Food Quality and Preference xxx (xxxx) 104634

Contents lists available at ScienceDirect

Food Quality and Preference

journal homepage: www.elsevier.com/locate/foodqual

Tackling nutritional and health claims to disentangle their effects on consumer food choices and behaviour: A systematic review

Petjon Ballco [a, b, c, d, *], Azucena Gracia [a, b]

[a] Unidad de Economía Agroalimentaria, Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Avda. Montañana 930, 50059 Zaragoza, España
[b] Instituto Agroalimentario de Aragón -IA2 (CITA-Universidad de Zaragoza), Zaragoza, España
[c] Departamento de Ciencias Agrarias y del Medio Ambiente, Universidad de Zaragoza, España
[d] Dyson School of Applied Economics and Management, Cornell University, Ithaca, NY, USA

ARTICLE INFO

Keywords:
Nutritional and health claims
Food choices
Product characteristics
Consumers' personal processes
Consumer characteristics
Purchase behaviour

ABSTRACT

This systematic literature review collected and summarized research on consumer preferences and the purchase behaviour of food products with nutritional claims (NCs) and health claims (HCs), to reconcile, and expand upon, the findings of previous studies. First, considering that consumer behaviour is affected by a wide range of factors, to narrow the research we used a theoretical framework and divided the determinants of the effects of NCs and HCs on consumers' preferences and purchasing behaviour into consumer characteristics, product characteristics, and consumers' personal processes, using the quality perception process. Second, since most studies were conducted within the European Union (EU), we collected the scientific literature from 2006, when the law on NCs and HCs was harmonized in the EU, until September 2020. This same period was used to scan for other studies outside EU who used similar terminology on NCs and HCs. In total, 125 articles were found to be relevant for further analysis. The results showed that consumer characteristics such as familiarity, nutritional knowledge, motivation, and demographics affected choices. Extrinsic product characteristics, such as price, brand, colour, packaging shape and NCs and HCs, affected purchase decisions. Taste was the most important intrinsic characteristic, and consumers are not willing to sacrifice the pleasure of sensory function for health benefits. Perceived healthiness, understanding of the claims, liking and use were important factors that affected consumers' personal processes in purchasing food with NCs and HCs. A challenge for future research is to consider exploiting new technologies and more realistic experimental methods to provide information that represents as close as possible consumers' behaviour in real-life situations.

1. Introduction

Consumers' food choices and interests in leading a healthy lifestyle have increased continuously in recent years (Steinhauser and Hamm, 2018). The health-related benefits of food products can be communicated by various means (e.g., traffic light systems, symbols, logos etc.). However, many manufacturers choose nutritional claims (NCs) and health claims (HCs) to help consumers make healthy food choices. Based on the EU Regulation No. 1924/2006, NCs indicate that a food has certain nutritional properties, while HCs indicate the relationship between food with nutritional properties and the health effects. A NC is not the same as a HC. Fig. 1 reports the specific definitions for the different claims within the EU. The EU however, was not the first jurisdiction to regulate statements related to the nutritional content of implied health effects of food ingredients. Already in 1991, the "Food for Specific Health Uses" (FOSHU) system was first developed in Japan (Ohama et al 2006) and other countries followed in the years thereafter, among others including Australia and New Zealand, Brazil, Canada, China, Mexico, the Republic of Korea and the United States of America (De Boer and Bast, 2015). Even though globally, similar terminology is used to define NCs and HCs, regulatory differences exist in what claims are allowed on food products or other categories of health-enhancing products (De Boer and Bast, 2015; Domínguez Díaz et al., 2020). In most countries, claims need to be based on scientific evidence, but in Europe specifically, NCs and HCs need to be authorised prior to their usage on the market (De Boer and Bast, 2015; Hobbs et al.,

Abbreviations: NCs, nutritional claims; HCs, health claims;; EU, European Union; FOP, front of pack; FFs, functional foods; WTP, willingness to pay; WTU, willingness to use

* Corresponding author at: Unidad de Economía Agroalimentaria, CITA, Avda. Montañana 930, 50059 Zaragoza, Spain.
E-mail addresses: pballco@cita-aragon.es (P. Ballco), agracia@cita-aragon.es (A. Gracia).

https://doi.org/10.1016/j.foodqual.2022.104634
Received 15 October 2021; Received in revised form 15 April 2022; Accepted 18 May 2022
0950-3293/© 20XX

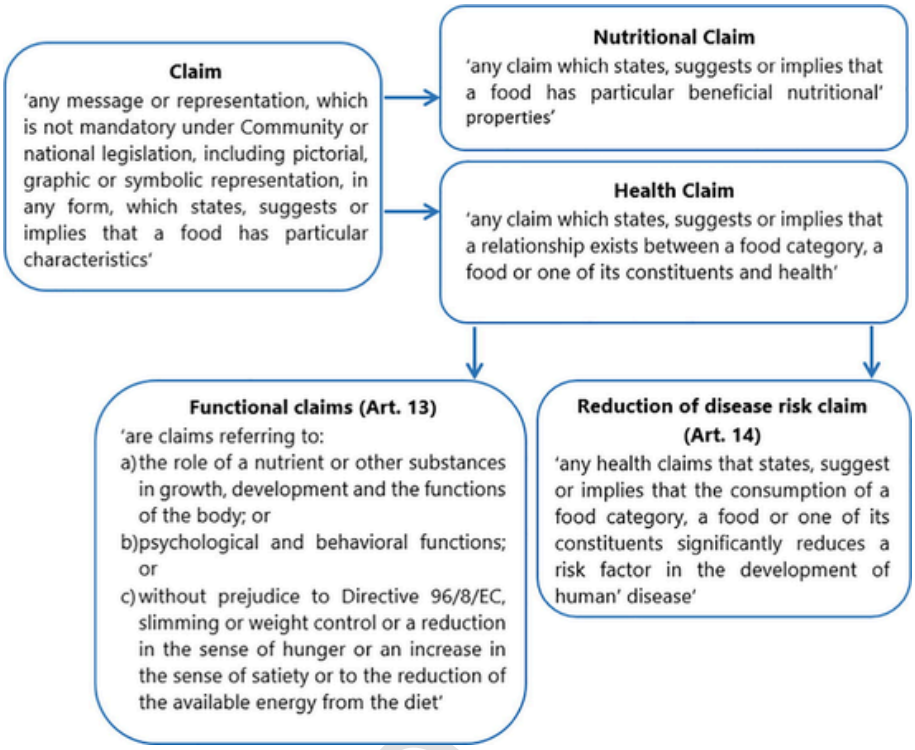

Fig. 1. Claim, nutritional and health claim definitions (based on Regulation No. 1924/2006).

2014). Since most studies found in this research were conducted within the EU, we decided to use as a study screening period the year 2006, when the law on NCs and HCs was harmonized in the EU, until September 2020. We use the same study screening period to select studies outside the EU as well, and more precisely, include only studies that used a similar terminology as the one used in Regulation No. 1924/2006 on NCs and HCs for further analysis.

The specific nutritional content of food products expressed by NCs (e.g., 'fat-free', 'source of calcium' etc.) may be of interest to a specific group of consumers particularly concerned with the nutritional aspects of their diet choices. Whereas, the health properties of the food products highlighted with HCs, could attract different consumers that are more interested in the direct link between food and health (e.g., Calcium is necessary for maintaining bones under normal conditions). Since the harmonization of the EU legislation on NCs and HCs, new food products are continuously being launched in the EU, and competition among brands and food categories bearing NCs and/or HCs on the front of pack (FOP) is becoming more intense (Ares and Gámbaro, 2007; Hoefkens and Verbeke, 2013). For this reason, research into consumer behaviour is crucial in the development of foods that bear NCs and/or HCs.

Previous studies have shown that NCs and HCs have a positive effect on consumer preferences and purchase behaviour (Ballco et al., 2019; Ballco et al., 2020a; Ballco et al., 2020b; Ballco and de-Magistris, 2018; Ballco and de-Magistris, 2019; Barreiro-Hurlé et al., 2010a; Barreiro-Hurlé et al., 2010b; Jurado and Gracia, 2017; Kaur et al., 2017). By contrast, others reveal that NCs and HCs have little to no effect on increasing consumer preferences and/or their willingness to pay (WTP) (Aschemann-Witzel and Grunert, 2015; Bialkova et al., 2016; Lähteenmäki, 2013; Orquin and Scholderer, 2015; Stancu et al., 2017; Van Buul and Brouns, 2015). Some studies report even lower purchase intentions (Berning et al., 2011; Kiesel and Villas-Boas, 2013). This mixed evidence has also been discussed in the results of several studies (Annunziata and Vecchio, 2013; Hieke et al., 2015; Lähteenmäki, 2013; Steinhauser and Hamm, 2018), but the absence of a consensus in the results of studies on consumer preferences concerning NCs and HCs is a complicated matter that requires further investigation. This review research aims to bring forward and summarize determinants of the effects of NCs and HCs on consumer preferences and purchase behaviour. To reach this main objective, an adapted theoretical framework from two pioneering studies (Fernqvist and Ekelund, 2014; Grunert and Wills, 2007) is used. This divides the determinants of the effects of NCs and HCs into three categories (consumer characteristics, product characteristics, and consumers' personal processes).

This review considers NCs and HCs that are explicitly labelled on the FOP in written form, mainly as similarly defined in the EU Regulation No. 1924/2006, and does not consider symbols, nutrition fact tables and/or labels present on the back of the pack, guideline daily amounts, multiple traffic lights, star ratings or other types of labelling formats. The research also considers studies outside the EU that explore consumer behaviour on food products with NCs and HCs with a similar terminology (e.g., low fat, low salt) as the one used in Regulation No. 1924/2006 on NCs and HCs for further analysis. Considering the increasing market demand for food with NCs and HCs, as well as the increasing number of consumer studies, there is a need to review the growing knowledge base on consumer behaviour towards these claims. There have been some previous attempts to bring forward and summarize the main effects of choosing food products with health benefits. These attempts, however, have mainly examined the overall consumer preferences for functional foods (FFs) with different formats of labels, including labels for genetically modified and organic products (Kaur et al., 2017; Miller and Cassady, 2015; Mogendi et al., 2016; Siró et al., 2008). Only the review by Steinhauser and Hamm (2018) examines consumer preferences and choice behaviours concerning NCs and HCs, using a different approach and a different theoretical framework from ours. We build our study based on this research. Besides the extrinsic attributes of a food product, we also consider intrinsic attributes such as taste that affect the purchase of food products with NCs and HCs. Although this review considers the EU legislation as the baseline legislation since most studies found were conducted in the EU, the aim is to bring forward and summarize the determinants of the effects of NCs and HCs on consumer preferences and purchase behaviour. Therefore,

we also include studies outside the EU that explore consumer preferences and behaviour for NCs and HCs with a similar terminology as the one used in Regulation No. 1924/2006 on NCs and HCs as well. Including cross-border studies will provide a better comparison of consumer preferences and their behaviour, especially for consumers from countries that have used NCs and HCs a long time before their use in the EU countries, which have a high level of familiarity with these claims.

2. Theoretical framework

Before mentioning the studies found, it is important to consider the types of effects that are possible and of interest. For this purpose, we developed a theoretical framework, that is based on *consumer decision making* and *attitude formation and change.* Research on *consumer decision-making* deals with processes that determine product choice in a situation that mimics a real-life purchase, where multiple options are available, and explores how choice is affected by the attributes/information of the choice alternatives (Bettman 1979; Bettman et al., 1998). Additionally, research on *attitude formation and behavioural change* deal with how consumers process the information when exposed to it, whether the information has a meaning for them, and whether it has a positive or negative significance to them, which is a prerequisite to affect their choice behaviour (Grunert and Wills, 2007; McGuire 1985; Petty and Cacioppo 1986). The theoretical framework in Fig. 2 is developed considering these two streams of research. The basic structure considers the classical step model of consumer decision-making (e.g., Engel et al. 1968) and a model for predictive measurements of communication effects (e.g., Lavidge and Steiner 1961). The main reason for basing our review on this approach is that this framework explains the consecutive steps from label exposure to food choice in a detailed way including the extrinsic and intrinsic characteristics of the food product. This framework has been also proven to be a valid tool when exploring consumer preferences and behaviours of credence quality cues such as NCs and HCs and sustainability labels (Fernqvist and Ekelund 2014; Grunert et al., 2014; Grunert et al., 2010; Grunert and Wills, 2007).

There is a hierarchy of stages that a consumer goes through before making a purchasing decision, which begins with search and exposure and ends with the final purchasing behaviour of the food with NCs and HCs (Fig. 2). Fernqvist and Ekelund (2014) use the consumer quality perception framework to explain the determinants for how the quality attributes of a physical product are formed by the quality cues coming from the product's intrinsic and extrinsic characteristics (Steenkamp, 1990). However, search and exposure to quality attributes do not necessarily imply that the attributes are perceived, understood, and/or are likely to be used in the decision-making process. Grunert and Wills (2007), in their theoretical framework, suggest that, besides various consumer characteristics such as interest, knowledge and demographics that affect search and exposure towards food with NCs and HCs, there are some other consumer characteristics, such as perception, understanding, liking and use (summarized under 'consumers' personal processes' in Fig. 2) that influence purchasing behaviour. Considering both frameworks, Fig. 2 adapts a conceptual framework to examine the influence of consumer characteristics, product characteristics and consumers' personal processes on purchase behaviour concerning food with NCs and HCs.

Searching for the information displayed on the package of a food product is a necessary step but not a sufficient condition to consider the assimilation of the information (i.e., only part of the available information is considered as a bias that can be properly detected). Searching for the information displayed on food packages has a greater effect when the consumer is familiar with the claim, has sufficient knowledge and ability to select food based on his/her interest, and is motivated toward healthy eating. The likelihood of processing the displayed information increases if the consumer is exposed to the characteristics of the food product. Product characteristics can be intrinsic or extrinsic. An intrinsic characteristic is any information stimuli of the physical product that cannot change without altering the essence of the product itself (Poulsen et al., 1996). In the case of food products with NCs and HCs, intrinsic product characteristics are given by the combination of the health-enhancing ingredient with the type of carrier used. An extrinsic characteristic is an informational stimulus not physically part of the product (e.g., the product's label and its elements) (Grunert et al., 1996). In our case, NCs and HCs available on the labels, the brand of the product, and its package are extrinsic characteristics. Intrinsic and extrinsic characteristics work usually as tools to inform consumers about the product's properties and attract and influence consumers' purchasing decisions. The exposure to the intrinsic and extrinsic characteristics of the products has an effect on subsequent behaviour only when the consumer perceives the information, whether consciously or subconsciously. Conscious perception is expected to be stronger and to affect subsequent behaviour (Grunert and Wills, 2007). Perception then leads to understanding, which is the meaning that the consumer attaches to what he/she perceives from the claims. Consumers' understanding of NCs and HCs may be subjective or objective and may include specific inferences (detailed in section 4.3.2). After consumers have perceived, understood, and processed the information, they may like the label. Consumers may like a label either because they find the information easy to understand or because they like other characteristics of the food product (e.g., colour, brand, organic and/or sustainability, environmental factors etc.). Liking is not necessarily linked with understand-

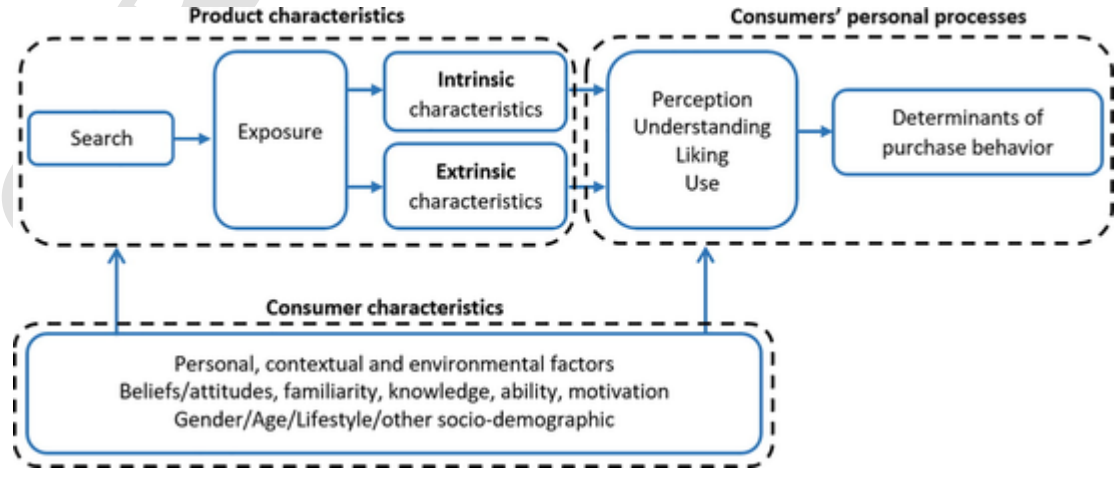

Fig. 2. Conceptual framework of the influence of consumer characteristics, product characteristics and consumers' personal processes on purchase behaviour of food with NCs and HCs.

ing, but it may have an impact on the effect of the label. Overall, a label that is liked leads to a more positive evaluation of the product even when the label is not understood (Grunert and Wills, 2007; Petty and Cacioppo, 1986). The final decision consists of the use of label information, which depending on the above mentioned will end either by purchasing the product or by searching for another one with other characteristics. The product characteristics and the steps of the personal processes, including search, exposure, intrinsic and extrinsic characteristics, perception, understanding, liking and use, will be influenced by several factors, which in Fig. 2 are defined under consumer characteristics. Kotler et al. (2013) mention four sets of consumer characteristics (i.e., personal-related factors) that influence the consumer decision-making process. These include personal (demographics, personality, lifestyle), psychological (familiarity, knowledge, perceptions, motives, attitudes, involvement), cultural (social class, reference group), and social factors (family, reference groups). In addition to consumer characteristics, environmental factors and product-related factors may influence the process (Kotler et al., 2013). In this review, we will mention the most prominent factors that have been discussed in the literature and are likely to play a role, based on general consumer behaviour theory. This framework is therefore used to extract information from, and evaluate, the studies found.

3. Methodology

To achieve the main objective of the research, we used a systematic literature review methodology from social sciences to select articles from online academic databases. Compared to narrative reviews, this systematic literature technique has the advantage of being more explicit; it is a more accurate selection process that involves a multi-step procedure similar to that used in research surveys (Bimbo et al., 2017; Petticrew and Roberts, 2006). Studies published in academic journals in the field of NCs and HCs were retrieved and classified for the selection of the determinants of the effects of NCs and HCs on food choices, and an inventory of four relevant online databases (Thomson Reuters Web of Science, Science Direct, EBSCO and ProQuest) was used. The search process was restricted to research papers published in English in peer-reviewed journals from 2006 to 2020. The choice of this period was motivated by the year of establishment of EU Regulation No. 1924/2006 and the preparation of the manuscript (September 2020). As illustrated in Fig. 3, the selection process and the inclusion/exclusion criteria reduced the number of studies employing structured queries developed using Boolean operators and a set of keywords.

Papers on other related topics, like medical or clinical trials related to nutrition labelling, were not included. Additionally, books, book chapters, revised editions of books, conference papers, editorial notes and commentaries, and articles in other languages were excluded from the research. The search terms needed to be linked to the various topics covering NCs and HCs. The following key terms were used to search the databases – "nutrition claim" AND/OR "health claim" AND "consumer" (for all texts in the title, the abstract and keywords) OR 'health label' OR 'nutrition label' OR 'nutritional claims' OR 'perception' OR'attitude' OR 'consumption' OR 'acceptance' OR 'understanding' OR 'behaviour' OR 'purchase' OR 'knowledge' OR 'motivation' were searched for in the title, the keywords, and/or the abstract of the article. It is worth mentioning that since we considered the EU legislation to narrow the wording terminology between EU and non-EU countries and the period of selecting the studies (2006–2020), many studies were not selected. In addition, studies that collected their data before 2006 and were published after this year, were not included. The search output initially included 1353 articles: 193 identified via Web of Science, 207 via EBSCO, 530 via ProQuest, and 423 via ScienceDirect. In the first step, the language of the study, the type of publication (i.e., research paper or review), and the focus of the study not being a medicinal or clinical trial were used as selection criteria. In the second step, the titles and abstracts of the remaining 673 papers were inspected, and duplicates and studies that did not include consumers and consumer behaviour were excluded. By duplicates, we mean exact copies found during the search process in the online databases (Thomson Reuters Web of Science, Science Direct, EBSCO and ProQuest). In the third step, the remaining 168 studies were further reduced by excluding 43 papers that did not include similar terminologies of NCs and/or HCs and 19 literature reviews. The final list of the 125 articles, and a summary of their key findings, are reported in the appendix in Table A1.

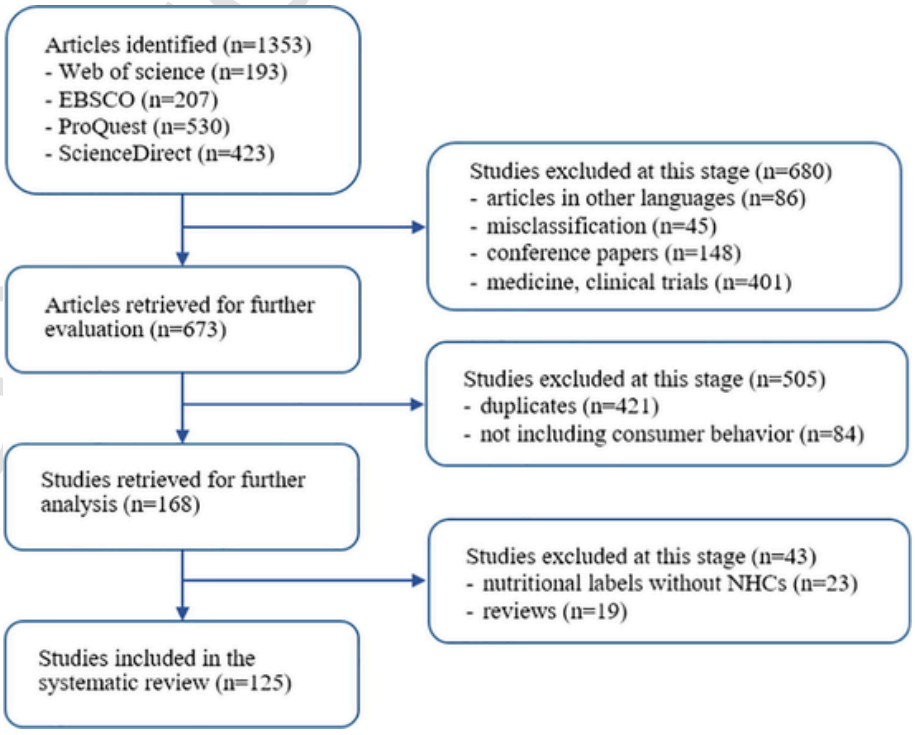

Fig. 3. Process for selection of papers.

Evidence from previous studies indicates that food products bearing NCs and HCs are seen as healthier than food without claims (Aschemann-Witzel and Hamm, 2009, 2010; Ballco et al., 2019; Ballco et al., 2020a; Moon et al., 2011) for which consumers are willing to pay a premium (Ballco et al., 2020b; Ballco and de-Magistris, 2018, Ballco and de-Magistris, 2019; Barreiro-Hurlé et al., 2008; Barreiro-Hurlé et al., 2010a; Barreiro-Hurlé et al., 2010b; de-Magistris et al., 2016; de-Magistris and Lopéz-Galán, 2016; Jurado and Gracia, 2017; Van Wezemael et al., 2014). However, although consumers express positive attitudes towards food with NCs and HCs, their purchase intentions do not always match their stated views, because there are other factors (such as consumer characteristics, product characteristics and consumers' personal processes) that interfere in the process of deciding to purchase (Fig. 2).

3.1. Consumer characteristics

3.1.1. Product-related factors

Previous research finds a tendency for NCs and HCs to be perceived more positively by consumers when linked to products with a positive health image (e.g., yoghurt) (Dean et al., 2007; Lähteenmäki et al., 2010; Siegrist et al., 2008; Van Kleef et al., 2005). Dutch consumers reported HCs to be more attractive on yoghurt and brown bread and less attractive on meat and chewing gum (Van Kleef et al., 2005). While consumers view certain food categories as more suitable than others to carry NCs and HCs, there is no consistency as to which is the most appropriate product category. Nutritional and health claims are not by default transferable across food categories, and natural combinations between a functional ingredient and the carrier product seem to be preferred (Krutulyte et al., 2011; Teratanavat et al., 2006; Lähteenmäki et al., 2010). In addition, HCs on different carrier products perform differently in various countries in terms of perceived healthiness. While respondents in Finland, Germany, Italy and the UK preferred bread and yoghurt over the cake as the carrier product, the perceived healthiness of bread scored higher in Germany and Finland than in the UK and Italy (Saba et al., 2010). The fact that people find NCs and HCs on certain products more acceptable than on others, does not imply that the overall attitude will be more positive because of that claim. Several studies show that yoghurt (Ares et al., 2008), juices (Jesionkowska et al., 2009; Verbeke et al., 2009), honey (Ares and Gambaro, 2007) and low-fat foods (Lyly et al., 2007), that tend to be perceived as healthy *per se*, do not benefit from an enrichment with a functional ingredient. Conversely, certain food categories with a less 'healthy' image (e.g., spreads, mayonnaise) benefit from carrying HCs (Ares et al., 2008; Barreiro-Hurlé et al., 2010b).

3.1.2. Environmental factors

Parallel to the trend towards healthier food, a trend towards more environmentally friendly or 'green' food has emerged (Aschemann-Witzel et al., 2013a; Aschemann-Witzel et al., 2013b). Several studies indicate that consumers are becoming more sensitive to sustainability issues and are more aware of the effect that their diets may have on the environment in the long run (De Marchi et al., 2016). This is also one main reason (besides health) why they value environmentally friendly attributes such as 'organic', and 'carbon trust' displayed on labels (De Marchi et al., 2016). However, to the best of our knowledge, few studies have considered simultaneously the effect of environmental factors on NCs and HCs, or that has combined different types of FOP claims with NCs and HCs (Biondi and Camanzi, 2020). One example is the work of Cagalj et al. (2016) on organic products who found that the claims related to the environmental and health dimensions equally increased the WTP for the product. Biondi and Camanzi (2020) explored consumers' perception of NCs and their positive environmental impacts. Findings show that consumers exposed to NCs enhanced the overall positive perception of not only the product's naturalness and healthiness but also the appreciation of products' environmental friendliness as well. Aschemann-Aschemann-Witzel et al. (2013a), Aschemann-Witzel et al. (2013b) who examined consumer preferences for organic foods with NCs and HCs show that occasional organic buyers were more likely to choose products with NCs and HCs. Conversely, two consumer studies show that products with HCs are perceived as less natural and environmentally friendly because most examples known to consumers are in fact of the type where the functionality is derived from technology-based enhancement, modification, removal or addition (Kahl et al., 2012; Lähteenmäki et al., 2010).

3.1.3. Attitudes and beliefs

Consumers' attitudes and beliefs determine their responses to NCs and HCs. In a study by Verbeke et al., (2009), the general attitude towards food products with health benefits had the strongest effect on how positively NCs and HCs were rated. This has been named the 'congruence with own beliefs' effect (Jesionkowska et al., 2009; Lähteenmäki et al., 2010; Wills et al., 2012). Consumer belief in the positive relationship between diet and health may be important in shaping demand for food with NCs and HCs. For this reason, studies suggest that claims who address a topic of personal relevance have more consumer appeal (Dean et al., 2007; Lalor et al., 2009; Verbeke et al., 2009). The study by Dean et al. (2007) show that the self-reported need to pay attention to health was the most important factor affecting how people see the particular product bearing HCs. Participants who worry about their health saw more benefits in all the products tested than those who do not look after their health. Therefore, indicating that perceived susceptibility to illness and personal relevance play a significant role in the perception of foods with HCs. Consumers who do not appreciate the impact of their diet on health will subsequently be more negative concerning NCs and HCs (Lalor et al., 2011a). In other words, health status does not necessarily lead to a belief of the NCs and HCs relevance. However, it should be noted that self-reported need to pay attention to health and objectively defined health status as assessed by a physician are two different points that do not necessarily correlate. Overall, female gender, a general interest in health and higher socioeconomic status tended to enhance personal relevance, and thus lead to more favourable attitudes towards HCs (Ares et al., 2008; Ares et al., 2009; Sabbe et al., 2009).

3.1.4. Familiarity

The concept of familiarity is related to the consumer's previous experiences with the product and with the NCs and HCs. The majority of studies found in this review suggest that a consumer's familiarity with the product and the NCs and HCs is linked to positive preferences (Annunziata and Mariani, 2019; Benson et al., 2018, 2019; Cavaliere et al., 2015; Dean et al., 2012; Grunert et al., 2009; Hodgkins et al., 2019; Hung et al., 2017; Hung and Verbeke, 2019; Orquin, 2014; Verbeke et al., 2009; Wong et al., 2014). By contrast, Banks et al. (2018) find that, in five European countries, the strength of the inferences about health benefits that a consumer draws from HCs is predicted independently by the strength of the trust in the HC, but not by familiarity with the claim.

Independently, several studies that examine consumer behaviour toward food with NCs and HCs report that consumers have higher preferences for food products with familiar claims such as calcium and vitamin C than they do for foods with less well-known nutrients such as β-glucans (Ares et al., 2009; Carrillo et al., 2012a; Krutulyte et al., 2011; Krystallis and Chrysochou, 2012; Miklavec et al., 2015; Van Trijp and Van der Lans, 2007). Additionally, NCs and HCs receive a more positive evaluation from consumers on food products that are the typical carriers of such claims (yoghurt, breakfast cereals, margarine, cheese and breakfast biscuits) (Ballco et al., 2019; Ballco et al., 2020a; Ballco et al., 2020b; Ballco and de-Magistris, 2019; Barreiro-Hurlé et al., 2010b; Carrillo et al., 2012a, 2012b; de-Magistris and Lopéz-Galán, 2016; Dean et al., 2012; Jurado and Gracia, 2017; Lalor et al., 2011b; Saba et al.,

2010; Verbeke et al., 2009; Williams et al., 2008). These results suggest that, when searching for food products with NCs and HCs, consumers use their previous knowledge. Another important factor, mentioned in the study by Steinhauser and Hamm (2018), is that familiarity does not only vary depending on the country but also depends heavily on the time over which consumers are exposed to the claim. For example, compared to European consumers, some studies conducted in the USA find that consumers have more positive attitudes towards food with NCs and HCs, which may be because they have been familiar with these claims since the 1980 s, while European consumers have only seen them since the 2000 s (Aschemann-Witzel and Grunert, 2015). Therefore, consumers' familiarity with food categories and the varieties of NCs and HC varies not only between countries such as the USA and different European counties (Van Trijp and Van der Lans, 2007) but also over the time during which consumers are exposed to them (Skaczkowski et al., 2016; Steinhauser and Hamm, 2018).

3.1.5. Nutritional knowledge

When consumers observe the packaging of a product, they use internal and external information. External information consists of the information that is provided on the food packaging (Miller and Cassady, 2015), while internal information consists of the knowledge (in our case, the nutritional knowledge) of the consumer, which is a fundamental factor that influences the search for and processing of information (Aschemann-Witzel and Grunert, 2015; Steinhauser and Hamm, 2018). Nutritional knowledge is divided into subjective nutritional knowledge, which refers to what a consumer believes they know about nutrition, and objective nutritional knowledge refers to what is stored in consumers' memory (Moorman et al., 2004). In their study, Ares et al. (2008) find that consumers with high objective nutritional knowledge evaluate food products with NCs and HCs to be healthier than consumers with low objective nutritional knowledge do because the former have a better understanding of the health effects of HCs. This result is also reflected in the outcomes of Petrovici et al. (2012), who suggest that consumers with high objective nutritional knowledge are prone to read the HCs on products more often than consumers with low objective knowledge. For Serbian consumers, Mitić and Gligorijević (2015) detect an overall low level of objective nutritional knowledge, but a positive correlation between consumers with the lowest level of knowledge and consumers with health problems. In Italy, Annunziata and Mariani (2019) indicate that objective knowledge of HCs is higher than that of NCs and has a positive relationship with the education level of consumers. By contrast, Andrews et al. (2009) find that consumers with a high objective nutritional knowledge evaluate snack bars with NCs and HCs less favourably than consumers with low objective nutritional knowledge. Likewise, Miller et al. (2011) observe that there are backlash effects, which cause children to make unhealthier choices when NCs and HCs are made about their food choices after undergoing an education programme on nutrition. Three studies report no influence of objective knowledge on the perception or the purchase behaviour for food with NCs and HCs. More precisely, Lalor et al. (2009) identify no influence on the purchase behaviour of consumers concerning food products with NCs and HCs. Barreiro-Hurlé et al. (2010a) find no difference in the stated use of NCs and HCs while shopping between groups with different levels of objective nutritional knowledge. Finally, Orquin (2014) reports that the level of objective nutritional knowledge does not influence the perception of NCs and HCs.

Regarding subjective nutritional knowledge, Baglione et al. (2012) find that nutritional knowledge positively affects the purchase of mushrooms with HCs. Likewise, eight studies find that subjective nutritional knowledge positively affects the purchase and consumption of food with NCs and HCs (Benson et al., 2019; Cavaliere et al., 2015; Gracia et al., 2007; Hung et al., 2017; Lu, 2015; Øvrum et al., 2012; Steinhauser et al., 2019a; Tan et al., 2016). Conversely, Cavaliere et al. (2016) notice a negative relationship between nutritional knowledge and consumers' interest in NCs and HCs, while Coleman et al. (2014) determine no effect on the intention to purchase bread with HCs in the UK.

3.1.6. Ability

Ability is the proficiency or skills in comprehending information (Maclnni and Jaworski, 1989) and is associated with the accuracy of using health-related information such as NCs and HCs (Moorman and Matulich, 1993). Low levels of ability pose a challenge in encoding and understanding the health message that NCs and HCs intend to deliver. Ability can be related to the actual knowledge and competencies that the recipient has that is relevant to the NCs and HCs. The research of Grunert et al. (2011) indicates that people who are more knowledgeable about food and health will find it easier to process HC information than people with less relevant knowledge. Besides knowledge, the ability also has a positive relationship with motivation (Hung et al., 2017). Studies suggest that the interaction of motivation and ability influences consumers' health behaviours (Moorman and Matulich, 1993). A high level of health information processing is the result of high motivation and ability (Maheswaran and Sternthal, 1990). When motivation and ability are both at high levels, consumers are expected to engage in central route processing (Petty and Cacioppo, 1986), where changes in attitude will last longer and have a stronger predictive power to subsequent behaviours (Cacioppo and Petty, 1982). Conversely, low motivation and ability will result in peripheral processing, with the risk of inferences and less stable effects on attitude and behaviour (Hung et al., 2017).

3.1.7. Health motivation

The motivation for healthy eating has been defined as the desire of consumers to process health-related information (Moorman, 1990), and it strongly influences how consumers advance in their search for exposure to health information for processing, attitude formation and the final purchase of the product (Mitchell, 1981). Stronger motivation is likely to result in a greater effort to understand the meaning of labels, in information processing with greater depth, and in a greater likelihood of the labels being used and weighed against other attributes during the decision-making (Grunert et al., 2014). The research of Bialkova et al. (2016) illustrates that the effectiveness of NCs and HCs on FOP labels depends on consumers' health motivation and on whether the product is perceived to be healthy. One possible reason that motivates consumers to purchase healthier food is that they are suffering from a disease (e.g., high blood cholesterol) (Lähteenmäki, 2013). Overall, consumers who perceive their health status to be poor show a higher interest in food with NCs and HCs (Cavaliere et al., 2015). These results are confirmed by the findings of three studies who suggest that consumers with a self-reported health problem (e.g., high blood cholesterol), prefer products with HCs referring to the disease and perceive these foods to be more beneficial for them (Dean et al., 2007; Lalor et al., 2011a; Lyly et al., 2007). Hung et al. (2017) find that, across ten European countries, motivation to process information emerges as a key determinant of consumers' use of HCs. Loebnitz and Grunert (2018) advise that, in Germany, the interaction effect of NCs and perceived benefits depends on the consumers' health motivation. Consumers who are concerned about their health present higher purchase intentions for hedonic food with NCs. These results are confirmed by the findings of Steinhauser et al. (2019b), who suggest that consumers with a higher health motivation show more interest in food with NCs and HCs. By contrast, the research of Chrysochou and Grunert (2014), which measures health motivation through advertisements, shows that consumers' purchase intentions are not influenced by the presence of NCs and HCs in food product advertisements and that consumers with a higher health motivation do not use functional claims more. Kemp et al. (2007), who examine consumers' motivation in processing NCs and HCs on food packages, also report contrary findings. The study suggests that consumers with a lower motivation are more likely to be affected

by NCs and HCs and are more likely to purchase food with these claims than consumers with higher motivation, who are less likely to rely only on NCs and HCs.

3.1.8. Socio-demographic characteristics

Research that examines consumer preferences for food with NCs and HCs indicates that older consumers, who also have a higher chance of having a health condition, show greater interest than younger individuals in choosing food with NCs and HCs (Ares et al., 2009; Cavaliere et al., 2015, 2016; Dean et al., 2012; Grunert et al., 2010; Hoefkens et al., 2011; Jurado and Gracia, 2017; Kuhar et al., 2020; Lynam et al., 2011; Masson et al., 2016; O'Brien et al., 2012; Øvrum et al., 2012; Sabbe et al., 2009; Siegrist et al., 2008; Szakos et al., 2020; Vidigal et al., 2011; Vila-López et al., 2017). Likewise, older consumers without health issues also have a stronger intention to purchase food with NCs and HCs (Ares et al., 2009; Baglione et al., 2012; Ballco et al., 2019; Ballco and de-Magistris, 2019; Biondi and Camanzi, 2020; Gracia and Barreiro-Hurlé, 2019; Lalor et al., 2011b). Other studies demonstrate that age has no impact on consumer preferences and purchase behaviour concerning food with NCs and HCs (Annunziata and Mariani, 2019; Aschemann-Witzel and Hamm, 2010; Coleman et al., 2014; Hung and Verbeke, 2019; Kashif, 2013; Klopčič et al., 2020; Lalor et al., 2011a; Nobrega et al., 2020; Strijbos et al., 2016), while minor differences for age are reported by another study (Urala and Lähteenmäki, 2007). Women compared to men have stronger intentions to buy food with NCs and HCs (Ares et al., 2009; Ares and Gámbaro, 2007; Ballco and de-Magistris, 2019; Benson et al., 2019; Cavaliere et al., 2015; Gravel et al., 2012; Grunert et al., 2010; Hoefkens et al., 2011; Jurado and Gracia, 2017; Lynam et al., 2011; Mitić and Gligorijević, 2015; Sabbe et al., 2009; Temesi et al., 2019; Vecchio et al., 2016; Vidigal et al., 2011). Other studies show that gender does not affect preferences or the intention to purchase food with NCs and HCs (Aschemann-Witzel and Hamm, 2010; Coleman et al., 2014; Dean et al., 2007; Hung and Verbeke, 2019; Klopčič et al., 2020; Kuhar et al., 2020; Lyly et al., 2007; Nobrega et al., 2020). One study illustrates that male consumers show more positive responses than female consumers do to HCs when purchasing extra virgin olive oil, with young people showing the most positive response (Contini et al., 2015).

Some studies find that consumers with lower education or lower-income are more interested in buying food with NCs and HCs (Barreiro-Hurlé et al., 2010a; Benson et al., 2018; Strijbos et al., 2016; Temesi et al., 2019). Others find that consumers with a high educational level and medium–high income show more interest in food with NCs and HCs (Cavaliere et al., 2016; Mitić and Gligorijević, 2015; Øvrum et al., 2012; Prieto-Castillo et al., 2015), while other authors suggest that education does not affect preferences (Contini et al., 2015; Gracia and Barreiro-Hurlé, 2019; Hoefkens et al., 2011; Jurado and Gracia, 2017; Nobrega et al., 2020).

3.2. Product characteristics

3.2.1. Search and exposure

Only labels to which consumers are exposed can be expected to have an impact on their search for food with NCs and HCs (Grunert and Wills, 2007). Consequently, searching for a label followed by being exposed to it are the first steps in information processing that will possibly lead to informed healthy food choices. However, when shopping, time constraints may prevent a consumer from attending to the information made available on food products, as many choice decisions are made within a few seconds; not all the information provided on the product's FOP is therefore noted (Milosavljevic and Cerf, 2008). Another reason that affects searching for and being exposed to food with NCs and HCs is that consumers are overwhelmed with information on the FOP of food products. In this regard, Verbeke (2005) suggests that overloading the package with information makes it more difficult to extract and process the information of interest and may even lead to confusion. Likewise, Verbeke (2008) suggests that consumers may apply heuristics to simplify their decisions, and when selecting food may not attend to all the product attributes displayed. It is also common that, because of information overload, consumers only partially process food information, and sometimes they are unaware of its presence on the label (Oliveira et al., 2016; Wedel and Pieters, 2008).

Taken together, this evidence indicates that packaging cues and the attention that consumers pay to the information play a key role in the effectiveness of food labelling systems. In their study, Vila-López et al. (2017) suggest that when consumers search for low-fat food products, visual clues such as size, colours, and images are more important than informational cues such as label design, understandable words, and size of letters. Similarly, the physical appearance of the FOP is considered a relevant factor that attracts attention and influences the intention to purchase low-fat products (Küster-Boluda and Vila-López, 2017, 2020). Findings from other studies suggest that some FOP nutrition labels are more effective than others in their exposure, as they capture the attention of consumers more effectively. For example, Carrillo et al. (2014) examine the perception of symbols and their relative importance when combined with verbal HCs in Spain and Denmark. Overall, the participants in both countries perceive the symbols in a similar way, but symbols on the FOP are considered more important than the verbal HC. Some authors suggest that, compared to other types of nutrition labels (e.g., daily intake guidelines, health star ratings, and multiple traffic lights), HCs do not produce a positive bias, while other FOP labels do, with the daily intake guidelines being the most likely to elicit this bias (Talati et al., 2016a; Talati et al., 2016b). Since the textual format of NCs and HCs may not be very attractive in the process of search and exposure, some authors have used eye-tracking technology to measure whether consumers visually pay attention to these claims on the FOP of food products and whether their visual attention is related to the final choice of the food product. The overall findings suggest that the longer a consumer visually attends to a specific claim, the more likely he/she is to purchase the respective product with NCs and/or HCs (Steinhauser et al., 2019a; Ballco et al., 2019; Ballco et al., 2020a). However, visual attention to health labels is not a predictor of healthy choices. Attention to health labels might indicate an interest in an unfamiliar food label, but it does not necessarily indicate that a healthy food choice will be made (Fenko et al., 2018).

3.2.2. Extrinsic and intrinsic characteristics

Within the search process, consumers are exposed to food attributes/characteristics that are classified as either intrinsic or extrinsic characteristics. Extrinsic characteristics are not part of the physical product and can be changed without altering its physical characteristics (Olson and Jacoby, 1972). Examples of extrinsic attributes that can influence the decision to purchase a food product and that can easily be evaluated by consumers during the purchase decision-making process include brand, price, and packaging layout, while other extrinsic attributes are unobservable (e.g., NCs and HCs, or organic and sustainability claims) and must be described (Fernqvist and Ekelund, 2014). Intrinsic characteristics, on the other hand, are product attributes that cannot be changed without altering the physical characteristics of the product itself (Olson and Jacoby, 1972). Examples of intrinsic attributes include sensory properties (e.g., taste, texture) and the chemical and physical properties of food. Sensory attributes are also known as experience attributes because consumers must experience the food to evaluate them (Asioli et al., 2017). Exploring the impact of intrinsic and extrinsic attributes enables researchers to obtain more complete and realistic information about consumer behaviour in real-life purchase situations (Grunert, 2015).

3.2.2.1. Extrinsic product characteristics. Apart from the product's brand, price, packaging, and organic and sustainability labels, other

extrinsic attributes of interest to us are the NCs and HCs available on the FOP. These attributes usually work as tools to inform a consumer about the properties of the product and attract and influence the decision to purchase the food product.

First, price is one of the most important attributes influencing the purchase of food with NCs and HCs (Ballco and de-Magistris, 2019; Banovic et al., 2019; Krystallis and Chrysochou, 2012; Lalor et al., 2011a; Lalor et al., 2011b; Stojanović et al., 2017). Overall, consumers are price sensitive and do not like paying high prices to purchase food with NCs and HCs. Some studies confirm that the lower the price, the higher the perceived healthiness of food with NCs and HCs and the higher the likelihood of the product being purchased (Biondi and Camanzi, 2020; Steinhauser et al., 2019a). By contrast, other studies find that consumers are willing to pay higher prices for food products with NCs and HCs (Ballco et al., 2020b; Ballco and de-Magistris, 2018; Ballco and de-Magistris, 2019; de-Magistris et al., 2016; de-Magistris and Lopéz-Galán, 2016; Gracia et al., 2009; Lemken et al., 2017; Lyly et al., 2007; Marette et al., 2010; Øvrum et al., 2012; Van Wezemael et al., 2014; Vecchio et al., 2016; Viscecchia et al., 2019).

Besides price, some authors suggest that the brand name affects the choices of food with NCs and HCs. More specifically, Carrillo et al. (2012a) find that consumers' familiarity with a brand name is an important attribute that enhances the overall acceptance of biscuits with NCs and HCs in Spain. The brand is important for Uruguayan consumers when choosing cookies and crackers with NCs (Tórtora et al., 2019), for Greek consumers when choosing milk and yoghurts with HCs (Krystallis and Chrysochou, 2011), and for Indonesian, Singaporean and Thai mothers when choosing milk powder with HCs (Tan et al., 2016). The brand is, however, less important for Danish consumers when they are choosing healthier options of cheese, butter, and ready-to-eat soup (Orquin and Scholderer, 2015), and has a negative influence on German consumers when they are choosing yoghurts, muesli, and pasta with NCs and HCs (Aschemann-Witzel and Hamm, 2010). Methods of production, such as organic methods, also tend to have a positive effect on the purchase of food with NCs and HCs. For example, Aschemann-Witzel et al. (2013) point out that organic consumers choose organic food with NCs over food without claims. Similarly, Vecchio et al. (2016) show that consumers positively value organic yoghurts with HCs, while Menozzi et al. (2020) detect positive premiums for sustainable fish products with NCs and HCs. Conversely, Gineikiene et al. (2017) provide empirical evidence that scepticism of HCs is negatively related to the perceived healthiness of organic and conventional yoghurt.

Numerous authors indicate that the presence of NCs and HCs may lead some groups of consumers to make healthy food choices (Ballco et al., 2020a; de-Magistris et al., 2016; de-Magistris and Lopéz-Galán, 2016; Gracia and Barreiro-Hurlé, 2019; Marette et al., 2010; Øvrum et al., 2012; Stojanović et al., 2017). Overall, products with NCs and HCs are part of a healthy diet (Kaur et al., 2017). However, evidence regarding preferences indicates that the presence of several types of NCs and HCs does not generate any positive effects and may even generate negative effects on consumer preferences. Specifically, Ballco et al. (2020b) show that HCs related to the fibre content do not add value to NCs, suggesting that the use of the NC alone is the most effective communication on breakfast biscuits. Carrillo et al. (2012b) find that NCs raise negative preferences for biscuits. Similarly, salt-related NCs are valued negatively on packaged cheese in Spain (de-Magistris and Lopéz-Galán, 2016). In Italy, Miele et al. (2010) report that HCs on mayonnaise do not affect consumer preferences. In Slovenia, Miklavec et al. (2015) discover that consumers attach a negative preference to claims related to the metabolism of fat from yoghurts. In the USA, Miller et al. (2011) illustrate that consumers show negative preferences for NCs on breakfast cereals. Finally, in Denmark, Orquin and Scholderer (2015) detect that HCs have a negative effect on the purchase intention of cheese, butter, and ready-to-eat soup. Consumer preferences also vary between NCs and HCs. Precisely, the results of Williams et al. (2008) suggest that, overall, consumers prefer HCs to NCs. Similar findings are reported by other studies, especially for HCs about controlling the levels of cholesterol. Specifically, HCs on dairy products that prevent cardiovascular diseases by lowering or controlling cholesterol levels are well accepted by consumers (Ares and Gámbaro, 2007; Ballco et al., 2020a; Ballco et al., 2020b; Ballco and de-Magistris, 2018; Ballco and de-Magistris, 2019; Crofton et al., 2013; Landström et al., 2007). Moreover, Marette et al. (2010) find positive WTP for food with cholesterol HCs even for participants without high cholesterol problems.

Another factor that affects consumer preferences for food with NCs and HCs is whether these extrinsic attributes are labelled on healthy or unhealthy food products (Bialkova et al., 2016; Lalor et al., 2009; Lu, 2015; Szakos et al., 2020; Temesi et al., 2019; Williams et al., 2008). Several studies in the literature show that the presence of NCs and HCs lead to more positive preferences when they are labelled on the FOP of unhealthy, rather than healthy, foods (Ares et al., 2008; Barreiro-Hurlé et al., 2010b; Carrillo et al., 2012a; Gravel et al., 2012; Hartmann et al., 2008; Krutulyte et al., 2011; Krystallis and Chrysochou, 2012; Maubach et al., 2014; Miller et al., 2011). By contrast, healthy food with NCs and HCs can create suspicion, as consumers might question the purpose of making healthy food even healthier (Lähteenmäki, 2013). This is confirmed by the results of Lampila et al. (2009) that improving a healthy product by adding healthy nutrients is deemed unnecessary. Consumers state that they would like to see nutritious enhancements in unhealthy products instead.

Last, the packaging is another extrinsic product characteristic that attracts attention and can influence the purchase decisions of consumers. Among others, Ares and Deliza (2010) examine the effect of packaging attributes on consumers' willingness to purchase low-fat chocolate milk desserts. Their findings illustrate that the colour and shape of the packaging influence consumers' purchases and that brown packaging increases the willingness to purchase the product. The shape of the packaging shows mixed effects on preferences for buying a low-fat dessert.

3.2.2.2. Intrinsic product characteristics. Among the intrinsic attributes of a food product with NCs and HCs, the taste is perceived as one of the most influential purchasing factors Ballco and de-Magistris, 2019; Bialkova et al., 2016; Carrillo et al., 2012b; Lalor et al., 2011a; Romagny et al., 2017). However, the desire to consume tasty food is often in contradiction with the desire to eat healthily, leading to a widespread assumption that unhealthy food tastes better than healthy food (Suzuki and Park, 2018). The literature has illustrated that consumers intuitively believe that the less healthy a food product, the better it will taste (Hamblin, 2018; Mai and Hoffmann, 2015; Raghunathan et al., 2006; Suzuki and Park, 2018). For example, in the USA Choi et al. (2012) find that foods advertised with nutrient-content claims are evaluated as healthier but less tasty than foods advertised with taste claims. By contrast, foods advertised with taste claims are perceived to be tastier but less healthy than foods advertised with nutrient-content claims. This intuition may be partially true for food with NCs and HCs in which the fat, sugar, and salt content, which is associated with improved taste and palatability of foods, is altered (Drewnowski and Specter, 2004; Kourouniotis et al., 2016; Vadiveloo et al., 2013). However, although no previous research has directly investigated whether food with NCs and HCs diminishes or increases the 'healthy = less tasty' intuition by incorporating sensory analysis and allowing consumers to taste the food and corroborate this intuition, the indirect evidence provides mixed results. For example, for healthy food (plain yoghurt) with NCs and HCs, Ballco et al. (2020a) show that the taste of the product has a negative influence on utility for consumers. Similarly, Carrillo et al. (2012a, 2012b) suggest that non-sugar NCs raise negative taste expectations and people associate them with sugar metabolism disorders. For NCs on bread, three studies find that taste-oriented con-

sumers prefer the traditional formula for bread over the version that is low in salt (Crucean et al., 2019; Gębski et al., 2019; Kuhar et al., 2020). For potato chips and cereal bars, Bialkova et al. (2016) state that preferences for less healthy food products change depending on whether the health or taste benefits are presented, and whether NCs related to the reduced content of fat/sugar are present. Likewise, Lyly et al. (2007) detect low preferences for beverages and soups containing β-glucan HCs after tasting, regardless of the type of HC, suggesting that the taste strongly affects the willingness to use (WTU) them. For reduced-sugar nectars, Oliveira et al. (2018) suggest that health/hedonic claims do not influence the expected liking of those consumers who are not interested in sugar-reduced products: they give the same overall liking scores to regular and sugar-reduced nectars. For fruit juices, Sabbe et al. (2009) show that health-oriented consumers are more likely to compromise on taste for an eventual health benefit, though, as shown by Vidigal et al. (2011), consumers still prefer the best tasting juice and are not willing to sacrifice the pleasure of a sensory function over health benefits. Two studies find negative preferences for cheese with low-salt NCs compared to conventional cheese (de-Magistris and Lopéz-Galán, 2016; Ritvanen et al., 2010). By contrast, for soy muffins with HCs, Padhi et al. (2015) suggest that the overall liking, aroma, flavour and taste of the product with HCs increase the willingness to consume the soy muffin when compared to the wheat muffin without claims. These results demonstrate that consumers are not fully prepared to compromise on taste over health. Hence, consumers will only change their purchase behaviour to incorporate more healthy items if the taste is comparable or superior.

The results presented above do not depict clear patterns in consumers' preferences and their process of searching for and being exposed to extrinsic and intrinsic attributes. The results seem to vary according to the relevance of a specific extrinsic attribute (e.g., price, brand, colour, shape, and NCs and HCs), while also highlighting the importance of intrinsic attributes such as taste.

3.3. Consumers' personal processes

3.3.1. Perception

Perception relates to whether the intrinsic and extrinsic (e.g., NCs and HCs) characteristics of a food are valued positively, and to whether they are taken into consideration in the decision by the consumer to purchase the food. The perception of healthiness in the case of food with NCs and HCs is an important factor that influences the effects of these claims (Bialkova et al., 2016; Grunert and Wills, 2007).

The existing literature gives conflicting results on how NCs and HCs affect consumers' perceptions of healthiness during the purchase decision. More specifically, several studies indicate that the presence of NCs and HCs increases the perception that food products are healthy, and therefore their acceptance (Ares et al., 2009; Aschemann-Witzel and Hamm, 2009, 2010; Banks et al., 2018; Benson et al., 2018; Biondi and Camanzi, 2020; Choi et al., 2012; Franco-Arellano et al., 2020; Küster-Boluda and Vila-López, 2017; Miraballes et al., 2014; Saba et al., 2010; Sabbe et al., 2009; Timpanaro et al., 2020; Van der Zanden et al., 2014; Wortmann et al., 2018). The perceived healthiness of the product is sometimes even the most important factor affecting the purchase decision (Annunziata and Vecchio, 2013; Ares and Gámbaro, 2007; Bech-Larsen and Grunert, 2003; Hailu et al., 2009; Krutulyte et al., 2011; Saba et al., 2010; Williams et al., 2008). Conversely, Van Trijp and Van der Lans (2007) show that individual differences have significant but small impacts on the perceived overall healthiness of food with NCs and HCs. Hartmann et al. (2008) find no impact for NCs and HCs on consumers' perceptions of the food product, while Gineikiene et al. (2017) present a negative perceived healthiness for yoghurts with HCs. Other aspects found in the literature to affect the perceived healthiness of food with NCs and HCs are the ingredients and their combination within the product carrier (Hieke et al., 2018; Menger-Ogle and Graham, 2018). More specifically, Cox et al. (2011) and Landström et al. (2009) demonstrate that consumers' perception of the healthiness of a food product with NCs and HCs is higher when the bioactive ingredient is 'naturally added' or inherent (Aschemann-Witzel and Grunert, 2017; Dean et al., 2007; Teratanavat and Hooker, 2006). These results are confirmed by the work of Krutulyte et al. (2011), who find negative perceptions for yoghurts enriched with omega-3 because the addition of this ingredient is perceived to be artificial. On the other hand, Krutulyte et al. (2011) and Ares and Gámbaro (2007) detect positive attitudes toward dairy products enriched with calcium, rather than antioxidants and iron, since the functional component (calcium) is 'naturally' inherent in this product category. Likewise, Verbeke et al. (2009) suggest that a NCs and/or a HC about omega-3 fatty acids leads to more positive perceptions for a fish product than it does for bread. Lampila et al. (2009) also identify that, in three countries, promoting a nutrient that is 'naturally' inherent to a food product is more likely to be accepted by consumers.

Consumers may also be misled in their perception of the healthiness of food with NCs and HCs because of several factors (Kaur et al., 2017). For example, consumers may attribute excessive health benefits to a food with a particular claim (the 'magic bullet' effect) (Roe et al., 1999; Williams, 2005). They may incorrectly have a more positive perception of a product carrying an NC and/or a HC than they do of a product without a claim (positivity bias), and they may also incorrectly credit the product with positive attributes unrelated to the claim (the 'health halo' effect). Moreover, there is evidence that NCs and HCs may increase food intake. For example, Wansink and Chandon (2006) discover that participants consumed more snack food when it was labelled as 'low-fat'.

These results suggest that the effects of NCs and HCs being carried by a product depend on the product's perceived healthiness and the specific combination of the product and the claim. Misleading perceptions of food with NCs and HCs might be avoided by a correct understanding of these claims, and more detail will be given on this in the following sections.

3.3.2. Understanding

Understanding NCs and, especially, HCs is an essential element that affects informed food choices (Hung and Verbeke, 2017). Although the EU regulation requires that HCs must be understood by 'average consumers', a challenge remains as to what this implies, as understanding a HC may depend on the use of scientific versus lay terms (e.g. normal homocysteine metabolism vs. normal function of the heart), the choice of words (e.g. 'is needed for' vs. 'contributes to'), and the length of the claim (Stancu et al., 2017; Tan et al., 2016). The general consumer understanding of NCs and HCs is divided into three parts in prior research. Subjective understanding refers to the meaning that consumers attach to the perceived NCs and HCs and includes the extent to which they believe they have 'understood' what is being communicated (i.e., how easy/difficult consumers perceive the claims to be). Objective understanding is whether the meaning that the consumer attaches to the claim matches the meaning that the claim is intended to communicate (i.e., whether the consumer's understanding is in accordance with the scientific profile of the claim) (see Wills et al. (2012) for an overview on the subjective and objective understanding of HCs). Lastly, specific inferences from an HC refer to the conclusions that consumers draw from the claim, which in some cases, as mentioned in the above section (i.e., halo effect, magic bullet effect), go beyond what the claim was intended to communicate (Andrews et al., 1998).

Regarding consumers' understanding of NCs and HCs on food products, Grunert et al. (2010, p. 2) find that the degree of understanding nutrition labels depends on the product category and is higher for healthy than unhealthy foods. Likewise, Grunert et al. (2011) illustrate that consumers with a positive attitude towards food with HCs are those most likely to understand the correct meaning of the HCs and that spe-

cial attention should be paid to people who have such a positive attitude. Tan et al. (2016) show that the understanding of HCs is influenced by the familiarity of the nutrient, knowledge, the perceived relevance, the use of scientific terms, the choice of words, and the phrasing and length of the claims. The results of Bilman et al. (2012) suggest that using simple labels and re-wording (e.g., 'helps you want to eat less') improves consumers' understanding. Conversely, Stancu et al. (2017) indicate that re-wording an authorized HC or adding information to it does not improve understanding and may even decrease the understanding of the claim. Similar results are reported by two studies (Ballco et al., 2020a; Ballco and de-Magistris, 2019) that examine consumer preferences for yoghurts with three HCs that are present in the Spanish market versus yoghurts with three HCs with easier wording for the same nutrients extracted from Regulation No. 1924/2006 and (EC) No. 432/2012. The results suggest that the re-wording did not affect the choices, as consumers' utility increased when the existing wording of the HC in the market was present on the yoghurt package. Two studies also reinforce the above findings by suggesting that the re-wording of HCs has a minor effect on consumers' perception of HCs (Lähteenmäki, 2013; Lähteenmäki et al., 2010).

The overall results suggest that consumers' understanding of NCs and HCs is an important part of the information processing, and might help, but might also mislead, consumers. The wording of NCs and HCs does not have a major impact on understanding them.

3.3.3. *Liking and use*

Another effect of the processing of information may be that the consumer likes the NCs and HCs. Consumers may like certain NCs and/or HCs because they find them easy to understand and useful. Liking is not necessarily linked with understanding, but it can have an impact on the use of the NCs and HCs, as these claims might lead to a more positive evaluation of the food product, even when they are not well understood (this phenomenon is called peripheral information processing, see Petty and Cacioppo, 1986) (Grunert and Wills, 2007).

At a general level across the studies, consumers generally like the idea of a food product with improved health benefits (i.e., NCs and HCs), and they like to use these claims to guide their food choices (Gracia et al., 2007), although there is a variety of factors that might affect their use. Barreiro-Hurlé et al. (2010a) suggest that the use of nutritional information by consumers does influence their choices of healthy food, although different consumers use different types of labels. Benson et al. (2019) find that pregnant women, the elderly, people with diabetes, and people attempting to lose weight or gain muscle are potential key users of products with NCs and HCs. Cavaliere et al. (2016) suggest that the use of labelled information is mainly affected by nutritional knowledge. Grunert et al. (2011) find that an interest in healthy eating has a direct effect on the use of nutritional information in the store. In a study in ten EU countries, Hung et al. (2017) detect that motivation and the ability to process are key determinants of HC use. Hung and Verbeke (2019) identify that consumers with special diets report a higher level of HC use. In particular, HC use is higher among individuals of normal weight and lower among obese consumers. Lyly et al. (2007) and Petrovici et al. (2012) state that the taste of the product strongly affects the use of HCs. Finally, Urala and Lähteenmäki (2007) indicate that the best predictors for WTU foods with NCs and HCs are the perceived reward and the necessity for such foods. Conversely, Prieto-Castillo et al. (2015) illustrate that almost half of all Spanish consumers do not use nutritional information when buying food. Likewise, Annunziata and Mariani (2019) state that, although Italian consumers consider themselves quite capable of understanding NCs and HCs, the use of these claims is not very widespread.

4. Discussion and conclusion

The main objective of this systematic literature review was to bring forward and summarize determinants of the effects of NCs and HCs on consumer preferences and purchase behaviour. A theoretical conceptual framework was adapted based on the pioneering studies. The determinants were then categorized as consumer characteristics, product characteristics and consumers' personal processes.

Overall, in terms of consumer characteristics, the research shows that there is a positive connection between familiarity and preferences. Many studies find that the more familiar consumers are with the nutrient (e.g., fibre) and the product category (e.g., bread), the higher their preference and purchase intention towards these foods with NCs and HCs. The results reveal that consumers' familiarity with food categories and varieties of NCs and HCs does not only change between countries but also changes depending on how long the consumers have been exposed to these claims. Our results support the idea that nutritional knowledge positively affects the use, purchase, and consumption of foods with NCs and HCs, although some papers find a negative effect or no effect at all. More research is needed in this area, as there is scant literature that brings forward and summarizes determinants of the effects of NCs and HCs on consumer preferences and purchase behaviour, and most of the studies identified have used non-validated scales to assess this relationship. Consumers may be highly knowledgeable about healthy food but may lack the ability to use health-related information such as NCs and HCs. Results from the limited research regarding this aspect, show that ability is one of the main antecedents influencing the level of information processing. Hence, consumers' ability to process NCs and HCs could potentially be improved by better informing them about the EC Regulation No. 1924/2006, where NCs and HCs are authorized only when they are substantiated by scientific evidence and proven to be understood and meaningful to the average consumers. Regarding motivation, findings that are more consistent indicate that a higher motivation for healthy eating leads to stronger preferences and purchase behaviour for food products with NCs and HCs. Experiencing a health problem has a positive correlation with the intention to purchase food with NCs and HCs. Most studies indicate that older consumers and women have higher prominence in the choice of food with NCs and HCs than younger people and men. Some authors suggest that consumers with higher education and medium to high-income levels are more disposed to purchase food with NCs and HCs, yet others show that education and income do not affect preferences.

Regarding product characteristics, NCs and HCs affect search and exposure and attract consumers' visual attention to food packages with these labels (compared to packages without these claims). Price, brand, colour, the shape of the packaging, and NCs and HCs are the extrinsic attributes that have the greatest effect on the preference of consumers. In comparison to NCs, HCs lead to higher utilities and stronger consumer preferences. Consumers prefer to see NCs and HCs on unhealthy food packages instead of healthy ones, although research that combines NCs and HCs with unhealthy products is scarce and more research in this area should be conducted. A novel result of this systematic review is the inclusion of taste stimuli as suggested by the systematic review of Bimbo et al. (2017). Indeed, taste was the most important intrinsic attribute that affects the decision to purchase food with NCs and HCs. Although consumers acknowledge that food with NCs and HCs is healthier than food without these claims, they still prefer the food that tastes best and are not willing to sacrifice the pleasure of sensory function for the health benefits.

Finally, regarding consumers' personal processes, our results indicate that there is extensive literature that investigates the perceived healthiness of food with NCs and HCs, but the results are mixed. While many studies indicate that food products with NCs and HCs increase perceived healthiness, other authors contradict these findings. Consumers' understanding of NCs and HCs is an important part of the infor-

mation processing; it might help, but might also confuse and mislead consumers. Re-wording NCs and HCs do not have a major impact on their understanding. Although consumers' understanding is closely linked to their nutritional knowledge, which are both important factors acknowledged in the literature to affect the decision to purchase food with NCs and HCs, there is limited research that examines the effect of the understanding of NCs and HCs on food products. Hence, more research regarding the understanding of consumers, in particular for HCs, needs to be conducted. Regarding liking and use, there is a consensus: most studies state that consumers like and have the WTU food products with NCs and HCs, although preferences vary and depend on many factors (e.g., general health interest, health condition or illness etc.).

In summary, in the present study, many antecedents of consumer behaviour and acceptance of food products with NCs and HCs have been investigated. Some of these antecedents show contradictory results, which makes it difficult to generalize. Regardless of these contradictions, one main reason for the inconsistency might be that most research is conducted using self-reported instruments. A known limitation of self-reported instruments such as surveys and questionnaires is their susceptibility to socially desirable responses. Socially desirable responding is the tendency to give answers that make the respondent look good, or the tendency 'to stretch the truth in an effort to make a good impression' (see Martin and Nagao (1989: 72) for more information). Additionally, other reviewed studies are conducted in the laboratory. As detailed by DellaVigna (2009), laboratory experiments raise serious questions because subjects are time-inconsistent (Thaler, 1981), the results violate rational expectations (e.g., participants tend to overestimate their skills) (Camerer and Lovallo, 1999), and the experiments are likely to suffer from a social desirability bias that may deviate from actual behaviour (Fisher, 1993). One conclusion that researchers suggest to solve the problem of this mixed evidence is that future research on NCs and HCs should examine such claims on authentic packages in more realistic settings (Hieke and Taylor, 2012; Jaeger and Porcherot, 2017; Kaur et al., 2017; Lähteenmäki, 2013). The effects of NCs and HCs should be measured with actual behaviour and not just self-reported preferences (Van Buul and Brouns, 2015; Wills et al., 2012).

This research has some limitations, while it should be acknowledged that it opens opportunities for future research. First, although we aimed to provide a comprehensive picture of the determinants of the effects of NCs and HCs on consumer preferences and purchase behaviour, most findings came from studies performed in Europe (northern Europe), with a few from American countries and Australia. In addition, the wording of the NCs and HCs and the period of selection (2006–2020) considered the EU legislation on these claims. However, there were many studies that did not use these exact wording (e.g., "nutrition claims", "health claims") and others that collected their data before 2006 that merit recognition. Hence, to understand other consumer characteristics and personal processes that affect decisions to purchase food with NCs and HCs, a wider period of screening the studies and a more general wording of NCs and HCs should be used to include these studies as well. Furthermore, aspects of purchasing behaviour in other national contexts such as the Mediterranean, the Balkans, and American and Asian countries need to be included. Second, besides the consumer characteristics that are examined in our theoretical framework, the goals and emotions/feelings of the consumer and their trust in NCs and HCs are important factors (Andrade et al., 2016; Köster, 2009) that require specific attention. However, we excluded this large area of the literature from this study as it is too vast and deserves its analysis. Future studies should include consumers' goals and emotions/feelings and their trust in NCs and HCs, because these factors may change the whole process of deciding to purchase food with NCs and HCs. Finally, this review mostly considered studies that covered the official NCs and HCs as defined by the EU. However, the effects of NCs and HCs should be examined in countries with different laws governing the use of these claims, such as the USA, Australia, and Asian countries, to see how the results differ from those of the EU, even when the wording of NCs and HCs is very different.

Besides addressing the limitations of this review, future research should also consider exploiting new technologies aimed to improve the realism of discrete choice experiments, such as methods based on virtual reality, and to increase the external validity of experiments. One example might be the latest work of de-Magistris et al. (2021) who investigate the external validity of a virtual with a real supermarket using real products and economic incentives. Additionally, combining eye tracking with virtual reality technology, real choice experiments and sensory analysis would be an ideal methodology, which would replicate a real purchasing process of visually evaluating, purchasing, and consuming a food product. These new tools might also be used to corroborate the findings of survey-based research. Although it is demonstrated in the literature that real choice experiments are more realistic, leading to higher external validity, than hypothetical discrete choice experiments (Alfnes et al., 2006; Cameron et al., 2002; Chang et al., 2009; Ding et al., 2005; Johansson-Stenman and Svedsäter, 2008; Loomis et al., 2009; Lusk et al., 2008; Lusk and Schroeder, 2004; Volinskiy et al., 2007; Yue and Tong, 2009), the literature using such experiments is scant. Besides real choice experiments, to increase realism in experimental economics, Grant et al. (2020) developed a new methodology named the "basket-based choice experiment" to capture consumer behaviour. This novel approach differs from conventional hypothetical discrete choice experiments and real choice experiments because it allows respondents to choose a food item or a combination of food items to be included in their shopping basket as in a real purchase. This approach has been recently used and shows promising results, yet there are no studies available to test its external ecological validity. Therefore, another challenge for future research is to consider exploiting real choice experiments, basket-based choice experiments, sensory analysis and using new technologies to provide information that represents, as closely as possible, consumer behaviour in real-life situations.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Table A1
List of studies exploring consumer preferences for food with NCs and HCs and their key findings.

Reference	Product	Country	Analytical method	Key findings
Ares and Gambaro, (2007)	Honey, yoghurt, cream soup, caramel, and marmalade.	Uruguay	Conjoint analysis	Gender, age and motives underlying food choice affect the preferences, but it depends on the carrier and enrichment considered, suggesting that functional ingredients might not be accepted by all the consumers.
Andrews et al. (2009)	Snack bar	U.S.A.	Interviews	Beyond the effects of the ad claims and disclosures, control variables, and the linear (main) effects of the knowledge and motivation measures, there were significant effects for caloric knowledge, obesity consequences knowledge, and motivation to search for nutrition information on intent to buy the high-calorie snack bar. This implies a strengthening of the negative relationship for intent for consumers who are at the highest levels of caloric knowledge, obesity consequences knowledge, and motivation.
Annunziata and Mariani 2019	Food products	Italy	Survey	Attention to, and use of, NCs and HCs are not very widespread among Italian consumers. Although consumers consider themselves quite capable of understanding claims, when objective knowledge is detected, the level of understanding of the selected claims is quite low, with misinterpretation and confusion being generated about the real meaning of the claims for both NCs and HCs. The degree of familiarity of NCs and HCs, as well as credibility, varies according to the claim considered. Consumers' objective knowledge of claims is higher for HCs than for NCs. Better educated consumers and females are generally more likely to search for NCs and HCs. No significant differences were identified as regards age or the presence of children.
Ares et al. (2008)	Yoghurt, milk desserts, bread and mayonnaise.	Uruguay	Conjoint analysis	Three groups of consumers are identified which depend on nutritional knowledge related to diet and diseases. Consumers with low nutritional knowledge are not interested in consuming functional foods, while consumers with a high level of nutritional knowledge are willing to try foods with NCs and HCs. Lacking nutritional knowledge might limit the use of NCs and HCs, thus it is necessary to assure consumers' awareness of their health benefits.
Ares et al. (2009)	Milk desserts	Uruguay	Survey	Gender (women) and age (old) are the most positive groups toward the evaluated NCs and HCs. Besides, young people emphasize the disease-preventing claims, while older people tend to be also interested in claims that focus on short term effects on health.
Aschemann-Witzel and Grunert (2017)	Yoghurt, fruit bar, red wine, energy drink and wine gum	Denmark	Survey and experiment	Naturalness has a positive effect on attitudes. Food 'naturalness', whether perceived because of the product category or due to the phrasing of the message, can lead to more positive attitudes towards a food especially when it is regarded as a functional food category. This positive reaction is partly explained by concerns about intense agriculture and food technology.
Aschemann-Witzel and Hamm (2009)	Muesli, pasta, and yoghurts	Germany	Survey and choice experiment	Foods with NCs and HCs are generally preferred over others without these claims. Determinants of choice are the perception of the healthiness of the product, the extent of information search and the credibility of the claim.
Aschemann-Witzel and Hamm (2010)	Yoghurt, muesli and pasta	Germany	Survey and choice experiment	Products with a claim are preferred, and choices differ between food categories. Choices are positively influenced by the perception of the healthiness of the product and negatively influenced by the habitually chosen brand. Age, gender and credibility of the claim are of no importance.
Aschemann-Witzel et al. (2013)	Yoghurt, muesli, and spaghetti	Germany	Purchase experiment	Organic consumers choose organic foods with NCs over those without claims. Respondents choosing a product with a claim are characterized by being occasional organic food buyers and being less sceptical about health-related information on products.
Baglione et al. (2012)	Mushrooms	U.S.A.	Survey	Knowledge and beliefs have an effect, which varies by nutrient and nutrient cluster. Knowledge of esoteric nutrients such as Pantothenic Acid is associated with the acceptance of HCs. The targeted consumer is females who claim to be nutritionally knowledgeable and who are older.
Ballco and De-Magistris (2019)	Yoghurt	Spain	Choice experiment	Consumers positively value most claims. Three consumer segments are identified: 'HC oriented', 'NC and HC oriented' and 'indifferent'. Women (HC-oriented) display higher levels of acceptance for fat-free yoghurts and with added calcium than men do (NC and HC-oriented). HC-oriented, as well as NC and HC-oriented consumers who are older than 55 years, attach higher utilities to both types of claims compared to younger members. Taste and price are the most important attributes that affect the purchase of yoghurts.
Ballco et al. (2019)	Yoghurt	Spain	Choice experiment	The presence of NCs generally increases visual attention in terms of fixation count, which may be linked to an increased likelihood of purchasing yoghurts with NCs. The source of calcium NC obtains the highest utility and visual attention while the low-sugar NC is the least preferred claim.
Ballco et al. (2020a)	Yoghurt	Spain	Sensory analysis and choice experiment	There is a relationship between the most highly valued NCs and HCs from the stated preferences and visual attention in terms of fixation count, which affirms that the final product selection is based not only on the type of labelling but also on the visual attention that consumers pay to it. Tasting a healthy food result in a negative utility, but greater visual attention attached to NCs and HCs and a lower percentage of attribute non-attendance.
Ballco et al. (2020b)	Breakfast biscuits	Spain	Choice experiment	The simultaneous provision of a saturated fat NC with the associated HC is the most appropriate way of communicating the nutrient improvement because consumers' valuation is higher compared to a NC alone. Conversely, the HC related to the fibre content does not add value to the NC; however, it does not derive a negative valuation. Therefore, seems that, for the high fibre claim, the use of the NC alone is the most proper way to be communicated on the breakfast biscuit packages.
Banks et al. (2018)	Food products	Germany, the Netherlands, Spain, Slovenia, U.K.	Survey	The strength of inferences about health benefits that participants draw from the HCs are predicted independently by the strength of the relevant causal pathways within the causal model, and belief in the truth of the HC, but not the familiarity with the claim. Participants draw inferences about the health benefits of the nutrients by extrapolating from their causal models of health.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Banovic et al. (2019)	fresh/ chilled, smoked, and canned fish	France, Germany, Italy, Spain, U.K.	Choice experiment	The country-of-origin label "produced in own country" together with aquaculture stewardship council eco-label function better than NCs and HCs as a driver of choices. Results further point to the existence of different segments of "nutrition-conscious", "ethnocentric", "price-conscious", and "eco-conscious" consumers.
Barreiro-Hurlé et al. (2008)	Wine	Spain	Choice experiment	The resveratrol-enrichment claim positively and significantly affects the probability of selecting a red wine. The willingness to pay for this attribute is as important as the ageing of wine.
Barreiro-Hurlé et al. (2010a)	Food products	Spain	Survey	The use of nutrition information by consumers, whether this involves the fact panel or the claim labels, does influence consumer choice of healthier food products to the same extent, although different types of consumers use the various types of labels considered.
Barreiro-Hurlé et al. (2010b)	Pork Frankfurter sausage and plain yoghurt	Spain	Survey and choice experiment	Although consumers attach positive utility to most NCs and HCs, the simultaneous presence of more than one NC has a positive impact on utility in one out of nine possible cases. The promotion of multiple labels should not be considered beneficial either from a regulatory or business perspective. Consumers are WTP for NCs and HCs on less healthy than healthy products.
Benson et al. (2018)	Breakfast cereals, lasagna and yoghurt	Ireland	Survey	Familiarity with the food and trust in NCs and HCs are the most consistent significant predictors of tastiness, healthiness, and filling perceptions. Familiarity and trust are also consistent predictors of portion size selection alongside gender (men), health interest and uncontrolled eating. Education influences perceptions of some foods. Those who trust the claims choose bigger portions and view the products as tastier, healthier, and more filling.
Benson et al. (2019)	Chocolate bars, breakfast cereals, and yoghurt	Ireland	Focus groups	Products with NCs and HCs are likely to be more beneficial to individuals with health issues. Pregnant women, the elderly, those with diabetes, and those attempting to lose weight or gain muscle are potential key users of products with claims. Familiarity and knowledge and characteristics/perceptions of products with NCs and HCs are key influences on the purchasing and consuming food with NCs and HCs.
Bialkova et al. (2016)	Potato chips and cereal bars	Germany	Sensory analysis and survey	The effectiveness of FOP labels depends on consumers' health motivation and the health perception of carrier products. The healthy food, and health benefit claims perform equally well. Preferences for the less healthy food alter depending on the presence of a health or taste benefit claim and whether a nutrition label (e.g. reduced fat/sugar) is present.
Biondi and Camanzi (2020)	Vegetable oil	Italy	Survey	The FOP messages do not directly affect consumers' willingness to buy, but they influence consumers' perception of the product. The perception of healthiness positively influences consumer willingness to buy. Price is considered important when choosing food, hence consumers are WTP less for it. Adult mothers living in the southern part of Italy, aged 35–49, with a higher income, are willing to purchase this food with NCs.
Carrillo et al. (2012a)	Biscuits	Spain	Sensory analysis	Consumers are greatly influenced by the claims highlighted on the FOP, particularly NCs. Biscuits with too much information are perceived negatively. Non-sugar biscuits raise negative expectations and are associated with people with sugar metabolism disorders. Comparison of the two tasting sessions finds that the information has a negative influence on the perception of taste.
Carrillo et al. (2012b)	Biscuits	Spain	Sensory analysis	Participants are not willing to compromise taste for health even though they consider that some food components are beneficial for the diet. Brand, familiarity with the product and familiarity with the claim are important attributes in enhancing the overall acceptance of some biscuits.
Carrillo et al. (2014)	Yoghurt	Spain and Denmark	Survey	The idea of the symbols perceived by the participants is similar in both countries, but the culture influences the connotations attached to them. The symbols on the FOP are more important than the verbal information (HCs).
Cavaliere et al. (2015)	Food products	Italy	Survey	Concerning NCs, females, families with young children, and consumers with a higher nutritional knowledge pay particular attention to such claims. HCs, instead, seem to be of interest to those consumers that are older, with limited income, and with a health condition.
Cavaliere et al. (2016)	Food products	Italy	Interviews	Consumers more health motivated are more likely to undertake actions that contribute to improving their health status. Nutrition knowledge affects the use of labelled information. There is a negative relationship between nutrition knowledge and consumers' interest in both claim categories (NCs and HCs). However, level of education and income are positively related to frequent use of the nutrition facts panel and NCs and HCs. Female and older consumers are more interested in consuming food with NCs and HCs.
Choi et al. (2012)	Yoghurt, ice cream, multigrain granola bar, and chocolate chip cookie	U.S.A.	Survey	Respondents evaluated the food advertisements with nutrient-content claims as healthier than those with taste claims. They trust and preferred the claims on matched food products more than mismatched ones (e.g., calcium claims perform better than omega-3 claims in yoghurts). This match-up effect might result primarily from consumers' pre-conceived expectations about the taste and healthiness of each food. Advertisements with nutrient-content claims are evaluated as healthier but less tasty than advertisements with taste claims. Conversely, advertisements with taste claims are perceived as tastier but less healthy than advertisements with nutrient-content claims.
Chrysochou and Grunert (2014)	Milk and cheese	Denmark	Survey	NCs and HCs in food advertisements influence the perceived healthfulness of products. Consumers' purchase intention is not influenced by the presence of NCs and HCs in food product advertisements. When consumers' health motivation increases, the impact of process claims on the evaluation of food healthfulness and purchase intention becomes stronger. Yet, consumers with higher health motivation do not use functional claims more.
Coleman et al. (2014)	Bread	U. K.	Survey	Claims tend to increase the overall purchase intent. Two clusters of consumers (receptive and non-receptive to HCs) are identified. There are no significant differences in age, gender or self-reported nutrition knowledge between clusters but significant differences in emotions to HCs. Consumers who are more likely to purchase bread with a HC report more positive emotions than consumers with low purchase intention of bread with HC.
Contini et al. (2015)	Extra virgin olive oil	Denmark and Italy	Choice experiment	The relationship between the HC and choice behaviour depends on a combination of factors of an attitudinal nature. The greater relevance is for males with a positive response to HCs, with a prevalence of young people. Education does not influence choices significantly, although it has a positive effect on the interest in nutritional healthy eating.
Crofton et al. (2013)	Cereal-based snacks	Ireland	Focus groups	Consumers expect a healthy snack to be low in calories, fat, salt, sugar, and contain high levels of whole-grain, oats, bran, nuts, seeds, pulses and fruit. Healthy snacks are required to be free from artificial colours, sweeteners and flavours. Consumers want a wider choice of snacks with specific HCs such as "high fibre", "omega 3 for mental health" and "reduces cholesterol".

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Crucean et al (2019)	Bread	France	Sensory analysis and focus groups	Vitamin B4 increase the perception of salt in salt-reduced bread in the sensory tests. Potential targets are health-oriented young people, parents who want to educate children to engage in a healthy lifestyle, and people sensitive to nutritional information. Taste-oriented consumers are more sceptical of the new bread formula due to greater attachment to the traditional bread.
Dean et al. (2007)	Bread, pasta, and biscuits.	U.K., Italy, Finland, Germany	Survey	Results confirm gender and country differences in people's perceptions of benefits related to functional grain products. People prefer processes such as fortification and traditional crossbreeding to genetic modification. The differences in perceived benefits between foods with general and specific HCs are largest for staple foods than for hedonistic foods.
Dean et al. (2012)	Cereal foods	Finland, the U.K., Germany and Italy	Survey	Relevance has a strong influence on perceptions of personal benefit and willingness to buy products with HCs. The impact of relevance is stronger especially when the claim promises a targeted risk reduction with detailed information about function and health outcome. Previous experience on foods with HCs and interest in healthy eating upheld the utility of all claims (HCs and NCs). Socio-demographics factors are weak predictors of the utilities, although age is positively linked to the utilities relating to the NC.
De-Magistris and López-Galán (2016)	Cheese	Spain	Choice experiment	Consumers are WTP a premium for cheese with reduced-fat claims, and for cheese with both reduced-fat and low salt claims on the FOP. A low-salt content cheese is valued negatively. Two different consumer segments are identified. Segment 1 consists of younger consumers with a higher level of income and a high level of education. Segment 2 predominantly comprises overweight and older consumers with low levels of income and low educational levels.
De-Magistris et al. (2016)	Potato chips	Spain	Choice experiment	Obesity and body image dissatisfaction are positively correlated with the purchase behaviour of potato chips. The body image dissatisfaction of normal weight people does not influence the WTP for healthier chips. Conversely, obese people with body image dissatisfaction are WTP more for healthier chips (i.e. low-salt content potato chips).
Fenko et al. (2018)	Yoghurt	The Netherlands	Experiment	General Health Interest (GHI) moderate the effect of visual attention when time is constrained. The condition without time constraints increases visual attention to health labels for participants with high GHI, but not for participants with low GHI. However, visual attention to health labels is a poor predictor of the subsequent healthy choice. Hence, attention to health labels might indicate the interest in an unfamiliar food label, but it does not necessarily indicate a healthier food choice.
Franco-Arellano et al. 2020	Juices	Canada	Survey	FOP labelling influences consumers' assessment of product healthfulness and, to a less extent, purchase intentions. The performance of each FOP labelling scheme differs by the nutritional quality of the drink (i.e., product's 'healthfulness'). The influence of a NC is mostly driven by the type of claim presented. A disease risk reduction claims significantly increase perceived product healthfulness in healthier and less healthy drinks, while no such difference is seen with a nutrient content claim.
Gębski et al. (2019)	Bread	Poland	Survey	Salt content has higher relative importance for the participants, while the relative importance of dietary fibre content is the lowest. The relative importance of both NCs is almost equal, namely 25.5% for the fibre claim and 25.4% for the salt claim. Providing information about the salt and fibre content of bread is necessary to encourage a healthy choice, but the claims placed on bread packaging seem to be insufficient as they contribute to the avoidance of the product.
Gineikiene et al. (2017)	Yoghurt	Lithuania	Survey	Health-conscious consumers tend to discount messages about the health value of functional food and exhibit an increased willingness to buy organic food. Despite healthy positioning, functional food fails to reach health-oriented consumers. The current study provides empirical evidence that scepticism towards HCs is negatively related to the perceived healthiness of functional, organic, and conventional yoghurt.
Gracia and Barreiro-Hurlé (2019)	Cereal-based food	Spain	Survey	For the average consumer, the most important NCs are "reduced saturated fat" and "with no added sugar", and the least important claim is "low salt". The "fat avoider" group of the consumer is made of younger females with an intense consumption of pastries, cookies, and cakes. The "fibre careless" group is characterized by older males with a high proportion of households that never consume pastries, cookies, and cakes. The "fat careless" group is made of younger females with a high proportion of households that never consume pastries, cookies, and cakes. There were no differences between clusters for education, weight, health status, eating habits or use of nutritional information.
Gracia et al. (2007)	Food	Spain	Survey	Individuals who suffer health problems related to food intake are more knowledgeable about nutritional labels and are more likely to use these labels. Perceived usefulness of the information provided by nutritional labels as well as the amount of presented information affect consumer perceptions of mandatory nutritional labelling.
Gracia et al. (2009)	Breakfast cookies	Spain	Choice experiment	Although consumers value both types of nutritional information, the nutritional facts panel label is valued more than a NC. Specifically, consumers' WTP is higher for a box of breakfast cookies with a nutrition label than for a box of breakfast cookies with a "light" NC.
Gravel et al. (2012)	Oatmeal-raisin cookies	Canada	Sensory analysis and survey	Cookies are perceived as being healthier in the "healthy" condition than in the "diet" and "hedonic" conditions. The caloric content is estimated as higher by participants in the "hedonic" than in the "healthy" condition, by women than by men, and by restrained than by unrestrained eaters. Although measured ad libitum cookie intake does not differ as a function of experimental condition, overweight restrained men consume more than women did. Conversely, overweight restrained women consume less than men did.
Grunert et al. (2009)	Food	Denmark, Finland, Iceland, Norway, Sweden	Survey	Respondents differ in the type of claim preferred: one group prefers "long" claims that give the full story consisting of the active ingredient, physiological function and health benefit, whereas the other prefers "short" claims consisting of the health benefit only. Familiar ingredients are preferred to the unfamiliar ones, whereas effects of positive versus negative framing depend on the type of health benefit addressed.
Grunert et al. (2010)	Food products	U. K.	Survey	The degrees of understanding of nutrition labels are much higher than degrees of usage and depend on product category (higher for healthy than unhealthy foods). Younger people and people in higher social grades have higher levels of understanding. Interest in healthy eating has a direct effect on the use of nutrition information in the store, and it is higher for women and older people.
Grunert et al. (2011)	Yoghurt	Germany	Survey	People with positive attitude to functional foods are most likely to make risky inferences from the HC. Therefore, testing for the correct understanding of HCs should pay special attention to this segment. Demographic factors had no effect in this study.
Hailu et al. (2009)	Yoghurt, ice cream, pills	Canada	Conjoint analysis	Three segments distinguished by preferences for mode of delivery, HCs and health claim sources were identified (pill lovers 37%, yoghurt lovers 31% and pill lovers 31%). Overall, Canadian consumers strongly prefer claims verified by the government and place little value on non-verified claims made by product manufacturers. Men are significantly more likely than women to prefer a pill as the mode of delivery of probiotics.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Hartmann et al. (2008)	Candies	Germany	Survey	The stated impact of NCs and HCs on product perception considerably differs among consumers. While some consumers feel misled by NCs and HCs on products with a negative nutrient profile such as candies, others point out that such claims have no impact on their product perception or even help them to make better choices. The majority of consumers is opposed to a ban of NCs and HCs on products with a negative nutrient profile.
Hodgins et al. (2019)	Food products	Germany, the Netherlands, Slovenia, Spain, U. K.	Interviews	Depending on the associative networks, consumers have previously formed between familiar NCs and HCs, they may not consciously differentiate between a NC and a HC in the way that regulatory experts do. Three key dimensions seem to affect choices: i) Familiarity with the nutrient, substance or food stated in the claim; ii) Statement type in terms of its simplicity/complexity; iii) Relevance of the claim, either personally or for a stated population group.
Hoefkens and Verbeke (2013)	Fruit juice	Belgium	Survey	Stronger implicit health-related motive orientations are associated with higher perceived credibility. Consumers' explicit health-related motive orientations, which refer to direct benefits of calcium in the body do not associate with reactions to the claims. Independently of consumers' health-related motive orientations, the claim type significantly affects the perceived credibility and purchasing intention of the product.
Hoefkens et al. (2011)	Food products	Belgium, France, Italy, Norway, Poland, Spain	Survey	Overall, consumers perceive the nutritional value of foods as important when selecting foods. A higher perceived importance is reported by women, older people, and more health-conscious respondents. The effects of children in the household, education and BMI are very small.
Hung et al. (2017)	Food products	10 EU countries	Survey	Motivation to process emerge as a key determinant of European consumers' use of HCs. The ability to process impact claim use to a much smaller extent but is strongly and positively influenced by the motivation to process. Participants with greater HC-related knowledge tend to be more able but less motivated to process HC. There are no differences in the tested model between countries that have regulations for HCs before 2006 and those that do not.
Hung and Verbeke (2019)	Food products	10 EU countries	Survey	More than half of the participants report understanding HCs. Familiarity, understandability, and credibility are positively correlated for all HCs. Correlations between the perceived characteristics also tend to be stronger for the HCs with higher ratings. There are no gender differences and no consistent relationship between age and HC use. Consumers with a special diet status report a higher level of HC use. HCs use is also higher among individuals with normal weight and lower among obese individuals.
Jurado and Gracia (2017)	Breakfast biscuits	Spain	Experiment	Consumers positively value two NC (reduced saturated fat and high in fibre) and three consumer segments are detected. Two of them positively value both NCs, while the third segment's valuation is negative. The difference between the two positive segments is that the consumers in the first one attached a higher valuation for 'reduced saturated fat' than for 'high in fibre.' Sociodemographic differences such as gender and age influence preferences. There is no difference for education.
Kashif and Rashidi (2013)	Food products	Pakistan	Survey	Health consciousness, health benefits and health beliefs explain variation in attitude towards food with NCs and HCs and purchase intentions. Married, young and educated females are more concerned about their health and have high purchase intentions than others. The income does not affect other variables but influences purchase intentions among all age groups.
Kemp et al. (2007)	Meals	U.S.A.	Experiment and survey	For people lower in motivation, there are minimal effects of claims on disease risk perceptions, consistent with a lesser concern with nutrition information and lower awareness of diet-disease risk, compared to consumers higher in motivation. When exposed to a low-carb claim, people with lower motivation to process nutrition information indicate a higher purchase likelihood than those with higher levels of motivation.
Klopčič et al. (2020)	Breakfast cereals	Slovenia	Survey, conjoint analysis, focus group	Consumers are moderately doubtful of NCs and HCs. The most important attribute when choosing breakfast cereals is HC, NC and visual image. The largest cluster consisted of young and old consumers with secondary education and middle income, who accept NCs and HCs due to trust in the authorities. There is no correlation between attention and trust with NCs and HCs and gender.
Krutulyte et al. (2011)	Food products	Denmark	Survey	The main effects for the carriers are much stronger than the main effects of the ingredients. The effect of ingredients on both purchase intention and the perceived fit is primarily via the interactions with the carrier. Health concerned people are more likely to buy functional foods. Combinations that have been available on the market and are familiar lead to higher purchases.
Krystallis and Chrysochou (2011)	Milk and yoghurt	Greece	Survey	On average, brands with low-fat claims perform better in the market than brands with high-fat claims. Compared with other health-related attributes the fat content attribute exhibits slightly higher loyalty, signifying the importance of the 'low-fat' claim as a means of communication.
Krystallis and Chrysochou (2012)	Potato chips, and croissant	Greece	Choice experiment	Parents generally perceived functionality as an attribute that contributes positively to the image enhancement of the (unhealthy) target product and are WTP premiums for it. Yet, the level of consumers' prior awareness of functionality plays a decisive role in their preference for functional products. Overall, prior and accurate awareness is found to increase the variety of functionality types and preferred carriers, the strength of preference per functionality type, and the price premiums willingly paid.
Kuhar et al. (2020)	Bread	Slovenia	Sensory analysis and survey	Consumers show significantly reduced liking scores for multigrain bread but not for white bread. Segmentation on perceived saltiness identifies three clusters (salt adherent, salt indifferent, and salt-sensitive consumers), but the importance of various health attributes of bread for bread purchase is low in all three. Preferences change based on age, gender and level of education.
Küster-Boluda and Vila (2017)	Candy and juice with milk	Spain	Survey	Consumers buy and use products matching their personalities. Projected personality influences HC's credibility and physical appearance. HC credibility, perceptions of the healthiness of the product and physical appearance are relevant to developing a positive attitude towards them. Physical appearance and overall attitude to low-fat products influence the intention to purchase.
Küster-Boluda and Vila (2020)	Candies and juices with milk	Spain	Survey and focus group	Credibility and physical appearance may stimulate the purchase intention of low-fat foods. Nutritional information and visual cues play a more relevant role than nutritional information response and informative cues. Both visual and informative characteristics of the packaging affect consumers' attitudes to the product. A consumer who shows a positive attitude to a product is more likely to buy it.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Lähteenmäki et al. (2010)	Bread, yoghurt and pork meat	Denmark, Finland, Norway, Sweden and Iceland	Survey	HCs have a moderate and negative impact on the perception of other product attributes. The wording of the claim has a small impact on the perception of the products, while the earlier market presence of the ingredient has a large impact. Consumers do not imply other health benefits from NCs and HCs and are not likely to cause any unrealistic positive inferences in perceived product quality.
Lalor et al. (2009)	Breakfast cereals, milk, yoghurt, and cheese	Ireland	Survey	Females scored significantly higher than males for nutrition knowledge. When claims are linked with specific carrier products the credibility ratings fall. A higher level of nutrition knowledge leads to a lower level of credibility of HCs. The level of nutritional knowledge does not impact the purchasing behaviour of products with HCs. Information alone is not enough.
Lalor et al. (2011a)	Yoghurt, breakfast cereals, chocolate, and pasta	Ireland	Survey	HCs are more credible to participants when labelled on yoghurt and breakfast cereals than on pasta and chocolate. Products claiming to reduce cholesterol are purchased more than any of the other products and mainly by older participants.
Lalor et al. (2011b)	Food	Ireland	Focus groups	Taste and price are the most influential factors in purchasing foods with HCs. Health claims do influence purchasing in older populations and mothers of young children People are positively disposed towards HCs when a friend/ relative suffers from a related condition.
Lampila et al. (2009)	Fruits and vegetables	Finland, the Netherlands, France	Focus groups	Consumers express positive attitudes towards flavonoids after receiving information on possible health benefits. The acceptance of flavonoids depends on the natural occurrence and the health benefits associated with common diseases. Yet, the need to enhance flavonoid content is questioned since fruit and vegetables are perceived to be healthy and naturally with flavonoid content. Consumers are sceptical about processing methods.
Lemken et al. (2017)	Pasta legume	Germany	Survey	Claims may increase the WTP, however, a combination of the HCs and environmental benefits is most successful and increases the average WTP of potential customers than individual claims. The combination of personal HCs and interpersonal environmental benefits helps consumers to justify a higher price and possibly the switching to a new product.
Leobnitz and Grunert (2018)	Chocolate bars, and cereal bars	Germany	Survey	The interaction effect of NCs and perceived benefits depends on consumers' health motivation. Health concerned consumers present higher purchase intentions for hedonic food with NCs. Less health concerned participants similarly express higher purchase intentions for utilitarian food with NCs together with benefit information. Priming a health motivation increases consumers' purchase intentions for utilitarian food endorsed with a NC.
Lu (2015)	Yoghurt, breakfast cereal, beef, fruit juice, eggs, and margarine,	Canada	Survey	The perceived fit between the carrier and the ingredient is a determinant of the purchase intention of food with NCs. Consumers' perception of carrier-ingredient fit should be considered as one of the major factors that determine the success or failure of these types of food. Consumers' nutrition knowledge contributes to a higher intention to purchase food with HCs. Health claims about the benefit of functional ingredients, with or without a nutrition content description, increase the purchase intention.
Lyly et al. (2007)	Beverages and ready-to-eat frozen soups	Finland, France, Sweden	Survey and sensory analysis	The taste of the product strongly affects the WTU. HC gave a small benefit to beverages and soups with β-glucan. The WTP for the beverages and soups containing β-glucan decreases after taste, regardless of the HC. No notable effect on gender or age on the WTU products with HCs is found.
Lynam et al. (2011)	Milk, yoghurt, spread, juice, cereal, and fruit drink	Ireland	Survey	Preference for claim type and claim perception differed with gender, age, and level of education. Structure-function and content claims are preferred across six products. Consumers' perception is associated with the health benefit claimed rather than with the strength of the claim itself.
Marette et al. (2010)	Yoghurt	France	Experiment	There is a positive influence of the HC linked to the reduction of cholesterol on WTP, even for participants without cholesterol issues. Little interest in information about potential risks and scientific uncertainties is viewed since consumers' impacts on WTP are not always statistically significant.
Masson et al. (2016)	Food products	France	Interviews and survey	Consumers do not think of their food in terms of nutrients (possible exceptions are older adults, people with medical conditions, and some younger females with diet and body image concerns). The majority of consumers are not in favour of NCs and HCs, whether the concept or the products themselves. They do not understand the claims, often do not see or notice them; some even consider the presence of a claim a motive for rejection.
Maubach et al. (2014)	Breakfast cereal	Australia	Survey	Participants are most likely to rate the healthiest option as the best and the unhealthiest option as the worst choice. HCs do have a positive effect on choice behaviour, but only for the moderate and poor nutrition profiles. HCs do not make the healthiest options appear more desirable. Not all HCs have a similar influence.
Menger-Ogle and Graham (2018)	Cheeseballs, fruit juice, biscuits, and Bhujia (fried noodle snack).	Nepal	Interviews	Findings show a weak and inconsistent influence of NCs on snack food products, suggesting that NCs are likely not an important contributor to nutrition transition. Scepticism or inattention towards NCs may act as a buffer. Only 12% of reported shopping priorities appeared to motivate the use of NCs when purchasing food.
Menozzi et al (2020)	Fish spices	France, Germany, Italy, Spain, and U.K.	Choice experiment	The highest premium is received for wild-caught fish than for farm-raised alternatives. Ready-to-cook products are generally preferred to whole fish, whereas fish fillet preference is more species-specific. The results show positive premiums for a sustainability label and NCs and HCs, with high heterogeneity across countries and species.
Miele et al. (2010)	Mayonnaise	Italy	Sensory analysis and focus group	When the meal accompaniment is a hamburger or French fries, the acceptability of mayonnaise increased, whereas boiled squid rings had a negative effect on acceptability. The HC did not affect the average consumer response.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Miklavec et al. (2015)	Yoghurt	Slovenia	Survey	While consumers generally consider the nutritional composition of yoghurt to be more important than the tested claims in the research, some groups of consumers are more sensitive to the use of health-related statements. Consumers' generally attach positive preferences for familiar claims (probiotic) and negative preferences for non-familiar claims (fat metabolism).
Miller et al. (2011)	Breakfast cereals	U.S.A.	Choice experiment	Nutritional information impacts choices in an intriguing way (a backlash effect), causing children to make unhealthier choices when claims are present in the choice set. This negative effect is most pronounced for general claims. The negative impact of NCs is reduced, by health education.
Miraballes et al. (2014)	Chocolate bars	Spain	Projective mapping	The information on the bars' packaging, including messages or claims, has a strong influence on the consumers' perception of the product, a clear influence on their expectations of the product and constitutes a driver for categorizing the different samples in consumers' minds.
Mitić and Gligorijević (2015)	Food products	Serbia	Survey	There is a positive relationship between awareness, attitudes, consumption, level of education and level of income. Women have more positive attitudes toward products with NCs and HCs than men. Respondents with chronic health problems show a lower level of awareness and consumption of food with NCs and HCs. A low level of nutrition knowledge is a general characteristic of Serbian consumers, but the lowest level of knowledge is in the group of respondents with some health problems.
Moon et al. (2011)	Soy-based foods	U.S.A.	Survey	Non-soy users and infrequent soy users who are exposed to HCs are significantly more likely to eat soy-based food products. These results suggest that HCs are most effective in altering consumer behaviour when they are targeted at non-users or infrequent soy users than frequent consumers.
Nobrega et al. (2020)	Yoghurt, juice, bread and crackers.	Brazil	Survey	Nutrition-related claims have a positive effect on the perceived healthfulness of all product categories. Products featuring nutrition-related claims were perceived as more healthful than those without claims. Consumer segments did not significantly differ in gender, age, educational level, socio-economic level and consumption frequency of the target product. Consumers who do not compromise pleasure for health give higher importance to the claims.
O'Brien et al. (2012)	Butter, cheese, egg, milk, red meat, fish, poultry, and yoghurt.	France, U.K., Portugal, Germany, Poland, and Italy.	Survey	People who are at greater risk of conditions associated with metabolic syndrome are willing to purchase 'healthy' fat-modified food products. The most preferred foods are fish and cheese. If standard fat-modified food products are shown to improve the risks presented by conditions associated with metabolic syndrome, then there is a ready market for such foods.
Oliveira et al. (2018)	Orange/ passionfruit nectars	Brazil	Sensory analysis and experiment	The influence of health and hedonic claims on the expected liking depends on consumer interest in sugar reduction. The inclusion of both claims on the labels leads to an increase in consumers' expected liking, particularly for the consumer segment interested in sugar-reduced products. Conversely, health/hedonic claims do not influence the expected liking of those consumers that are not particularly interested in sugar-reduced products and give the same overall liking scores to regular and sugar-reduced nectars.
Orquin and Scholderer (2015)	Cheese, butter, and ready to eat soup	Denmark	Survey	Consumers are not in any danger of being misled by NCs and HCs. The health branding manipulations have strong detrimental effects on sensory expectation and purchase intention. NCs do have a small positive effect on consumer perceptions of healthfulness and sensory expectation. These evaluations, however, do not change purchase intentions for the products carrying the NCs. The HCs have a negative effect on purchase intention.
Orquin et al. (2014)	Food products	Denmark	Survey	Consumers who have high or low nutrition and health knowledge make almost the same judgments of food healthfulness. Consumer judgments of food healthfulness are based almost entirely on the food category and to a lesser extent on the brand and familiarity with the product.
Øvrum et al. (2012)	Cheese	Norway	Choice experiment	Cheese preferences are affected by exposure to health information. Participants exposed to the health information are WTP price premiums for low-saturated-fat cheese and low-fat cheese. Age and being female is positively associated with subjective statements on diet-health awareness. Education is a strong indicator of subjective diet-health knowledge but is simultaneously unrelated to diet-health awareness.
Padhi et al. (2015)	Muffins	Canada	Sensory analysis and survey	The presence of a HC significantly increases willingness to consume soy muffins. Muffins made from soy flour are acceptable by consumers and a HC would enhance their acceptability.
Petrovici et al. (2012)	Food products	U. K.	Interviews	Nutritional knowledge, health control, and perceived need for dietary change affect the use of nutritional information and NCs and HCs on food. The use of nutritional information and HCs is less likely for consumers for whom 'taste' is an important driver of food purchasing behaviour. More discerning and health-conscious shoppers are less likely to consider HCs.
Prieto-Castillo et al. (2015)	Food products	Spain	Interviews	Two-thirds of consumers read nutrition labels regularly before purchasing. Almost half of them do not fully understand the nutrition information nor use it on their diet. Information on additives and fats draws the most interest of consumers. People who live with a partner or with children, with higher education, and young females mostly search for food with NCs and HCs.
Ritvanen et al. (2010)	Havarti Cheese	Finland	Sensory analysis and survey	Consumers preferred reduced-fat Havarti-type cheeses with a pale appearance, sticky consistency, and rich flavour. The least-preferred cheeses are those with the lowest flavour intensities, while the most preferred ones are cheeses with the highest salt content.
Romagny et al. (2017)	Sausage, chorizo, dry sausage, cheese and muffins	France	Experiment	Cooked sausage with reduced sugar, fat and salt nutrient reformulation does not maintain consumer appreciation and reduced its positioning on the market. For cheese and muffins, the reformulation does not affect the product's pleasantness. The reformulation of dry sausage and chorizo not only maintained consumer appreciation but also increased pleasantness.
Saba et al. (2010)	Bread, cake and yoghurt	Finland, Germany, Italy and the U.K.	Survey	The presence of a HC on foods has a positive influence on respondents' perception of healthiness and on the likelihood to buy the products. The findings show that health-related information on food labels differently influences the healthiness perception and the likelihood to buy the product, suggesting that different cultures, traditions, and eating habits have to be taken into account.
Sabbe et al. (2009)	Fruit juices	Belgium	Sensory analysis and survey	Providing health information yields a positive liking, perceived healthiness and perceived nutritional value and purchase intention. Sensory experiences remained predominant in the acceptance of the fruit juices. Health-oriented consumers are more likely to compromise on taste for health benefits, though they still prefer the best tasting juice. Older respondents and women are more likely to accept fruit juices with a particular health benefit.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Siegrist et al. (2008)	Yoghurt, chocolate, and soup	Switzerland	Survey	HCs are most positively valued when attached to a product with a positive health image. Participants who trust the food industry are more likely to buy foods with HCs compared to those with low trust in the food industry. Old people are more interested in foods with HCs than young consumers.
Stancu et al. (2017)	Yoghurt and whole grain bread	Denmark	Interviews	Re-wording an authorized HC or adding information does not improve understanding and may even decrease the understanding of the claim.
Steinhauser et al. (2019a)	Orange juice	Germany	Close-to-realistic shopping situation	The longer a consumer looked at a specific claim, the more likely they would purchase the respective product. The lower the price and the higher the perceived healthiness and tastiness of the product further heightened its likelihood of being purchased. Consumers with higher health motivation and higher nutrition knowledge show more interest in food with NCs and HCs. Consumer characteristics do not affect the purchase decision.
Steinhauser et al. (2019b)	Orange juice and milk chocolate	Germany	Close-to-realistic shopping situation	Each claim is noticed by at least 85% of the participants and HCs are looked at longer than NCs or taste claims. The longer a participant looks at a specific claim, the more likely they are to purchase the respective product. NCs are preferred on orange juice FOP, taste claims are preferred on milk chocolate FOPs, and HCs are not preferred in any FOP.
Stojanović et al. (2017)	Food products	6 Western Balkan countries	Survey	Compared with regulated markets, unregulated Western Balkan Countries markets are characterized by a higher level of 'spurious' statements dominated by regional/domestic producers not obliged to use scientifically approved claims. A general health claim is dominant without any difference between regulated and unregulated markets.
Strijbos et al. (2016)	Meat products	The Netherlands	Survey	The majority of consumers indicate meat products with phytochemicals as acceptable. Promotion by a national health foundation is perceived as credible, and health magazines are perceived as a credible media platform. Neither weekly meat consumption, nor gender and age affect the consumer credibility of some HCs, but the education level does.
Szakos et al. (2020)	Food products	Hungary	Interview and Survey	Elderly people accept functional foods, especially when functionality is attached to increased vitamin, protein, and fibre content. They prefer products with lower salt and sugar content, which are less relevant for other age groups. Compared to other segments, older adults accept products of animal origin (especially milk products) and even breakfast products on a higher level.
Talati et al. (2016a)	Cookies, corn flakes, pizzas and yoghurts	Australia	Survey	Health claims do not produce a positivity bias, while other FOP labels do, with the Daily Intake Guidelines being the most likely to elicit this bias. The Health Star Rating most frequently leads to lower ratings of unhealthy foods than the Daily Intake Guidelines and Multiple Traffic Lights; this FOP label has the lowest risk of creating an inaccurate positivity bias in unhealthy foods.
Talati et al. (2016b)	Breakfast cereals, cheese, chicken nuggets, muesli bar, potato chips, and yoghurt	Australia	Focus groups	HCs were more likely to be considered during product evaluations if they are perceived to be trustworthy, relevant, and informative. Trust and ease of interpretation are most important for FOP labels, which are more likely than HCs to meet criteria and be considered during product evaluation (especially the Health Star Rating and Multiple Traffic Lights). Results indicate that consumers generally find FOP labels more useful than HCs.
Tan et al. (2016)	Milk powder	Indonesia, Singapore and Thailand	Focus groups	Mothers trust HCs on the products and the international brand manufacturers. The understanding of HCs is influenced by the familiarity of the nutrient, knowledge, the perceived relevance, the use of scientific terms, the choice of words, and also the phrasing and length of the claims.
Temesi et al. (2019)	Orange juice, muesli bar, yoghurt, and chocolate rye-bread	Hungary	Survey	The expected taste has the greatest influence on the perceived fit of a carrier–ingredient combination. Awareness of the combination, the health image of the carrier and perceived correspondence of health effects also have a positive influence. Enhancing an existing and well-known health effect of the carrier increases positive perceived fit even if the ingredient is not originally present in the carrier. The targeted participants are women, with secondary education and with an average income.
Timpanaro et al (2020)	Tomato	Italy	Survey	At present, the potential consumer of biofortified food products is generally confused and uninformed, conditions that, even when there is a high willingness to pay, limit purchases of biofortified products. Even in the absence of a concise definition and clear labelling at a globally recognized level, in Italy biofortified products are increasingly widespread, confirming consumer demand for this category of product.
Tórtora et al. (2019)	Cookies and crackers	Uruguay	Conjoint experiment	Nutritional warnings are efficient in capturing consumers' attention, as the majority of participants attended them while making food choices. The visual attention of nutritional warnings is similar to that of brand name and tended to be higher for NCs and the facts up front panel. The inclusion of a NC has a positive effect on consumers' choices.
Urala and Lähteenmäki, (2007)	Different foods	Finland	Survey	Gender does not differ in attitudes towards foods with NCs and HCs. There are very small differences in attitudes towards foods with NCs and HCs between age and education groups. The best predictors for WTU foods with NCs and HCs are the perceived reward and the necessity for such foods. The dimensions, however, predict reported behaviour differently depending on the target product.
Van der Zanden et al. (2014)	Different foods	The Netherlands	Focus groups	For the independently living elderly, medical advice is an important facilitator that could overcome barriers to purchasing and consuming protein-enriched food. For the residential home elderly, the sensory appeal of protein-enriched foods is a facilitator. Preferences on the food carrier are similar for both groups. The elderly prefer protein-enriched foods based on healthy products that they consume frequently.
Van Trijp and Van der Lans (2007)	Yoghurt	Italy, Germany, U.K., U.S.A.	Survey	There is little effect on perceived overall healthiness, perceived specific-health impact and consumer appeal of the way NCs and HCs are being formulated. Individual differences have a significant (small) impact on the perceived healthiness, perceived specific-health impact, appeal, perceived newness, credibility, and difficulty to understand the NCs and HCs.
Van Wezemael et al. (2014)	Beef	Belgium, France, the Netherlands, U.K.	Choice experiment	Consumer valuation of NCs and HCs varies across countries. In Belgium, the Netherlands and France, NCs and HCs on saturated fat yielded higher utilities than claims on protein and/or iron, while the opposite was found among consumers in the UK.

(*continued on next page*)

Table A1 (*continued*)

Reference	Product	Country	Analytical method	Key findings
Vecchio et al. (2016)	Yoghurt	Italy	Survey and experiment	Providing additional information through HCs increases consumers' perceived value of the product. Additional information on organic regulation does not add much to the premium. Specific socio-demographic variables (such as gender, age, presence of kids in the household and following a specific diet) positively affect WTP for functional and organic yoghurts.
Verbeke et al. (2009)	Fruit juice, spread and breakfast cereals	Belgium	Survey	HCs outperformed NCs, and both outperformed reduction of disease risk claims. Consumer preferences for fibre-enriched cereals were higher than the rest. Positive attitudes towards functional foods and familiarity with the concrete functional product category boosted the claim type and product ratings, whereas perceived control over own health and perceiving functional foods as a marketing scam decreased all product concept appeal.
Vidigal et al. (2011)	Fruit juices	Brazil	Sensory analysis and survey	Age (old) and gender (women) were more likely to accept fruit juices that claim a health benefit. Most respondents reported that the main factor motivating the consumption is taste, thus revealing a greater concern to meet sensory pleasure. Consumers are not willing to sacrifice the pleasure of sensory function for health benefits in a food with an unpleasant taste.
Vila-López et al. (2017)	Food products	Spain	Survey	When searching for a healthy and low-fat food product, visual cues (colours, images etc.) are more important than informational cues (label design and size of letters). Age explains alternative packaging strategies because young adults do not pay equal attention to both packaging cues.
Viscecchia et al. (2019)	Mozzarella cheese	Italy	Choice experiment	Respondents have a clear preference for products from the Puglia region, for the combined NCs over single NCs and for the reduction of disease HC over other HCs. The WTP for HCs is higher than NCs.
Williams et al. (2008)	Different foods	Australia	Interviews	Claims and carriers independently have a significant effect on ratings of attractiveness and intention to try but, the carrier is a more important predictor of intention to purchase than the HC.
Wong et al. (2014)	Margarine and breakfast cereals	Canada	Survey	All NCs and HCs that mention either plant sterols or oat fibre generate positive attitudes towards the overall product healthfulness and purchasing intentions than the taste control claim. The preferences of consumers depend on their familiarity with the food, the component being claimed and their familiarity with the specific food-health relationship.
Wortmann et al. (2018)	Apple	Germany	Survey	Findings indicate a moderate acceptance of biofortified apples, as well as of biofortified NCs and HCs among the participants. Additional information about the beneficial health effects of biofortified had a significant impact on consumer acceptance. People who regularly eat convenience food and prefer to buy apples at supermarkets were particularly attracted by the product idea.

References

Alfnes, F., Guttormsen, A., Steine, G., & Kolstad, K. (2006). *Consumers' willingness to pay for the color of salmon: A choice experiment with real economic incentives. American Journal of Agricultural Economy*, *88*(4), 1050–1061.

Andrade, J.C.de, Nalério, É.S., Giongo, C., de Barcellos, M.D., Ares, G., & Deliza, R. (2016). *Influence of evoked contexts on rating-based conjoint analysis: Case study with lamb meat. Food Quality and Preference*, *53*, 168–175.

Andrews, J. C., Netemeyer, R., & Burton, S. (2009). The nutrition elite: Do only the highest levels of caloric knowledge, obesity knowledge, and motivation matter in processing nutrition advertising claims and disclosures? *Journal of Public Policy & Marketing*, https://epublications.marquette.edu/market_fac/31. https://epublications.marquette.edu/market_fac/31.

Andrews, J.C., Netemeyer, R.G., & Burton, S. (1998). *Consumer generalization of nutrient content claims in advertising. Journal of Marketing*, *62*(4), 62–75.

Annunziata, A., & Mariani, A. (2019). *Do consumers care about nutrition and health claims? Some evidence from Italy. Nutrients*, *11*(11).

Annunziata, A., & Vecchio, R. (2013). *Consumer perception of functional foods: A conjoint analysis with probiotics. Food Quality and Preference*, *28*(1), 348–355.

Ares, G., Giménez, A., & Gámbaro, A. (2009). *Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. Food Quality and Preference*, *20*(1), 50–56.

Ares, G., & Deliza, R. (2010). *Identifying important package features of milk desserts using free listing and word association. Food Quality and Preference*, *21*(6), 621–628.

Ares, G., & Gámbaro, A. (2007). *Influence of gender, age and motives underlying food choice on perceived healthiness and willingness to try functional foods. Appetite*, *49*(1), 148–158.

Ares, G., Giménez, A., & Gámbaro, A. (2008). *Influence of nutritional knowledge on perceived healthiness and willingness to try functional foods. Appetite*, *51*(3), 663–668.

Aschemann-Witzel, J., & Hamm, U. (2009). *Preferences for food with nutrition and health claims in a close-to-realistic choice context. ACR North American Advances*, NA-NA36. https://www.acrwebsite.org/volumes/14720/volumes/v36/NA-36.

Aschemann-Witzel, J., Maroscheck, N., & Hamm, U. (2013a). *Are organic consumers preferring or avoiding foods with nutrition and health claims? Food Quality and Preference*, *30*, 68–76.

Aschemann-Witzel, J., & Grunert, K.G. (2015). *Influence of 'soft' versus 'scientific' health information framing and contradictory information on consumers' health inferences and attitudes towards a food supplement. Food Quality and Preference*, *42*, 90–99.

Aschemann-Witzel, J., & Grunert, K.G. (2017). *Attitude towards resveratrol as a healthy botanical ingredient: The role of naturalness of product and message. Food Quality and Preference*, *57*, 126–135.

Aschemann-Witzel, J., & Hamm, U. (2010). *Do consumers prefer foods with nutrition and health claims? Results of a purchase simulation. Journal of Marketing Communications*, *16*(1–2), 47–58.

Aschemann-Witzel, J., Maroscheck, N., & Hamm, U. (2013b). *Are organic consumers preferring or avoiding foods with nutrition and health claims? Food Quality and Preference*, *30*(1), 68–76.

Asioli, D., Varela, P., Hersleth, M., Almli, V.L., Olsen, N.V., & Næs, T. (2017). *A discussion of recent methodologies for combining sensory and extrinsic product properties in consumer studies. Food Quality and Preferences*, *56*, 266–273.

Baglione, S.L., Tucci, L.A., & Stanton, J.L. (2012). *Self-reported nutritional knowledge and the acceptance of health-related food benefit claims. British Food Journal*, *114*(4), 453–468.

Ballco, P., Caputo, V., & de-Magistris, T. (2020). *Consumer valuation of European nutritional and health claims: Do taste and attention matter? Food Quality and Preference*, *79*, 103–793.

Ballco, P., & de-Magistris, T. (2018). *Valuation of nutritional and health claims for yoghurts in Spain: A hedonic price approach. Spanish Journal of Agricultural Research*, *16*(2), 01–08.

Ballco, P., & de-Magistris, T. (2019). *Spanish consumer purchase behaviour and stated preferences for yoghurts with nutritional and health claims. Nutrients*, *11*(11), 27–42.

Ballco, P., de-Magistris, T., & Caputo, V. (2019). *Consumer preferences for nutritional claims: An exploration of attention and choice based on an eye-tracking choice experiment. Food Research International*, *116*, 37–48.

Ballco, P., Jurado, F., & Gracia, A. (2020). *Do health claims add value to nutritional claims? Evidence from a close-to-real experiment on breakfast biscuits. Food Quality and Preference*, *85*, 103968.

Banks, A.P., Egan, B., Hodgkins, C.E., Peacock, M., & Raats, M.M. (2018). *The role of causal models and beliefs in interpreting health claims. British Journal of Health Psychology*, *23*(4), 933–948.

Banovic, M., Reinders, M.J., Claret, A., Guerrero, L., & Krystallis, A. (2019). *A cross-cultural perspective on impact of health and nutrition claims, country-of-origin and eco-label on consumer choice of new aquaculture products. Food Research International*, *123*, 36–47.

Barreiro-Hurlé, J., Colombo, S., & Cantos-Villar, E. (2008). *Is there a market for functional wines? Consumer preferences and willingness to pay for resveratrol-enriched red wine. Food Quality and Preference*, *19*(4), 360–371.

Barreiro-Hurlé, J., Gracia, A., & De-Magistris, T. (2010). *The effects of multiple health and nutrition labels on consumer food choices. Journal of Agricultural Economics*, *61*(2), 426–443.

Barreiro-Hurlé, J., Gracia, A., & de-Magistris, T. (2010). *Does nutrition information on food products lead to healthier food choices? Food Policy*, *35*(3), 221–229.

Bech-Larsen, T., & Grunert, K.G. (2003). *The perceived healthiness of functional foods. A conjoint study of Danish, Finnish and American consumers' perception of functional foods. Appetite*, *40*(1), 9–14.

Benson, T., Lavelle, F., Bucher, T., McCloat, A., Mooney, E., Egan, B., … Dean, M. (2018). *The impact of nutrition and health claims on consumer perceptions and portion size selection: Results from a nationally representative survey. Nutrients*, *10*(5).

Benson, T., Lavelle, F., McCloat, A., Mooney, E., Bucher, T., Egan, B., & Dean, M. (2019). *Are the claims to blame? A qualitative study to understand the effects of nutrition and health claims on perceptions and consumption of food. Nutrients*, *11*(9).

Berning, J.P., Chouinard, H.H., & McCluskey, J.J. (2011). *Do positive nutrition shelf labels affect consumer behavior? Findings from a field experiment with scanner data. American Journal of Agricultural Economics*, *93*(2), 364–369.

Bettman, J.R. (1979). *An information processing theory of consumer choice*. Reading, MA: Addison-Wesley.

Bettman, J., Luce, M.F., & Payne, J.W. (1998). *Constructive consumer choice processes. Journal of Consumer Research*, *25*, 187–217.

Bialkova, S., Sasse, L., & Fenko, A. (2016). *The role of nutrition labels and advertising claims in altering consumers' evaluation and choice. Appetite*, *96*, 38–46.

Bilman, E.M., Kleef, E.V., Mela, D.J., Hulshof, T., & Van Trijp, H. (2012). *Consumer*

understanding, interpretation and perceived levels of personal responsibility in relation to satiety-related claims. Appetite, 59(3), 912–920.
Bimbo, F., Bonanno, A., Nocella, G., Viscecchia, R., Nardone, G., De Devitiis, B., & Carlucci, D. (2017). *Consumers' acceptance and preferences for nutrition-modified and functional dairy products: A systematic review. Appetite, 113*, 141–154.
Biondi, B., & Camanzi, L. (2020). *Nutrition, hedonic or environmental? The effect of front-of-pack messages on consumers' perception and purchase intention of a novel food product with multiple attributes. Food Research International, 130*, 108962.
Cacioppo, J.T., & Petty, R.E. (1982). *The Need for Cognition. Journal of Personality and Social Psychology, 42*, 116–131.
Cagalj, M., Haas, R., & Morawetz, U.B. (2016). *Effects of quality claims on willingness to pay for organic food. British Food Journal, 118*(9), 2218–2233. https://doi.org/10.1108/BFJ-11-2015-0453.
Camerer, C., & Lovallo, D. (1999). *Overconfidence and excess entry: An experimental approach. The American Economic Review, 89*(1), 306–318.
Cameron, T.A., Poe, G.L., Ethier, R.G., & Schulze, W.D. (2002). *Alternative non-market value-elicitation methods: Are the underlying preferences the same? Journal of Environmental Economics and Management, 44*, 391–425.
Carrillo, E., Fiszman, S., Lähteenmäki, L., & Varela, P. (2014). *Consumers' perception of symbols and health claims as health-related label messages. A cross-cultural study. Food Research International, 62*, 653–661.
Carrillo, E., Varela, P., & Fiszman, S. (2012a). *Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. Food Research International, 48*(1), 209–216.
Carrillo, E., Varela, P., & Fiszman, S. (2012b). *Packaging information as a modulator of consumers' perception of enriched and reduced-calorie biscuits in tasting and non-tasting tests. Food Quality and Preferences, 25*(2), 105–115.
Cavaliere, A., Marchi, E.D., & Banterle, A. (2016). *Does consumer health-orientation affect the use of nutrition facts panel and claims? An empirical analysis in Italy. Food Quality and Preference, 54*, 110–116.
Cavaliere, A., Ricci, E.C., & Banterle, A. (2015). *Nutrition and health claims: Who is interested? An empirical analysis of consumer preferences in Italy. Food Quality and Preference, 41*, 44–51.
Chang, J.B., Lusk, J.L., & Norwood, F.B. (2009). *How closely do hypothetical surveys and laboratory experiments predict field behavior? American Journal of Agricultural Economics, 91*(2), 518–534.
Choi, H., Paek, H.-J., & King, K.W. (2012). *Are nutrient-content claims always effective? International Journal of Advertising, 31*(2), 421–443.
Chrysochou, P., & Grunert, K.G. (2014). *Health-related ad information and health motivation effects on product evaluations. Journal of Business Research, 67*(6), 1209–1217.
Coleman, K.L., Miah, E.M., Morris, G.A., & Morris, C. (2014). *Impact of health claims in prebiotic-enriched breads on purchase intent, emotional response and product liking. International Journal of Food Sciences and Nutrition, 65*(2), 164–171.
Contini, C., Casini, L., Stefan, V., Romano, C., Juhl, H.J., Lähteenmäki, L., … Grunert, K.G. (2015). *Some like it healthy: Can socio-demographic characteristics serve as predictors for a healthy food choice? Food Quality and Preference, 46*, 103–112.
Cox, D.N., Evans, G., & Lease, H.J. (2011). *The influence of product attributes, consumer attitudes and characteristics on the acceptance of: (1) Novel bread and milk, and dietary supplements and (2) fish and novel meats as dietary vehicles of long chain omega 3 fatty acids. Food Quality and Preference, 22*(2), 205–212.
Crofton, E.C., Markey, A., & Scannell, A.G.M. (2013). *Consumers' expectations and needs towards healthy cereal based snacks: An exploratory study among Irish adults. British Food Journal, 115*(8), 1130–1148.
Crucean, D., Debucquet, G., Rannou, C., le-Bail, A., & le-Bail, P. (2019). *Vitamin B4 as a salt substitute in bread: A challenging and successful new strategy. Sensory perception and acceptability by French consumers. Appetite, 134*, 17–25.
De Boer, A., & Bast, A. (2015). *International legislation on nutrition and health claims. Food Policy, 55*, 61–70.
De Marchi, E., Caputo, V., Nayga, R.M., & Banterle, A. (2016). *Time preferences and food choices: Evidence from a choice experiment. Food Policy*. https://doi.org/10.1016/j.foodpol.2016.05.004.
de-Magistris, T., Lopéz-Galán, B., & Ballco, P. (2021). *Do virtual reality experiments replicate projection bias phenomena? Examining the external validity of a virtual supermarket. Journal of Agricultural Econ., 0*, 1–15.
de-Magistris, T., & Lopéz-Galán, B. (2016). *Consumers' willingness to pay for nutritional claims fighting the obesity epidemic: The case of reduced-fat and low salt cheese in Spain. Public Health, 135*, 83–90.
de-Magistris, T., López-Galán, B., & Caputo, V. (2016). *The impact of body image on the WTP values for reduced-fat and low-salt content potato chips among obese and non-obese consumers. Nutrients, 8*(12), 830.
Dean, M., Lampila, P., Shepherd, R., Arvola, A., Saba, A., Vassallo, M., … Lähteenmäki, L. (2012). *Perceived relevance and foods with health-related claims. Food Quality and Preference, 24*(1), 129–135.
Dean, M., Shepherd, R., Arvola, A., Vassallo, M., Winkelmann, M., Claupein, E., … Saba, A. (2007). *Consumer perceptions of healthy cereal products and production methods. Journal of Cereal Science, 46*(3), 188–196.
DellaVigna, S. (2009). *Psychology and Economics: Evidence from the Field. Journal of Economic Literature, 47*(2), 315–372.
Domínguez Díaz, L., Fernández-Ruiz, V., Cámara, M. (2020). An international regulatory review of food health-related claims in functional food products labeling. *J Funct. Foods*, 68, 103896. Drewnowski, A., & Specter, S. (2004). Poverty and obesity: the role of energy density and energy costs. *The American Journal of Clinical Nutrition, 79*(1), 6–16.
Engel, J.F., Kollat, D.T., Blackwell, R.D. (1968) *Consumer behavior*. Holt, Rinehart & Winston, New York.
Fenko, A., Nicolaas, I., & Galetzka, M. (2018). *Does attention to health labels predict a healthy food choice? An eye-tracking study. Food Quality and Preference, 69*, 57–65.
Fernqvist, F., & Ekelund, L. (2014). *Credence and the effect on consumer liking of food – A review. Food Quality and Preference, 32*, 340–353.
Fisher, R.J. (1993). *Social desirability bias and the validity of indirect questioning. Journal of Consumer Research, 20*(2), 303–315.
Franco-Arellano, B., Vanderlee, L., Ahmed, M., Oh, A., & L'Abbé, M. (2020). *Influence of front-of-pack labelling and regulated nutrition claims on consumers' perceptions of product healthfulness and purchase intentions: A randomized controlled trial. Appetite, 149*, 104629.
Gębski, J., Jezewska-Zychowicz, M., Szlachciuk, J., & Kosicka-Gębska, M. (2019). *Impact of nutritional claims on consumer preferences for bread with varied fiber and salt content. Food Quality and Preference, 76*, 91–99.
Gineikiene, J., Kiudyte, J., & Degutis, M. (2017). *Functional, organic or conventional? Food choices of health conscious and skeptical consumers. Baltic Journal of Management, 12*(2).
Gracia, A., & Barreiro-Hurlé, J. (2019). *Making sense of information overload: Consumer ranking of nutritional claims in cereal based products. Nutrients, 11*(12), 2858.
Gracia, A., Loureiro, M.L., & Nayga, R.M. (2009). *Consumers' valuation of nutritional information: A choice experiment study. Food Quality and Preference, 20*(7), 463–471.
Gracia, A., Loureiro, M., & Nayga, R.M. (2007). *Do consumers perceive benefits from the implementation of a EU mandatory nutritional labelling program? Food Policy, 32*(2), 160–174.
Grant, A., Lusk, J., Caputo, V. (2020). Economic and Nutritional Effects of a Meat Tax: Results from a Basket-Based Choice Experiment Working Paper. http678s://www.uoguelph.ca/fare/files/seminar/Grant_Lusk_Caputo_Feb.pdf.
Gravel, K., Doucet, É., Peter Herman, C., Pomerleau, S., Bourlaud, A.-S., & Provencher, V. (2012). *"Healthy", "diet", or "hedonic". How nutrition claims affect food-related perceptions and intake? Appetite, 59*(3), 877–884.
Grunert, K.G. (2015). *The common ground between sensory and consumer science. Current Opinion in Food Science, 3*, 19–22.
Grunert, K.G., Hartvig Larsen, H., Madsen, T.K., & Baadsgaard, A. (1996). *Market orientation in food and agriculture*. Norwell, MA: Kluwer.
Grunert, K.G., Hieke, S., & Wills, J. (2014). *Sustainability labels on food products: Consumer motivation, understanding and use. Food Policy, 44*, 177–189.
Grunert, K.G., Lähteenmäki, L., Boztug, Y., Martinsdóttir, E., Ueland, Ø., Åström, A., & Lampila, P. (2009). *Perception of health claims among Nordic consumers. Journal of Consumer Policy, 32*(3), 269–287.
Grunert, K.G., Scholderer, J., & Rogeaux, M. (2011). *Determinants of consumer understanding of health claims. Appetite, 56*(2), 269–277.
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*(5), 385–399.
Grunert, K.G., Wills, J.M., & Fernández-Celemín, L. (2010). *Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. Appetite, 55*(2), 177–189.
Hailu, G., Boecker, A., Henson, S., & Cranfield, J. (2009). *Consumer valuation of functional foods and nutraceuticals in Canada. A conjoint study using probiotics. Appetite, 52*(2), 257–265.
Hamblin, J. (2018, September 24). *A Credibility Crisis in Food Science*. The Atlantic. https://www.theatlantic.com/health/archive/2018/09/what-is-food-science/571105/.
Hartmann, M., Lensch, A.K., Simons, J., & Thrams, S. (2008). *Nutrition and health claims – call for and justification of governmental intervention from the consumers' perspective. German Journal of Agricultural Economics, 57*(2), 1–11.
Hieke, S., Kuljanic, N., Wills, J.M., Pravst, I., Kaur, A., Raats, M.M., … Grunert, K.G. (2015). *The role of health-related claims and health-related symbols in consumer behaviour: Design and conceptual framework of the CLYMBOL project and initial results. Nutrition Bulletin/Bnf, 40*(1), 66–72.
Hieke, S., Pieniak, Z., & Verbeke, W. (2018). *European consumers' interest in nutrition information on (sugar-free) chewing gum. Food Quality and Preference, 64*, 172–180.
Hieke, S., & Taylor, C.R. (2012). *A critical review of the literature on nutritional labeling. Journal of Consumer Affairs, 46*(1), 120–156.
Hobbs, J.E., Malla, S., Sogah, E. K. (2014). Regulatory Frameworks for Functional Food and Supplements. *Can. J. Agric. Econ. Can. d'Agroecon*, 62, 569–594. Hodgkins, C. E., Egan, B., Peacock, M., Klepacz, N., Miklavec, K., Pravst, I., Pohar, J., Gracia, A., Groeppel-Klein, A., Rayner, M., & Raats, M. M. (2019). Understanding how consumers categorise health related claims on foods: A consumer-derived typology of health-related claims. *Nutrients*, *11*(3).
Hoefkens, C., & Verbeke, W. (2013). *Consumers' health-related motive orientations and reactions to claims about dietary calcium. Nutrients, 5*(1), 82–96.
Hoefkens, C., Verbeke, W., & Van Camp, J. (2011). *European consumers' perceived importance of qualifying and disqualifying nutrients in food choices. Food Quality and Preference, 22*(6), 550–558.
Hung, Y., Grunert, K.G., Hoefkens, C., Hieke, S., & Verbeke, W. (2017). *Motivation outweighs ability in explaining European consumers' use of health claims. Food Quality and Preference, 58*, 34–44.
Hung, Y., & Verbeke, W. (2017). *Sensory attributes shaping consumers' willingness-to-pay for newly developed processed meat products with natural compounds and a reduced level of nitrite. Food Quality and Preferences, 70*, 21–31.
Hung, Y., & Verbeke, W. (2019). *Consumer evaluation, use and health relevance of health claims in the European Union. Food Quality and Preference, 74*, 88–99.
Jaeger, S.R., & Porcherot, C. (2017). *Consumption context in consumer research: Methodological perspectives. Current Opinion in Food Science, 15*, 30–37.
Jesionkowska, K., Sijtsema, S.J., Konopacka, D., & Symoneaux, R. (2009). *Dried fruit and its functional properties from a consumer's point of view. The Journal of Horticultural Science & Biotechnology*, 85–88.
Johansson-Stenman, O., & Svedsäter, H. (2008). *Measuring hypothetical bias in choice*

experiments: The importance of cognitive consistency. *The B.E. Journal of Economic Analysis & Policy*, *8*(1).
Jurado, F., & Gracia, A. (2017). *Does the valuation of nutritional claims differ among consumers? Insights from Spain*. *Nutrients*, *9*(2).
Kahl, J., Załe˛cka, A., Ploeger, A., Bugel, S., & Huber, M. (2012). *Functional food and organic food are competing rather than supporting concepts in Europe*. *Agriculture*, *2*(4), 316–324.
Kashif, S. (2013). *An empirical investigation of nutrition and health claims in shaping consumer pre-purchase intentions*. *Journal of Indepence Studies and Research-Management, Social Sciences and Economics*, *11*, 83–98.
Kaur, A., Scarborough, P., & Rayner, M. (2017). *A systematic review, and meta-analyses, of the impact of health-related claims on dietary choices*. *The Internaltional Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 93.
Kemp, E., Burton, S., Creyer, E.H., & Suter, T.A. (2007). *When do nutrient content and nutrient content claims matter? Assessing consumer tradeoffs between carbohydrates and fat*. *Journal of Consumer Affairs*, *41*(1), 47–73.
Kiesel, K., & Villas-Boas, S.B. (2013). *Can information costs affect consumer choice? Nutritional labels in a supermarket experiment*. *International Journal of Industrial Organization*, *31*(2), 153–163.
Klopčič, M., Slokan, P., & Erjavec, K. (2020). *Consumer preference for nutrition and health claims: A multi-methodological approach*. *Food Quality and Preference*, *82*, 103863.
Köster, E.P. (2009). *Diversity in the determinants of food choice: A psychological perspective*. *Food Quality and Preference*, *20*(2), 70–82.
Kotler, P., Armstrong, G., Harris, L., & Piercy, N. (2013). *Principles of marketing European Edition* (6th edition). Upper Saddle River: Pearson Prentice Hall.
Kourouniotis, S., Keast, R.S.J., Riddell, L.J., Lacy, K., Thorpe, M.G., & Cicerale, S. (2016). *The importance of taste on dietary choice, behaviour and intake in a group of young adults*. *Appetite*, *103*, 1–7.
Krutulyte, R., Grunert, K.G., Scholderer, J., Lähteenmäki, L., Hagemann, K.S., Elgaard, P., … Graverholt, J.P. (2011). *Perceived fit of different combinations of carriers and functional ingredients and its effect on purchase intention*. *Food Quality and Preference*, *22*(1), 11–16.
Krystallis, A., & Chrysochou, P. (2011). *Health claims as communication tools that enhance brand loyalty: The case of low-fat claims within the dairy food category*. *Journal of Marketing Communications*, *17*(3), 213–228.
Krystallis, A., & Chrysochou, P. (2012). *Do health claims and prior awareness influence consumers' preferences for unhealthy foods? The case of functional children's snacks*. *Agribusiness*, *28*(1), 86–102.
Kuhar, A., Korošec, M., Bolha, A., Pravst, I., & Hristov, H. (2020). *Is a consumer perception of salt modification a sensory or a behavioural phenomenon? Insights from a bread study*. *Foods*, *9*(9), 1172.
Küster-Boluda, I., & Vila-López, N. (2017). *Health/Nutrition food claims and low-fat food purchase: Projected personality influence in young consumers*. *Journal of Functional Foods*, *38*, 66–76.
Küster-Boluda, I., & Vila-López, N. (2020). *Can health perceptions, credibility, and physical appearance of low-fat foods stimulate buying intentions? Foods*, *9*(7).
Lähteenmäki, L. (2013). *Claiming health in food products*. *Food Quality and Preference*, *27*(2), 196–201.
Lähteenmäki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, Ø., Åström, A., & Martinsdóttir, E. (2010). *Impact of health-related claims on the perception of other product attributes*. *Food Policy*, *35*(3), 230–239.
Lalor, F., Kennedy, J., & Wall, P. (2009). The impact, among third-level students, of nutrition knowledge on behaviour towards products with health claims. *Proceedings of the Nutrition Society* (p. 68(OCE3).).
Lalor, F., Madden, C., McKenzie, K., & Wall, P.G. (2011). *Health claims on foodstuffs: A focus group study of consumer attitudes*. *Journal of Functional Foods*, *3*(1), 56–59.
Lalor, F., Kennedy, J., & Wall, P.G. (2011). *Impact of nutrition knowledge on behaviour towards health claims on foodstuffs*. *British Food Journal*, *113*(6), 753–765.
Lampila, P., van Lieshout, M., Gremmen, B., & Lähteenmäki, L. (2009). *Consumer attitudes towards enhanced flavonoid content in fruit*. *Food Research International*, *42*(1), 122–129.
Landström, E., Hursti, U.-K.-K., Becker, W., & Magnusson, M. (2007). *Use of functional foods among Swedish consumers is related to health-consciousness and perceived effect*. *The British Journal of Nutrtion*, *98*(5), 1058–1069.
Landström, E., Hursti, U.-K.-K., & Magnusson, M. (2009). *"Functional foods compensate for an unhealthy lifestyle". Some Swedish consumers' impressions and perceived need of functional foods*. *Appetite*, *53*(1), 34–43.
Lavidge, R.J., & Steiner, G.A. (1961). *A model for predictive measurements of advertising effectiveness*. *Journal of Marketing*, *25*(4), 59–62.
Lemken, D., Knigge, M., Meyerding, S., & Spiller, A. (2017). *The value of environmental and health claims on new legume products: A non-hypothetical online auction*. *Sustainability*, *9*(8), 1340.
Loebnitz, N., & Grunert, K.G. (2018). *Impact of self-health awareness and perceived product benefits on purchase intentions for hedonic and utilitarian foods with nutrition claims*. *Food Quality and Preference*, *64*, 221–231.
Loomis, J., Bell, P., Cooney, H., & Asmus, C. (2009). *A comparison of actual and hypothetical willingness to pay of parents and non-parents for protecting infant health: The case of nitrates in drinking water*. *Journal of Agricultural and Applied Economics*, *41*(3), 697–712.
Lu, J. (2015). *The effect of perceived carrier-ingredient fit on purchase intention of functional food moderated by nutrition knowledge and health claim*. *British Food Journal*, *117*(7), 1872–1885.
Lusk, J.L., Fields, D., & Prevatt, W. (2008). *An incentive compatible conjoint ranking mechanism*. *American Journal of Agricultural Economics*, *90*(2), 487–498.
Lusk, J.L., & Schroeder, T.C. (2004). *Are choice experiments incentive compatible? A test with quality differentiated beef steaks*. *American Journal of Agricultural Economics*, *86*(2), 467–482.
Lyly, M., Roininen, K., Honkapää, K., Poutanen, K., & Lähteenmäki, L. (2007). *Factors influencing consumers' willingness to use beverages and ready-to-eat frozen soups containing oat β-glucan in Finland, France and Sweden*. *Food Quality and Preference*, *18*(2), 242–255.
Lynam, A.-M., McKevitt, A., & Gibney, M.J. (2011). *Irish consumers' use and perception of nutrition and health claims*. *Public Health Nutrition*, *14*(12), 2213–2219.
Maclnni, D.J., & Jaworski, B.J. (1989). *Information processing from advertisements: Toward an integrative framework*. *Journal of Marketing*, *53*, 1–23.
McGuire, W.J. (1985). Attitudes and attitude change. In G., Lindzey, & E., Aronson (Eds.), *The handbook of social psychology* (2, 3rd edn. ed., pp. 233–346). New York: Random House.
Mai, R., & Hoffmann, S. (2015). *How to combat the unhealthy = tasty intuition: The influencing role of health consciousness*. *Journal of Public Policy & Marketing*, *34*(1), 63–83.
Marette, S., Roosen, J., Blanchemanche, S., & Feinblatt-Mélèze, E. (2010). *Functional food, uncertainty and consumers' choices: A lab experiment with enriched yoghurts for lowering cholesterol*. *Food. Policy*, *35*(5), 419–428.
Martin, C.L., & Nagao, D.H. (1989). *Some effects of computerized interviewing on job applicant responses*. *Journal of Applied Psychology*, *74*(1), 72–80.
Maheswaran, D., & Sternthal, B. (1990). *The effects of knowledge, motivation, and type of message on ad processing and product judgments*. *Journal of Consumer Research*, *17*, 66–73.
Masson, E., Debucquet, G., Fischler, C., & Merdji, M. (2016). *French consumers' perceptions of nutrition and health claims: A psychosocial-anthropological approach*. *Appetite*, *105*(1), 618–629.
Maubach, N., Hoek, J., & Mather, D. (2014). *Interpretive front-of-pack nutrition labels. Comparing competing recommendations*. *Appetite*, *82*, 67–77.
Menger-Ogle, A.D., & Graham, D.J. (2018). *The influence of front-of-package nutrition claims on food perceptions and purchase intentions among Nepali consumers*. *Food Quality and Preference*, *66*, 160–170.
Menozzi, D., Nguyen, T.T., Sogari, G., Taskov, D., Lucas, S., Castro-Rial, J.L.S., & Mora, C. (2020). *Consumers' preferences and willingness to pay for fish products with health and environmental labels: Evidence from five European countries*. *Nutrients*, *12*(9), 2650.
Miele, N.A., Di Monaco, R., Cavella, S., & Masi, P. (2010). *Effect of meal accompaniments on the acceptability of a walnut oil-enriched mayonnaise with and without a health claim*. *Food Quality and Pref.*, *21*(5), 470–477.
Miklavec, K., Pravst, I., Grunert, K.G., Klopčič, M., & Pohar, J. (2015). *The influence of health claims and nutritional composition on consumers' yoghurt preferences*. *Food Quality and Preference*, *43*, 26–33.
Miller, E.G., Seiders, K., Kenny, M., & Walsh, M.E. (2011). *Children's use of on-package nutritional claim information*. *Journal of Consumer Behaviour*, *10*(3), 122–132.
Miller, L.M.S., & Cassady, D.L. (2015). *The effects of nutrition knowledge on food label use. A review of the literature*. *Appetite*, *92*, 207–216.
Milosavljevic, M., & Cerf, M. (2008). *First attention then intention: Insights from computational neuroscience of vision*. *International Journal of Advertising*, *27*(3), 381–398.
Miraballes, M., Fiszman, S., Gámbaro, A., & Varela, P. (2014). *Consumer perceptions of satiating and meal replacement bars, built up from cues in packaging information, health claims and nutritional claims*. *Food Research International*, *64*, 456–464.
Mitchell, A.A. (1981). *The Dimensions of Advertising Involvement. Advances in Consumer Research*, *8*(1), 25–30.
Mitić, S., & Gligorijević, M. (2015). *Consumers' attitudes, knowledge and consumption of products with nutrition and health claims*. *Economics of Agriculture*, *62*(2), 1–18.
Mogendi, J.B., De Steur, H., Gellynck, X., & Makokha, A. (2016). *Consumer evaluation of food with nutritional benefits: A systematic review and narrative synthesis*. *Interational Journal of Food Sciences and Nutrition*, *67*(4), 355–371.
Moon, W., Balasubramanian, S.K., & Rimal, A. (2011). *Health claims and consumers' behavioral intentions: The case of soy-based food*. *Food Policy*, *36*(4), 480–489.
Moorman, C. (1990). *The effects of stimulus and consumer characteristics on the utilization of nutrition information*. *Journal of Consumer Research*, *17*(3), 362–374.
Moorman, C., & Matulich, E. (1993). *A model of consumes' preventive health behaviours – The role of health motivation and health ability*. *Journal of Consumer Research*, *20*, 208–228.
Moorman, C., Diehl, K., Brinberg, D., & Kidwell, B. (2004). *Subjective knowledge, search locations, and consumer choice*. *Journal of Consumer Research*, *31*(3), 673–680.
Nobrega, L., Ares, G., & Deliza, R. (2020). *Are nutritional warnings more efficient than claims in shaping consumers' healthfulness perception? Food Quality and Preference*, *79*, 103749.
O'Brien, G.M., Stewart-Knox, B.J., McKinley, A., de Almeida, M.D.V., & Gibney, M.J. (2012). *Perceived risk of metabolic syndrome and attitudes towards fat-modified food concepts among European consumers*. *Food Quality and Preference*, *23*(1), 79–85.
Ohama, H., Ikeda, H., & Moriyama, H. (2006). *Health foods and foods with health claims in Japan*. *Toxicology*, *221*, 95–111.
Oliveira, D., Ares, G., & Deliza, R. (2018). *The effect of health/hedonic claims on consumer hedonic and sensory perception of sugar reduction: Case study with orange/passionfruit nectars*. *Food Research International*, *108*, 111–118.
Oliveira, D., Machín, L., Deliza, R., Rosenthal, A., Walter, E.H., Giménez, A., & Ares, G. (2016). *Consumers' attention to functional food labels: Insights from eye-tracking and change detection in a case study with probiotic milk*. *LWT - Food Science and Technology, Complete*, *68*, 160–167.
Olson, J.C., & Jacoby, J. (1972). *Cue utilization in the quality perception process*. *ACR Special Volumes*, SV-SV02. http://acrwebsite.org/volumes/11997/volumes/sv02/SV-02.
Orquin, J.L. (2014). *A Brunswik lens model of consumer health judgments of packaged foods*. *Journal of Consumer Behaviour*, *13*(4), 270–281.

Orquin, J.L., & Scholderer, J. (2015). *Consumer judgments of explicit and implied health claims on foods: Misguided but not misled. Food Policy*, *51*, 144–157.
Øvrum, A., Alfnes, F., Almli, V.L., & Rickertsen, K. (2012). *Health information and diet choices: Results from a cheese experiment. Food Policy*, *37*(5), 520–529.
Padhi, E.M.T., Dan Ramdath, D., Carson, S.J., Hawke, A., Blewett, H.J., Wolever, T.M.S., … Duncan, A.M. (2015). *Liking of soy flour muffins over time and the impact of a health claim on willingness to consume. Food Research International*, *77*, 491–497.
Petrovici, D., Fearne, A., Nayga, R.M., & Drolias, D. (2012). *Nutritional knowledge, nutritional labels, and health claims on food: A study of supermarket shoppers in the South East of England. British Food J*, *114*(6), 768–783.
Petticrew, M., & Roberts, H. (2006). *Systematic reviews in the social sciences: A practical guide* (pp. xv, 336). Blackwell Publishing.
Petty, R., & Cacioppo, J. (1986). *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. Springer-Verlag.
Poulsen, C.S., Juhl, H.J., Kristensen, K., Bech, A.C., & Engelund, E. (1996). *Quality guidance and quality formation. Food Quality and Preference*, *7*, 127–135.
Prieto-Castillo, L., Royo-Bordonada, M.A., & Moya-Geromini, A. (2015). *Information search behaviour, understanding and use of nutrition labeling by residents of Madrid, Spain. Public Health*, *129*(3), 226–236.
Raghunathan, R., Naylor, R.W., & Hoyer, W.D. (2006). *The unhealthy = tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. Journal of Marketing*, *70*(4), 170–184.
Regulation (EC) No. 1924/2006. Retrieved June 20, 2018, from https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A02006R1924-20121129.
Ritvanen, T., Lilleberg, L., Tupasela, T., Suhonen, U., Eerola, S., Putkonen, T., & Peltonen, K. (2010). *The characterization of the most-liked reduced-fat Havarti-type cheeses. Journal of Dairy Science*, *93*(11), 5039–5047.
Roe, B., Levy, A.S., & Derby, B.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*(1), 89–105.
Romagny, S., Ginon, E., & Salles, C. (2017). *Impact of reducing fat, salt and sugar in commercial foods on consumer acceptability and willingness to pay in real tasting conditions: A home experiment. Food Quality and Preference*, *56*, 164–172.
Saba, A., Vassallo, M., Shepherd, R., Lampila, P., Arvola, A., Dean, M., … Lähteenmäki, L. (2010). *Country-wise differences in perception of health-related messages in cereal-based food products. Food Quality and Preference*, *21*(4), 385–393.
Sabbe, S., Verbeke, W., Deliza, R., Matta, V., & Van Damme, P. (2009). *Effect of a health claim and personal characteristics on consumer acceptance of fruit juices with different concentrations of açaí (Euterpe oleracea Mart.). Appetite*, *53*(1), 84–92.
Siegrist, M., Stampfli, N., & Kastenholz, H. (2008). *Consumers' willingness to buy functional foods. The influence of carrier, benefit and trust. Appetite*, *51*(3), 526–529.
Siró, I., Kápolna, E., Kápolna, B., & Lugasi, A. (2008). *Functional food. Product development, marketing and consumer acceptance—A review. Appetite*, *51*(3), 456–467.
Skaczkowski, G., Durkin, S., Kashima, Y., & Wakefield, M. (2016). *The effect of packaging, branding and labelling on the experience of unhealthy food and drink: A review. Appetite*, *99*, 219–234.
Stancu, V., Grunert, K.G., & Lähteenmäki, L. (2017). *Consumer inferences from different versions of a beta-glucans health claim. Food Quality and Preference*, *60*, 81–95.
Steenkamp, J.B.E.M. (1990). *Conceptual model of the quality perception process. Journal of Business Research*, *21*(4), 309–333.
Steinhauser, J., & Hamm, U. (2018). *Consumer and product-specific characteristics influencing the effect of nutrition, health and risk reduction claims on preferences and purchase behavior - A systematic review. Appetite*, *127*, 303–323.
Steinhauser, J., Janssen, M., & Hamm, U. (2019a). *Who buys products with nutrition and health Claims? A purchase simulation with eye tracking on the influence of consumers' nutrition knowledge and health motivation. Nutrients*, *11*(9), 2199.
Steinhauser, J., Janssen, M., & Hamm, U. (2019b). *Consumers' purchase decisions for products with nutrition and health claims: What role do product category and gaze duration on claims play? Appetite*, *141*, 104337.
Stojanović, Ž., Dragutinović-Mitrović, R., & Zaouche-Laniau, M. (2017). *Products with nutrition and health claims in the Western Balkans: Labelling behaviour, regulation and policy implications. European Journal of Law and Economics*, *43*(1), 107–123.
Strijbos, C., Schluck, M., Bisschop, J., Bui, T., de Jong, I., van Leeuwen, M., … van Breda, S.G. (2016). *Consumer awareness and credibility factors of health claims on innovative meat products in a cross-sectional population study in the Netherlands. Food Quality and Preference*, *54*, 13–22.
Suzuki, S., & Park, J. (2018). *Consumer evaluation of healthy, unpleasant-tasting food and the post-taste effect of positive information. Food Quality and Preference*, *66*, 107–110.
Szakos, D., Ózsvári, L., & Kasza, G. (2020). *Perception of older adults about health-related functionality of foods compared with other age groups. Sustainability*, *12*(7), 2748.
Talati, Z., Pettigrew, S., Dixon, H., Neal, B., Ball, K., & Hughes, C. (2016). *Do health claims and front-of-pack labels lead to a positivity bias in unhealthy foods? Nutrients*, *8*(12).
Talati, Z., Pettigrew, S., Hughes, C., Dixon, H., Kelly, B., Ball, K., & Miller, C. (2016). *The combined effect of front-of-pack nutrition labels and health claims on consumers' evaluation of food products. Food Quality and Preference*, *53*, 57–65.
Tan, K.Y.M., van der Beek, E.M., Kuznesof, S.A., & Seal, C.J. (2016). *Perception and understanding of health claims on milk powder for children: A focus group study among mothers in Indonesia, Singapore and Thailand. Appetite*, *105*, 747–757.
Temesi, Á., Bacsó, Á., Grunert, K.G., & Lakner, Z. (2019). *Perceived correspondence of health effects as a new determinant influencing purchase intention for functional food. Nutrients*, *11*(4).
Teratanavat, R., & Hooker, N.H. (2006). *Consumer valuations and preference heterogeneity for a novel functional food. Journal of Food Science*, *71*(7), S533–S541.
Thaler, R. (1981). *Some empirical evidence on dynamic inconsistency. Economics Letters*, *8*(3), 201–207.
Timpanaro, G., Bellia, C., Foti, V.T., & Scuderi, A. (2020). *Consumer behaviour of purchasing biofortified food products. Sustainability*, *12*(16), 6297.
Tórtora, G., Machín, L., & Ares, G. (2019). *Influence of nutritional warnings and other label features on consumers' choice: Results from an eye-tracking study. Food Research International*, *119*, 605–611.
Urala, N., & Lähteenmäki, L. (2007). *Consumers' changing attitudes towards functional foods. Food Quality and Preference*, *18*(1), 1–12.
Vadiveloo, M., Morwitz, V., & Chandon, P. (2013). *The interplay of health claims and taste importance on food consumption and self-reported satiety. Appetite*, *71*, 349–356.
Van Buul, V.J., & Brouns, F.J.P.H. (2015). *Nutrition and health claims as marketing tools. Critical Reviews in Food Science and Nutrition*, *55*(11), 1552–1560.
Van der Zanden, L.D.T., Kleef, E.V., de Wijk, R.A., & Van Trijp, H.C.M. (2014). *Understanding heterogeneity among elderly consumers: An evaluation of segmentation approaches in the functional food market. Nutrition Research Reviews*, *27*(1), 159–171.
Van Kleef, E., Trijp, V.H.C.M., & Luning, P. (2005). *Functional Foods: Health claims-food product comparability and the impact of health claim framing on consumer evaluation. Appetite*, *44*, 299–308.
Van Trijp, H.C.M., & Van der Lans, I.A. (2007). *Consumer perceptions of nutrition and health claims. Appetite*, *48*(3), 305–324.
Van Wezemael, L., Caputo, V., Nayga, R.M., Chryssochoidis, G., & Verbeke, W. (2014). *European consumer preferences for beef with nutrition and health claims: A multi-country investigation using discrete choice experiments. Food Policy*, *44*, 167–176.
Vecchio, R., Loo, E.J.V., & Annunziata, A. (2016). *Consumers' willingness to pay for conventional, organic and functional yogurt: Evidence from experimental auctions. International Journal of Consumer Studies*, *40*(3), 368–378.
Verbeke, W. (2005). *Agriculture and the food industry in the information age. The European Review of Agricultural Economics*, *32*(3), 347–368.
Verbeke, W. (2008). *Impact of communication on consumers' food choices. The Proceedings of the Nutrition Society*, *67*(3), 281–288.
Verbeke, W., Scholderer, J., & Lähteenmäki, L. (2009). *Consumer appeal of nutrition and health claims in three existing product concepts. Appetite*, *52*(3), 684–692.
Vidigal, M. C. T. R., Minim, V. P. R., Carvalho, N. B., Milagres, M. P., & Gonçalves, A. C. A. (2011). Effect of a health claim on consumer acceptance of exotic Brazilian fruit juices: Açaí (Euterpe oleracea Mart.), Camu-camu (Myrciaria dubia), Cajá (Spondias lutea L.) and Umbu (Spondias tuberosa Arruda). Food Research International 44(7), 1988–1996.
Vila-López, N., Küster-Boluda, I., & Sarabia-Sánchez, F. (2017). *Designing a packaging to promote healthy and low-fat foods: Adolescents versus young-adults. Food Research International*, *99*, 815–820.
Viscecchia, R., Nocella, G., De Devitiis, B., Bimbo, F., Carlucci, D., Seccia, A., & Nardone, G. (2019). *Consumers' trade-off between nutrition and health claims under Regulation 1924/2006: Insights from a choice experiment analysis. Nutrients*, *11*(12).
Volinskiy, D., Adamowicz, W.L., Veeman, M., & Srivastava, L. (2007). *Does choice context affect the results from incentive-compatible experiments? The case of non-GM and country-of-origin Premia in Canola Oil. Canadian Journal of Agricultural Economics/ Revue Canadienne d'agroeconomie*, *57*(2), 205–221.
Wansink, B., & Chandon, P. (2006). *Can "low-fat" nutrition labels lead to obesity? Journal of Marketing Research*, *43*(4), 605–617.
Wedel, M., & Pieters, R. (2008). *Eye tracking for visual marketing. Foundations and Trends in Mkt.*, *1*(4), 231–320.
Williams, P. (2005). *Consumer understanding and use of health claims for foods. Nutrition Reviews*, *63*(7), 256–264.
Williams, P., Ridges, L., Batterham, M., Ripper, B., & Hung, M.C. (2008). *Australian consumer attitudes to health claim – food product compatibility for functional foods. Food Policy*, *33*(6), 640–643.
Wills, J.M., Storcksdieck genannt Bonsmann, S., Kolka, M., & Grunert, K.G. (2012). *European consumers and health claims: Attitudes, understanding and purchasing behaviour. The Pr. of the Nutrition Society*, *71*(2), 229–236.
Wong, C.L., Mendoza, J., Henson, S.J., Qi, Y., Lou, W., & L'Abbé, M.R. (2014). *Consumer attitudes and understanding of cholesterol-lowering claims on food: Randomize mock-package experiments with plant sterol and oat fibre claims. European Journal of Clinical Nutrition*, *68*, 946.
Wortmann, L., Enneking, U., & Daum, D. (2018). *German Consumers' Attitude towards selenium-biofortified apples and acceptance of related nutrition and health claims. Nutrients*, *10*(2).
Yue, C., & Tong, C. (2009). *Organic or local? Investigating consumer preference for fresh produce using a choice experiment with real economic incentives. HortScience*, *44*(2), 366–371.