is one piece of the whole product information delivered at the point of purchase, and the nutritional information influence is a pervasive process that happens throughout the daily lives of consumers.

The current research reviews previous research on nutrition label use and consumer information processing, as well as industry marketing efforts and government regulations, and then makes the following conclusions: first, nutrition label information processing efficiency is increased when the information is attractively displayed on the front of the package in a summarized, simple and user-friendly format, with the possible addition of health logos or nutritional claims; second, the nutrition label is one stimulus of the whole nutritional information process, and it needs to be integrated into the more comprehensive nutritional policy.

*Nutrition Label, Information Processing*

More than one-third of young people in the United States (U.S.) are either obese or at risk of becoming obese. The obesity rate is also equally increasing in other parts of the world. Obesity is largely due to food intake, which makes nutritional information and labeling key points of ongoing debates among policy makers and food actors. However, previous research has either examined how consumers process information in nutrition labeling at the point of purchase, or how this obesity epidemic has been shaped in part by the marketing efforts of the food industry (Goldberg & Gunasti, 2007).

Although these approaches provide valuable insights, currently there is no integrated framework that combines the nutrition labeling information processing at the moment of purchase, which is under the influence of the consumer's characteristics, food industry marketing efforts and government regulations. Our research fills the gap by reviewing the current nutrition labeling systems in use, along with government regulations and industry efforts in different countries, and by synthesizing the consumer information processing theory and its application in nutrition labeling information processing.

Further, the authors will propose a conceptual framework aiming at positioning and understanding nutrition labeling as one piece of the overall nutritional information processing. This proposed conceptual framework will also address initiating acceptable solutions to stakeholders, along with identifying future research needs.

The current research is organized to, first, review "inside the box"—the existing practices of nutrition labeling and the relative consumer information processing with regard to concrete nutrition label information; and, second, investigate influences "outside the box"—notably, consumer characteristics, food industry marketing practices, government regulations and

policies, and their combined influence on nutrition label information processing. Based on the research review, we propose research directions and practices to improve nutrition label processing efficiency.

## Nutritional Information and Nutrition Labeling

Providing nutritional information is part of obesity-prevention plans in most developed countries such as the U.S., Canada and Europe. Nutritional information is "*an attempt to provide consumers, at the point of purchase, with information about the nutrition content of individual food products, in order to enable consumers to choose nutritionally appropriate food."* (Grunert et al., 2007)

Nutrition labeling involves "all forms of information disclosure on a product, ranging from mere nutrition fact panels to daily reference values, recommendations, health claims and disclaimers" (Hieke & Taylor, 2012, p. 126). Nutrition labeling typically encompasses the provision of nutritional facts, along with health and nutritional claims or health logos. The provision of nutritional facts, such as energy and key nutritional contents, can be given in a detailed fashion (as in the mandatory nutrition table listed on the back of the pack) or in a summarized format (as in the voluntary labels on the front of the pack).

Health and nutritional claims are a voluntary initiative from the industry, featuring specific health or nutritional benefits on food products that are eligible. Health logos are generic and are based on a set of undisclosed nutritional criteria. Nutrition labeling usually does not encompass the ingredient lists or the various qualitative logos. The ingredient list provides detailed and highly regulated information that is not specifically meant to promote healthier eating. Qualitative logos are not specific to nutritional values, and examples include

declaration of origin, organic culture, and ethical issues such as fair trade.

Nutrition labeling has emerged as a prominent policy tool for promoting healthy eating (Campos, 2011), with the underlying assumption being that informed consumers will make rational choices. In most developed countries, the display of nutritional information (energy and key nutrient contents) on packaged goods is either required by law or considered as common practice. While the display of nutritional information on packaged goods has been mandatory in the U.S. since 1994 and in Canada since 2005, it is still optional in restaurants in both countries. Nutritional information is increasingly present on European products, and including this information will be mandatory as of December 2014 on packaged goods. This research reviews only nutrition labeling on pre-packaged foods sold in retail stores.

As a key measure of obesity-prevention plans, nutrition labeling is largely encouraged by government and the food industry. It is intended to influence both *consumer demand* and *industry offerings*. Nutrition labeling originates from governments' efforts to improve the nutritional quality of goods produced and consumed in most developed countries. Toward industry, governments issue qualitative norms and dietary guidelines,-design nutrition and health logos to inform the consumers , and tax "unhealthy" foods to encourage reformulations and/or new product development. These measures also address food distributors with regard to nutritional information in shelf labeling.

Further, governments rely on positive actions, such as consumer education programs—e.g., the Plan National Nutrition Santé (PNNS) campaign in France—and nutritional information disclosures to encourage consumers to adopt healthier diet patterns. Governments also resort to restrictive measures—such as taxing "unhealthy" foods and restricting, or prohibiting, their

promotion—in order to discourage consumption of these "unhealthy" foods.

To anticipate or respond to governmental pressure, and to meet its stakeholders' requests for healthy lifestyle (especially requests from consumers and civil advocates), the food industry has also become interested in participating in nutritional efforts. The most common industry initiatives include healthier food product development, voluntary nutritional information disclosures, nutritional health claims, portion-size definitions, control size packaging, and responsible promotion techniques. Health and nutritional claims, along with nutritional information, aim at providing transparency and promoting healthier products.

Several industry sectors have developed their own set of dietary guidelines, voluntary norms, and/or nutrition and health logos to inform the consumers, promote their products and demonstrate goodwill toward the governments, with the underlying motivation of avoiding stricter regulation. Voluntary initiatives (such as the Children and Food Beverage Initiative (CFBI) in the U.S. or the PNNS voluntary charts in France) are typical illustrations of the industry's voluntary commitments to nutrition. The PNNS campaign is now also being supported by the French government.

As such, nutritional information is a common tool that serves both governmental and industrial objectives. On the government side, it is meant to encourage consumers to improve their diet pattern and to encourage industry to formulate healthier products that meet public dietary guidelines. On the industry side, it is a useful tool to promote improved products, demonstrate care for consumers, and show positive responses to public expectations. Therefore, it is natural to take into consideration governments' and the food industry's influences on the communication of nutritional information.

As nutritional information regulation is still on a low level, diverse nutrition labeling systems have been developed to meet these objectives. The systems vary, influenced by factors such as the initiator (private versus public), the country, the regulation status, the food category, and the maturity of various health issues in the relevant country. In light of these ambitious objectives and the various existing responses, all actors involved would like to identify what works best in terms of positively influencing consumers' dietary behavior and offering food improvements. Much research has been conducted, both in academia and by the industry and governments.

## Nutrition Labeling: Existing Practices

### Back of Pack (BOP) Nutritional Information

Back of pack (BOP) nutritional information is the display of detailed nutritional facts (energy- and nutrient-based) that is mandatory in the U.S. and Canada or that is optional but of growing practice in Europe.

Based on the Food Labeling to Advance Better Education for Life (FLABEL) survey, conducted by Grunert et al. (2011) for the European Food Information Council (EUFIC) in 27 European member states and Turkey, around 85% of the audited products contained BOP nutritional information, ranging from 70% for Slovenia to more than 95% for Ireland, the United Kingdom (U.K.) and the Netherlands. The BOP information provided is generally rather detailed and purely factual, and the format is generally a column table. In Europe, 84% of BOP nutrition label formats are a tabular or linear listing of calorific value and nutrient

composition; 34% of these BOP labels highlight calories, protein, carbohydrates and fat (known as the "Big 4"); and 49% of these BOP labels list the Big 4 plus sugar, saturated fat, fiber and sodium (collectively known as the "Big 8").

This detailed and factual nutritional information, best illustrated by nutritional charts mandated by the 1990 U.S. Nutrition Labeling and Education Act (NLEA), has proven to be tedious to read and use, addressing mainly the most motivated consumers—hence, the current focus of policy makers, food industry and research on front of pack (FOP) labels and in nutritional health claims.

**Front of Pack Labeling**

Because of general acknowledgment of the weak impact of the full nutritional information grid (considered as complex and not user-friendly), food companies and governments are in favor of simplified, concise and impactful nutritional information, in addition to BOP information. This simpler format is to be placed, fully if possible, at the front of the pack (FOP), as most consumers do not take the time to read BOP information (Food Standards Agency, 2009). As this is an industry initiative, with a potential to create a competitive advantage, food manufacturers have been very active in creating various formats of FOP labels, with or without government approvals.

According to the FLABEL survey, FOP nutritional information was found on an average 48% of European products, reaching a high 82% in the U.K., where FOP labeling is encouraged by the U.K. Food Standards Agency (FSA). Approximately 67% of respondents reported using

FOP symbols often or sometimes when making purchase decisions (Hawley et al., 2011).

Whereas a high prevalence of label use was self-reported as 75% in the U.S. and 47% in the European Union (Campos et al., 2011), combined in-store observations and consumer interviews in the U.K. generated a lower 27% of respondents reporting having looked for the nutritional information while shopping (Grunert et al., 2007).

Because of the potential of FOP labels to create a competitive advantage for products, the issue of FOP signaling has become a "fiercely contested arena" for manufacturers and retailers (Lobstein & Davies, 2007). Various systems coexist, differing in content and style of the information delivered.

Facing this proliferation of FOP symbols and the inconsistency of information content and style, public authorities are starting to get involved in the harmonization issue for the sake of coherence, reliability and usefulness of FOP nutritional information. For example, the U.S. Food and Drug Administration (FDA) undertook an FOP labeling initiative to determine whether one approach could be recommended over others (2011). In Europe, as well, FOP systems are under examination by governments (see Appendix 1).

In light of the growing consensus for global harmonization of FOP labeling systems, the question arises as to the best FOP labeling format in terms of consumer friendliness, efficiency and acceptability by all parties involved. The most current FOP labels include health logos such as the Keyhole icon in Sweden; the traffic light rating system (with a single traffic light or multiple traffic lights) in the U.K.; the Guideline Daily Amounts (GDA) in

Europe; the Choices Program, with its Green Tick logo, which began in the Netherlands; the Facts Up Front icons in the U.S.; and the Wheel of Health graphic that is used in the U.K.

These examples illustrate the two basic types of FOP labels: *health logos*, which, with regard to a product's nutritional content, operate on a "presence" or "absence" mode (such as the Choices or Keyhole programs), and the *summarized version* of the full nutrition grid (GDA, traffic light rating systems, Facts Up Front, Wheel of Health).

The summarized nutrition labels are nutrient-specific: they generally feature the energy value and key nutrients to reduce, or at least monitor, usually three to five items—namely, fat, sugars, salt and saturated fats. Some labels opt for a simpler, single score, which can be a compounded score (agglomerating several nutrients or nutritional criteria) or a unidimensional approach based on one single criterion (such as energy density). The health logos do not calculate a score but deliver a "comply/do not comply" check mark with regard to specific dietary guidelines. They represent single statements about several nutrients, aiming at helping consumers recognize healthy food choices.

Health logos (such as the Dutch Choices or Swedish Keyhole programs) are the simplest FOP labels. They are a quick, impactful and simple way to identify healthier foods. A Dutch survey (Hawley et al., 2012) reported a high proportion of Green Tick products purchased by the more nutrition-conscious consumers, supporting the usefulness of this logo. In the FLABEL research (2011) bearing on attention, reading, liking, understanding and use by European consumers of different nutrition labeling formats, Grunert et al. showed that all FOP logos perform well within the categories of "Attention" and "Reading" with regard to directive labels—i.e., health logos, such as the Smart Choice logo—performing better in time-

pressure shopping situations. Health logos are also useful to consumers with low self-control, or, as seen in previous research, to consumers with a lower education, or to older consumers as they facilitate informational interpretations.

However, health logos are limited in scope because they only cover the eligible products and they do not grasp the complexity of the nutrient profile. They also raise the issue of the nutritional criteria that back them up. The suspicion of partial and biased criteria sets and dietary guideline sources behind the Smart Choice program is the reason why it has been denounced by the U.S. FDA and consumer advocates (Taylor, 2009).

Health logos are also subject to consumers' skepticism as to the underlying criteria or calculation mode. Consumers want to understand what the simplified information stands for, as Grunert et al. point out (2007).

Among the summarized nutrition labeling, systems featuring singular traffic light ratings are evaluated much like health logos (Grunert et al., 2007). Best for simplification, these systems appear as too "didactic" or "paternalistic" when consumers want to be empowered, not patronized, in their decision making. Multiple traffic light rating systems show the most equitable performance among socio-economic groups (Hawley et al., 2012). The inclusion of text ("Hi/Med/Low"), in addition to color codes, has been shown to improve consumer understanding of products' perceived nutritional values. Yet, consumers may over-interpret "negative" colors (red and amber) as signals to avoid certain foods (Grunert et al., 2010).

While the GDA-percentage FOP format is appreciated by the most knowledgeable consumers for the completeness and transparency of the information, the notion of "guideline daily

amounts" (GDA) is not self-explanatory. Also, percentages are viewed by some consumers as confusing or difficult to understand (Hawley, 2012), especially among the eldest (65 years of age or older) and the lower-educated. Findings suggest that GDA percentage performance (in terms of liking and understanding) is improved by color and/or text, as featured by hybrid formats.

Graphic FOP labels display nutrient values in graph formats (in bar or pie styles). Most have been found to be complicated (Grunert, 2007) and are little used.

According to the 2011 FLABEL survey, in Europe, nutritional claims and GDA were the most prevalent forms of FOP nutritional information (both averaging 25%, with nutritional claims ranging from 12% in Estonia to 37% in Ireland and Portugal, and GDA ranging from 2% in Turkey to 63% in the U.K.). Sweden and the Netherlands were the only countries where the penetration of health logos—such as the Choices and Keyhole programs, and the Healthy Choice clover icon—exceeded 10% of penetration for all products combined.

Further analysis of the various FOP formats finds that the information delivery varies in terms of directiveness. When the information is factual (as in "non-directive" labels), it provides quantities of nutrients (per 100 g and/or per portion), with a possible addition of GDA (recommended daily intake) delivered in a fact-based, neutral fashion. Normative (or "semi-directive") labels assess the good or poor contribution to the consumer's diet based on the various nutrients (such as with traffic light rating systems or the color-coded GDA) and in reference to established dietary guidelines that are issued from the industry or from independent experts. Finally, health logos (such as the Keyhold program) can be directive in nature, indicating a positive recommendation when warranted.

The FOP labels also follow two different schemes: absolute or relative. The absolute scheme (e.g., GDA and the traffic light rating systems) provides nutrient values, with possible references to recognized dietary guidelines; the relative scheme (e.g., Keyhole and Smart Choice progams) provides improved nutrient values versus existing products of the same category.

The first scheme is more common, and it serves the purpose of promoting healthy foods overall, while the second scheme promotes "healthier" versions of manufacturers' existing products and also assists the government by encouraging product reformulation. The Keyhole and "Better for You" systems correspond to the relative scheme.

In line with previous research, the 2011 FLABEL survey supported the preference for multidimensional labels such as GDA, multiple traffic light and hybrid formats (with the added "saturated fats" nutrient). This enhances the need to find the right balance between complete (thus, reliable) information and quick, simple information.

As the nutrient-specific systems (such as the multiple traffic light rating system and the GDA) all highlight calories and a few nutrients, the question arises of the ideal number and nature of nutrients provided. A maximum of three nutrients, in addition to the energy value (calories), seems the best for consumers' acceptability. The most sought nutrient information is with regard to fat, sugars and salt (Campos, 2011). The choice of "negative" nutrients (such as fat, salt and sugars) is consistent with previous findings on the greater predisposition of consumers to attend to negative nutrient attributes over positive ones (Balasubramanian,

2002). This may be explained by the immediate benefit perceived in reducing these nutrients, generally related to the calorie intake, a notion well understood by most consumers.

Roberto et al. (2012) showed that extra information, such as in FOP labels with up to five nutrients, might be problematic. This amount of information takes more time to process and understand; additional nutrients seem to cause confusion and increase the information overload. Also, adding new nutrients increases complexity, as the desired sense of nutrient variation will vary depending on the nutrient: the basic nutrients (fat, salt and sugars) are generally to be reduced, while the new nutrients are to be favored (fiber, for example).

In addition, knowledge of the "other nutrients"—such as cholesterol, saturated fats or trans fats—is very dependent on the country's culture. While the issue of saturated fat is very popular in some countries (such as in the U.K.), it is less so in France. It depends on the country's average diet, media attention and local labeling legislation (trans-fat listing is not currently mandatory in France, for example, and it will not be required to list the origin of vegetable oil until 2014). On the other hand, calories are "the best established notion with European consumers" as per the 2005 EUFIC Forum.

Preference between GDA and the multiple traffic light rating system is highly related to the familiarity with the system, as related to the dominant nutritional information system per country, such as the traffic light rating system in the U.K., and the GDA percentages in Belgium (Hawley, 2012).

Also, the traffic light rating system label was judged to be more user friendly than the Facts Up Front system (a U.S. variant of the GDA system). In France, the NutriNet-Santé survey

(Méjean, 2012) pointed out that most knowledgeable consumers liked the multiple traffic light rating system. The FLABEL survey (2011) shed a complimentary light on the comparison of several FOP labels in Europe. In line with previous studies, GDA and traffic light rating systems performed the best with regard to consumer liking and intended use, with the addition of a hybrid system. But liking is not necessarily related to better understanding, as evidenced by the FLABEL survey, where the various FOP formats did not generate significant differences in inferences of product healthiness.

Yet, it should be noted that the traffic light rating system encounters fierce opposition from the food industry, as is the case in France, despite consumer support and some defenders in the retailing sector (some retailers are featuring traffic light rating systems on their private labels).

**Health and Nutritional Claims**

Health and nutritional claims are another industry tool. They are private industry initiatives aiming at creating a competitive advantage for some of their products by featuring "positive" or "negative" claims, with eventual endorsements by health experts or a health organization.

Health and nutritional claims are considered by the industry as powerful tools in consumer communications, as they feature positive food properties in relation to health or nutritional issues to which consumers are particularly sensitive, whether from strong media attention, a national health problem (such as cholesterol or diabetes), a recent food crisis, a growing concern with consumers, or otherwise.

With food safety and health currently being recognized as major and growing concerns among consumers, health and nutritional claims are increasingly used by the food industry to reassure consumers about product value. While health and nutritional claims cover a wide array of content and presentation, they comply with an increasingly regulated framework.

Nutritional and health claims differ in nature. Nutritional claims bear on the presence, absence or reduction of a specific ingredient or nutrient (acknowledged for its positive or negative health impact), while health claims state the positive health effects that the food itself (or one of its constituents) produces.

Nutritional claims can be positive or negative. Positive claims are usually associated with an ingredient or a nutrient recognized for its positive health influence. Examples of such nutrients include fiber, whole cereals, unrefined cane sugar, stevia, whole wheat, calcium, and vitamins. Negative claims bear on the absence (or reduction) of an ingredient or a nutrient generally accepted as undesirable. Examples of such nutrients include saturated fat, hydrogenated vegetable fats, aspartame, palm oil, salt, preservatives, colorings, artificial sweeteners, monosodium glutamate (MSG), and added sugar.

Nutritional and health claims can also bear on the energy content (lower-calorie foods, in particular). Health claims can promote a disease risk reduction or a positive health effect, such as reducing heart disease or cholesterol and fortifying bones. Negative claims (absence of nutrients) are the most powerful, as consumers tend to look more closely at nutrients they wish to avoid (Campos, 2010). Positive nutrient claims can also greatly influence health perceptions, as is the case for nutrients such as vitamins, fiber or calcium, depending on the countries and consumer segments.

In addition to, or in lieu of, nutritional and health claims, endorsement logos (preferably from an outside recognized source) can be displayed to strengthen or justify the claim. Samples of endorsement logo sources are the American Heart Association and various cancer associations. These endorsements differ from health logos, which are not specific to a given nutritional or health claim.

While discretionary, all claims must be "truthful, relevant and understood by consumers," as stated by the 2007 European legislation. They must also be supported by scientific evidence. This regulation has recently tightened in Europe, with a limitative list of authorized nutritional and health claims, the goal being to protect the consumer from vague, abusive or misleading claims.

The existing practices illustrate that the nutrition labeling systems are a complex whole deserving thorough understanding of how consumers generally process information (in particular, nutrition labeling information), along with how consumers may be influenced by their socio-demographic characters and the industry's marketing practices, as well as by the governmental regulations, policies and food cultures in their countries (Appendix 1).

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**Consumer Processing of General and Nutritional Information**

One of the main objectives facing nutrition labels is to present consumers with information that forms the basis of how consumers will subsequently make their decisions. This information engagement and processing efficiency are key points of the success or failure of nutrition labeling. The information engagement and processing efficiency depend on the appropriateness of the information, the information system structure, and consumer processing motivation and characteristics. As such, a literature review of the above elements is necessary.

The appropriateness of information is one of the key factors in information deliverance. The type of information should be selected to deliver the most appropriate information to the consumers. Previous research illustrates that the interactive communication giving consumers control over the content, order and duration of product-relevant information causes information to have higher value and to become increasingly usable over time.

Consequently, consumers can better match their preferences, have better memory and knowledge about the domain they are examining, and are more confident in their judgments when they have control over the information flow (Ariely, 2000). As such, an interactive communication form of nutrition labeling should be considered. Examples include asking for consumers' feedback, inviting consumers to participate in games and contests provided in the packaging, or offering customized nutritional advice on websites.

Literature also illustrates that people in a state of high confidence view messages framed in an abstract manner as more relevant, and thus engage in greater processing of messages framed abstractly. As such, high confidence leads people to focus on abstract construal, whereas low confidence leads people to focus on concrete construal (Wan & Rucker, 2013).

In the practical field, nutrition labeling should be differentiated toward consumers with higher confidence levels and consumers with lower confidence levels. For consumers who are knowledgeable of nutrition and are confident of their nutrition choices, abstract messages are more relevant. In such cases, traffic-light and synthetic information are better than detailed nutrition labeling information. For consumers who are less knowledgeable and less confident, concrete information is necessary. In such cases, detailed nutrition labeling is more appropriate.

Further, people in states of low confidence process information more carefully compared to people with high confidence levels (Wan & Rucker, 2013). When consumers become less confident that what they yearn for is possible, then they engage in motivated reasoning related to products that purport to enable goal attainment (de Mello, MacInnis & Stewart, 2007). As such, they selectively search for information from a product-favorable information source and regard this information as more credible. These people are less discriminating of low-credibility message arguments and require more negative information. They are also more likely to judge the product as effective at helping them attain their goal. In that context, the nutritional information toward less-confident consumers may focus both on product-favorable information and on negative information (such as information on potential health threats). Examples include red traffic light ratings, along with warnings of consequences regarding the intake of unhealthy nutrition.

Since information use is most efficient when consumers do not make a lot of effort in information processing (Russo, Staelin, Nolan, Russel & Metcalf, 1986), nutritional-information communications should ideally reduce the information-processing costs of

comparing alternative foods. A unique selling proposition may apply in the nutritional information presentation to reduce consumer information processing efforts and attract consumer attention. Additionally, information overload must be predicted. Lurie (2004), applying a Monte Carlo simulation, illustrates that the amount of information processing mediates the relationship between information structure and information overload.

The accessibility of prior information in memory induced by the learning goal manipulation is found to significantly affect brand choice outcomes (Biehal & Chakravarti, 1983). The encoding factors—such as self-reference ratings, semantic judgments of a set of personal trait adjectives and an impression formation set—have an impact on how consumers make their brand and product choice decisions.

Similarly, the format matching between the information communication and the consumers' mode of information processing is found to enhance communication effectiveness (Thompson & Hamilton, 2006).

With regard to the information structure, the amount of information to process increases with the number of attribute levels, and is greatest when attribute levels occur with uniform probability (Lurie, 2004). As such, the likelihood of information overload should be higher and the choice quality lower when attribute levels are uniformly distributed across alternatives or when there are more attribute levels. In the field of nutritional information, for example, if 50% of nutritional information offered by a company has one-line package displays and 50% has two-line displays, there is more uncertainty from the consumer perspective than if 90% of nutritional information has one-line package displays and 10% has two-line displays.

Bringing the information structure to the nutritional field, when the nutritional information is designed to reduce the information processing effort, it is more likely to increase information use, especially for the more highly valued negative nutrients (Russo et al., 1986).

## Consumer Label Preferences

Because the labeling formats are so diverse and play a key role in determining attention to, and use of, nutritional information, much research has been conducted on consumer liking and preferences of the various formats. Until now, most studies converge on the consumer need for simplicity, especially for consumers with lower nutritional knowledge (Hawley et al., 2012).

First, *summarized* or limited information is preferred to detailed information, and information overload is rejected. While the content of the nutritional information should cover the energy (in kilocalories) as the prevalent information, it should also include key nutrients such as fats, sugars and salt as the most common ones.

Second, consumers expect the information to be *ready to use*, providing the data per 100 g (for product comparison) and per portion size (for intake control).

Third, v*isual triggers*, especially colors and symbols, improve label liking.

Fourth, d*ata interpretation* is preferred to raw data, that is, data presented as a percentage of GDA (guideline daily amounts or daily values) or data qualified in words ("High, medium or low," as in the traffic light rating systems) versus exact quantities of the various nutrients.

Fifth, FOP labels are preferred to BOP nutrition panels (such as enacted by the NLEA) for quick attention, low search effort, and summarized or key information.

Sixth, health logos are liked, provided that the source is recognized and neutral; nutritional or health claims are also liked for their simple, impactful message, but their credibility might be questioned. Additionally, health claims are very specific, thus targeting consumers with the relevant health concern only. Concerning nutrient claims, "negative" claims (the absence of an ingredient seen as unhealthy) are more impactful than positive claims. Examples include such claims as "no trans-fat," "without palm oil" and "without hydrogenated vegetable fat"—these examples are very common in France, especially if the issue is media supported.

While BOP, FOP, and health and nutritional claims are examined individually, it should also be acknowledged that there can be interferences between the various nutritional information details on the pack. First, health claims tend to override the full nutritional information: in a mall intercept study, Roe et al. (1999) found that the presence of health and nutrient content claims on food packages lead to truncated information searches, as stressed by Drichoutis et al. (2006). Also, health and nutritional claims create a "healthy" halo effect, regardless of the actual nutrition profile of the product. "Positive" messages from FOP labels (such as green traffic light ratings) may produce the same halo effect. Lastly, contradictory signals (such as coexisting red and green traffic light ratings) can cause confusion, leading consumers to discard the nutritional information altogether.

While all studies show that consumers like simplification, Grunert and Wills (2007) argue that two other considerations guide consumer liking for the various signposting formats: first, how

is the simplification made and from whom does it come? The trustworthiness of the source and computation method is key. Also, information should not be patronizing, since consumers do not want to feel coerced or pushed to make choices they do not want to make.

Health and nutritional claims and FOP labeling systems are useful tools in facilitating consumer food choices. They are a simple, quick and easy way to spot a food product's specific nutritional properties. As such, they correspond to a heuristic information processing model, where the consumers sort and select details within specific information in order to create shortcuts for quick decisions on low involvement and repeat purchase categories, as is traditionally the case in grocery shopping. It is, therefore, crucial that these synthetic messages be uniform and science-based.

As to the importance of nutrition as a purchase criteria, it should be noticed that, while most consumers understand the importance of nutrition and also display a good awareness of basic nutritional issues (such as reducing salt and fat and increasing intake of fruits, vegetables and fiber, as per the 2009 FSA qualitative survey on food labeling), nutrition is rarely the most decisive purchase criteria.

Other criteria, among which taste usually ranks first, also come into play. They include the various marketing-mix elements, such as product, price, packaging, promotion, brand and personal experience with the product. Criteria weights vary per country, shopping situation, food categories, and consumer preferences—over time, making ranking generalization difficult. In a Swedish study, respondents ranked health and nutrition sixth in importance after food safety, freshness, taste, absence of pesticides, and consideration of animal welfare (Grunert et al., 2007).

While health and nutritional claims are meant to enhance product attractiveness, they can also be counterproductive. As taste is usually the main driver in food purchases, some studies have shown that health and nutritional claims can decrease taste expectations, thus negatively affecting purchases. Price can also negatively affect "healthier" options if priced higher than competitive products.

Convenience is also a key purchase criterion, as witnessed by the rise of prepared foods, and it may overrule nutritional concerns, especially as these convenient products are highly promoted, branded and indulgent. Additionally, food safety is a rising concern and may overrule the nutritional aspect, especially in times of crisis, such as with the "horse meat" scandal in France or mad cow disease. The origin of foods and pricing (due to job uncertainties in depressed economies) are concerns that may relegate nutritional considerations to a lower ranking. Another key consideration, while difficult to isolate, is the profound routine mode of grocery shopping: habitual behavior promotes fast decision-making. This puts into perspective the role that nutrition labeling actually plays.

As such, nutritional information is unevenly used by the various consumer segments. The social status of the shopper strongly discriminates understanding and, thus, the use of nutrition labels. Another key segmentation axis, beyond socio-demographic factors, would be the personal motivation of consumers: the more health-conscious they are, the more they are involved in using nutritional information.

## Consumer Characteristics

Beyond the narrow context of nutritional information processing, however, consumer characteristics also have an impact on how they process information. Internal factors (such as

consumer nutrition knowledge, motivation, attitudes, emotions and impulsiveness), external factors (such as consumer socio-demographic characteristics), and situational factors (such as shopping occasions) intertwine with each other and shape consumers' understanding and processing of nutrition labeling information.

Nutritional knowledge, or self-perception of this knowledge, positively influences label use, which, in turn, increases the consumer's ability to read labels. Drichoutis (2006) stated, *"It may facilitate label use by increasing its perceived benefits."* For Grunert et al. (2010), nutritional knowledge is a strong predictor of nutritional information understanding, thus influencing the consumer's ability to use the nutritional information.

While this knowledge is often acquired through external sources (media, education campaigns, doctors, hearsay, and the consumer's own search), it is also acquired from label use. Nutritional knowledge is, therefore, linked to the availability of nutritional information, which varies from one country to the other and across food categories. Nutritional knowledge also depends on the consumer's personal interest in nutrition. Lower incomes or education are negative factors (Campos, 2011) of nutritional knowledge and, thus, of label understanding. Consequently, nutritional knowledge is a label use moderator, itself dependent on consumer personal characteristics and external label stimulus.

Motivation (i.e., the consumer's personal and social stake in the decision) and ability to process the information (knowledge, time and cognitive resources) are found to be two key determinants in the use of nutritional health information (Leathwood et al., 2007; Grunert et al., 2012). Motivation stems from the combination of the various personal factors, and it affects all phases of nutritional information processing. Ability to process depends on

personal factors such as personal nutritional knowledge, along with the external stimulus of the label format. Attitudinal and behavioral characteristics also have impacts on consumer nutritional information processing.

The *general attitude toward food and health* is closely linked to the consumer's interest in nutrition: the more consumers are health-conscious, the more likely they are to use nutritional information. For example, organic buyers are more likely to use nutritional information. Conversely, "hedonistic" consumers may resist a "scientific" approach to food (Grunert et al., 2007). *A special diet status or interest* will also positively impact the nutritional-information search. *The conflict of general attitude versus health claims* also influences label use: consumers may be more or less skeptical about health claims (usually generated by the industry), which can be seen as a marketing gimmick.

Finally, *psychological and emotional factors* will impact label use, as well. Individuals with a generally high level of self-control will pay more attention to nutrition, while emotional factors can temporarily push consumers toward purchasing indulgent foods. "Mood when shopping," while unpredictable, has also been cited by consumers to explain their level of nutrition label use.

In the field of nutrition, consumers' impulsiveness, together with their recall of previous behavior, impacts their upcoming behavior with regard to temptation (Mukhopadhyay, Sengupta & Ramanathan, 2008): chronically nonimpulsive individuals display behavioral consistency over time—resisting (succumbing) when they recall having resisted (succumbed) earlier. In contrast, impulsive individuals show a switching pattern, resisting current

temptations if they recall having succumbed, and vice versa.

Consumers' socioeconomic levels are found to have an impact on how they process information. Educated consumers are more accomplished information processors than subjects of low socioeconomic status (SES). In general, they seek more information (especially under high perceived-risk conditions), and, in particular, more testing agency and price information. They tend to access at least one information item for each brand (high-level strategies) and to handle choice complexity by employing conceptually complex, but operationally simpler, attribute-processing strategies.

Low-SES subjects, on the other hand, handled their information environments by using less information in total, and tended to ignore completely some brand alternatives. They also tended not to use the conceptually more difficult attribute-processing strategies; their processing was either conceptually simpler, yet operationally more difficult, brand processing, or was classified as random. Finally, they used less price- and testing-agency data, but used brand name in a manner that suggests that it guided search—whereas, for mid- to high-SES subjects, it seemed to be just another information item.

With regard to nutrition label information processing, women tend to use nutrition labels more than men (Campos et al., 2011); this can be due to their calorie consciousness, their meal planning and nutritional responsibility toward young children. Age influences label use, as well. Older informants are generally more interested in nutrition due to rising health concerns. But older people have also been found to perceive the labels as less understandable. In contrast, young people would be more at ease with the use of the labels. So age is a

motivational factor, but logo complexity acts conversely. Yet adolescents, a critical target, are less likely to use labels (Campos et al., 2011).

As for the *type of household*, households with preschool children positively influence the search for nutritional information, while research on *size of household* has generated contradictory results. *Higher education* leads to higher use, and better understanding, of labels. Yet some research has shown interest for nutrition among the less educated, but difficulty in understanding the information.

Research on *income* has shown contradictory results. In its systematic review, Campos et al. (2011) found a positive relationship between income and label use. Income being usually related to education, the positive relationship with label use can be accepted. The *geographical and cultural origin* of consumers have also been found to affect label use: consumers in Europe, especially in Nordic countries and the U.K., were found to be more interested in nutritional information. This can be linked to country culture (e.g., a hedonistic versus functional attitude toward food in Southern European countries like France, Greece and Spain) and the maturity of health issues (in particular, the obesity prevalence in the U.K.).

While most of the research works conclude to the influence of socio-demographics, Grunert et al. (2010) argues that socio-demographic factors "are not usually causal predictors in themselves, but rather serve as proxies for something else," in particular, interest in healthy eating, a typically attitudinal factor.

Further, situational factors affect label use as well. While rarely studied, it is most likely that the attention to the nutrition label will also depend on the consumer's accidental or intended

exposure to the label. Indeed, while the most involved consumers will look for the nutritional information, many consumers may just be exposed to it without any intent. Grunert and Wills (2007) have made this important distinction in their theoretical framework. As more and more brands are developing short and impactful nutritional messages on the front of the pack, chances of accidental exposure increase. Additionally, the consistency of the label positioning on the pack reinforces its presence awareness.

*Shopping intention* is a label use determinant: shopping for oneself for a health-conscious consumer or shopping for preschool children will positively impact interest in nutrition; whereas, shopping for planned meals results in less interest in nutrition (Drichourtis, 2006). A lower *time pressure* in shopping allows for higher use of nutrition labels (Campos et al., 2011). The *product experience* strongly influences label use, since, for example, a first-time purchase will generate more interest in nutrition than a repeat purchase where routine and product knowledge overrule other criteria.

The *purchase occasion*, while little researched in the literature reviewed, is likely to matter, as well: an impulse buy probably generates less interest in nutrition than a planned purchase. The *food processing level* definitely influences label use: the more processed the food (such as ready meals), the higher the interest in nutrition (with fresh produce being at the lower end). Interest in nutrition varies also per *food category*: some categories, generally viewed as "healthy" (yogurt, for example), generate more interest in nutrition. Conversely, some purely indulgent foods (such as chocolate) "raise low nutritional interest because they are perceived as "unhealthy" by nature. As for *price sensitivity*, the more price-conscious consumers would be less nutritionally sensitive (Campos et al., 2011, and Grunert, 2010), probably because of lower income and higher perceived pricing of healthier foods.

Parallel to these issues, nutrition labeling and nutritional information processing should also be considered under a macro political and societal environment, where divergent conceptions of the role of food and the consumer's responsibility have raised several debates. A classical debate is the preference for mandatory versus voluntary information provision. Another underlying and more political/technical debate is the definition of "healthy" and "unhealthy" foods on which many measures rest. Also under discussion is how directive the nutritional information should be—a debate reflecting various degrees of liberalism among cultures and stakeholders. Finally, another key issue is the role of nutritional information in global plans to fight obesity. In these debates, politicians, governments and consumer advocates can have diverging views, thus delaying labeling decisions or producing heterogeneous solutions across countries.

## The Government Policy

### Healthy Food Definitions

Most labeling systems introduce some type of assessment of the food nutrient profile, whether it is a health logo or a traffic light rating system. The question then bears on the criteria used to evaluate a food's nutritional quality. While most governments or international organizations, such as the World Health Organization (WHO), have set dietary guidelines with the input from independent scientists, the food industry has generally elaborated on these public guidelines to establish its own set of guidelines. These are usually specific to a sector (such as the beverage and snack industry) and serve as a basis to formulate "healthier" versions of their existing products, such as a reduced-sugar snack or a higher-fiber cereal (Lobstein, 2008).

Critics of these industry dietary guidelines bear on the partial set of criteria used and on a relative versus an absolute notion of "healthy food." With this definition, a lower-fat ice cream becomes a "healthier" option than regular ice cream, with no consideration of the product's absolute nutrient profile.

It can be argued that, given the existence of independent dietary guidelines currently recognized by governments, there is sufficient data to use as a common ground.
The food industry also argues that there is no such thing as "healthy" and "unhealthy" foods; all food considerations are a matter of a balanced diet. This being true, consumers still need guidance in balancing their total diets—hence, the role of public authorities with no stake in promoting one category or another.

Recent ruling initiatives from governments—such as health claims in Europe or FOP system reviews in the U.S.—address the need for objective, transparent and uniform nutritional information systems.

**Voluntary versus Mandatory Labeling**

An intense debate between consumer advocates and the food industry, with various degrees of involvement from the government and food retailers, is whether or not nutrition labeling should be mandatory.

The food industry's labeling systems have demonstrated partial or biased use of scientific data, a cacophony in label formats and industry self-guided objectives (promoting their own

products regardless of the contribution to the consumer diet improvement). The debate is fierce.

Since BOP nutritional information is mandatory in the U.S. and Canada, and is soon to be in Europe, the debate mostly bears on FOP nutrition labeling. Defenders of the mandatory option are mostly the consumers who want an independent party, endorsed by the government, to guarantee credible, uniform and reliable labeling information.

Consumers in focus groups (Hawley, 2012) and quantitative surveys (Feunekes, 2008) showed that endorsement by independent national or international organizations, as opposed to food industry origin, increased their perceptions of credibility. On the other hand, the food industry generally favors the voluntary mode, as evidenced by the defunct Smart Choices program in the U.S. or the current GDA system in Europe.

The food industry fears overly restrictive or categorizing approaches from governments and a basis to impose new taxes or advertising and promotion restrictions on the "least healthy" foods. Yet some ground for reconciliation has seemed to emerge in recent moves, such as with the Choices program, where industry initiatives were backed up by the Dutch government.

**Directive versus Non-Directive Systems**

Two major types of FOP labels that are now competing in Europe—the traffic light rating system versus GDA (or the Facts Up Front program in the U.S.)—reflect the political and societal aspects of the debate: Should nutritional policies be directive (as in the traffic light

rating system) or non-directive (as in GDA)?

In this discussion, the food industry is opposing color codes found in FOP labels (as in traffic light rating systems or hybrid systems), arguing that they are over-simplistic, demonize some food groups, and do not reflect the improved product formulations. The food industry also fears that the "red" color code deters consumers from buying whole food groups.

While English retailers claim that no such effect was observed, Intermarché, a major French distributor, has replaced red with amber (and added yellow) in its "Nutri-Pass" scheme initiated on its own brands.

Research by Grunert et al. in the 2011 FLABEL survey tends to minimize the importance of the format versus the content of the label. Cultural differences may also explain the industry resistance to the traffic light rating system, as it stems from a functional approach to food rather than from a hedonistic approach—a classical north-south cultural difference in Europe.

While it can be argued whether the color coding is appropriate or not, all research tends to conclude to the need for some assistance in interpreting straight data. The GDA represents progress toward qualifying the data, but it is still perceived as complex, especially for the lower-educated consumers who are not at ease with the manipulation of percentages.

**Role of Nutritional Information in Global Plans to Fight Obesity**

While determining the best labeling options, consumer advocates and governments caution against the emphasis put on the sole labeling of packaged foods, as food away from home has

taken a large share of consumers' calorie intake in developed countries. Several attempts at posting nutritional information in quick-service restaurants have been made with few conclusive results.

Caution is also not to overestimate the role of nutritional information versus the other measures to fight obesity. As few consumers actually use the nutritional information when shopping, and still less consumers interpret them properly, educational campaigns on nutrition, including how to read the nutritional information, should accompany the nutritional information.

Also, educational campaigns should take into account the great disparities between consumers on their ability to process the information. Finally, it should be acknowledged that even well-informed, educated consumers do not always make "rational" choices, especially when it comes to food consumption where cultural, societal, marketing and psychological influences are so determinant.

Based on this research review, the authors propose a conceptual framework of nutritional information processing by consumers, with the identification of the key variables to leverage in order to increase nutrition label use. This will help us establish the basis for public and industry policy recommendations.

## Proposition for Increasing Nutrition Labeling Efficiency

Based on existing models (Drichoutis et al., 2006 & Grunert et al., 2006 and 2011) and the existing research review, we can infer a funnel-shaped information processing model where

the chances of consumers actually using the nutritional information narrow down as the consumer progresses toward the final stage

Each stage of the process is influenced, positively or negatively, by nutrition label and consumer factors, as well as by industrial and governmental factors (the "label use determinants" as studied above), which also interact with each other. Additionally, the consumer's nutritional information processing needs to be positioned under multi-factor influences—notably, those of consumer characteristics, industry marketing practices and government policies.

The various processing steps in the model follow the sequence of Exposure, Awareness, Interest, Desire to Use, Actual Use, and, finally, the Impact on the dietary intake, which is the final outcome.

*Exposure* is the prerequisite to label use. It can result from an active search, by the most motivated consumers, or from accidental exposure, which, in all likelihood, increases with the availability and visibility of the nutrition label.

*Awareness*, or attention paid to the nutritional information, does not automatically stem from nutrition label exposure. A general positive environment, such as educational campaigns or high media coverage on nutritional issues, prompts nutrition label awareness. Personal interest in health and nutrition, as well as a favorable context, will also affect the consumer's awareness. The label format itself, eye-catching and easily recognized, is key to attracting attention.

*Interest* in the nutritional information is the next condition to label use. The will to read the information is highly related to personal factors, especially interest in nutrition, but also socio-demographics and attitudinal factors, which, in turn, reinforce motivation. Some situational factors, very personal in essence, such as time to shop and routine buy, will affect the interest in nutritional information as well. As for external influences, again, the label format, the food category (the more processed, the higher the interest in nutritional information), the shopping environment and the country culture will further influence consumers' interest in nutritional information.

*Desire to Use* the label stems from interest in nutritional information and additional factors—most notably, personal motivation, nutritional knowledge and label characteristics. Label friendliness (or likeability), relevance of the nutritional information and ease of understanding are strong label-use determinants. Grunert (2007) isolates "liking" and "understanding" as the two key dimensions of label perception. Here we argue that the ability to understand, whether objective or subjective, is a result of nutritional knowledge, itself dependent on motivation and socioeconomic status. Personal beliefs or attitudes, such as the trust toward industry messages or the acceptance of directional messages can also influence the desire to use the label's nutritional information , a somehow underestimated factor.

The *Actual Use* of the nutritional information not only depends on the desire to use it but also on more situational factors that are difficult to control, such as the purchase occasion, the familiarity with the product, the time pressure and the mood when shopping. Other purchasing criteria, such as taste, may override nutritional considerations. Consumers may not be willing to pay a premium for healthy foods, either. Conversely, a simple, easy-to-use nutrition label, a novelty product and a highly processed food category will contribute to actual label use.

The final *Impact* that the nutritional label will produce on food purchase and consumption patterns, and its eventual incidence on the general population's health, is dependent on the actual label use and the way it is being used. Consumers may misuse the nutritional information, either from misinterpretation or biased use. Also, the science of balancing a proper diet, including in-home and out-of-home food consumption, is a difficult task requiring education, experience and guidance beyond solely nutritional information.

Finally, the measure of the nutritional information impact also depends on the choice of the behavioral change taken into consideration: whether it bears on the purchase decision, the volumes bought or the purchase frequency will produce different results. Also, longitudinal observational surveys on a larger category of foods are still necessary.

The measures to increase label use and efficiency will play on two key drivers: *the motivation to process* information and the *ability in processing information.* Motivational measures will aim at raising consumers' awareness of, and interest in, nutritional issues and the existence of nutrition labeling. They will be best achieved through educational campaigns, both from governments and the food industry, media coverage of nutritional issues and widespread nutrition labeling.

*Public educational programs and campaigns* will aim at raising interest in nutrition and healthy lifestyles, and will inform consumers of the existence and usefulness of nutritional information. *Marketing nutritional programs* from the food and retail industry will contribute to the public effort, exploiting their own media (such as packaging, websites or store merchandising) and using appropriate promotion techniques. *The Media* can help in bringing

nutritional issues to the general public and in facilitating the understanding of basic dietary guidelines. Finally the *generalization* of on-pack nutritional information— simple FOP information combined with detailed BOP information—in a consistent place and manner, will bring awareness to a high level.

The desire and ability to process nutritional information will be best increased through *the label stimuli* itself but also through *educational programs* to enable consumers to understand the provided information.

As for the *front-of-pack label* itself, the abundant research has pointed to the desired key features. In its execution, the FOP nutrition label should be displayed in a consistent position and format (in terms of content and style). It should be consumer friendly—easy to use and understand, simple, synthetic and visual, and ideally illustrated with colors and symbols (especially for the less-knowledgeable consumers). The provided information should be relevant, providing energy and a few key nutrients, and trustworthy through regulations and endorsements from public organizations.

In scope, the nutrition label should be able to cover all food categories but with a priority on those categories where nutrition is of greater interest to consumers, i.e., processed foods, new products, and products that have a certain "health" positioning or that target consumers with a specific nutritional or health issue (such as children, the elderly, or people with a heart or diabetic condition).

*Educational campaigns or programs*, both private and public, will aim at enabling consumers to use the information—explaining the basic concepts of energy, key nutrients and daily intake (as well as how to use them), as well as the limits of nutrition labeling.

Despite the abundant research on nutrition label formats, two main issues still remain regarding choosing the best style and appropriate content. First, how to find the right balance between data accuracy (leading to detailed information, such as in GDA percents) and visual, intuitive information (using symbols and color-coding such as in the multiple traffic light rating system); and, second, how to select the number and nature of nutrients to feature.

While consumers generally prefer the intuitive system, the food industry generally opposes it, supporting the GDA-type system. Although more accurate and neutral, this system has its flaws in terms of processing efficiency: faced with information overload in a time-pressure and routine-buy environment, consumers will use a heuristic processing mode, selecting one or two nutrients only or disregarding the information as a whole. Our knowledge of the consumer processing mode speaks in favor of minimal but accurate FOP information, such as the energy provision alone (absolute and relative to the average daily intake) with more detailed and visual BOP nutritional information. In addition to systematic FOP labels, health logos are also a helpful tool, provided they are backed by a scientific set of data and approved by a public health authority.

Whatever the final form of nutrition labeling is, one can only stress again the paramount importance of embedding the nutrition label policy into wider health plans, aiming at promoting a healthy diet and lifestyle, improving the offer, framing marketing techniques from the industry, and improving the market environment to fight against obesity.

## Common Grounds for Stakeholders

From this analysis, we can infer guidance from stakeholders involved in nutrition labeling policies, such as the government, the food industry (food providers and retailers) and consumers.

The first recommendation would be to agree on nutrition labeling objectives; to help consumers monitor their food intake, in terms of quantity and quality; and to encourage the industry to reformulate its products. The selected scheme should allow consumers to assess the products in an absolute manner and in comparison to one another.

Secondly, the consumer target should be clearly identified, whether it is the general population or specific groups at a higher health risk. The second option is tempting but would imply specific labeling rules or differentiated labeling, a somewhat unrealistic option.

Third, a strategy to elaborate and roll out the adopted labeling system needs to be designed. Almost as important as the outcome, the process by which the decision is made is key. A collaborative approach among all stakeholders is a condition for success.

The common ground on which the system should be based includes a set of scientific data (nutrient profiles and dietary guidelines), consistency in place and format of the label, transparency and honesty in the portion definition, accurate but user-friendly formats, realism in application to small packaging, and a legal framework to prevent misleading claims and a cacophony of label formats.

## Conclusion and Discussion

While some key issues remain on the amount of nutritional information to provide and its style, the authors would like to argue that it is better to agree on a minimal format than to dispute on more comprehensive ones, keeping in mind that the FOP nutrition label is mostly appropriate at bringing nutrition top-of-mind rather than empowering consumers to make informed choices.

A minimal solution could be the mandatory posting of calories per portion, essential information for the consumer, in a simple and visually attractive format on the front of the pack. A national health logo, endorsed by public health authorities, could supplement the energy value on eligible foods to help consumers identify healthier options.

Finally, nutritional and health claims need to remain authorized, under public regulation as is now the case, to encourage product reformulation or innovation by the food industry.

## Future Research

Once the parties agree on a tentative format, with some minor variations if necessary, a pan European survey would be necessary to select or improve the proposed labeling format. As for health logos, a few options, including the Dutch Keyhole icon, should be tested across Europe. In the quantitative research stage, methodologies should include real-life surveys to evaluate nutritional information performance in an actual shopping situation. Nutritional

education campaigns should also be pre- and post- tested, both for style and content, in the same fashion as for regular advertising campaigns.

The current research is limited because it has selected articles and practices that the authors thought were the most significant and useful on the topic. In terms of the research reviewed, it mostly takes into consideration the consumer viewpoint when the issue of nutritional labeling is mainly driven by food-industry actors. Qualitative interviews of these decision-makers would shed an interesting light on the topic.

However, it is, to our knowledge, one of the only research papers with such a scope, synthesizing the convergent findings to date on nutritional information processing by consumers and on adopting a more holistic view of the role of nutritional information within the total food environment in which consumers evolve.

## REFERENCES

Ariely, D. (2000). Controlling the information flow: Effects on consumers' decision-making and preferences. *Journal of Consumer Research,* 27, 233-248.

Balasubramanian, S. K., & Cole, C. (2002). Consumers' search and use of nutrition information: The challenge and the promise of the Nutrition Labeling and Education Act. *Journal of Marketing,* 66, 112-127.

Biehal, G., & Chakravarti, D. (1983). Information accessibility as a moderator of consumer choice source. *Journal of Consumer Research,* 10, 1-14.

Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: A systematic review. *Public Health Nutrition* 14:08, 1496-1506

De Mello, G., MacInnis, D. J., & Stewart, D. W. (2007). Threats to hope: Effects on reasoning about product information. *Journal of Consumer Research,* 34, 153-161.

Drichoutis. A. C., Lazaridis, P., & Nayga Jr., R. M. (2006). Consumers' use of nutritional labels: A review of research studies and issues. *Academy of Marketing Science Review,* 10 (9).

Feunekes, G. I., Gortemaker, I. A., Willems, A. A., Lion, R., & Van Den Komer, M. (2008). Front-of-pack nutrition labeling: Testing effectiveness of different nutrition labeling formats front-of-pack in four European countries. *Appetite,* 50, 57-70

Grunert, K. G., & Wills, J. M. (2007). A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health* 15:385-399.

Grunert, K. G., Wills, J. M., & Fernandez-Celemin, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the U.K. *Appetite*, 5, 045

Hawley, K . L., Roberto, C. A., Bragg, M. A., Liu, P. J., Schwartz, M. B., & Brownell, K. D. (2012). The science of front-of-package food labels. *Public Health Nutrition* 1 (1), 1-10.

Hieke, S., & Charlers, R. T. (2012), A Critical Review of the Literature on Nutritional Labeling. *The Journal of Consumer Affairs*, Spring: 120-156

Lobstein, T., & Davies, S. (2008). Defining and labeling 'healthy' and 'unhealthy' food. *Public Health Nutrition* 12(3), 331-340.

Leathwood, P. D., Richardson, D. P., Strater, P., Todd, P. M., & Van Trijp, H.C. (2007). Consumer understanding of nutrition and health claims: Sources of evidence. *British Journal of Nutrition*, 98, 474-484.

Lurie, N. H. (2004). Decision making in environments: The information role of structure -rich information. *Journal of Consumer Research*, 30, 473-486.

Méjean, C. , Macouillard, P., Peneau, S., Hercberg, S., & Castetbon, K. (2013). Perception of front-of-pack labels according to social characteristics, nutritional knowledge and food purchasing habits. *Public Health Nutrition*, 16(3), 392-402.

Mukhopadhyay, A., Sengupta, J., & Ramanathan, S. (2008), Recalling past temptations: An information-processing perspective on the dynamics of self-control, *Journal of Consumer Research*, 35, 586-599.

Roberto, C., Bragg, M. A., Schwartz, M. B., Seamans, M. J., Musicus, A., Novak, N., & Brownell, K. D. (2012). Facts up front versus traffic light food labels. *American Journal of Preventive Medicine*, 43, 134-141.

Roe, B., Levy, A.S., & Derby, M. (1999). The Impact of Health Claims on Consumer Search and Product Evaluation Outcomes: Results from FDA Experimental Data. *Journal of Public Policy & Marketing*, 18, 89-105.

Russo, J. E., Staelin, R., Nolan, C. A., Russell, G. J., & Metcalf, B. L. (1986). Nutrition Information in the Supermarket. *Journal of Consumer Research*, 13, 48-70.

Thompson, D. V., & Hamilton, R.W. (2006). The effects of information processing mode on consumers' responses to comparative advertising. *Journal of Consumer Research*, 32, 530-540.

Wan, E. W., & Derek, D. R. (2013). Confidence and construal framing: When confidence increases versus decreases information processing. *Journal of Consumer Research*, 39, 977-992.

Children's Food and Beverage Advertising Initiative. http://www.bbb.org/us/childrens-food-and-beverage-advertising-initiative/.

Plan National Nutrition Santé . http://www.sante.gouv.fr/nutrition-programme-national-nutrition-sante-pnns,6198.html

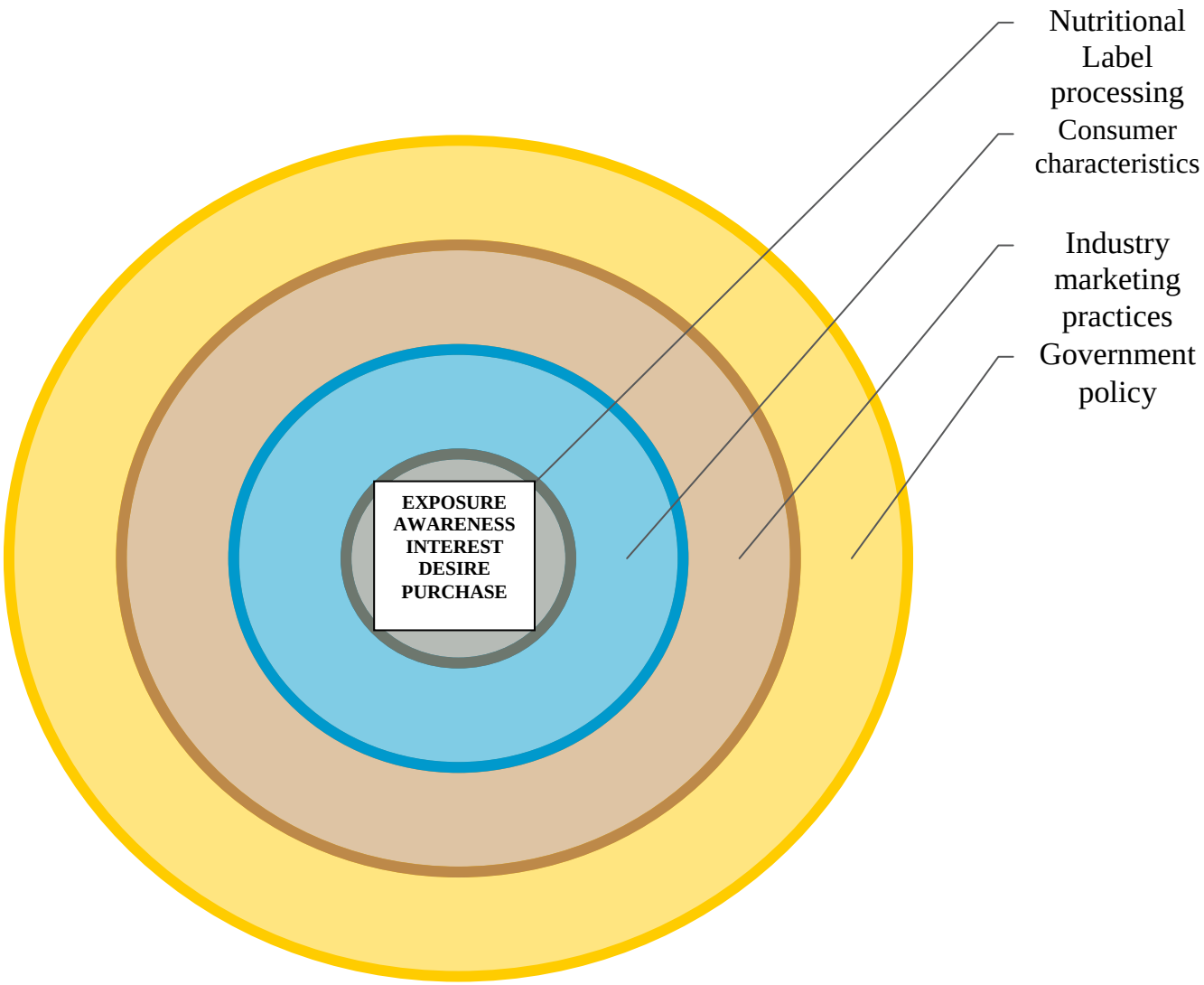
Food Labeling to Advance Better Education for Life (FLABEL), 2011. http://flabel.org/en/News/FLABEL-final-webinar/

FSA Food Labeling (2009), Qualitative research to explore people's use of food labeling information, Ipsos MORI. www.food.gov.uk/multimedia/pdfs/pmpreport.pdf

Food and Drug Administration. New front-of-package labeling initiative. www.fda.gov/Food/LabelingNutrition/ucm202726.htm)

Taylor, M., & Mande, J. (2009), Letter to the Smart Choices Program (August 19). Available at: http://www.fda.gov/Food/LabelingNutrition/LabelClaims/ucm180146.html.

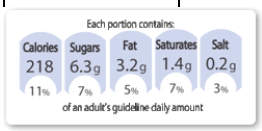
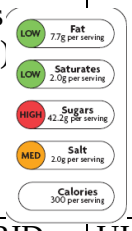
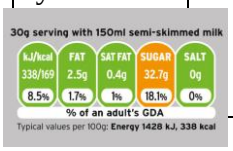
Figure 1. Nutritional Label and Multi-Factor Influence



# APPENDICES

## APPENDIX 1. BOP and MAJOR FOP NUTRITION LABELS OVERVIEW

| | Country | Initiator | Nature (format/content) | Principle |
|---|---|---|---|---|
| **Back-of-pack (BOP)** | | | | **Detailed nutrition facts** |
| Nutrition Facts panel | USA 1990 | Government (NLEA) | MANDATORY<br>Nutrition facts : quantities and % Daily Values (DV) of various nutrients in chart format | Factual<br>Accurate and detailed Nutritional Information (NI)<br>Data per portion |
| Nutrition Facts | Europe | Manufacturers under the European Food labeling Regulations (1996) | VOLUNTARY (unless a nutrition claim is made)<br>Various formats<br><br>MANDATORY as of December 2014 | Per 100g (or 100ml) and possibly per portion<br>Basic declaration: Group 1 declaration (energy, protein, carbohydrates, fat)<br>Possible additional nutrients with the Group 2 declaration: saturated fats, sugars, sodium and fiber.<br>Tabular format (linear if lack of space) |
| **Front-of-pack (FOP)** | | | **VOLUNTARY Summary NI** | **Energy and key nutrients per portion OR Health Logos** |
| Keyhole | Sweden 1989<br>Denmark<br>Norway | Swedish National Food Administration | HEALTH LOGO<br>Logo on “healthy” foods<br>Owned by the National Food Administration | Identifies healthier products within a product group<br>Complies with national dietary guidelines |
| Choices Program | Nether-lands 2006 | Industry in partnership with the government | Logo on “healthy” foods<br>Approved by the Dutch government | Based on food nutrient profiles determined by independent Dutch scientists |
| Smart Choices program | USA 2009 | Food industry | Logo type<br>Green checkmark symbol on “healthy” food | Suspended by FDA<br>System based on industry approved nutrient profiles |

| | | | | |
|---|---|---|---|---|
| % GDA   | Europe 2006 | Food industry (CIAA) | Factual information on key nutrients | Calories, fat, saturated fats & sodium per portion and as a % Guideline Daily Allowances (GDA) Monochrome scheme |
| Facts up Front   | USA 2011 | Food Industry and Distribution (FMI &GMA) | Close to % GDA | Calories, fat, saturated fat & sodium per portion and as a % DV (Daily Values) Possible additional nutrient information Monochrome scheme |
| Multiple Traffic Lights (MTL)   | UK 2009 | FSA (Food Standards Agency) supported | Assessment of the food nutritional quality on energy and 3 or more nutrients (fats, saturated fats, salt, sugars) in a colored scheme | Color per nutrient is based on the level of the nutrient:<br>Red= High<br>Amber=Medium<br>Green = Low<br>Based on international dietary guidelines |
| HYBRID food labeling system   | UK 2011 | UK health minister & retailers | Colored scheme GDA | GDA with color codes as on MTL and High/Medium/Low text |

APPENDIX 2. NUTRITION LABELING EFFICIENCY SUGGESTION