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Portuguese consumers' attitudes towards food labelling


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Research team: Sandra Gomes, Mafalda Nogueira and Mafalda Ferreira
(Instituto Português de Administração de Marketing) and Maria João Gregório
(Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto)

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Executive summary

Policy-makers, researchers, food manufacturers and retailers are re-examining the provision of nutrition information to consumers on food labels. The WHO Regional Office for Europe has called on countries to extend the use of consumer-friendly front-of-package (FOP) labelling that is easy to understand and interpret on the basis of strong, consistent evidence that such schemes are preferred and correctly understood. Challenges in implementing policies at national level have been experienced, however, because governments and policy-makers lack knowledge about consumers' attitudes and behaviour in regard to food choice and consumption. In some setting, it has therefore been difficult to identify the most appropriate scheme. In the Portuguese context, little was previously known about consumers' attitudes towards food labelling. There was some evidence of differences between consumers who are poorly and highly literate and also according to gender, age and socioeconomic status; however, there were no unequivocal data on how different consumer segments understand and respond to nutrition labelling.

Consumers read labels for several reasons: to obtain information about a product (e.g. its contents, production process, origin, certification), to compare different brands and when purchasing a new product. Often, consumers expect that they will reinforce previously learnt information. Recently, because of food safety scandals and the increasing popularity of health- and environment-conscious consumption patterns, consumers are interested in making better-informed decisions and healthy food choices by reading the information on product packaging (e.g. nutrition labels, environment labels, warning labels and health claims) (Dörney & Gyulavári, 2016). Thus, it is clearly important to provide appropriate, understandable nutrition information to consumers, and it can have a significant positive effect on food choice (Wills et al., 2009).

The aim of this report is to show how Portuguese consumers use and understand nutrition information on food labels in their daily lives. It starts by presenting the theoretical framework for exploring the research goals. This is followed by a description of the methods, including the overall research approach, data collection techniques and data analysis procedures. Primary data were collected in a survey of 1127 Portuguese consumers and in four focus groups that explored differences among adults who were strongly conscious about healthy eating, adults who were weakly conscious about healthy eating, adults with less education and young people aged 15–18 years.

A first important insight of this study is the importance in investigations of using mixed methods to gain deeper understanding of consumers' attitudes towards nutrition labelling. The qualitative approach allowed us to further characterize consumers' preferences for labels and to identify obstacles to their use, which may be useful in future intervention strategies.

In a national survey (A.C. Nielsen, 2012), Portuguese consumers reported that they often used food and nutrition labelling to make choices, especially at the point of sale. The results of the focus groups discussions, however, indicated that actual use of food labels, and especially nutrition labels, in food purchase is lower. This study shows that they consider the best location for information about nutrients in food to be the front of the package. Consistent with much international evidence, all segments of Portuguese consumers preferred symbolic, coloured schemes and simple, FOP presentation of key nutrients. According to the results of the focus groups, the "traffic light" scheme is best understood by all groups and can result in faster decision-making at points of sale. The report ends with some recommendations for the main stakeholders on real use of nutrition labels.

This report adds knowledge about Portuguese consumers' understanding, preferences and use of different labelling formats. It makes a valuable contribution to policy discussions on FOP labelling and may inform decisions on a national scheme. Internationally, the study adds to the growing consensus that FOP labelling is important to consumers and that the most effective schemes are likely to be those that are interpretive and based on symbols, colours, words or quantifiable elements.

1. Theoretical background

1.1 Complexity and determinants of food choices

Food choices and consumption in developed countries have become increasingly complex and difficult to monitor. According to Grunert (2002), the complexity of food choice derives from the intricacies of supplier–demand relations: on the supply side, companies are continuously challenged to offer differentiation, and, on the demand side, consumers are becoming more heterogeneous. Research on the topic reveals that the consumption patterns of actual consumers are difficult to categorize in a simple manner (Krebs-Smith & Kantor, 2001).

The overload of alternatives increases the difficulty of consumers in making food choices (Schwartz, 2004). Traditionally, food has been considered a "low-involvement" product, that is to say, a good that is habitually purchased and hence requires minimal effort from the consumer. Consumers are, however, becoming increasingly knowledgeable and demanding, better informed and connected and more aware of combining health and pleasure in the products they consume. As mentioned above, the range of food choice on offer has increased, both within categories and overall. Issues such as health preservation, well-being, environmental sustainability and a quest for personal and social happiness are also coming to occupy the heart of consumers' concerns, which implies growing involvement with products and a significant change in their food choices and consumption behaviour.

As pointed out by Grunert (2002), the selection and consumption of food are subject to a complex network of cultural and individual factors. As demand becomes more dynamic, complex and heterogeneous, understanding consumer behaviour becomes more laborious. Yet, it simultaneously creates new opportunities for food producers to add value and to differentiate their products. Inspired by the literature on psychology and consumer behaviour, the following sections present insights into the complexity of consumers' attitudes towards food choices.

1.2 Decision-making in food choices and consumption

Decision-making is a "hot" topic among researchers into consumer behaviour. Particularly in the context of decision-making in food choices, Steenkamp´s (1997) model has been inspirational by identifying four stages in decision-making: need recognition, search for information, evaluation and choice.

The first stage, need recognition, or the need to purchase food, depends on a number of variables. The second stage, search for information, is an important phase, as it is related to the degree of consumer involvement with the product and the information stored in their memories about its attributes. Informed consumers seek less information about a product, make easier, quicker evaluations and are less exposed to external influences, whereas less-informed consumers rely more on brand names and the recommendations of others to evaluate products and make a decision. Garber et al. (2003) argued that choice and buying behaviour involve comparisons of competing brands. Hence, consumer knowledge about food is important in determining their choices. The extent of their nutrition consciousness, nutrition literacy or food literacy thus becomes important in influencing their food choices. According to Rozin (2006), preference implies choice. To prefer a food is to choose it over another.

Numerous models have been proposed for the main explanatory variables of consumer behaviour and food purchase. Depending on the scientific area of origin of these models, they have a greater focus on economic variables, rational–cognitive variables, social and cultural influences and personal characteristics. Ene (2008) concluded that traditional models are no longer adequate to understand the complexity of food consumption behaviour in post-industrial societies. In order to find an integrated perspective and a multidimensional model, the following section systematizes some of the dimensions that determine food choice.

1.3 Determinants of food choices

The literature differentiates three types of determinant that most directly influence food choice: personal, sociocultural and contextual.

1.3.1 Personal determinants

Consumers make decisions on the basis of their personal lifestyle, economic status, occupation, age, personality and self-esteem. A number of determinants of consumer behaviour in food choice and purchasing have been identified in the literature.

Health and appearance are two of the most important determinants. Consumers develop perceptions of what they consider to be healthy and unhealthy foods, which come from various sources during socialization, creating representations of what is and is not considered healthy. These representations influence food choices throughout the life-cycle (Vila-López & Kuster-Boluda, 2016).

Pleasure can be seen simultaneously as a consequence of and an influence on food choice. The acts of feeling, smelling, tasting and looking at food at the place of purchase are clearly stimuli that anticipate pleasure and incentivize consumption. This variable is considered to be multifaceted, involving anticipation, consumption and rewards associated with food (Pettigrew, 2016).

The sensory aspects of food (taste, appearance and smell) are highly valued as determinants of food choice. Taste is clearly the dominant sense, but it is an experience that can be evaluated only after purchase. Hence, consumers with limited information about these attributes use other variables to predict it, such as brand and price (Grunert et al., 2001).

Emotions have also been suggested as significant determinants of food choice, as some emotions provoke a demand for certain types of food products (Gutjar et al., 2015). For example, empirical evidence indicates that stress and negative emotions influence consumers' choices of food (Roberts, 2008).

Cost includes not only the actual price of the food but also the cost perceived by the consumer. Rose et al. (2010) stated that "we use food cost, instead of price because the actual price that a consumer pays is a function of the in-store price and travel costs to the store where the food is purchased" (pp. 22–23). A consumer's perception of food cost depends strongly on the macroeconomic environment, because, regardless of personal and family conditions, consumers are indirectly influenced by the economic situation of the country. The climate of consumer trust and distrust is influenced by national and international economic developments, which are known to influence consumption in general and food in particular.

Environmental conscience is becoming a key determinant of food choice. The rise in collective and individual environmental awareness in recent decades has increased a preference for natural ingredients and concern about carbon footprints and food packaging, which have had a major impact on purchasing decisions (Steptoe et al., 1995).

Consumer interest in *convenience* has increased over the past few decades. Although convenience is seen as an intangible aspect, associated with time- and energy-saving during purchasing, storage, preparation and consumption of food, it is a commodity that can be spent or saved (Furst et al., 1996; Grunert, 2002; Ene, 2008).

Sociodemographic determinants comprise several dimensions that, unsurprisingly, influence consumers' decisions on food purchase, namely age, gender, life-cycle and literacy. For example, in general, women have been found to be more concerned about food purchases, take longer to make their choices in the market-place and are usually responsible for buying and preparing food for their families. Concern about food increases with advancing age, clearly influencing purchase and consumption. Consumers' literacy (knowledge and understanding of nutrition information) is

another forceful influence on food choice. Likewise, consumers' life-cycles and household composition determine food choice. Households in which there are children and seniors have specific food choices (Gould, 2002).

1.3.2 Sociocultural determinants

Cultures, subcultures and social context clearly have a major influence on consumers' food choices, to the point that food may be interpreted as a manifestation of a nation's culture. Montanari (2006) stated that "the mind, shaped by culture, plays the most important role in tasting food". Tastes, preferences, cravings and dietary patterns are formed and transmitted to individuals from birth through to adulthood during socialization. Authors such as Rozin (2006) proclaim culture and the social context as the primary influences on food choice. Food is the cultural representation of a nation's eating habits and the rituals and traditions involved in its various stages, from production to preparation and consumption (Steptoe et al., 1995; Prescott et al., 2002). Marshal (1995) argued that "people like what they eat" rather than "eat what they like", and Nordström et al. (2013) added that "there is no culture without food. Food functions as a way to give structure to daily life and to ritualistically mark the passages from one formal life stage to another" (p. 358). Taste preferences differ by country, and there are also distinct perceptions in countries about what is healthy and convenient and the kind of production process that is most acceptable (Nielsen et al., 1998). Nutrition appears to be a cultural biological process (Rozin, 2006).

The family is one of the main socializating agents and a powerful carrier of cultural food patterns through generations, including food products, rituals and symbols. Education in food taste is initiated in both extended and nuclear families. Besides active participation in the social construction of taste, the preferences of each person in a household influence food choices overall.

Given that food is a trigger of social interaction (Steptoe et al., 1995), *peer groups* are major socializing agents, in that greater diversity in food habits is brought by elements of different groups. Ultimately, eating experiences in nursery schools and schools heavily influence food choices, which make new demands on parents.

Social media and blogs are increasingly influencing food choices. Today, consumers do not feel fulfilled when eating alone. They are eager to share their gastronomic experiences, food habits, food markets and other information that eventually influences other people's food choices.

1.3.3 Contextual determinants

Contextual variables are also a strong influence on consumers' food choices. The food supply, including food production, marketing, sales and distribution, have a strong influence on what people eat (Fine & Leopold, 1993).

The *range of supply*, comprising competing products and the type and variety of products available, is obviously a major factor in food choices. Furthermore, the *environment at the point of sale* (noise, afflux, smell, cleanliness, music, presence of other customers) also shapes consumers' food choice (McFerran et al., 2010), as consumers are influenced by the behaviour of third parties, with or without interaction. The physical environment is also an influential factor. For example, Biswas et al. (2017) found an effect of ambient light on food choices, dim light resulting in unhealthy food choices with a high calorie content. Regarding *place of consumption* (at home or elsewhere), the food eaten at home depends on factors such as the availability of products at the point of sale, whereas food eaten elsewhere depends on the available time and menu choices in restaurants, schools and canteens.

Legal regulations by governments and *self-regulation* by the agri-food industry actively determine food choices, as regulations protect consumers and provide a context involving different actors, necessarily representing new inputs into food choice.

Point-of-sale marketing strategies, such as shelf placement, packaging, labels and shop layout, are also sources of information that influence food choices. According to Ene (2008), nutritional education at the point of sale is likely to

influence food shopping. Dimitri and Rogus (2014) suggested that shelf placement of food products affects sales and that the amount of healthy food on supermarket shelves correlates with the quality of the diet of residents in a given area. Of the marketing strategies, packaging is one of the major determinants of food choices, because of its influence on both consumers' perceptions about a product and the immediate decision to purchase the product. Packaging, and particularly the effects of the information displayed on labels, has not been sufficiently investigated; the following section summarizes the findings on the influence and importance of food packaging in food choices.

1.4 Influence of packaging on food choices

Packaging has multidimensional functions. Besides having information about a product and a company, it is a powerful technique for communicating with consumers and safeguarding product quality (Silayoi & Speece, 2004). Food packaging has been defined as "a structure designed to contain a commercial food product, i.e. to make it easier and safer to transport, to protect the product against contamination or loss, degradation or damage and to produce a convenient way to dispense the product" (Peters-Texeira & Badrie, 2005).

Underwood and Ozanne (1998) reported that research on the influence of packaging on the perception of food quality was recent. It began in the 1980s by questioning the relation between package and quality and was followed in the 1990s by more detailed investigation of the understanding and use of nutrition information. Several authors have described the increasing importance of packaging in the current context of greater competitiveness in the food sector, not only as a fundamental marketing tool at the point of sale but also as a major determinant of purchasing behaviour and food consumption (Underwood et al., 2001; Silayoi & Speece, 2004; Estiri et al., 2010). In this section, we present the importance of packaging in food choice, starting with packaging functions and elements.

1.4.1 Functions of packaging

Authors are unanimous in distinguishing two types of function of packaging: logistical, functional or technical; and marketing and communication.

Logistic, functional or technical function
This function essentially protects the product during its movement through distribution channels, from production to disposal. In addition to protection and conservation, it ensures safe, easy handling, especially by consumers. Concern about packaging for storage is becoming crucial in view of the characteristics of the housing of consumers. The importance of environmental protection in the disposal phase has also been mentioned (Prendergast & Pitt, 1996; Peters-Texera & Badrie, 2005). Packaging technology should be considered research and development, as innovation is required to find new products that are more efficiently produced and ensure packaging that lasts longer and is environmentally friendly and nutritionally responsible (Underwood et al., 2001).

Marketing and communication function
Packaging has become a key vehicle in marketing communication and managing food brands, particularly at points of sale (Estiri et al., 2010). Packaging reaches more widely than advertising and can differentiate products from others. It promotes, influences and reinforces purchase decisions at the point of sale and when the product is used (Deliya & Parmar, 2012). Keller (2008) pointed out that consumers are exposed to more than 20 000 product choices on a 30-min visit to a supermarket; thus, packaging becomes "an ultimate selling proposition stimulating impulsive buying behaviour, increasing market share and reducing promotional costs" (Delyia & Parmar, 2012). Rundh (2005) reported that packaging attracts consumers' attention to a brand, enhances its image, influences perceptions about the product, adds unique value to products, differentiates the product from others and helps consumers to choose the product from a range of similar products. Prendergast and Pitt (1996) reported that a perception that packaging is of high or low quality leads consumers to perceive its content as also of high or low quality. Consumers imagine how the product looks, feels, smells or sounds when they see the packaging (Underwood et al., 2001). Ampuero and Vila (2006) suggested that packaging can last beyond the product when it serves other purposes.

1.5 Packaging elements

The two main categories of packaging are visual and informational (Underwood et al., 2001; Silayoi & Speece, 2004).

1.5.1 Visual elements

The visual elements consist of graphics and the size and shape of packaging. They are usually associated with the affective aspect of decision-making. Two of the visual elements of a package are graphics and colour and size and shape.

Graphics and colour include layout, colour combination, typography and photography. Graphics and colours are critical aspects in low-involvement buying. For example, the colour of a package influences the consumer's perception of the health attributes of the product (e.g. lighter colours are associated with healthier products); illustrations of the product on packaging attract consumers' attention; and the design and features of packaging differentiate the product from those of competitors (Underwood et al., 2001).

Several studies have emphasized the importance of packaging *size and shape* in consumer perceptions of the product. Wansink (1996) concluded that larger packages are perceived as less expensive and encourage greater use. Consumers usually perceive more stretched-out forms as larger, even when they usually buy the product and know its exact volume.

1.5.2 Information elements

The information provided and the techniques used in packaging appear to be related more closely to the cognitive aspect of decision-making. Written information on packaging can help consumers to make their decisions on the basis of product characteristics. Three types of information are usually considered in packaging research: mandatory, nonmandatory and nutritional (Droulers & Amar, 2016).

Nonmandatory information usually provides commercial information, including brand name, slogan, logos and bar codes. *Mandatory information* depends on national regulations but usually includes description, list and quantity of ingredients, list of allergens, net quantity, "use-by" date, name and address of manufacturers and place of origin. *Nutritional information*, which may be mandatory or nonmandatory, includes nutrients, such as energy (in kJ and kcal), protein, carbohydrate, fat (in g), sugars, saturated compounds, fibre and sodium.

Consumers now pay more attention to information on labels, as they are more concerned with their health and nutrition (Coulson, 2000). Despite the importance of the information on packaging, it can create confusion, either because there is too much or because it is inaccurate and confusing (Underwood & Klein, 2002). This and other considerations are discussed in the next section, on the influence of the information displayed on food packaging on consumers' choices.

1.6 Importance of packaging information in food choices

The literature on this topic describes two theoretical models for understanding the importance of packaging in consumers' decision-making process. The *attitude–behaviour model* indicates that motivation clearly affects the search for information, while the *cue utilization theory* indicates that consumers tend to use extrinsic clues as indicators of product quality. Both help to understand the growing importance of packaging for communicating with consumers (Vila-López & Kuster-Boluda, 2016). As packaging is intrinsically linked to marketing and communication functions, it can be used to promote a healthy lifestyle (Chandon & Wansink, 2012). Thus, strategically used, "packaging is a power information tool" (Silayoi & Speece, 2004:181). These authors add that the impact of packaging elements on consumer purchasing decisions depends on variables including their level of involvement, time pressure and individual characteristics.

Researchers have analysed all the elements and functions of packaging and their impact on purchasing decisions (Underwood et al., 2001; Silayoi & Speece, 2004). The subsequent literature on this topic is still recent and does not provide a clear response, as the results are diverse, due not only to the research models and methods used but also to the research context. One of the most influential types of information displayed on packaging is the brand name (Torres-Moreno et al., 2012; Kim et al., 2013). Package size and visual elements were also reported to be attractive to consumers (Raheem et al., 2014). Estiri et al. (2010:541) suggested that, apart from the tangible visual and informational elements, the buying moment is the actual determinant of food choices, "The food product buyers mostly pay attention to information written on food package when they are going to make their ultimate purchase decision."

Miraballes et al. (2014) concluded that the information on packaging, including claims and messages, strongly influence consumers' perception of a product. Shah et al. (2013) commented that labelling is one of the most visible parts of a product and an important element in marketing. As consumers increase their knowledge and interest in nutrition and health, they intensify their search for information, particularly on labels. The aim of the section below is to provide a comprehensive discussion of information on nutrition and food labelling and its influence on decisions about food products.

1.7 Influence of food and nutrition labelling on food choices

This section provides an explanation of the concept of food and nutrition labelling and its different formats. A definition of the purpose of food and nutrition labelling and its influence on consumer behaviour is followed by a brief summary of the various formats of labelling.

1.7.1 Understanding food and nutrition labelling

In the European Union, labelling is required for all types of prepackaged food, with different requirements for certain categories of food (processed foods, raw agricultural foods, meat, dairy, poultry and eggs and seafood). Attempts to influence eating patterns by informing consumers about the link between diet and health have met with difficulty, and nutrition labelling has been considered one of the major means of shifting consumer behaviour and promoting healthier eating patterns (Grunert & Wills, 2007). Labels provide consumers with information about the nutrition content of food products at the point of purchase, which enables them to make nutritionally appropriate choices (Grunert & Wills, 2007; Wills et al., 2009). Nutrition labels are intended to inform shoppers of the nutritional content of the food items they purchase, increasing shopping efficiency. They can also encourage manufacturers to produce healthier foods. The dual aims of FOP labelling are:

- to assist people in assessing the healthfulness of products in their overall diet and judging the relative healthfulness of food products; and
- to stimulate favourable changes in the composition of the retail food supply as manufacturers seek competitive advantages and avoid unfavourable disclosures.

On the basis of various reports, Andrews et al. (2014) concluded that, because food and nutrition labelling are important policy interventions, their outcomes can include various short-, intermediate- and long-term effects on consumers, food manufacturers and retailers. For consumers, the outcomes include increasing recognition (short-term), promoting understanding (intermediate-term), improving diets (long-term) and decreasing the risks of consumers for obesity and chronic disease (overall impact). For manufacturers and retailers, a number of activities are required to attain the outcomes, such as consumer and stakeholder education and media campaigns. Moreover, companies should be incentivized to commit to simple symbols, more FOP symbols and product reformulation for longer-term impacts on consumer diets, obesity rates and chronic disease.

Grunert and Wills (2007:385) commented that nutrition labels are an attractive means of promoting healthy eating habits, as they "support the goal of healthy eating while retaining consumer freedom of choice, and reduce information search costs for consumers, which should make it more likely that the information provided is actually

being used". Other research generally suggests that nutrition labels and nutrition information are effective in altering consumer behaviour and purchasing decisions. Other studies suggest, however, that consumers still experience difficulty in interpreting nutritional information such as nutritional content and nutrient and health claims (Berning et al., 2010). The section below provides a brief summary of the types of food labelling encountered daily by consumers.

1.7.2 Food and nutrition labelling formats

Extensive research has been conducted on the effectiveness of different label formats (Berning et al., 2010; Hersey et al., 2013; Cecchini & Warin, 2016; Grunert & Aachman, 2016). Effectiveness can be viewed from various perspectives. This section briefly summarizes the main formats discussed by academics and practitioners: types of label (nutrition labels, ingredient lists and health and nutrition claims); FOP and back-of-package (BOP) labelling; and categories of symbols (summary or nutrient-specific).

Types of label

Three types of food label are most commonly used to convey information on nutrition and health: nutrition labels, ingredient lists and claims (Miller & Cassady, 2015).

A *nutrition declaration* usually provides information on the number of calories, serving size and the amounts and/or daily values of macronutrients, vitamins and minerals (e.g. fats, carbohydrate, and calcium).

Ingredient lists categorize ingredients in descending order of proportion by weight. Font size and presentation should conform to regulations to ensure maximal readability; however, even when they do, font size is a frequent problem for consumers trying to read ingredient lists. Ingredient lists also include non-nutrition information (e.g. additives) and information to help consumers to evaluate the healthiness of foods.

Health and nutrition claims are intended to communicate the scientifically proven health benefits of consuming a particular food, including the value or relative amount of each nutrient in a food product (e.g. fibre-rich, fat-free, low-calorie). It has been shown that claims attract more attention than nutrition tables or ingredient lists (Grunert & Wills, 2007). Health claims can also provide information, such as structure and function (e.g. "helps promote heart health"), content and symbols (e.g. "low in saturated fat", image of a heart), health claims (e.g. "calcium-rich foods such as yoghurt may reduce the risk for osteoarthritis") and dietary guidance (e.g. "grain foods may reduce the risk for heart disease"). Many food labels now display claims such as "gluten-free", "natural", "organic" or "GMO free". These statements unquestionably provide some information to assist consumers in making a decision; however, consumers often consider such statements confusing, misleading or sometimes untrustworthy (Andrews et al., 2014). In the absence of nutritional criteria for the use of claims, they may appear on the packaging of foods that are objectively high in saturated fats, sugar and/or salt and may thus communicate a conflicting message.

Front-of-package (FOP) and back-of-package (BOP)

Use of information on FOP and BOP labels has been the subject of intensive debate. Many national governments and food manufacturers have introduced FOP nutrition labelling to provide consumers with at-a-glance information (Andrews et al., 2014), which has been justified as a necessary aid to interpretation, as it provides a simplified message or summary on the FOP label (signpost) of the more complex nutrition table on the BOP label (Grunert & Wills, 2007; Wills et al., 2009).

In the past few years, consumers of packaged food products have been flooded with a variety of nutrition systems, symbols and icons.[1] Whichever format is used, the purpose of FOP (or BOP) labels is to increase the use of nutrition information. FOP labels are considered to be a helpful, rather than an alternative, supplement to nutrition information

1 For example, the Smart Choices icon, Kellogg's "Nutrition at a Glance", Mars' "Guideline Daily Amounts", the American Heart Association's "Heart Checkmark", WalMart's "Great for You" initiative, Hannaford's "Guiding Stars", the Grocery Manufacturers of America and the Food Marketing Institute's "Facts Up Front" system, the NuVal nutrition scoring system and the United Kingdom's traffic light system, based on guidelines for daily amounts.

tables, and their location may be more convenient and effective for consumers making food choices (Andrews et al., 2014).

Examples of FOP nutrition labels are "traffic light" systems, guidelines for daily amounts and health logos or ratings. In the traffic light system, green indicates smaller amounts of nutrients, amber medium amounts and red large amounts.

Categories of symbol

FOP labelling systems are intended to help consumers make accurate evaluations of nutrition and better food choices. The symbols may be summary ("evaluative") or nutrient-specific ("reductive") (Andrews et al., 2014).

Summary or evaluative symbols provide a global assessment of a product's healthfulness. The summary system usually includes a symbol or check if the product meets certain nutritional criteria. The first system was "Smart Spot" by PepsiCo in 2004, followed by the "Smart Choices" programme and icon of Unilever, Kraft, Coca-Cola, Pepsi and Kellogg's (Lupton et al., 2010). Examples of government schemes include the Nordic "keyhole" logo, the "Choices International" logo and the Finnish heart symbol. Recent summary indicators include the Australian "Health Star" rating and the French "Nutriscore" (a colour-coded single rating).

Nutrient-specific or reductive FOP labelling systems and symbols usually present a small amount or "snapshot" of information, which is displayed in the form of a symbol. The traffic light FOP label, originally launched by the United Kingdom Food Standards Agency, is probably the best-known nutrient-specific symbol. A simple, coloured traffic light icon with absolute and percentage guideline daily amounts is affixed, which lists energy (calories), fat, saturated fat, sugars, and salt (sodium) per 100 g of the food in question.

Andrews et al. (2014) emphasized the importance of standardized criteria and a format that is: widely adopted by food retailers and manufacturers; standardized such that consumers can readily notice, understand and use it; and is appropriate for a wide range of literacy and demographic factors. Thus, both consumer awareness and comprehension (through product nutrient information and education) are important objectives of FOP labelling, as well as actual use (dietary choices and behaviour). Consumers prefer a FOP label on which the healthfulness of a product is easy to understand and which comes from a trusted source (Hawley et al., 2013; Andrews et al., 2014). Hence, it is important to understand how consumers in various sectors and backgrounds behave in the face of different types of information on food labels. The next section discusses these themes and contributes to understanding how consumers respond and act to food labels.

1.8 Factors that influence consumers' attitudes towards food and nutrition labelling

Four main factors have been identified that influence consumers' attitudes towards food labelling: interest (nutritional consciousness), knowledge, demographics and label format (Grunert & Wills, 2007). This section provides insights on how each factor has been interpreted in previous research, particularly on its direct and indirect influence on consumers' responses to food labelling.

1.8.1 Interest

Consumers show widespread interest in nutrition information on food packaging, although the interest depends on the situation and the product (Grunert & Wills, 2007; Wills et al., 2009). It has been suggested that nutrition consciousness might be a dimension of interest in food labelling. "Nutrition consciousness" can be defined as the likelihood that a person will pursue a healthy diet and might be interpreted as an element of interest (Berning et al., 2010). The review by Grunert & Wills (2007) revealed surprising consistency in consumer interest in nutrition information and, specifically, in information on the nutritional properties of the foods they eat. Nutrition information is not, however, the main

element of interest with regard to food, even in countries where nutrition issues are considered important. In the same review, it was reported that, in Sweden, for example, health and nutrition were ranked sixth in importance after food safety, freshness, taste, freedom from pesticides and animal welfare.

Consumers are more interested in nutrition information for some products than others. For example, consumers consider information less pertinent for fresh products like fruit, vegetables and meat, but it was considered to be valuable for processed products such as ready-to-eat meals. Consumers who are interested in nutrition information do not necessarily wish to obtain the information from labels, although they are generally positive about labelling, especially when it is applied systematically to all packaged products. Expressed interest was often linked to situations in which a product was bought for the first time, when the wish for information was greatest. Consumers are not interested in nutrition information when they are in a hurry, which is typical of many shopping trips (Grunert & Wills, 2007).

1.8.2 Knowledge about nutrition

Broadly defined, *knowledge* about nutrition is knowledge about the concepts and processes related to nutrition and health, including diet and health, diet and disease, foods that are major sources of nutrients and dietary guidelines and recommendations. It can be interpreted as the ability to use food labels in a wide variety of situations, which could require various types of knowledge (Miller & Cassady, 2015).

Knowledge about nutrition can be expected to affect two attitudes in particular, which are discussed below: understanding and use (Grunert & Wills, 2007). Nutrition knowledge is expressed fairly consistently across studies. In the study of Grunert et al. (2010a), three types of consumers' knowledge were addressed: about dietary recommendations, sources of nutrients (whether they had high or low levels of fat, saturated fat, salt and sugar) and the calorie content. All the studies concluded that consumers are often confused and frustrated by what they perceive as contradictions among experts and by the permanent emergence of new, diverse information (Grunert & Wills, 2007). Nevertheless, consumers indicated that knowledge is particularly useful for comparing two products to identify nutritional differences (Miller & Cassady, 2015).

Nutritional knowledge can be linked to the concepts of *food literacy* and *nutritional literacy*. Food literacy is defined as, "the everyday practicalities associated with navigating the food system and using it in order to ensure a regular food intake that is consistent with nutrition recommendations. Food literacy is the scaffolding that empowers individuals, households, communities or nations to protect diet quality through change and strengthen resilience over time" (Vidgen & Gallegos, 2014:50).

Cullen et al. (2015) added that food literacy is the ability to understand food in such a way that consumers develop a positive relation with it and make decisions that support personal health and a sustainable food system. Velardo (2015), in turn, defined nutritional literacy as the ability to identify foods that have a high content of sugar or fat or to understand the health benefits of dietary fibre; and she suggested a distinction between functional and interactive nutritional literacy. While "functional nutrition literacy" is the basic level of literacy, which is the ability to obtain factual dietary information and understand factors that enhance or inhibit good health, "interactive nutrition literacy" is the ability to trust the sources and factors that shape their capacity to interpret, critically evaluate and use such information.

1.8.3 Sociodemographics

Sociodemographic factors (e.g. age, gender, education) significantly influence the search for, use and understanding of labelling information. A range of sociodemographic effects have been reported, including more use of labels by women, older consumers (because of generally greater concern about health), more educated consumers, the parents of children living at home and consumers in higher social strata (Grunert & Wills, 2007; Drichoutis et al., 2009; Dörney & Gyulavári, 2016).

Older consumers, those in the lowest social strata and those with less education also commonly have more difficulty in processing information and classifying nutrients correctly (Grunert & Wills, 2007). Elderly individuals are also reported to read labels less often because of difficulty in understanding and interpreting them (Kim et al., 2000).

Most studies report that labels are read more often by women than men. Women read labels carefully and several times, usually to determine accordance with dietary recommendations for weight control and aesthetic concerns (Grunert & Wills, 2007; Dörney & Gyulavári, 2016). Men and women build different identities and different attitudes towards their bodies (Becker et al., 1977; Bourdieu, 1984). Thus, women are generally more willing to change their eating habits and are more interested in learning more about health than men (Fagerli & Wandel, 1999). Primary grocery shoppers and meal planners, who tend to be women, are also more likely to read the information on packaging because they are responsible for others in their household and therefore have greater incentive to believe the stated benefits when they purchase a product (Drichoutis et al., 2009).

Geographical and cultural dimensions also strongly influence consumers' attitudes to using and understanding food labelling. Consumers in northern countries (e.g. the Netherlands and the United Kingdom) were more interested in receiving nutrition information than those in countries such as France, Greece and Spain. The United Kingdom may be a special case, owing to the media attention that has been given to nutrition and a history of widespread provision of nutrition information on labels (Grunert & Wills, 2007; Grunert et al., 2010a).

1.8.4 Label format

Consumers are profoundly influenced by the format of labels and might ignore them if they are inadequate, undecipherable or difficult to read and understand (Byrd-Bredbenner et al., 2000). With respect to the supply of information, the format of labels obviously has a major effect on food choices (Grunert & Wills, 2007). The label format can influence not only health-related attitudes but also seeking, using and understanding food labels. From the consumers' viewpoint, the ideal label must be simple, familiar and include images and adjectives rather that complex language or technical terms (Dörney & Gyulavári, 2016).

1.9 Consumer responses to nutrition labelling

A large body of research on consumer responses and attitudes towards nutrition information and food labelling has emerged and is growing. Most studies have evaluated whether the nutrition information on food packaging affects consumer decisions, whether they are aware of labelling schemes, whether they seek nutritional information, whether they understand its meaning and whether they actually use the labels in making decisions. This section presents the results of these studies.

Grunert and Wills (2007) reviewed 58 studies on European consumer responses to food labels and designed a theoretical model of the hierarchy of effects of nutrition information on consumer behaviour. In the model, a set of consumer responses is arranged in a hierarchical order: search, exposure, perception (conscious and subconscious), liking, understanding and inferences (objective and subjective) and use. These dimensions are in turn influenced by factors such as interest, knowledge, demographics and label format. Later, the model was revised to include three additional responses – integration, evaluation and decision (Grunert et al., 2010a) – and was more recently adapted to determine consumer responses to labels about quality (Grunert & Aachmann, 2016).

Subsequently, various aspects of consumers' responses to food labelling were studied. Wills et al. (2009), for example, acknowledged that consumers in the USA have access to nutrition and health information on food labels but questioned their perception and use of the information. The authors called attention to work by the International Food Information Council Foundation (2006) on how consumers perceive, understand and apply health and nutrition information on food labels when purchasing or consuming food and beverages. Notably, use and understanding of nutrition information on food labels has been subject to scrutiny in the field of consumer research (Cowburn &

Stockley, 2005; Grunert & Wills, 2007; Wills et al., 2009; Grunert et al., 2010a; Annunziata & Vecchio, 2012; Gregori et al., 2014). Use of nutrition information by shoppers is determined by a trade-off between obtaining information about a product and spending time on acquiring and processing the information. Shoppers attribute different costs to acquiring and processing information, and they may have different capacity to use nutrition information (Berning et al., 2010).

Below, we review the responses reported in the literature and their influences. These are presented according to the hierarchy of the models of Grunert and colleagues, beginning with the four main factors that influence consumers' attitudes to food labelling and consumers' responses to food labelling reported by Grunert & Wills (2007), Grunert et al. (2010a) and Gruner & Aachmann (2016).

1.9.1 Search and exposure

It is important to distinguish "search" from "exposure" theoretically. Grunert & Wills (2007:390) defined "search" as "effortful activities by consumers to get access to information on nutrition labels, in contrast to situations where consumers are accidentally exposed to these labels and then may or may not process the information on them". When consumers make an effort to search for nutrition information, they will find it easier to process, and the chance that the information will actually affect their food choices is higher.

Dörney & Gyulavári (2016) described "search" as part of a dynamic process, as an antecedent to and a consequence of influencing factors such as those described above. The authors suggested that there are three main factors in search: general personal factors, product category factors and label-related factors. Situation factors also directly affect search and moderate consumers' planned behaviour. For example, when a product or preferred brand is unavailable, consumers look for an alternative, which stimulates them to seek information before making a decision. Hence, despite customers' habits of reading food labels because of health consciousness, situational factors such as time pressure, product and brand availability, diverse alternatives might increase or decrease the amount of information they seek.

In a study on consumers' attitudes to quality labels, Grunert & Aachman (2016) recalled that consumers must be exposed to labels before any effect can occur: only labels to which consumers are exposed can be expected to have an effect. The chances of exposure increase when consumers actually search for information, but the label leads to a purchase only if the information is perceived (Grunert & Wills, 2007).

1.9.2 Perception

Grunert & Wills (2007) defined "perception" as the actual reading of label information by a consumer. They distinguished between conscious and subconscious perception, whereby conscious perception is expected to have a stronger effect on food choices. Perception depends on personal and situational factors. For example, when a product is bought for the first time, perception takes time to build. Time pressure decreases the development of perception as it decreases the likelihood that nutrition information will be read.

There is a fine line between perception, understanding and use. Perception leads to understanding, which is the meaning that consumers attach to what they perceive (Grunert & Wills, 2007).

1.9.3 Understanding and inference

Understanding is assigning meaning to what has been read and perceived on food labels and is thus a cognitive endeavour. Understanding is to a large extent an issue of inference, because consumers relate the information they perceive to their existing knowledge and use this to infer meaning. Hence, it has been argued that the process of assigning meaning to labels can be subdivided into understanding and inference (Grunert & Wills, 2007; Grunert & Aachmann, 2016).

Understanding has two perspectives: consumers know what food labels stand for, and they understand the differences between labels. Most individuals can understand at least some basic nutrition information on food labels; however, the accuracy of comprehension decreases for more complex tasks like accurate identification of differences in nutrients between two products or calculating the contribution of a single food to total daily intake (Miller & Cassady, 2015). It is important to distinguish between subjective and objective understanding. Subjective understanding is the meaning consumers attach to perceived information on a label and also the extent to which they believe they have "understood" what is being communicated (Grunert & Wills, 2007; Grunert & Aachman, 2016). Objective understanding is the compatibility between the meaning of label information and that which it is intended to communicate (Grunert & Wills, 2007).

Inferences are the conclusions drawn from label information. Thus, a label may indicate a particular or better taste or a production process valued by certain consumers (traditional production, use of local raw materials, absence of additives). Inferences are not based on the label alone, as other attributes contribute, including consumers' previous purchasing experience, brand, appearance and packaging. All these inferences influence decision-making and willingness to pay, leading to brand choice (Grunert & Aachmann, 2016).

1.9.4 Use

This dimension is use of nutrition information on a label to decide whether to purchase a product. It is important to know whether consumers actually use the label to decide whether to buy the product that carries the label (Grunert & Wills, 2007). Limited attention has been paid to label use, however, and there are virtually no studies on actual use. The available research on consumer behaviour (Grunert & Wills, 2007) indicates wide use of nutrition labels; however, consumers may not use nutrition labels even though they say they do, or they may misunderstand them. Processing of label information may alter the overall pattern of purchase, for instance if consumers wish to learn which product categories are healthier.

Most studies of the use of nutrition labels found a significant relation between knowledge and use. Knowledge refers to how well consumers use food labels (Miller & Cassady, 2015). Grunert & Wills (2007) noted that perception and use are related but are conceptually different. Consumers might read and understand nutritional information on labels and not use it in making a decision. Wills et al. (2009) reported that consumers may say they use nutrition information especially when purchasing a product for the first time or comparing two products with similar prices or FOP label claims. Hence, label use is positively related to buying products for the first time but negatively related to time pressure.

1.9.5 Liking

Another effect of perception and processing of information may be liking a label. "Liking" refers to the preference of consumers for different label formats. Consumers may like a label because they find it easy to understand or because they like the symbols and colours used. Liking is not necessarily related to understanding but can lead to a positive evaluation of a product even when the label information is not understood. Consumers generally liked the idea of improved nutrition labels and FOP signposting as shopping aids (Grunert & Wills, 2007).

Grunert & Wills (2007) proposed that three basic considerations guide consumer liking. First, consumers liked simplicity, because they had limited time to shop. Hence, they reported liking simple, clear labels; however, most were poorly legible and contained unknown terms. Secondly, consumers like to know the meaning of simplified information like traffic lights and health logos. Thirdly, consumers do not like to be forced into a particular behaviour. Thus, nutrition information may generate resistance when consumers feel coerced or pushed to make a choice.

A number of studies have addressed the types of food labels and information that consumers like. For example, in a comparison of traffic light systems, guideline daily amount systems and health logos or ratings, consumers liked simple traffic lights and health logos less because they considered them too "paternalistic". Consumers liked the use of colours to provide information, particularly, multiple traffic lights and colour-coded guideline daily amounts. For instance, in

a comparison of colour-coded and a monochrome guideline daily amount, consumers overwhelmingly preferred the coloured one (Grunert & Wills, 2007).

In terms of the units in which nutrition information is presented, some consumers liked information presented as percentages rather than grams because they considered that they simplified the information and made it more difficult to ignore, while others disliked percentages because they increased the complexity and did not add information. Consumers liked nutrition information presented per 100 g or per serving equally. Nevertheless, they commented that a "serving" was not always clearly defined (Grunert & Wills, 2007).

1.9.6 Evaluation and decision

Thus, for nutrition labels to have any effect, consumers must be exposed to them and perceive them. On the basis of their understanding, which is in turn affected by their nutrition knowledge, consumers may use the information on the label to make inferences about the healthfulness of the product, which, with pre-existing information (e.g. about the taste of the product), may affect their evaluation and eventually their decision to purchase a product (Grunert et al., 2010a).

2. The Portuguese context

We outline below the empirical Portuguese context on the basis of secondary data. The first section presents a brief sociodemographic characterization of the population and the educational qualifications and literacy of Portuguese consumers. Section 2.2 describes the nutrition labelling systems in Portugal, and section 2.3 reports the results of studies on the attitudes and perceptions of Portuguese consumers regarding food labels.

In 2016, Portugal had 10 358 000 residents, of whom 53% were female. According to the National Institute of Statistics, 15% of residents were 0–14 years old, 60% 15–64 years and 15% ≥65 years. The Portuguese population is evolving similarly to those in other countries: ageing at both the base and the top of the pyramid. The profile of the Portuguese consumer drawn up by Marktest (2013), indicates a fair distribution of consumers by age >15 years. The population is distributed geographically, with 95% on the continent and 5% in the Azores and Madeira islands. On the continent, the regions of Lisbon and Porto account for 33% of the population (Table 1).

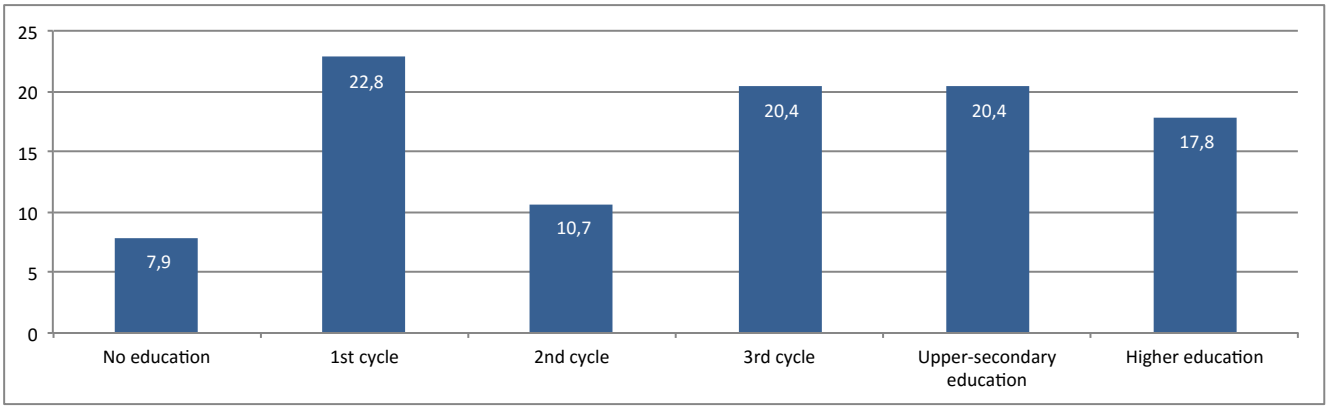
Table 1. Proportions of the population in different regions of Portugal

Marktest region	Percentage of population
Greater Lisbon	21
Greater Porto	12
North coast	19
Central coast	15
Northern interior	21
Southern interior	12

Source: Marktest (2013)

Portugal has seen increasing levels of education over the years. Nevertheless, in 2016, 7.9% of the population had no educational qualifications and 22.8% had attained only the first cycle (4 years) (Fig. 1).

Fig. 1. Educational levels of resident population aged ≥15 years (%)



Source: Instituto Nacional de Estatística (2016)

2.1 Literacy of the Portuguese population

The only study on the literacy rate of the Portuguese population was conducted in 1996 (Benavente et al., 1996). In comparison with international rates, that of Portugal was worrying low, with about 50% of the Portuguese population in the lowest of five levels of literacy. Portugal was second-to-last among 33 countries with regard to literacy, followed only by Chile. The current situation is unknown; however, even if there has been a significant improvement during the past 20 years, the literacy rate is probably not be high. Furthermore, "Individuals with certification at the level of secondary education in Portugal have relatively positive results in the prose and quantitative literacy scales, but less positive in the scale of documentary literacy" (Gabinete de Estatística e Planeamento da Educação, 2009:81).

Literacy plays an important role in people's health (Gabinete de Estatística e Planeamento da Educação, 2009), and a poor literacy rate in the population clearly influences their health literacy. An evaluation of health literacy in Portugal in 2015 (Espanha et al, 2015) indicated that the average health literacy rates in Portugal are always slightly lower than those in the other European countries analysed. In Portugal, 11% of the population had "inadequate" literacy and about 38% had a level considered to be "problematic"; the proportion at "excellent" level (8.6%) was the lowest in all countries surveyed. In Portugal, more than 60% of respondents with low levels of education (up to basic) had "problematic" or even "inadequate" levels of health literacy.

2.2 Food and nutrition labelling regulations

Regulation (EU) No. 116/21 of 25 October 2008 of the European Parliament approved new food labelling rules making nutrition labelling compulsory in all European Union Member States from December 2014 for pre-packaged foodstuffs (which already had compulsory nutritional information) and from December 2016 onwards for other packaged foods. According to Esteves (2013), it became compulsory for the label on a food product to include:

- the legal name or, in its absence, a current or descriptive name;
- a list of all ingredients, in descending order of weight;
- ingredients or other substances to which consumers might be allergic or intolerant;
- the quantities of certain ingredients or categories of ingredients;
- the net quantity of the food;
- the date of minimum durability or expiration date;
- the conditions of storage and/or use;
- the name or business name and address of the food business operator;
- the country of origin or of provenance;
- the mode of use;
- the actual volume of alcohol (if > 1.2%); and
- a nutrition statement.

The mandatory nutrition declaration must be in the form of a table (if there is space, otherwise in text), with a minimum established font size. The statement must include (in this order):

- the energy value (kJ and kcal),
- lipids and saturated fatty acids (g),
- carbohydrates and sugars (g),
- proteins (g) and
- salt (g).

The Portuguese Government has organized campaigns to raise awareness among consumers. Organizations and companies in the sector have also played an important role, including the Federação das Indústrias Portuguesas Agro-Alimentares (FIPA) and some retail brands. The FIPA nutrition labelling plan of 2002 was based on four primary elements (FIPA, Associação Portuguesa de Empresas de Distribução, 2003), and a model for presenting nutritional information was proposed, with voluntary implementation by food brands. Over the years, FIPA updated the plan. The blue symbols appeared in 2006 and the present version in 2009 (Fig. 2). The proposal was voluntarily adopted by some retail brands, namely Pingo Doce.

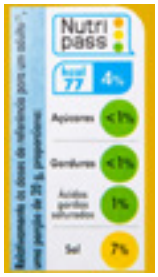
Fig. 2. Proposals of the Federação das Indústrias Portuguesas Agro-Alimentares for nutrition labels

Source: FIPA, APED (2013)

Another model of voluntary nutrition labelling used in Portugal is the nutritional traffic light, initially developed by the Food Standards Agency in the United Kingdom, with colour codes assigned to some nutrients. It was introduced in Portugal in 2009 with its adoption by the Continente brand for its products. In addition to the nutrients indicated by the Food Standards Agency, they also included the energy value, in grey (Cordeiro et al., 2010). According to a European Union study (Ipsos, London Economics, 2013) Portugal was one of six European countries with the most food labelling schemes; this may confuse consumers, who would prefer a single scheme.

The Flabel Project (Bonsmann et al., 2010) determined the presence of BOP and FOP nutrition labels on the packaging of the same categories of food products in the 27 countries of the European Union plus Turkey. In Portugal, 90% of the products analysed had BOP labels with nutritional information, and 57% had FOP labels. These results placed Portugal in the fifth place for BOP information and eighth place for FOP labels. Some retail brands in Portugal bear nutrition labels on a voluntary basis in various formats as part the companies' policy of social responsibility, to prevent disease and encourage healthy food choices. According to an analysis published by Deco (2016), the variety of nutrition label schemes in Portugal could cause difficulties for consumers.

Fig. 3. Food labels in Portuguese supermarkets

Brand	Nutrition label used
Continente (2009)	
Intermarché (2008; Nutri-pass)	 
Auchan	
Pingo Doce	
E. Leclerc	

Source: Deco (2016)

2.3 Consumer attitudes to food labelling

Little research has been conducted in Portugal on consumers' attitudes to nutrition labels. Gregori et al. (2014) studied a sample of 7550 individuals in 16 European countries, including Portugal (500 respondents). They found that the main source of information for diet awareness and healthy lifestyle was personal experience (69%) and then medical doctors (36%). For obesity awareness, the main source was again personal experience (44%), then television and radio (39.4%) and medical doctors (33%). In an evaluation of the correctness of the answers given by consumers about nutrition labelling information, most appeared to be confused, especially due to the use of technical and numerical information. In comparison with the other 15 countries, Portuguese consumers had the fewest correct answers for specific messages on labels. The overall proportion of correct definitions of the reference amount (100 g) on labels was 40.7%, while that in Portugal was only 12.4%. Knowledge of the correct meaning of "per 100 kcal" was less frequent, as only 5.9% of participants in all 16 countries and 3% of Portuguese consumers gave a correct answer. Understanding of "per portion" was 18.7% overall and only 3.9% in Portugal.

In self-reported understanding of the reference amounts on labels, Portugal (25.2%) was close to the average of all countries (25.1%) for "per 100 g", surpassed (29.4%) the other countries (4.1%) for "per 100 kcal" and scored themselves as 45.4% correct for "per portion" as compared with the 70.2% average. Thus, Portuguese consumers overevaluated their understanding of nutrition labelling. Portuguese consumers preferred the reference "per portion" on FOP labels (51.6%), as in the other countries (49.3%).

A study by A.C. Nielsen study (2012) that included Portuguese consumers addressed food labelling in 56 countries, with a total of 25 000 answers. Portugal was one of the European countries in which consumers understood nutrition labels on food packaging the best. In a "target group index" study by Marktest (2014), 65.7% of Portuguese consumers said that they usually read the information on food product labels, and women and older respondents reported regularly reading labels. Only 4.7% of Portuguese consumers said they always verified the nutritional value of what they ate, 20.8% did so often and 29% sometimes; 41.2% reported not verifying the full nutritional value of the food products they consumed.

Deco (2016) recorded consumers' responses to different label formats in 2013 and concluded that they preferred red, yellow and green traffic lights to classify nutrients, as the system was simpler to interpret and use.

Ipsos & London Economics (2013) sampled 800 Portuguese respondents and concluded that they obtained most of their information on food schemes from television (62%). With regard to their perceptions of food labelling information, 68% declared that they trusted the information (one of the highest scores). The Portuguese sample, however, gave the highest proportion of no answer or don't know (in the order of 31%). Product packaging was considered the most important method of obtaining information on food (65%). This result was similar to those in other countries, but most Portuguese consumers considered that there were too many food labelling schemes.

3. Conceptual model and methodological approach

3.1 Decisions about methods

This section describes the methods defined for this research. It starts by justifying the use of a mixed approach and then provides a clear definition of the research problem, with the main and specific goals. This is followed by a brief presentation of the conceptual model used, which is based on models of Grunert and colleagues (Grunert et al., 2001; Grunert & Wills, 2007; Grunert et al., 2010a; Grunert et al., 2010b; Grunert & Aachmann, 2016).

3.1.1 Choice of methods

We used mixed methods to answer the research questions, as they allow better understanding of complex phenomena. Articulated use of quantitative and qualitative methods has important advantages, because it allows a more comprehensive understanding of a problem, combining the strengths of both types of method. Quantitative methods establish relations between variables in highly controlled circumstances, with a large sample. Qualitative methods are used to explore and understand individual or group meanings, allowing greater insight into consumer attitudes. We chose the focus group technique to obtain the participants' points of view (Krueger & Casey, 2015), perceptions, attitudes and motivations. In this technique, participants influence and are influenced by others, replicating the real decision-making process.

3.1.2 Research goals

In general terms, the aim of the study was to understand Portuguese consumers' attitudes towards food labelling and to determine the types of FOP labelling that make it easier for consumers to assess the nutritional content of foods and make healthier choices. We used examples of FOP labelling of foods currently on the Portuguese market or in

other European countries. The results of the study are intended to orient policy-makers, particularly the Portuguese Ministry of Health, in preparing guidance for retailers and manufacturers on voluntary food labelling. The answers to the main research questions will also clarify the scope and nature of possible consumer education initiatives that might be required to introduce such a scheme in Portugal.

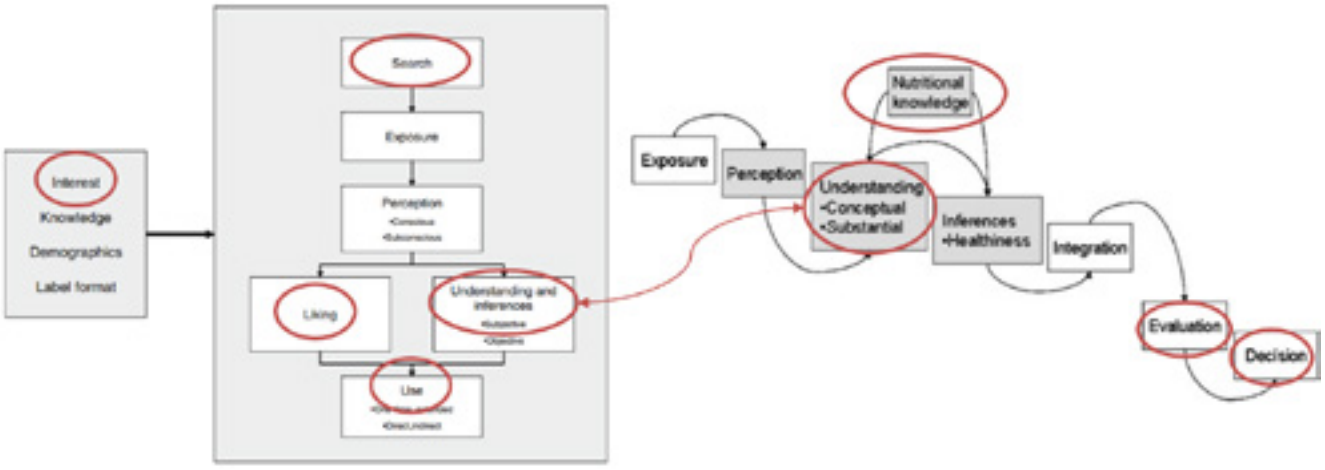
Six specific research goals were established:

1. to determine whether, how and when consumers use FOP interpretative labelling in making purchasing decisions;
2. to determine how specific elements of FOP labels (colours, text, numbers, interpretative logos) are used to make purchasing decisions;
3. to learn more about how different schemes enable consumers to interpret the levels of key nutrients in food products correctly;
4. to identify any barriers to interpreting the information on the labels;
5. to gauge consumers' knowledge (objective and subjective) about nutrition and nutrition labelling (quantitative and qualitative); and
6. to determine the effect of sociodemographic factors (e.g. age, educational attainment, gender) in the research areas identified above.

3.2 Research design

Quantitative and qualitative data collection instruments were developed to evaluate the different theoretical dimensions, based on the conceptual models of Grunert & Wills (2007) and Grunert et al. (2010a). Eight types of analysis were used. The theoretical framework is shown in Fig. 4.

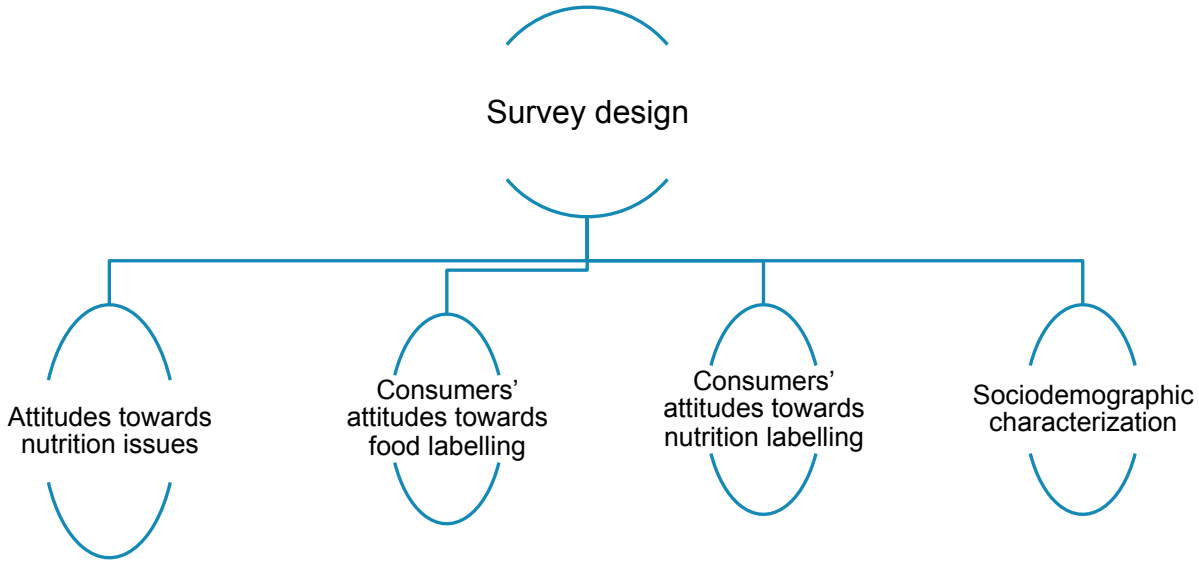
Fig. 4. Theoretical framework of the study



This theoretical approach takes into account three influencing factors – interest, knowledge and demographics – and six responses about food labelling – search, liking, understanding, use, evaluation and decision. The "interest" dimension was also measured on the "nutrition consciousness" scale of Berning et al. (2010) and the "use" dimension in the model developed by Wills et al. (2009).

The survey was composed of 36 questions to distinguish four main aspects (Fig. 5).

Fig. 5. Survey design



The survey consists mainly of closed questions. One open-ended question was included to collect consumers' suggestions for improving nutrition labelling. From a sample of 1127, 59 qualitative answers were retrieved. A pre-test conducted with two specialists in the area of consumption and nutrition and 10 consumers with different levels of education resulted in some changes to improve understanding of the questions.

A focus group guide was designed on the basis of the conceptual framework (Annex 1). It was clearly linked to the literature review and comprised introductory questions, transition questions and key questions, as suggested by Krueger & Casey (2015):

- introductory questions: evaluation of interest and importance attributed to food options in defining a healthy lifestyle;
- transition questions: understanding of determinants of food choice (the importance of healthy criteria and of food labelling in food choices); and
- key questions: knowledge, understanding, liking, search and use of food labels, with a simulation of a food choice.

Participants were given nine packages of sweet biscuits with different label formats and nutrition information, which were available in the main Portuguese supermarkets. They were asked to choose a product for themselves, for a child or for an elderly person and to choose one product that was healthier and one that they had never bought before, justifying all their choices.

Initially, three focus groups were set up:
- concerned adults mainly responsible for grocery shopping in their households;
- non-concerned adults mainly responsible for grocery shopping in their households; and
- people aged 15–22 years.

Later, because of difficulties with the survey raised by one group of respondents, a fourth focus group was set up, to obtain the opinions of consumers with less education or reading problems. As mentioned above, there was a high rate of non-conclusive answers to the survey by respondents who had difficulty in understanding the written information. The survey was conducted between February and December 2016. The first two focus groups were held in September 2015, the group of young people in March 2016 and the last in December 2016.

3.3 Selection of participants and sampling method

3.3.1 Focus group participants

Participants for the focus groups were selected after a recruitment survey on interest in nutrition and on the basis of sociodemographic variables such as gender, age, level of education and residence. The survey was sent to all contacts in the database of the Instituto Português de Administração de Marketing Consumer Observatory. Each focus group consisted of six to eight people who met the inclusion criteria (Soares Silva et al., 2014).

The group of concerned consumers consisted of one man and seven women aged 32–66 years with a middle to high level of education. The non-concerned consumer group, three men and five women, were aged 25–46 years and also had a middle to high educational level. The young group consisted of four women and four men aged 15–23 years, all of whom were students. The last focus group comprised nine women with an educational level equal to or inferior to the ninth year who were responsible for household purchases.

3.3.2 Survey sample

A purposive sampling method was used, with the following criteria for eligibility: over 18 years of age, living in Portugal (including the Autonomous Regions of the Azores and Madeira) and responsible for purchasing food for the household.

The survey was disseminated through a snow-ball approach, on an online platform. In certain situations, face-to-face surveys were necessary to ensure the inclusion of several education and age profiles. The survey included respondents in all regions of the national territory, with over-representation of Greater Lisbon and Greater Porto, the two main urban areas in Portugal, which have higher population densities. There was underrepresentation of less-educated people because of their inability to understand some of the written information. As the non-completion rate in this group was 52%, a fifth focus group was organized to obtain their perspectives, as described above.
The final sample consisted of 1127 respondents, which allowed us to classify it as robust.

3.4 Analysis of data from focus groups

Data from the focus groups were analysed by thematic content. In order to optimize the analysis, full transcriptions were made of the discussions, giving rise to a corpus; then, the registration units were selected. Themes were separated into categories defined *a priori*, later completed by an analysis of post-hoc categories from the transcriptions.

After data were collected from the survey, a database was prepared in SPSS version 23, and database consistency was verified by confirming that all the data entered were inside response intervals. The sample was then characterized by measures of central tendency (mean) and dispersion (standard deviation).

To determine the psychometric qualities of the scale used, we conducted exploratory factor analysis. The first analysis was of commonalities, to determine the total variance explained by common factors. To guarantee correlations between variables, the Kaiser-Meyer-Olkin criterion and Bartlett sphericity test were applied, which confirmed the assumptions for continuation of factor analysis. Only items with saturations >0.550 were considered. Internal consistency, the proportion of response variation that results from differences among respondents, was confirmed with Cronbach's alpha.

To analyse mean differences between groups of subjects in quantitative variables, Student's *t*-test for two independent samples was used. One-way analysis of variance (ANOVA) was used to determine any statistically significant differences between the means of two or more independent (unrelated) groups. In addition, post-hoc tests of multiple comparisons of averages were performed. Given the size of the sample, we used the Bonferroni correction to adjust

the *P* values (Maroco, 2007). Preliminary analyses were carried out to ensure nonviolation of the assumptions of normality, independence and homeosticity. We used the chi-squared test to analyse differences between qualitative variables and to determine whether the observed differences in the distribution of results were statistically significant.

4. Results

4.1 Quantitative data: survey

4.1.1 Sociodemographic characterization

Although the sample was not strictly statistically representative, it included respondents from a variety of sociodemographic backgrounds: 72.7% had a high socioeconomic status, 19.1% a middle status and 8.2% a low status. The 1127 respondents were aged between 18 and 79 years (Fig. 6) and were mostly female (71%). The female overrepresentation, also observed in other studies, was due to the primary filter question, whereby only consumers who were mainly responsible for purchasing food and beverages for the household were eligible.

Fig. 6. Age distribution of survey respondents

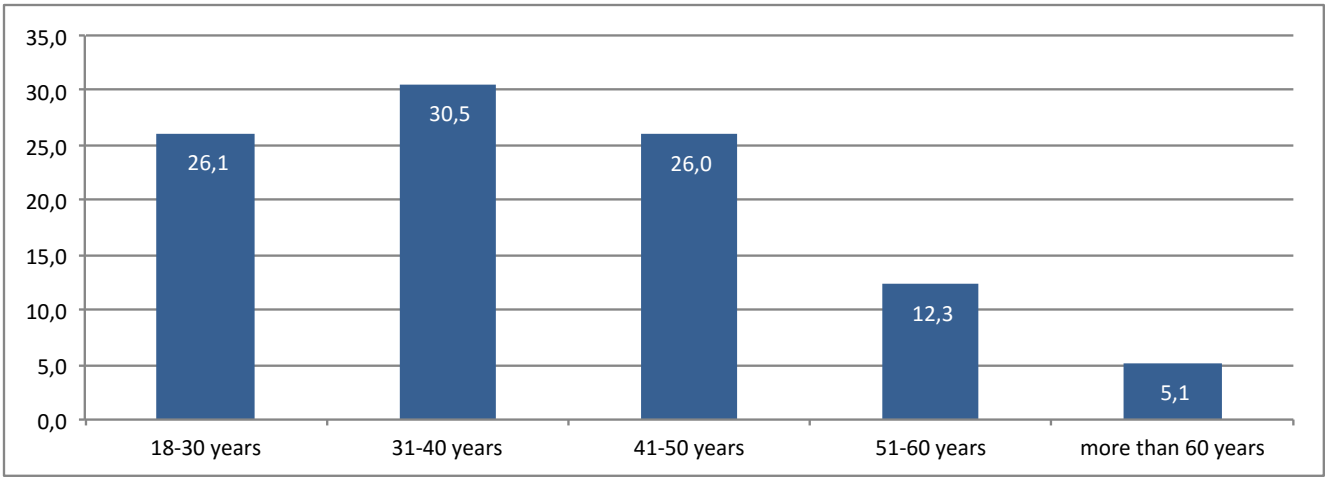
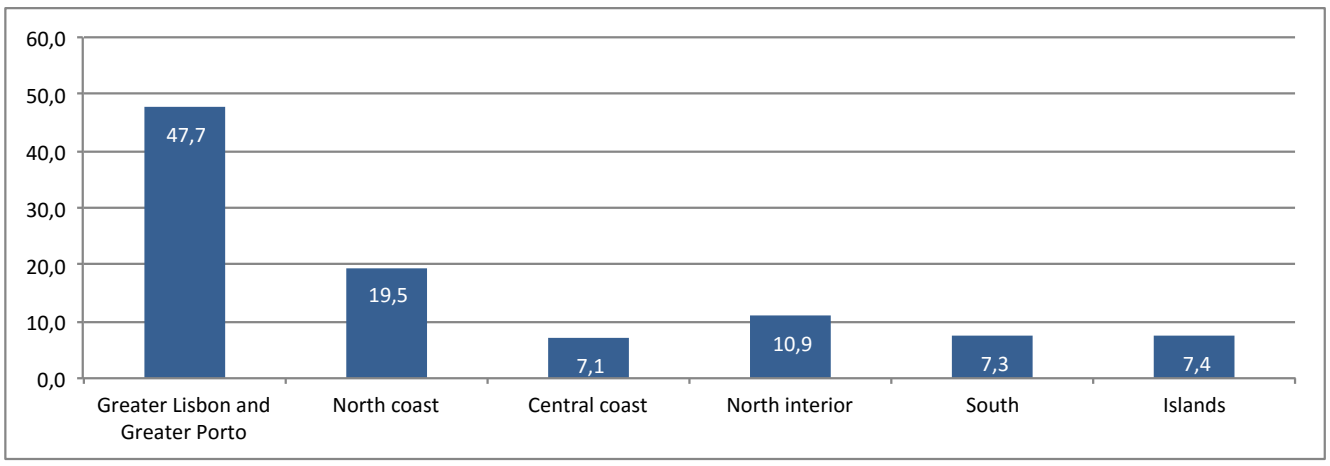


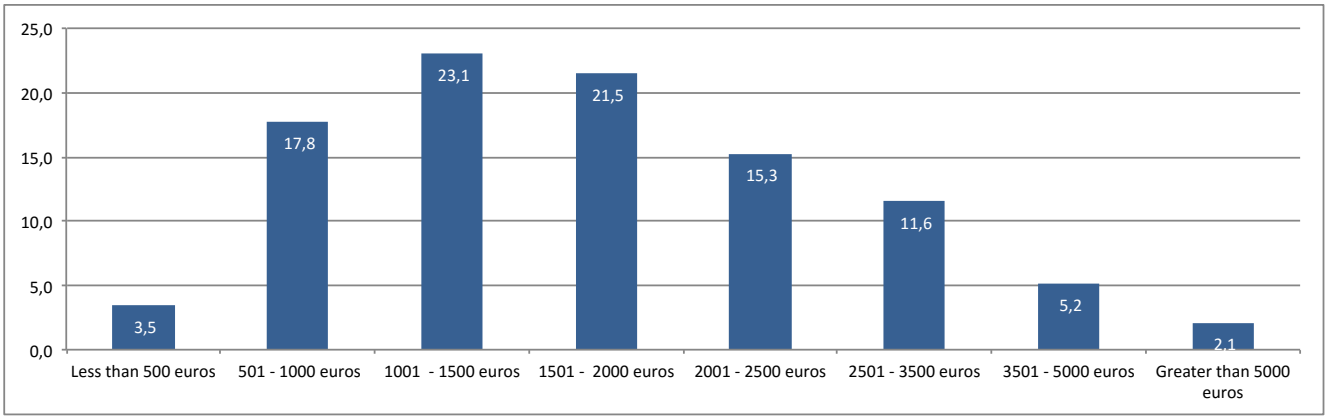
Fig. 7 shows the distribution of respondents by residence. Almost 50% of respondents lived in the two most populous areas (Greater Lisbon and Greater Porto).

Fig. 7. Distribution of respondents by region of residence



In terms of education, 72.7% of respondents had a university degree (high level), 19% middle-level education (corresponding to 12 years in the education system) and 8.2% a low level (up to 9 years).
Concerning household composition, 7% of respondents lived in a household with older people and 47% in households with children. Net monthly household income is shown in Fig. 8.

Fig. 8. Monthly net income per household



4.1.2 Interest in nutrition labels

Previous studies have found an association between interest in nutrition labelling and consumers' attitudes. In order to evaluate consumers' interest in nutrition, we analysed self-reported assessment of nutrition consciousness on a scale adapted from Berning et al. (2010). As it had not previously been used for a Portuguese sample, we validated it before use. After a Kaiser-Meyer-Olkin test (0.877), we conducted an exploratory factor analysis (Table 2), and one item was excluded from the initial eight items because of a low commonality score (<0.5). The analysis confirmed that one factor, nutrition consciousness, explained a variance of 57%, which is considered acceptable. The Chronbach alpha score of the scale was 0.87, indicating good internal consistency.

Table 2. Factorial analysis of nutrition consciousness

Item	Communalities	Mean	Standard deviation	Factor
I try to monitor the number of calories I consume daily.	.507	3.48	1.115	.712
I try to avoid large amounts of fat in my diet.	.567	4.24	0.831	.753
I have a healthy diet.	.488	3.78	0.793	.698
I am interested in nutritional information about the foods I eat.	.583	3.99	0.986	.763
I try to avoid high levels of saturated fat in my diet.	.655	4.22	0.844	.809
I try to avoid high levels of sugar in my diet.	.624	4.21	0.854	.790
I try to eat a healthy number of calories each day.	.570	3.63	0.959	.755

The results show that Portuguese consumers avoid large amounts of fat and saturated fat in their diets and try to avoid high sugar levels. The item with the lowest level of agreement was the daily number of calories.

An independent *t* test showed a statistically significant difference between the genders (P <0.001), women (M= 4.02) having greater nutrition consciousness than men (M= 3.7).

The one-way ANOVA to assess differences in nutrition consciousness by level of education showed that consumers with a higher education level had greater nutrition consciousness (P <0.005), and a Bonferroni post-hoc test indicated that consumers with high education were more conscious of nutrition than those with less education (0.29; SD = 0.0077) or medium education (0.222; SD = 0.052).

Respondents were questioned about the importance they give to nutritional information on certain products (Table 3).

Table 3. Importance attributed to nutritional information by product

Product	Mean
Children's food	4.65
Breakfast cereals	4.16
Pre-packaged meals	4.14
Yoghurts	4.07
Juices	4.04
Soft drinks	4.03
Sweet biscuits	3.93
Tinned food	3.78
Milk	3.72
Cheese	3.68
Rice	3.15

The labels on rice, cheese and milk were less important to consumers; the most important were those on children's food, breakfast cereals and pre-packaged meals, indicating that consumers value information on processed and composite foods most highly.

4.1.3 Use of nutrition labels

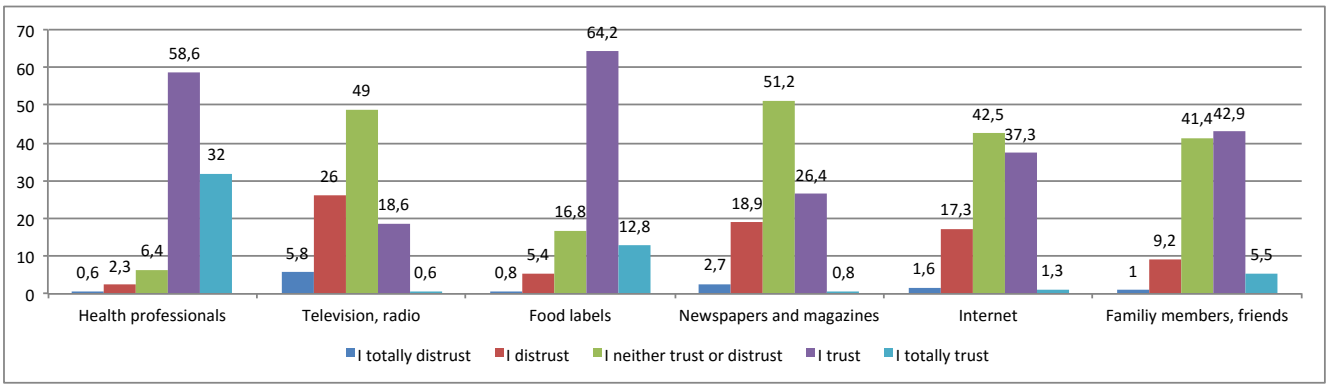
To determine whether nutrition labels are a useful source of information for consumers, respondents were asked what sources they usually used to obtain nutritional information. Food labels were the main source of information (75.9%), followed by recommendations from family members and friends (62.9%), health professionals (39.2%), newspapers and magazines (17.7%), the Internet (16.6%) and television and radio (12.3%); 18.8% did not seek nutritional information. Pearson's chi-squared test showed significant differences between educational level and the source of information about nutrition (R <0.005) (Table 4).

Table 4. Relations between level of education and source of nutrition information

Source	Level of education (%)		
	Low	Medium	High
Television and radio	28	18	9
Food labels	51	71	80
Newspapers and magazines	8	20	18
Family members and friends	37	69	64

More highly educated consumers consulted sources of information more than less well-educated consumers. A difference was also found by gender: women consulted food labels as a source of nutrition information on the products they bought or consumed significantly more than men ($P < 0.005$).
The main trusted sources of information were, in descending order, food labels, health professionals, family members and friends, the Internet, newspapers and magazines and television and radio (Fig. 9).

Fig. 9. Trusted sources of nutrition information



In a one-way ANOVA to determine differences in confidence in food labelling source by age and level of education, statistically significant differences were found by age. The differences between younger (18–30 years) and older (41–50 and 51–60 years) consumers were confirmed In a post-hoc Bonferroni test: 41–50 years, M = 0.198 (SD, 0.063; P = 0.016); 51–60 years, M = 0.411 (SD, 0.079; P = 0.00). Young consumers relied more on food labelling than older people.

An ANOVA showed significant differences ($P < 0.05$) in the level of confidence in food labels according to consumers' level of education. Thus, consumers with a high education trusted food labelling more than respondents with a low education (M = 0.213; SD, 0.084; P = 0.03) or a medium education (M = 0.198; SD, 0.057; P = 0.002).
With respect to the frequency of reading food labels, 42% of consumers reported regular use, 29.9% reported occasional use, 16.7% claimed that they always read them, and 11.2% said that they never or usually did not read food labels. The reasons given by consumers who did not read food labels were that they always bought the same brands (23.8%), they found labels in general of little importance (19.8%), they considered that there is too much information on food labels (19.0%), they found labels unnecessary (15.9%), lack of time (7.9%), no food allergies or intolerance in the family (5.6%), more attention to price (4.8%) and they found the letters on labels too small (3.2%).

A statistically significant difference ($\chi^2 = 0.034$) in the frequency of reading food labels was found by gender: 8.7% of women and 15% of men reported that they never or usually did not read labels, and 61.4% of women and 52.4% of men reported that they always or regularly read nutrition labels. There were also statistically significant differences by level of education ($\chi^2 = 0.00$). Less-educated consumers reported reading nutrition labels less frequently: 18.7% never or not usually and 29.4% regularly or always, whereas 64.6% of consumers with a higher level of education read labels always or regularly and only 9.2% never or not usually did.

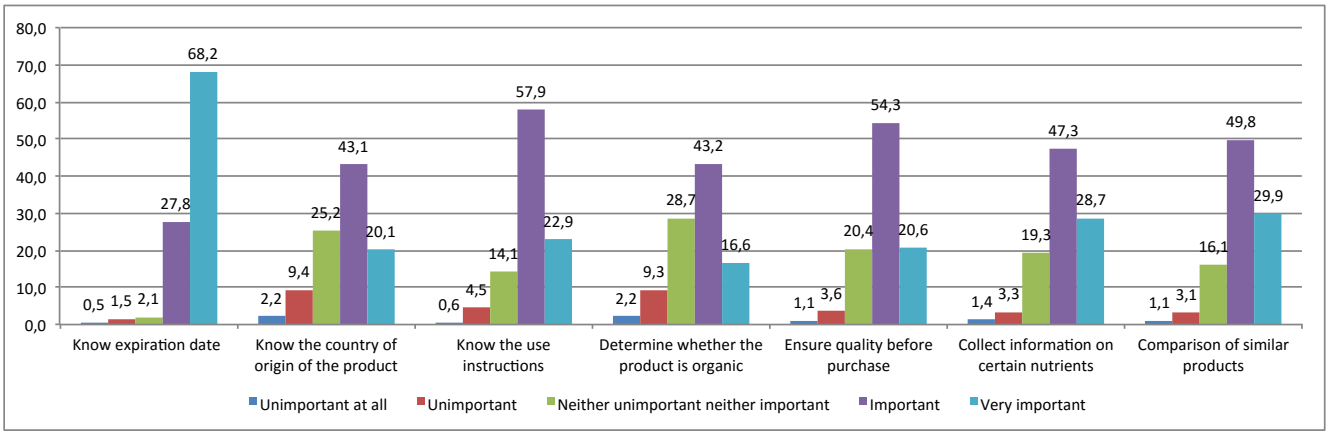
A one-way ANOVA showed statistically significant differences (all $P < 0.05$) in the frequency of food labelling use according to nutritional consciousness. Consumers with a higher level of nutritional consciousness food labelling used more regularly, as seen in the results of a Bonferroni post-hoc test (Table 5).

Table 5. Results of a Bonferroni post-hoc test of nutrition consciousness

Read food labels		Average difference	SD
Always	Never	1.38508	0.09626
	Not usually	1.21738	0.07569
	Occasionally	0.84740	0.05187
	Regularly	0.36885	0.04911

Consumers who read food labels attributed more importance to certain information. The most important were "knowing the expiration date" (M = 4.62), "comparison with similar products" (M = 4.04), "understanding the instructions for use" (M = 3.98) and "for information on certain nutrients" (M = 3.95) (Fig. 10).

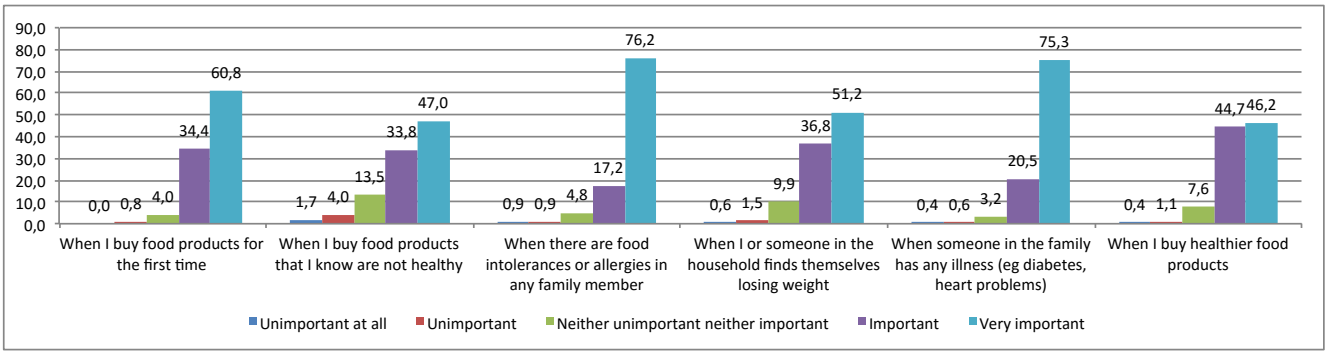
Fig. 10. Importance attributed to reasons for reading food labels



4.1.4 Search for nutrition labels

The most important reasons given for seeking food labels were: when someone in the family is ill (4.70), when someone in the family has a food intolerance or allergy (4.67) and when buying a food product for the first time (4.55) (Fig. 11).

Fig. 11. Importance attributed to reasons for seeking food labels



Portuguese consumers looked for nutritional information on food products most often at the time of purchase (51%) and when buying a food product for the first time (26%). Other reasons given were: when planning meals (10.4%), having little interest in nutrition information (8.1%) and during preparation, confection and consumption (3.9%).

4.1.5 Knowledge about nutrition

Objective knowledge about nutrition was evaluated. One fourth of the respondents (24.7%) did not know the recommended maximum daily salt intake for an adult, and 55.5% thought the limit was lower than the 5 g/day recommended by WHO (2015): 38% of respondents answered 2 g, 17.9% replied 4 g, 14.8% replied 5 g, 1.1% answered 10 g, and 0.4% replied 8 g; 24.7% did not know.

A one-way ANOVA showed statistically significant differences between mean nutrition consciousness and real knowledge of the recommended daily limit for salt. Consumers who answered "Don't know" had less nutrition consciousness than those who gave an answer below the recommended daily limit. In a chi-squared test to determine differences by gender and level of education, more women knew the recommended daily salt intake than men (P = 0.007) (Table 6), but there was no statistically significant difference by level of education.

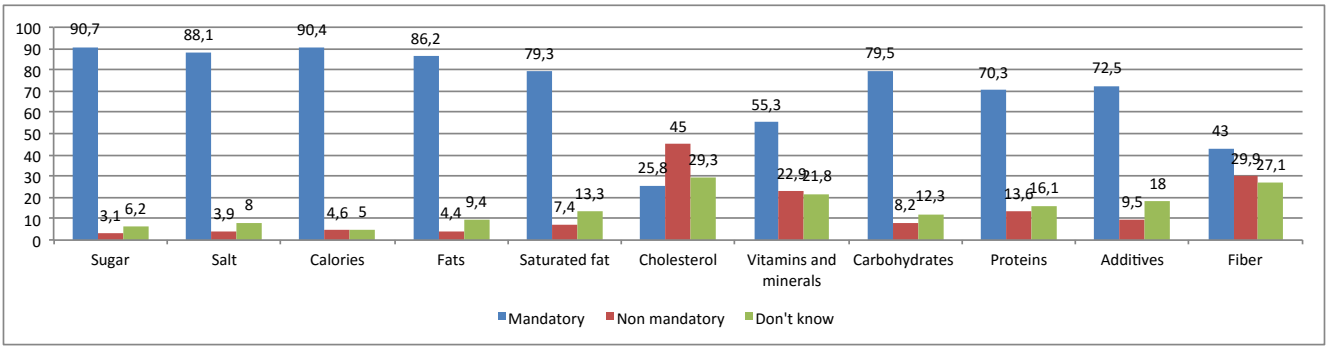
Table 6. Association between gender and knowing the recommended daily intake of salt

	Women (%)	Men (%)
Below limit	57.0	51.5
Correct answer (5 g)	16.5	10.8
Above the limit	4.8	5.5
Don't know	21.7	32.0

Knowledge about the recommended daily intake of sugar by an adult was also limited, as only 6% of consumers answered correctly. The 2015 WHO guideline is 50 g of sugar (12 teaspoons) per day (WHO, 2015), while 40% of consumers thought that the limit was 6 g. In total, 92.9% of consumers thought the limit was lower than that recommended, and only 1.3% thought that it was higher; 5.8% gave the correct answer. A chi-squared test showed no statistically significant difference by gender or level of education.

The nutrients that must be declared on nutrition labels according to recent regulations are: sugar, salt, calories, fats and saturated fats, carbohydrates and proteins. Most Portuguese consumers knew about these mandatory declarations, particularly with regard to sugar (91% knew), calories (90.4%), salt (88%) and fats (86%), and the majority also knew that declaration was mandatory for carbohydrates (79.5%), saturated fat (79%) and proteins (70%) (Fig. 12). Most respondents mistakenly thought that declaration of additives (73%) and vitamins and minerals (55%) was mandatory.

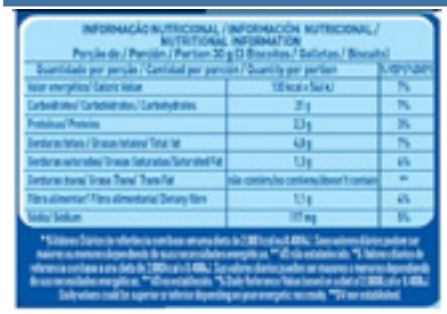
Fig. 12. Knowledge about mandatory and non-mandatory nutrition information



4.1.6 Understanding of nutrition labels

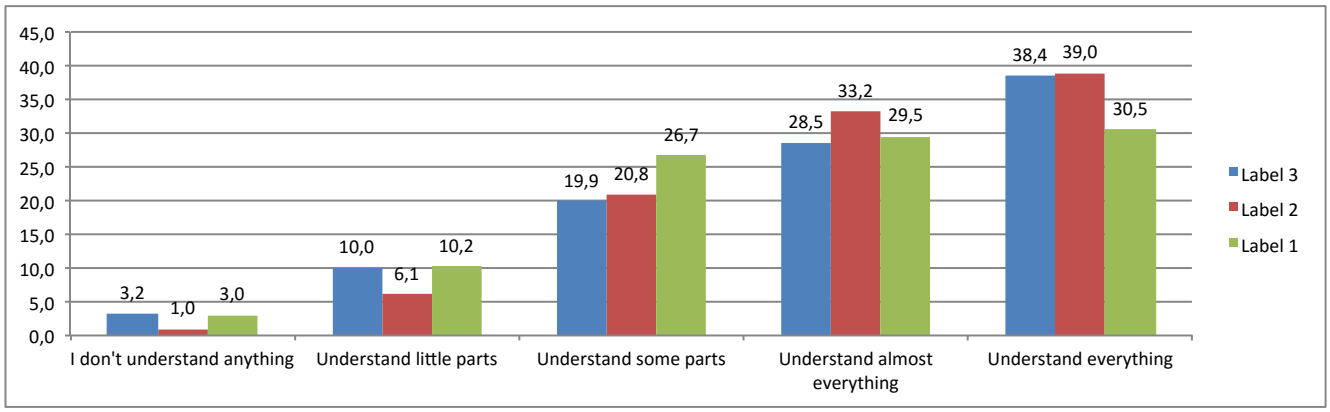
Consumers were divided about whether food labels are easy to understand: 42.9% considered that they were, 37% considered that they were not, and 20% neither agreed nor disagreed.

Consumers were then asked their level of understanding of nutritional information on three types of nutrition label in Portugal:

Label 1	Label 2	Label 3
		

They found the two labels with symbols (FIPA and traffic light) more subjectively understandable (Fig. 13).

Fig. 13. Level of understanding of nutrition information on three types of food label



The consumers assessed themselves highly, most reporting at least some level of understanding of the three types of label. To clearly determine the level of objective understanding of nutrition labels, consumers were asked to choose between two food products based solely on their nutrition labels, assuming that they had hypertension and wanted to buy a product with a lower salt content. The labels chosen were BOP nutrition declarations and traffic light schemes.

Of the two BOP labels, option A had information per 100 g of product and option B per portion of product. Thus, the consumer had to make a calculation to interpret them correctly. The correct answer was option A, as it contained the least amount of salt.

Option A	Option B
	

Most consumers interpreted the information correctly and selected option A (61.5%); however, 28% did not look at the reference measure and selected option B, and 11% said that they did not know the answer. Thus, 39% of consumers did not really understand the basic nutritional information on food labels. This first exercise should have been easy, because, even if consumers checked only the unit of measure, they would realize that option A had less salt.

A one-way ANOVA demonstrated a statistically significant difference between nutrition consciousness and objective understanding of nutrition labelling ($P < 0.005$; M = 0.139, SD = 0.044). A chi-squared test to determine differences by gender and level of education showed statistically significant differences. Consumers with a high education level gave more correct answers (65.9%) than those with medium (54.3%) or low education (38.4%). Level of education is therefore a predictor of objective understanding of nutrition labels.

A traffic light scheme was used in the second exercise. This was more complex than the first, as the reference levels were different (per 100 g and per 30 g) but the salt level was similar. When both are expressed per 100 g, they are similar: option A corresponds to 0.77 g of salt and option B to 0.8 g.

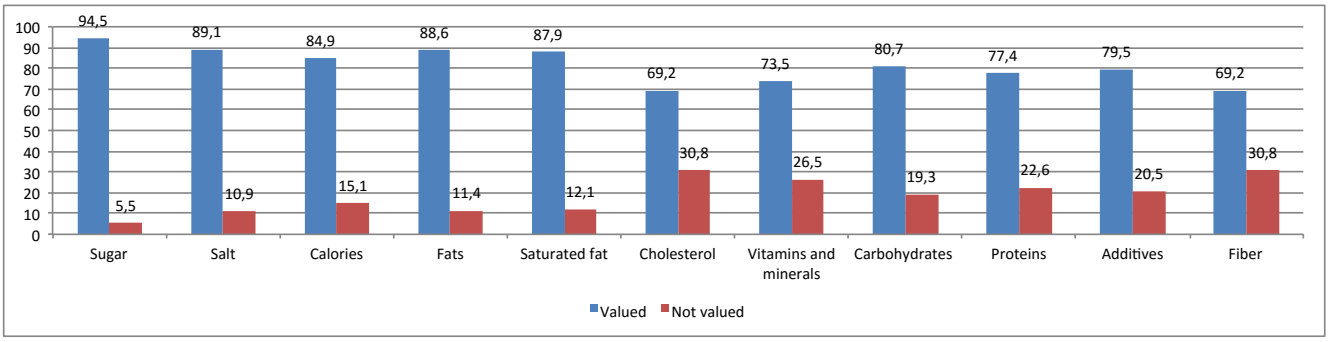
Option A (per portion of 30 g)	Option B (per 100 g)
	

Analysis of the answers showed that 41% of the respondents selected option A and 18% selected "either", which we considered correct answers. The remaining 41% of answers (26% option B, 7.6% neither and 7.2% don't know) were incorrect.

4.1.7 Liking of nutrition labels

With regard to the preferences of Portuguese consumers towards nutrition labelling, opinions were divided on the best location of nutrition information on food packaging: 30% preferred presentation of key nutrients on FOP and more detailed information on BOP; 26% preferred FOP, and 22% preferred BOP; 22% had no preference.
A chi-squared test showed no significant difference by level of education, and a one-way ANOVA showed no statistically significant difference by level of nutrition consciousness.
Most consumers considered it important that all nutrients be declared on labels. The most important were considered to be sugar, salt, fats and saturated fats and calories; fibre and cholesterol were considered less important (Fig. 14).

Fig. 14. Nutrient levels on labels considered to be of value



An open-ended question was presented to obtain suggestions for improving nutrition labelling, in order to evaluate the dimension "liking" further. Analysis of the 59 answers to the question showed six main categories of improvement that consumers would like to see (Table 7).

Table 7. Suggestions for improving food labelling

Category	Suggestions
Legibility	"The letter size. It seems to be done on purpose so nobody can read it. A situation that must be regulated urgently!!"
	"The graphics and their design are very confusing, the microscopic letters are impossible to read."
	"First of all, the letter size."
Language	"More current language so that people from all educational levels can understand it."
	"The language should be more accessible for the general population, namely talking about sugars rather than carbohydrates, fats instead of lipids."
	"Using less technical language, more accessible to all people. And use symbols to aid this understanding."
Colour symbols (traffic-light)	"I consider the traffic light system, like that used on Continente products, simple and easy to teach, so it could be a good mechanism to implement in Portugal!"
	"A large proportion of the Portuguese population has a very low level of literacy. A way of presenting simpler and more practical labels should be studied. As an example, there is 'the traffic-light model'."
	"In some cases, it would make letters more readable and perhaps a numerical or colour scale (from red to green) to indicate the place of the product in a healthy diet."
	"I would go more often to the traffic light labelling, which is most easily understood by consumers."
	"Using colours would help a lot."

Awareness-raising campaigns	"I think a national awareness or education campaign on nutrition labelling would be important." "Training in schools would be important; training in health centres would be important." "Family doctors could warn about this fact." "In my view, the problem is not that the information is poorly understood, but rather the fact that people do not understand the meaning of the components such as carbohydrates or a food with a large amount of sodium."
Transparency in nutrition information	"Usually, nutrition labels mask the names of sugars and fats. If it is sugar should say sugar not 'Syrup of ...' and similar ones that end in 'ose'." "I wish it were more specific and true. Always tell the actual amounts of sugar, healthy fats and carbohydrates, which does not always happen, and they are sometimes camouflaged."
Harmonization	"Equal nutritional language for all products."

The suggestions show that the legibility of labels should be improved, as they are considered unreadable. Another suggestion was to simplify the language, which was considered extremely technical and not accessible to everyone. Use of symbols could result in better understanding of nutrition labelling. The third recommendation was use of a colour scheme, such as traffic lights. The use of colours was considered to aid understanding of nutrition information, especially by consumers with low literacy. Some respondents considered there should be greater transparency in nutrition information, perhaps because less trustful consumers think that brands are trying to camouflage the nutritional reality of their products.

Another recommendation was for health professionals, schools and governments to conduct awareness-raising campaigns. Some consumers called for harmonization of nutrition information on different brands and products.

4.2 Qualitative data: focus groups

The findings of the four focus group are presented according to the main theoretical dimensions, interest, knowledge, search, liking, understanding, use and evaluation and decision.

4.2.1 Interest

According to Grunnert and Wills (2007) "Participants were generally aware of the overall link between food and health, indicate an interest in nutrition and are also interested in getting information about the nutritional properties of the food they eat". We found the following:

The concerned consumers showed an interest in nutrition issues and understood the fundamental importance of a diversified, balanced diet from the food chain. In their daily lives, this group ensured healthy eating by choosing fresh, and in some cases organic, foods, cooking at home, preparing many meals throughout the day and not using products that they considered harmful to health (crackers, juices, oil). They had strong interest in information, particularly on food composition, origin and validity.

The non-concerned consumers said that they knew what they should do to have a healthier lifestyle but did not practise it. They agreed that there is a clear relation between a healthy lifestyle and diet but were not interested in meal planning or nutrition information.

The young people considered that they knew nutrition facts but used this information in a poorly structured way. They also claimed to know what they should do to have a healthier lifestyle, including a more carefully chosen diet and physical exercise, but did not practise it.

The adults with a low educational level were very interested in nutrition information, and they valued diversity and the inclusion of certain products in the daily diet. They considered that a healthy diet depends on moderation and diversity. They had no interest in product labels because they had difficulty in interpreting the information.

4.2.2 Knowledge

The health-conscience consumers were very knowledgeable and sought current information systematically.

The non-health-conscience consumers considered that they were knowledgeable about nutritional issues but that this might be a perception. They said they knew how to eat in a healthy way but did not do so because they had no interest or no time to organize their meals differently. "The information on healthy eating is so easy that we have no excuse not to do it, but we don´t!" Some participants considered that healthy eating was exaggerated. "Anyway, there are stereotypes .... This paranoia of healthy eating will last a year and then everything will be as before." Or "This healthy eating is a fashion ... and as other fashions it will only last some time."

The young people considered that they had some knowledge of nutritional issues, but they did not apply them in everyday life. There was clear concern about weight, which determines their nutritional options.

The adults with a low educational level considered that they had some knowledge but that they had some difficulty in interpreting the information. We found that some information was not interpreted correctly; for example, "oatmeal cookies are very good for health".

4.2.3 Search

Search was defined by Grunnert & Wills (2007) as "effortful activities by consumers to get access to information". *Concerned consumers* generally knew the assumption necessary for interpreting information, which is searching packaging or other credible sources of information.

The non-concerned consumers did not seek information and did not read nutrition labels because they did not value the information.

The young people did not seek nutritional information, except that on calories. They unanimously sought complementary information on social networks, which they used to find any information.

The adults with a low educational level never looked for information on labels as they could not interpret their meaning. When they had doubts, they questioned their doctor.

4.2.4 Liking

"Consumers may like the label – for example because they find it easy to understand and useful, or also because they like the symbols and colours used." (Grunnert & Wills, 2007)

The health-conscience consumers commented that the negative aspects of labels are the large amount of text and the small size of the letters. Furthermore, the diversity of scales and metrics hinders interpretation of the information.

The non-health-conscience consumers considered the traffic light system appealing and the use of different colours

advantageous because it increased interest in reading.

The young people considered that the negative aspects of labels were the large amount of text and the small size of the letters. These factors influenced their interest in more detailed reading of labels. They also referred to the difficulty in interpreting the information. They said that the information they are interested in – the relation between the amount ingested and the physical exercise necessary to eliminate it – does not appear on labels. They liked the traffic light nutrition labels.

The adults with a low educational level also considered that the large amount of text and the small size of the letters were negative aspects of nutrition labels.

4.2.5 Understanding

In analysing understanding, it is important to distinguish between subjective and objective understanding. Subjective understanding is the meaning the consumer attaches to the perceived label information and covers also the extent to which consumers believe they have "understood" what is being communicated. Objective understanding is whether the meaning the consumer has attached to the label information is compatible with the meaning that the sender of the label information intended to communicate. (Grunnert & Wills, 2007).

The concerned consumers, recognizing that the information on nutrition labels is unclear, found ways of understanding them, for example by performing calculations and comparisons. These consumers used the information on packaging, such as expiration date, origin and composition, and demonstrated a greater capacity for interpretation than other consumers. They commented that it was difficult to compare products when the labels had different units of measurement (unit or weight, for example).

The non-concerned consumers considered that they fully understood the information and had analytical skills but did not use them because they did not value the information. Their nutritional choices were based in personal preferences rather than nutritional attributes. Although they claimed perfect understanding of nutritional information, they reported that some of their choices were based on wrong information.

The young people said that the nutritional information on the labels was too confusing, and they considered it very difficult to read and interpret.

The adults with a low educational level considered that is impossible to understand nutritional information because it is too technical.

4.2.6 Use

"The label information may be *used* in making choices" (Grunnert & Wills, 2007).

The concerned consumers often used information such as expiration date, origin and composition on packages, which was important for them.

The non-concerned consumers considered that labels are not important and they did not use them, except when they sought specific information, such as on allergens.

The young people did not use labels, except to determine the amount of calories in a product they used for the first time.

The adults with a low educational level never used nutrition labels

4.2.7 Evaluation and decision

Label information may result in the consumer learning about which product categories are more healthy and which are less, and this may alter the overall pattern of purchases such that categories now regarded as less healthy are bought less and categories regarded as more healthy are bought more often. (Grunnert & Wills, 2007).

The concerned consumers evaluated the information. They commented on: lack of clarity in communication, making interpretation difficult; inclusion of information that is not objective to guide consumer opinion and is not valuable; and incomplete information, although compliance with legal regulations is monitored. These consumers always used label information to evaluate and better understand products and make purchase decisions that were in line with their beliefs. Daily interest in healthy eating led them to analyse product labels and conduct further research.

The non-concerned consumers never used nutritional information to decide what to buy and what to eat. Their decisions were based on preferences.

The young people evaluated products on the basis of their previous experience or used nutritional information to decide whether a product met their requirements (e.g. low in calories).

The adults with a low educational level used information from others to evaluate products and to make purchase decisions. For some, price was very important and determined their final decision.

4.2.8 Overall results

The four focus groups revealed the different perspectives on the importance of nutrition labelling, which affect consumers' decisions.

The concerned consumers were deeply interested in nutrition issues and in information on the nutritional properties of the food they ate. They actively sought information, used the information on nutrition labels and did further research. These consumers generally understood the information; however, they considered that labels do not always provide objective information. Nevertheless, they evaluated products and made purchase decision on the basis of this information.

The non-concerned consumers had no interest in nutrition issues, did not seek nutritional facts, did not use the information on nutrition labels and evaluated them negatively. They considered that they understood the information; however, we found some misunderstanding and misinterpretation of nutrition labels. This is related to the concept of subjective and objective understanding presented by Grunert & Wills (2007). In some circumstances, consumers have a different perception of information from that which the sender intended to communicate. The non-concerned consumers did not use the information and did not like nutrition labels. They evaluated products and made decisions according to their personal preferences.

The young people were not very concerned about nutritional issues, except if they wanted to control their weight. They had some nutritional facts but also some misconception about nutrition. They did not use the information and did not like nutrition labels because they contain too much information. The liked the traffic light labels because of the colours. They usually did not understand the information on labels and did not use it to evaluate products or decide on a purchase.

The adults with a low educational level were interested in nutritional issues and sought information, but they never read nutrition labels. They used the nutrition information they obtained from others to evaluate products and to make purchase decisions. They had some misconceptions about nutrition information but firmly believed some of the information and used it daily in making decisions.

5. Conclusions and recommendations

5.1 Conclusions

This report adds to information on Portuguese consumers' understanding, preference and use of different labelling formats. It makes a valuable contribution to discussions on a policy for FOP labelling and may inform decisions for a national scheme. Internationally, this study adds to the growing consensus that FOP labelling is important to consumers and that the most effective schemes are likely to be those that are interpretive and based on symbols, colours, words or quantifiable elements.

A first important insight from this study is the importance of using mixed methods in investigations to ensure deeper understanding of consumers' attitudes. Respondents' responses to quantitative and self-reported questionnaires sometimes reflect social desirability, with some behaviour over-represented. In focus groups, participants reveal their real behaviour. Our focus group discussions showed that preconceived knowledge about nutrition is not always correct, that there is limited actual use of nutrition labels and that consumers find difficulty in decoding the technical language on labels. The qualitative approach allowed us to further characterize consumer preferences for labels and to identify obstacles to their use, which may be useful in designing intervention strategies.

Below, we present answers to the initial research objectives.

1. Determine whether, how and when Portuguese consumers use food and nutrition labelling.
In this national survey, Portuguese consumers considered that they often used food and nutrition labelling, especially at the point of sale. Gender, nutritional awareness and level of education were important variables in determining the use of food labels. Women and consumers with a higher level of education and greater nutritional awareness used food labels more frequently.

The focus group results indicate that actual use of food labels, and especially nutrition labels, during food purchase is lower. Only more concerned consumers reported that they used labels in choosing products and only when they bought them for the first time. Non-concerned consumers used food labels when they needed specific information, mainly in cases of illness or allergy in household members. Consumers with a low level of education who are somewhat interested in nutritional issues do not use labels because they do not understand the information or cannot read it. They use nutrition information from other sources and follow it without critical judgement or personal reflection. They trust their own judgement, knowledge and experience and consider that they are making healthy choices. This does not always correspond to reality, as was seen in the simulation exercises of food choices.

Thus, Portuguese consumers use food labelling mainly when there is illness, allergy or intolerance in the household, when they have to decide between two products, or when they are buying a product for the first time.

Portuguese consumers attach great importance to the use of nutrition labels on almost all types of product but especially on children's food, breakfast cereals and prepackaged meals. Little importance was attached to labels on rice, cheese, milk or tinned foods.

The consumers who said that they used food labels attached most importance to the expiration date, comparison with similar products, the use instructions and information on certain nutrients.

Consumers usually use nutritional information at the point of sale.

The reported reasons for not using nutrition labels were habit, previous patterns of food purchase and conviction that they already know which food products are healthy and unhealthy. The focus groups revealed two more reasons for

lack of use of nutrition labels. One was lack of understanding of the information by consumers with a lower level of education, and the second was lack of interest by young and non-concerned consumers. In both the quantitative and the qualitative studies, label format was the common reason for difficulty in use and understanding. All consumers noted that the lettering is too small and labels have too much information and are usually technical and complex, all of which make it difficult for consumers to decode labels at the time of purchase.

The absence of FOP labels on some products limits use of nutrition information at the time of purchase.

2. Determine how specific elements of FOP labels (colours, text, numbers, interpretative logos) are used to make purchasing decisions.

The focus group results show that only interested consumers seek nutrition information before choosing a product. The survey data show that consumers consider that all nutrients should be mentioned in nutrition labelling, even if they do not use the information. The most commonly mentioned nutrients were fat, saturated fat, sugar, salt and calories.

Young consumers who use FOP labels seek information mainly on calories. They prefer colour-coded labels because they are more intuitive. Consumers in general considered interpretive logos to be useful; however, concerned consumers felt that one of the most relevant elements is trust in the source of information. Colour is considered one of the elements of FOP labels that is most important at the time of a purchase decision. Colour was appreciated by all consumers, who find it easy to understand the information and make decisions at the point of purchase.

Concerned consumers, who really look for nutritional information, prefer values per 100 g, as this facilitates comparison of products. They also prefer information to be presented per portion or unit so that they can decide what to eat to satisfy their daily nutrient requirements (which would have to be standardized across products).

Portuguese consumers found it difficult to understand nutrition labelling when they had to perform calculations. This applied in particular to those with less education.

Interpretive information and recommended reference values help to compare products and to choose specific products for the daily diet. This information was considered particularly important by concerned and educated consumers.

3. Learn more about how different schemes enable consumers to interpret the levels of key nutrients in food products correctly.

We found a gap between how consumers evaluate their understanding of nutrition labelling and their objective understanding. Participants suggested that nutrition labels could be improved by ensuring consistency, uniformity, clarity and a simpler design. The best location for nutrient labelling was considered to be the FOP. All four groups of consumers said that they preferred symbols and colour schemes, simple presentations and FOP labels for key nutrients. All four focus group preferred the traffic light scheme, which was best understood and allowed faster decision-making at points of sale. Concerned consumers, however, indicated that these labels might cause confusion because either the units of measurement or the recommended daily intake is sometimes not clear.

Consumers' requirements for nutrition labels are simplicity, easy comprehension and large, colourful letters. They also suggested standardization for all food brands. These changes might make labels simpler to use and allow easier comparison of products at the time of purchase.

4. Identify any barriers to interpreting the information provided on labels.

Two important barriers to better understanding of nutrition labels were identified. One is the characteristics of the label. Consumers considered that the main problems with nutrition labels are the time it takes to read them, because of excessive information, the technical language, the requirement for mathematical skills to understand the content and lack of standardization and objective criteria. The use of many different, non-standardized labels confuses consumers and creates barriers to better understanding of nutritional information.

The other barrier to understanding nutrition labelling is the level of education and literacy of consumers. A low level of education is a predictor of poor understanding of nutrition information. As consumers usually take purchase decisions in shops, fast reading and understanding of information are essential.

5. Gauge consumers' knowledge about nutrition and nutrition labelling.
Although consumers considered that all nutrients should be included in the nutritional information on labels, they showed ignorance of the legislation, as most were unable to identify the currently mandatory statements. Portuguese consumers also lacked knowledge about the recommended daily intakes of salt and sugar. The recommended daily maximum limits are much lower than those given by the consumers. We conclude that they do not understand the meaning of the measures and are not aware of the salt and sugar content of some of the products they usually consume, as consumption of sugar and salt in Portugal is well above the limit recommended by WHO.

Some of consumers' knowledge is obtained from informal sources during socialization and is often based on misinformation. For example, beliefs and food traditions considered by family members as healthy are subjective but become considered real knowledge. One example is: "As oats are good for health, I can eat oatmeal cookies as a healthy option". Thus, knowledge has more to do with interest than with educational level.

Although Portuguese consumers claim to know the nutritional value of the foods they consume and buy, this knowledge is not always effective. They consider that they understand the information on nutrition labels, but their level of understanding is lower than what they perceive. The self-reported survey showed greater use and understanding of nutrition labels than was found in the focus groups.

5.2 Recommendations

The aim of this study was to contribute to understanding of Portuguese consumer behaviour with regard to nutrition labels. Such understanding is fundamental for developing public policies and actions in the agri-food sector in order to promote knowledge, understanding and effective use of nutrition labels in decisions to buy food products.

The recommendations below provide orientation in two areas that were clearly identified in the study:
- to make necessary *changes to food labelling*, as the majority of participants reported being confused in interpreting food labels; and
- to *conduct social marketing campaigns* to enable consumers, producers and retailers to become food literate.

5.2.1 Change food labelling schemes

1. Policy-makers should critically consider consumers' perspectives and ideally enact legislation for standardization of nutrition information on FOP labels. Portuguese consumers have been flooded with a variety of nutrition schemes, symbols and measures. Standard criteria should be created by the Government, with a national recommended scheme. This would encourage use of a single scheme that takes into account all levels of literacy and other demographic factors. The participants in this study provided clear arguments against the proliferation of symbols, logos and formats and requested harmonized food labelling across products and brands.

2. Subsequently, the Government should be guided by the evidence that interpretative FOP labelling is the most easily understood and preferred by consumers. Government, including national health authorities, plays an important role in the development of trusted systems, including the nutrient profiling criteria that underpin the schemes. Formal, continuing system development and implementation should be applied, involving consumer and health organizations, the scientific community and food manufacturers and retailers. Labelling guidelines produced by individual manufacturers increase misunderstanding and uncertainty in consumers' minds. Voluntary food labelling will work only if producers consider the problem from the point of view of their customers, rather than suiting themselves or their corporate social responsibility agenda.

3. In line with the previous suggestion and given the level of illiteracy in the Portuguese population, nutrition information should be provided in language that all consumers understand and which does not require calculations (mathematical or other) to understand which product is healthier. The information must be clear and easy to understand, for example with the use of graphics that allow easier interpretation and comparison. Too much information is a barrier to effective use of nutrition labelling, and only important facts should be presented.

4. Policy-makers should consider amending their recommendations for mandatory and non-mandatory information. FOP labelling should be guided by the following principles: use of symbols and colours, simple language, information presented per 100 g and per portion and harmonized in a single format. Portion sizes should be standardized. Nutrition labels should be objective, clear, simple, easy to understand, colourful, large and readable. FOP labels should target people who currently do not use nutrition labelling or find it difficult to understand and use.

5.2.2 Conduct social marketing campaigns to improve food and nutrition literacy

1. Well-resourced education and consumer engagement are necessary for implementation of FOP labelling, to improve nutrition literacy and to ensure that the system is widely understood. Social marketing should be used to promote better understanding and healthier food choices. Companies in the agri-food system have sought to provide consumers with nutritional information within their social responsibility strategies, to help them make healthier food choices. This is not enough, however, to promote decisions to buy healthier options. Brands should renounce the passive position of merely providing nutrition information and take an active role in tutoring and educating consumers in translating the information into better choices by seeking, using, understanding and actually applying food and nutrition information when they purchase food.

2. Both policy-makers and agri-food stakeholders producers and retailers can and must work together to design and implement public and mass educational programmes in four areas.

- Organize interactive education campaigns at points of sale. As reported by the participants of this study, consumers use nutrition labels mainly at the time of purchase. It would therefore make sense to design various point-of-sale campaigns, similar to the food promotions commonly conducted in supermarkets and grocery shops. The aim would be to disseminate nutrition knowledge that could be translated into better buying decisions.
- The first suggestion could be reinforced by merchandising that promotes better understanding and use of nutrition information by different groups of consumers. For example, a teaspoon could be defined as the right measure of salt in grams or one pot of soup containing X litres of water as corresponding to Y grams of salt (for healthy consumers).
- The online environment should also be considered, as many consumers purchase food online. In order to compare the prices of alternative products, e-commerce platforms could offer sugar and salt calculators with an embedded function for comparing the quantities in competing products. This technology could stimulate competitive food brands to develop healthier products.
- Dynamic interactive games and experimental challenges could be used at points of sales both online and offline. Nutrition information is considered to be abstract and difficult to understand; therefore consumers, especially with poor literacy, might be helped by seeing real amounts of nutrients and not intangible references to grams.
- Some of these actions could be strengthened and accelerated with forceful incentives from the Government, such as explicitly offering benefits for companies that are willing to implement such campaigns and investing in research and development of technologies and products (e.g. apps) to improve understanding of nutrition information.

5.2.3 Overall recommendation

Our final, overall suggestion is directed to policy-makers and particularly to the Portuguese Ministry of Health. Critical reflection on this issue leads us to propose development of a strategic social marketing plan to improve the nutritional literacy of the Portuguese population, to cover the period 2018–2022. This 5-year strategic plan should be developed with many stakeholders, provide strategic guidelines for all and ensure synergy. The State should be considered the main regulator, in order to ensure independent guidance. The plan should include all the above suggestions and have

three aims: to improve consumers' knowledge, to invest in improving consumers' understanding and to increase use of nutrition labelling to actively promote healthier food choices.

Importantly, campaigns should be tailored to consumers' level of education, age and interest in nutrition. Starting with children, by campaigns in schools, competitions could be held for people with different education levels to increase their knowledge, understanding and use of nutrition information in making food choices. Experience in other fields, such as recycling, in which families' behavioural changes came the bottom up, from children to their parents, might be useful for such campaigns.

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Annex 1. Focus group guidelines

Questionnaire for recruitment

1. What is your opinion regarding the following sentences:

1 Totally disagree	2 Disagree	3 Neutral	4 Agree	5 Totally agree

	- I am worried concerning food consumption in my daily life.
	- I'm concerned regarding controlling my weight.
	- I try to find information regarding the nutritional value of the food I buy.
	- I practise regular exercise.
	- I usually read food labelling carefully.
	- I am generally concerned with the use of additives in food.
	- I like to know the origin of food products I buy and consume.

2. Are you one of the main people responsible for buying food products in your home? Yes ☐ No ☐
3. Gender: F ☐ M ☐
4. Age: _____
5. Level of education: _____
6. Your profession: _____
7. Your husband's or wife's profession: _____
8. Professional situation (your own):
   - ☐ Self-employed worker with 10 or more employees
   - ☐ Self-employed worker with fewer than 10 employees
   - ☐ Employed worker
9. Professional situation (your husband's or wife's):
   - ☐ Self-employed worker with 10 more employees
   - ☐ Self-employed worker with fewer than 10 employees
   - ☐ Employed worker
10. Number of elements in your household? (including yourself): _____
11. Do you have children at home? Yes ☐ No ☐

    If Yes, indicate their ages: _____

Would you participate in qualitative market research or group interviews (focus groups) with a maximum duration of 1h 30 min to be scheduled according to your availability? ? Yes ☐ No ☐

Name: _____

Email: _____

Telephone number: _____

Guidelines for focus groups

The Instituto Português de Administração de Marketing is developing qualitative market research. The theme will be revealed at the end. There are no right or wrong answers. Our conversation is being recorded so that we can analyse the data later.

Opening question

1. Please begin by giving your names, age, profession, with whom you live and your favourite food.

Introductory questions

2. What is the first word you think of when I mention a healthy lifestyle? What does being healthy mean to you?

3. What is your degree of daily concern with issues related to health? And what are your main concerns? And what are the lesser ones? What strategies do you have or should have to improve your health? (*Assessment of the interest and the importance attached to food choices in a healthy lifestyle setting*)

Transition questions

4. When you buy food products, how do you choose the products? Do you bring a list or do you decide in the shop?

5. What do you consider to be healthy food? In your daily choices, what do you value the most? And what do you value the least? What mechanisms do you use to ensure that your food is healthy? (*Check whether food labels are an important source in their choices.)*

Key questions

6. What do you think of spontaneously when I talk about food labelling?

7. Now we are showing some food product packaging. (*First, they have to fill in three small surveys alone, and then we start discussion in the group.)*

8. How do you use the information presented on food labels?

9. What kind of information would you like to see on food labels? Do you think there is another way of communicating nutrition information besides food labelling?

10. In which circumstances do you consider that you need more information on the nutritional value of food products? What are your main sources of information? Which do you trust most and least?

11. In general, how do you evaluate food labelling and the information it provides? (positive and negative)

12. How could we minimize the problems or difficulties? What should be the role of institutions (companies, nongovernmental organizations and the State) in doing that?

13. Do you remember any campaign giving information on the use and interpretation of nutrition labelling?

Final question

14. We are just finishing. What advice would you give to improve food labels?

Food choice simulation (question 7)

(Participants had access to real package sizes.)

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BOLACHA
COM AVEIA
300 g


ORIGINAL
OREO


CONTINENTE
TARTELETES
COM RECHEIO
DE MORANGO
TARTELETES COM RECHEIO
DE MORANGO


Cuétara
Roscayema
Cuétara
Roscayema


VIENA
água e sal
58
77%

First exercise

	Product number	Reason
Which one would you buy for yourself?		
Which one would you buy for a child?		
Which one would you buy for an older person?		
Which one would you not buy?		

Second exercise

	Product number	Reason
Which product has the most relevant food labelling information for you?		
Which product has the least relevant food labelling information for you?		

Third exercise

	Product number	Reason
Which product do you consider the healthiest?		
Which product do you consider the least healthy?		

The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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World Health Organization Regional Office for Europe
UN City, Marmorvej 51, DK-2100 Copenhagen Ø, Denmark
Tel.: +45 45 33 70 00 Fax: +45 45 33 70 01
Email: euwhocontact@who.int
Website: www.euro.who.int