Eur J Nutr (2009) 48 (Suppl 1):S41–S48
DOI 10.1007/s00394-009-0075-1

SUPPLEMENT

Consumer understanding and nutritional communication: key issues in the context of the new EU legislation

Hans C. M. van Trijp

Published online: 25 November 2009

Abstract
Background Nutrition communication by means of nutrition and health claims and otherwise, holds the potential to contribute to public health by stimulating informed healthier food choices and enhanced health-focussed competition in the market place, provided that the health messages are trustworthy (i.e. scientifically substantiated) and correctly used and interpreted by the consumer. Not surprisingly, these two considerations constitute the cornerstone of the new EU legislation on nutrition and health claims, in which evidence for consumer understanding of nutrition and health claims is a new requirement.
Aim of the study To review some of the key issues in consumer understanding of nutritional communication as a basis for reflection on the consumer understanding element of the new EU legislation on nutrition and health claims.
Conclusions There is a need for more methodologically advanced research in consumer understanding of nutrition and health claims as a basis for truly assessing the real-life use of such information and its actual effect on consumer food choices. Such approaches are pertinent in light of the evaluation and approval process of (new) nutrition and health claims as required under the new EU legislation on nutrition and health claims.

Please direct all correspondence to: ILSI Europe a.i.s.b.l, Avenue E. Mounier 83, Box 6, 1200 Brussels, Belgium.
E-mail: publications@ilsieurope.be

H. C. M. van Trijp (✉)
Marketing and Consumer Behaviour Group, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, The Netherlands

Keywords Consumer understanding · Nutrition and health claims · EU legislation · Nutrition communication

Introduction

Nutritional communication, including the sharing with consumers of information on the nutritional properties and associated health effects of food products [28] has become a very relevant issue in today's food markets where foods are increasingly being positioned and marketed on the basis of their (positive) contribution to a healthy diet and a healthy lifestyle [1, 21]. Nutritional communication is an important tool for reducing the information asymmetry between the consumer and other stakeholders such as food companies, NGOs and governments [26]. Such information asymmetry exists because knowledge on nutritional content and potential health effects of food products resides in the expert domain of nutritional sciences and cannot be directly perceived nor verified by the individual consumer. Rather this so-called credence quality [4] of the food needs to be communicated to make it accessible as an information cue in the consumer's search and selection process of food products [5]. Without such communication much of the nutrition and health information would remain hidden to the consumer and hence have no impact on actual informed choices.

Effective communication draws heavily on the extent to which message(s) are adequately understood by the receiver. This also holds for nutritional communication. However, a large number of factors combine to determine the extent to which the consumer decodes the message as was intended by the sender. As a consequence the meaning that the receiver extracts may easily go beyond the literal meaning of the message and even the intended meaning.

In the context of nutritional communication three factors that affect effective communication deserve specific attention.

1. Specific nutritional knowledge is often lacking with consumers. Much of the nutritional information is based on specialist knowledge residing in the area of nutritional sciences. Effective decoding and adequate understanding of nutritional information requires a certain level of nutritional knowledge on the part of the consumer. Without such background knowledge there is a danger that any (more detailed) communication will not reach the target audience or may be misinterpreted. Interpreting nutritional information in relation to health requires knowledge on the products attributes and its benefit [28]. Knowledge on nutrients is at best superficial, with the concept of calories being relatively well understood but much less so for other nutrients [11]. This limited knowledge favours simple and straightforward nutritional messages as more detailed (and probably more scientifically correct) information may be less meaningful to consumers and further increase the chances of misinterpretation.
2. Many food choice decisions are examples of low involvement decisions with limited time and effort spent on information processing. Whereas knowledge determines the consumer's *ability* to process nutritional communication, much of the research shows that *motivation* to process information may also be a limiting factor in the case of food products. Many food choices are of a low involvement nature and characterised by very limited effort invested into information processing. For low involvement decisions, i.e. those that do not typically involve high levels of perceived personal relevance and risk of wrong decisions, consumers have a tendency to revert to peripheral or heuristic processing rather than more central detailed processing [18]. The implication is that consumers tend to base their choice on superficial, simple to interpret cues rather than the more detailed information.
3. Consumers are active processors of information not passive receivers. The decoding process of nutritional information is far from a linear process. Rather, the information is actively processed by consumers in constant interaction with other external information (e.g. brand name, packaging, endorsement etc.) and with internal knowledge representations already present in memory. As a consequence external information (such as nutritional) may be "enriched" as a consequence of (spontaneous) associations that are co-activated in the brain (so called spreading activation). This process of "filling in" the information from (in-) accurate inferences may again add to the probability of nutritional information being misinterpreted well beyond its factual and even intended meaning (see also [15]).

It is against this background that consumer understanding of nutritional information needs to be understood. On the one hand it is necessary that the information is cognitively processed by consumer at least to some degree. But on the other hand it should not be "over-processed" in the sense that consumers build associations that would not be justified by the literal or intended meaning of the nutritional information/claim.

More recently, the issue of consumer understanding of nutritional information has received considerable policy interest. It takes a prominent position in the New EU Regulation on Nutrition and Health claims [7], adopted in January 2007, where it is defined as a prerequisite in the claim approval process, next to scientific substantiation of the claimed benefit. From a consumer protection point of view, this is an important milestone in nutrition and health communication at the European level. But at the same time, it raises the issue of what adequate consumer understanding constitutes and how it should be operationalised.

The aim of this paper is to provide a succinct overview of the state of the art in consumer understanding of nutrition and health information in the context of the new EU Regulation. The paper will be based on a number of recent studies and reviews both in the areas of nutritional labelling [3, 11, 24], nutrition and health claims [25, 30] and consumers' use of nutritional labels in general [5]. It will focus on four specific issues:

1. the importance of nutrition communication from the perspective of various stakeholders involved,
2. a brief overview of the current knowledge in how consumers process and handle nutritional information
3. the position of consumer understanding in the new EU regulation on nutrition and health claims
4. the implications of the new regulation for consumer understanding research in health claim substantiation

Finally, we discuss some specific research needs in the field of consumer understanding in relation to nutrition and health claims.

The importance of nutrition and health information to different stakeholders

As argued before, nutritional communication aims at reducing information asymmetry on nutritional features and health effects, that consumer cannot verify from personal consumption experience. To form personal beliefs

about health (and other credence qualities), consumers can revert to one of two belief formation processes [9]. They might accept information from others (known as "information belief formation") in which case he/she would either rely on informants (such as relatives, experts, consumer organisations or brand manufacturers) or alternatively rely on nutritional information cues on the pack (such as endorsements, logos etc.). Trust and confidence in the informants and the information they provide is a prerequisite for the informational belief formation process to be effective. A second process often used by consumers is "inferential belief formation" in which case the consumers uses his/her own rules of thumb, often based on subjective knowledge, to infer the level of healthiness of a food product. Cues from which such inferences are made can be diverse to include health claims, colour of the product, brand name, etcetera.

For *consumers*, nutritional information is important as it provides them with an information cue that can guide their decision process. Nutrition information on pack can be a very effective cue, provided that the information is correct, complete and trustworthy. If so, this information is indispensable for consumers' informed choices in which nutritional quality is taken into account. However, in final choice the nutritional information is traded off against other product perceptions (such as taste, price and convenience), implying that the informed choice is not necessarily the healthy choice.

For the *food industry*, nutritional labelling is important too as it provides an opportunity to communicate to consumers that their products are of good nutritional quality. This provides them an opportunity to make visible their corporate social responsibility through the process of "be good and tell it". In addition, given the consumer and public interests in the diet-to-health link, nutritional labelling may provide the food industry with a tool for differentiation and hence to achieve competitive advantage from consumer preferences.

For *policy makers*, reliable nutritional labelling plays a key role in reducing information asymmetry, so as to ensure transparency in the market and enable consumers to execute their right to know. By regulating nutritional information they ensure that consumers can make an informed choice which in turn will hopefully stimulate more healthy diets among consumers. Finally, ensuring a fair system of nutritional labelling regulation will support innovation and stimulate fair competition in the food industry [7].

The objectives of these three stakeholder groups will converge, provided that the health information is justified scientifically and correctly understood and used by the consumer. Not surprisingly, these are also two important pillars underlying the new EU regulation [7]. It takes into about both the coding (scientific justification) and the decoding (consumer understanding) of the nutrition and health claims.

Nutritional information from a consumer information processing point of view

From a consumer point of view, for nutritional information to have an impact on consumer decision making there needs to be some level of processing of the information. Such information processing goes through a series of stages, for which various models have been proposed in the communication and marketing literature (see [15]). These models vary in the number and naming of the different stages. An integration of these models in the context of nutritional information has recently been provided by Grunert and Wills [11] which provides a very useful structuring device for the research on nutritional information (see also [13]). We use a similar structure along the phases of (1) presence and interest, (2) attention and perception and (3) interpretation and understanding.

Presence of nutritional information is of course a necessary prerequisite for information to be processed. Although accidental exposure to such information may in itself already trigger a processing of the information, exposure to information will be enhanced if the consumer has a level of *interest* in it, stimulating the consumer to actively search for exposure. However, exposure itself is not a sufficient condition for information processing as much of the information in the environment is ignored by consumers. The information needs to be *attended* to to be brought into the perceptual system allowing further processing. Once the information is attended to, the consumer will start a process of assigning meaning to the information (*perception*). This elaboration on information will form the basis for *interpretation* and *understanding* of the nutritional information. Based on such subjective (mis-)understanding the consumer may decide to *use* or ignore that information in the decision whether or not to buy the product. When interpreted and understood correctly, the use of the nutritional information will lead to an informed and (hopefully) healthier choice. The whole process, is likely to differ between different consumers types (segments) and as a function of the information content and the format in which it is provided. But neither labelling formats nor individual differences between consumers are the focus of this paper.

A concise review of existing knowledge on consumers and nutritional information

As several excellent recent reviews (e.g. [3, 5, 11, 31]) of consumer science on nutritional information are available,

we will restrict ourselves here to just a brief review of key findings. The reader is encouraged to consult the relevant references for further detail.

Presence and interest

Nutritional information on pack and in advertising is widely available (e.g. [2, 12, 16]), although this may vary considerably between product categories and countries [12, 30]. Back of pack nutrition facts panels appear on many of the packaged foods, although in Europe only mandatory if a nutritional or health claim is being made for the product. Several initiatives are currently ongoing (see [6]) in moving some of the relevant back of pack nutritional information front of pack, such as through GDA (developed by IGD), Traffic Lights (supported by FSA), My Choices logo [8], Green Keyhole [14], other food information programmes [22] and front of pack calorie labelling [24]. Overall, presence of nutritional information seems not a limiting factor in nutritional communication on pack and the problem is probably more one of information abundance rather than information shortage.

A consistent finding in most of the consumer research has been that consumer *interest* in nutritional information is high. This is also evidenced by the fact that health has become the key driver of the world's fastest growing food and beverage categories [3]. Thanks to advancement of the nutritional sciences and public health communication efforts, the diet and health link generates high awareness among consumers and is even increasing. However, many of these studies also reveal that nutritional information is not THE most important information cue to consumers [7]. A cross-culturally consistent finding is that taste, price, naturalness and absences of pesticides are considered by consumers of greater importance than health information. Interest for nutritional information tends to be higher among women, parents and older consumers and consumers in North/Central Europe tend to be more interested [6, 7].

Attention and perception

Attention and perception has been explored from two different streams of research. Many survey studies [11] reveal that about 40% of consumers typically report to use nutritional information before purchasing. But an important question of course is to what extent survey methodologies provide a reliable insight into attention and perception. Observational studies, not relying on consumers' self-expression of general attitudes and behaviours towards nutritional labelling paint a different picture. They reveal that in store, consumers spend very limited time on food selection and think-aloud protocols (where consumers think aloud on the consideration they make in selecting products in store) find very low levels of search and consideration of nutritional information (e.g. [19]). As a field experiment on a nutritional intervention in store, one study [23] showed that only 50% of consumers had noticed the intervention and only 25% had noticed that the intervention involved nutritional labelling. This finding shows that many consumers simply do not attend to the information provided. Another study conducted by Kellogg's (reported in [11]) using tachistoscopic research in which consumer are very briefly exposed to food packaged with labels showed 3–4% of the respondents noticed the label with a 1 s exposure and 20% noticed the label after 2 s exposure.

There exists a clear need for more research on consumer attention and perception to nutritional information in more market-relevant conditions as attention may be an important bottleneck in the further processing of nutritional information. Such research should have to rely on experimental and behavioural observation methods rather than purely on survey research.

Understanding is the crucial part of consumer information processing of nutritional information. There is no precise and agreed upon definition of what understanding is in the context of nutrition and health information. But clearly, understanding requires a reference base with the consumer from his/her nutritional knowledge. Unfortunately, detailed nutritional knowledge is often lacking with consumers. Consumers seem to have a basic awareness of calories but much less so for other nutrients [11]. Also, they lack the specific knowledge on daily dietary needs for nutrients. As a result of this limited knowledge, consumers get easily confused by detail and scientific wording of the nutritional information [30]. Also, many consumers seem sceptical about commercial health claims [30].

Understanding of nutritional information and health claims is a dynamic process. As consumers are active information processors, rather than passive recipients of the information, the meaning assigned to nutritional information may easily go beyond the literal (or even intended) meaning conveyed in the nutritional claim [15]. This is largely due to the fact that the human memory is organised as an "associative network" of interlinked information items. Much of this information can be accessed spontaneously, with little mental effort, a process known as "spreading activation". In the context of nutritional information this implies that simple nutritional messages (e.g. with extra vitamin C) may automatically trigger other (subjective) knowledge (e.g. helps prevent flu, reduces risk of cancer etc.). Consumer decoding of nutritional messages depends to large extent on whether these subjective inferences are correct or not. Seminal work by Roe et al. [20] has identified four important potential misinterpretation effects in nutrition and health claims. The *positivity* bias

implies that the presence of a claim in itself can already lead to a more positive interpretation of the product carrying the claim, almost irrespective of the content of the claim. In other words, the consumer will infer that because of the fact that the product carries a health claim, it must be a healthy product. But more specific effects may also occur. The *halo* effect implies that the fact that the product is claiming to be good in one specific nutrient (e.g. is low in cholesterol) is taken by the consumer as evidence that the product will likely be good on some other nutrients too (e.g. is also low in total fat), even though such relationship need not exist nor is implied by the claim. The *magic bullet* effect extends this even further in which case the consumer assigns inappropriate health benefits to the product because of the claim. Finally, there may be an *interactive* effect in which case the presence of a health claim may obstruct consumers' further search for other information, such as back of pack. In those cases, the information is taken for granted without being verified or qualified against other available nutritional information.

One consistent finding in this research (e.g. [29, 30]) is that consumers prefer simple and easy to understand information on the front of the pack, with more detail being provided back-of-pack. Although Roe et al. [20] find that front of pack nutritional information truncates search of back of pack information in actual shopping situations, other studies that have taken a more experimental approach show that this is probably mainly due to lack of motivation to search further, rather than inability to do so. These studies (e.g. [10]) suggest that consumers are capable of integrating both streams of information and even to identify inconsistencies between what is communicated front-of-pack and back-of-pack.

In sum, the process of information processing of nutritional information is a multistage process where at each of the steps information may be lost or incorrectly interpreted. As a result, the understanding of the information is problematic from a public health perspective (reducing information asymmetry) and also from a consumer perspective (reliable information cues for informed choices). Consumers see claims as useful information, but are sceptical about commercial claims [30]. They prefer to receive the information in a simple format and wording [24], with more detail available back of pack [29]. They are easily turned off by scientific wording and long claims and they do not seem to differentiate between different types (e.g. content claims vs. health claims) of claims [25, 30]. By and large, this illustrates the dilemma in nutritional communication. The information needs to be scientifically correct which will probably require long and complex wordings, and on the other hand it needs also be understandable to the consumer, which will require very simple messages. This balance between the two conditions is addressed in the new EU regulation on nutrition and health claims to which we turn next.

Consumer understanding in the new EU Regulation on nutrition and health claims

The new EU Regulation on nutrition and health claims [7] adopted early 2007 complements the Directive on general labelling provisions contained in Directive 2000/13/EC on general labelling provisions which prohibits the use of information that would mislead the purchaser or attribute medicinal properties to food. In doing so it makes explicit provisions for the level of consumer understanding which we will summarise in this section before we turn to the implications for consumer understanding research.

As a general principle for all claims (article 3), "the use of nutrition and health claims shall not be false, ambiguous or misleading". But article 5.2. extends this in stating that "the use of nutrition and health claims shall only be permitted if the average consumer can be expected to understand the beneficial effects as expressed in the claim". Health claims (article 13.1) will only be allowed if "they are (1) based on generally accepted scientific data, and (2) well understood by the average consumer". Similarly for reduction of disease risk claims, an initial judgment will come from the Authority that (article 16.3) "shall give advice on whether the proposed wording of the health claim is understandable and meaningful to the average consumer".

The new regulation further defines the target population of the average consumer. It takes as a benchmark (article 15 of preamble) "the average consumer, who is reasonably well- informed and reasonably observant and circumspect, taking into account social, cultural and linguistic factors as interpreted by the Court of Justice". Additionally, this article states that "The average consumer test is not a statistical test. National courts and authorities will have to exercise their own faculty of judgment, having regard to the case-law of the Court of Justice, to determine the typical reaction of the average consumer in a given case."

Consumer understanding is a new element in the regulation, and by January 19 2013 at the latest, the European Commission will submit to the European Parliament and evaluation report on "the evolution of the market in foods in respect of which nutrition or health claims are made and on the consumers' understanding of claims, together with a proposal for amendments if necessary".

In sum, there is quite a bit of attention for the actual consumer understanding of nutrition and health claims in addition to their scientific substantiation. This is an important good, as in the end all sincere stakeholders will benefit from a market in which available health claims are

scientifically correct as well as effectively communicated to consumers. This will ensure transparency, facilitate informed choice and create a level playing field as a basis for fair competition and, given the consumer and public interest for food and health, also further stimulate healthy innovation in the food and drink industry.

One important condition for this situation to arise is an agreed upon definition and measurement approach to what is consumer understanding of nutrition and health claims. The ILSI Consumer Science Task Force has made a first attempt in exploring the implications for consumer research to which we will turn next.

Consumer research approaches to verify consumer understanding

Consumer understanding of nutritional and health claims poses a number of new challenges to the food consumer science community. Leathwood et al. [15] recently reflected on what could be considered adequate evidence for consumer understanding of nutritional information. Taking a consumer processing of nutritional information perspective, they argue that a useful operational definition of consumer understanding would be that from the nutritional information provided "the consumer makes inferences that are justified by the objective content of the claim without significant embellishment of exaggeration". Because in market situations consumers use multiple information cues in addition to the sheer nutritional information, inferences may be influenced by other communication elements in the environment of the claim such as the packaging and/or endorsements, so understanding of the claim needs to be tested in context [15].

Adequate testing of consumer understanding is a complex issue for a number of reasons. A major complication comes from the fact that such testing is to be executed a priori (i.e. before approval and launch). At that point in the innovation process, it is unlikely that the full marketing mix of the product has already been developed. At best, the new health product can only be tested as a prototype or mock up of what the product as marketed would look like. Second, particularly for new health claims it is quite unlikely that a substantial level of consumer understanding will exist before the full communication mix has been developed. Often, health claims can actually play a role in generating awareness on a new diet–health relationship. In that sense, the upfront requirement of consumer understanding could actually work against substantive innovation in the food and beverage industry. Further, although it is do-able to define the target population a priori, it is much more difficult to define the actual user group a priori as also non-target group members may decide to adopt the product. Finally, because consumer understanding is not a well delineated dependent variable and consumers are active information processors, it may always be possible to find an inaccurate inference in any specific study which would formally lead to rejection of the null hypothesis (no inferences that are not justified by the claim). As a consequence, what is needed at this stage is a pragmatic (rather than ideal) approach with an agreed level of consensus among key stakeholders, which is scientifically justifiable as well as do-able for food operators at the early stage of the new product development process.

After reviewing four prominent methodologies of consumer research (qualitative research, quantitative research, experimental research and econometric analyses from panel data) on their strength and weaknesses in relation to the objective of measuring consumer understanding of nutrition and health claims, Leathwood et al. [15] propose a four step approach (1) Identify and define the consumers to be recruited, in terms of the target group of intended consumers, (2) define the food—claim—presentation combination to be tested, in terms of a mock up or detailed concept of the appropriate food and packaging, (3) identify the range of consumer interpretations with the claim, though qualitative research techniques such as in-depth interviews, and (4) quantify the accuracy of consumers' understanding of the claim, through quantitative research on consumer interpretation of the claim in his/her own words (see [15] for more detail).

An important aspect of the methodology is that each of the steps needs to allow for replication and validation. For that reason, at all stages it is crucially important that the test conditions (e.g. characteristics of the target group, sample size, stimulus material, procedure for presenting and testing, etc.) are made explicit and ideally would be agreed upon a priori. Over time, the methodology will have to be further refined both in terms of methodological approach as well as agreed standards of what constitutes an adequate level of evidence. As a first start, the analysis could focus on the percentage of consumers that can outline the beneficial effects of the product with health claim in their own words. This would require a content analysis of spontaneous associations (classified for justified and unjustified spontaneous associations) and probably a statistical analysis of rating scales on which the consumer indicates which benefits are associated with the health product. At this stage there is no scientific evidence for what would be a reasonable benchmark and this will have to be developed over time when experience with the approach is building up.

Conclusion and future research needs

This paper has addressed selected issues in consumer understanding of nutrition and health claims. More detailed

information can be found in several recent reviews in relation to health claims [30], nutritional labelling both back of pack and front of pack [3, 11], as well as on consumer use of nutritional information more generally [5]. In line with a recent WHO analysis [12] most of these reviews conclude that despite progress, there is still a shortage of research on understanding how consumer interpret, understand and use health claims in real life. Developing such better understanding has become more urgent in light of the new EU legislation on nutrition and health claims which incorporates consumer understanding as one of the criteria for approval [7]. Key learnings from the existing literature are that there is widespread self-stated interest in nutritional information, but that knowledge and lifestyle factors limit consumers in using the information in detail. Consumers prefer simple and trustworthy information over scientific detail, although such detail is welcomed on back of pack as a means of potential verification and reassurance. Due to lack of knowledge and motivation misinterpretation and over-generalisation is likely to occur but there exists limited quantitative insight into the degree of misperception.

Regarding front of pack labelling (see [6] for an overview), there is still a debate going on on the preferred format in which this simplified information should be made available to consumers. This topic has not been addressed in this paper as there still is no general consensus reached (see [11]. From a consumer understanding perspective there is an urgent need to solve this discussion, as multiple schemes (with diverging criteria underlying them) are likely to further confuse the consumer. Also, there is a need for pan-European validation of consumer preferences for front-of-pack labelling as much of the current research evidence may be country specific.

Methodologically, the research field of consumer understanding of nutrition and health claims is in strong need for further development, particularly at the interface with public policy. Research in this field almost exclusively depends on self-reported attitudes and behaviours, in terms of "how interested are your in…", "do you usually read or use", "how important is nutritional information in your product choices" etcetera. Although such self reported opinions provide valuable insights into consumers basic attitudes toward nutritional information, they likely suffer from so called social desirability bias as the validity of these measures relies on an unrealistically high level of assumed introspection on the part of the consumer. By explicitly confronting consumers in the response task with the stimulus at hand, existing research often imposes forced exposure and information processing. As in real life situations, consumers are much more distracted and time pressured it is questionable to what extent these findings have external validity for actual food choice situations. There is a strong need for experimental and observational research on consumers' attention and perception processes. Finally, much of the current research evidence comes from qualitative research, often conducted in one country only which may cast doubt on the replicability and generalisability of findings. When the purpose is to understand consumer understanding of nutrition and health claims, there is an urgent need to complement this type of research with behavioural and observational studies both at the supermarket shelf and at the dinner table.

Ultimately, the proof of the pudding is in the eating and this also holds for food products with health claims approved under the new regulation. This should encourage outcome based studies in which from scanner and purchase data the true effect of the nutrition and health label regulation is evaluated in terms of its main objectives: (1) has it increased the share of healthy food choices among consumers, (2) has it stimulated health innovation, and (3) through changes in food choices has it had a significant impact on public health. Each of these questions will hopefully receive due attention when the effects of the new regulation will be reviewed in the year 2013.

Acknowledgements This article was commissioned by the Functional Foods Task Force of the European branch of the International Life Sciences Institute (ILSI Europe). Industry members of this task force are Ajinomoto Europe, Barilla G. & F. Fratelli, Bayer CropScience BioScience, Beverage Partners Worldwide, Cadbury, Coca-Cola Europe, Colloïdes Naturels International, CSM, Danisco, Danone, Dow Europe, DSM, FieslandCampina, Frutarom, International Nutrition Company – INC, Kellogg Europe, Kraft Foods, La Morella Nuts, Mars, Martek Biosciences Corporation, McNeil Nutritionals, Monsanto, Naturex, Nestlé, PepsiCo International, Procter & Gamble, Raisio Group, Red Bull, Raffinerie Tirlemontoise – ORAFTI, Südzucker/BENEO Group, Syral, Tate & Lyle, Ülker Bisküvi, Unilever, Soremartec Italia – Ferrero Group, Valio, Wild Flavors, Wimm-Bill-Dann Foods, Wrigley and Yakult Europe. For further information about ILSI Europe, please email info@ilsieurope.be or call +32 2 771 00 14. The opinions expressed herein are those of the authors and do not necessarily represent the views of ILSI Europe.

Conflict of interest statement The author declares no conflict of interest.

References

1. Nielsen AC (2006) What's hot around the globe: insights on growth in food and beverages. http://www2.acnielsen.com/reports/documents/2006WhatsHotFoodBev.pdf
2. Caswell JA, Ning T, Liu F, Mojduszka EM (2003) The effect of new labelling regulations on the use of voluntary nutrient-content and health claims by food manufacturers. J Public Policy Mark 22:147–158
3. Cowburn G, Stockley L (2005) Consumer understanding and use of nutrition labelling: a systematic review. Public Health Nutr 8:21–28

4. Darby MR, Kerni E (1973) Free competition and the optimal amount of fraud. J Law Econ 16:67–88
5. Drichoutis AC, Lazaridis P, Nayga RM (2006) Consumers'use of nutrition labels: a review of research studies and issues. Acad Mark Sci Rev 10(9). Available at: http://www.amsreview.org/articles/drichoutis09-2006.pdf
6. EHN (2007) Review of front of pack nutrition schemes. European Heart Foundation
7. European Parliament (2007) Corrigendum to Regulation (EC) No. 1924/2006 of the European Parliament and of the Council of 20 December 2006 on Nutrition and Health Claims made on Foods, Corrigenda, Official Journal of the European Union, January 18, 404:L12/3-L12/18
8. Feunekes GIJ, Gortemaker IA, Willems AA, Lion R, Van den Kommer M (2008) Front-of-pack nutrition labelling: testing effectiveness of different nutrition labelling formats front-of-pack in four European countries. Appetite 50:57–70
9. Fishbein M, Ajzen I (1975) Belief, attitude, intention, and behavior: an introduction to theory and research. Addison-Wesley, Reading
10. Garretson JA, Burton S (2000) Effects of nutrition fact panel value, nutrition claims and health claims on consumer attitudes, perceptions of disease-related risks and trust. J Public Policy Mark 19:213–227
11. Grunert KG, Wills JM (2007) A review of European research on consumer response to nutrition information on food labels. J Public Health 25:385–399
12. Hawkes C (2004) Nutrition labels and health claims: the global regulatory environment. World Health Organisation, Geneva
13. Keller SB, Landy M, Olson J, Velliquette A, Burton S, Andrews C (1997) The effects of nutrition package claims, nutrition facts panels and motivation to process nutrition information on consumer product evaluation. J Public Policy Mark 16:256–269
14. Larsson I, Lissner L, Wilhelmsen L (1999) The 'Green Keyhole' revisited: nutritional knowledge may influence food selection. Eur J Clin Nutr 52:776–780
15. Leathwood P, Richardson DR, Straeter P, Todd PM, Van Trijp HCM (2007) Consumer understanding of health claims: sources of evidence. Br J Nutr 98(3):474–484
16. LeGault L, Brandt MB, Mccabe N, Adler C, Brown A-M, Brecher S (2004) 2000–2001 Food label and package survey: an update on prevalence of nutrition labelling and claims on processed packaged foods. J Am Diet Assoc 104:952–958
17. Parker BJ (2003) Food for health. J Advert 32:47–55
18. Petty RE, Cacioppo JT (1986) The elaboration likelihood model of persuasion. In: Berkowitz L (ed) Advances in experimental social psychology 19. Academic Press, New York, pp 123–205
19. Rayner M, Boaz A, Higginson C (2001) Consumer use of health-related endorsements on food labels in the United Kingdom and Australia. J Nutr Educ 33(1):24–30
20. Roe BE, Levy AS, Derby BM (1999) The impact of health claims on consumer search and product evaluation outcomes: results from FDA experimental data. J Public Policy Mark 18(1):89–115
21. Sloan AE (2007) Top 10 food trends. Food Technol 61(4):22–39
22. Smith SC, Stephen AM, Dombrow C, MacQuarrie D (2002) Food information programs: a review of the literature. Can J Diet Pract Res 63(2):55–60
23. Steenhuis IP, Van Assema P, Van Breukelen G, Glanz K (2004) The effectiveness of nutrition education and labelling in Dutch supermarkets. Am J Health Promot 18:221–224
24. Van Kleef E, Van Trijp HCM, Paeps F, Fernandez L (2008) Consumer preferences for front-of-pack calories labelling. Public Health Nutr 11(2):203–213
25. Van Trijp HCM, Van der Lans IA (2007) Consumer perceptions of nutrition and health claims. Appetite 48:305–324
26. Verbeke W (2005) Agriculture and the food industry in an information age. Eur Rev Agric Econ 32(3):347–368
27. Wansink B (2003) How do front and back package labels influence beliefs about health claims? J Consum Aff 37(2):305–316
28. Wansink B, Cheney M (2005) Leveraging FDA claims. J Consum Aff 39:386–398
29. Wansink B, Sonka S, Hasler C (2004) Front-label health claims: when less is more. Food Policy 29:659–667
30. Williams P (2005) Consumer understanding and use of health claims for foods. Nutr Rev 63:256–264
31. Williams P, Yeatman H, Ridges L, Houston A, Rafferty J, Roesler A, Sobierajski M, Spratt B (2006) Nutrition function, health and related claims on packaged Australian food products: prevalence and compliance with regulations. Asia Pac J Clin Nutr 15(1):10–20