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Labelling: the view, position and opinion of Portuguese food and nutrition professionals

Rotulagem: visão, posição e opinião do profissional português da área alimentar

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Dedication

To my parents. To those who believed in me.

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Abstract

INTRODUCTION: Food and nutrition labelling is an important tool for food and nutrition professionals, in their practice since it provides information on food safety and nutritional content of prepacked food products. With the implementation of Regulation (EU) No 1169/2011, several rules concerning mandatory information on prepacked food, legibility, presentation, and nutrition labelling became standardized.

OBJECTIVES: The main objectives were: to explore the view of a sample of Portuguese food and nutrition professionals about food and nutrition labelling and the legal requirements for prepacked foods established by Regulation (EU) No 1169/2011; to assess the different positions of these professionals regarding food and nutrition labelling, and to analyse the opinions and suggestions of these professionals concerning nutrition labelling.

METHODOLOGY: A cross-sectional study was conducted, using a non-probabilistic sample of food and nutrition professionals, obtained after contacting several Portuguese entities in the food and nutrition area. The eligibility criteria were being 18 years old and over, living and working in Portugal, and having a professional activity in the food area. A web-based self-administered survey was developed, including questions about labelling (importance, reading, use, trust, satisfaction, and influence in food choices), and the level of agreement with the changes established by Regulation (EU) No 1169/2011 about the content, presentation and legibility of the mandatory food and nutrition information. Data collection occurred from December 2016 to April 2017. Descriptive statistics and analysis were performed, using IBM SPSS®, in order to assess differences between groups (independent samples tests, with a significance level of 0.05) and responses patterns (cluster analysis).

RESULTS: The sample was constituted of 297 participants, 81.1% women, 53.2% married, with an average age of 39 years old, and with academic degrees in the food area/nutrition. Professionals in different areas of activity have distinct views concerning the changes in the Regulation (EU) No 1169/2011. In particular, **Clinical care professionals** were more confident in the values presented on the nutrition declaration, and more influenced by labelling information on their food choices. **Primary health care, community and public health professionals** gave the highest importance and read more frequently the nutrition information, agreed that more detailed information should be provided, believed that front-of-pack nutrition labelling will benefit their professional activity, and supported colour coding. **Food industry, innovation, marketing, and laboratory analysis professionals** read more frequently the food name, operator and origin, and agreed more with the inclusion of the food portion size and fibre. **Foodservice professionals** consulted more often the information on allergens, storage conditions and durability date; were more likely to use labelling; and agreed with the mandatory information being more visible. **Research,**

education, and training professionals did not stand out significantly from the studied aspects. **Quality control and food safety, inspection and consulting professionals** read more frequently the lot number, were more satisfied with the layout information and agreed that front-of-pack nutrition labelling can lead to a repetition of the information.

Three different positions were found in the way food and nutrition labelling was perceived by professionals: **cluster 1 - confident**, which included professionals who gave higher relevance to nutrition labelling and agreed more with the Regulation (EU) No 1169/2011; **cluster 2 - sceptical**, comprised by professionals that valued labelling less and were less satisfied with the modifications in EU regulation; and **cluster 3 - enthusiasts**, consisting of professionals who used food and nutrition labelling, were more satisfied with its content, layout, the addition of new information and comprehensibility. The professionals, in each cluster, have a different educational background, professional activities, and concerns regarding food processing, safety and health.

Of the 297 participants, 33 (11.1%) answered the open-ended question regarding the improvements that should be done in nutrition labelling. Two types of improvements were proposed: **the simplification of the information**, and **the promotion of understanding and nutrition literacy**, both aiming to favour the consumers' health and use of labelling. The professionals who provided suggestions showed the least satisfaction with the label information, namely the specific technical terms/ terminology, the quantity of information, the symbols used and the nutritional claims.

CONCLUSIONS: Different views were found in the way food and nutrition labelling is used, at a professional level, influenced by the different educational backgrounds (educational level and courses) and areas of activity. Three positions emerged (confident, sceptical and enthusiasts) regarding the way food and nutrition labelling and the Regulation (EU) No 1169/2011 were perceived by professionals. One in nine professionals considered that nutrition labelling and nutrition literacy should be improved, to promote the consumer's empowerment and encouraging them to make conscious and healthy food choices.

Keywords

- Consumer and health protection
- Food and nutrition labelling
- Food and nutrition professionals
- Food labelling use
- Food product quality and safety
- Foodstuffs' legislation
- Labelling
- Nutrition information

Resumo

INTRODUÇÃO: A rotulagem alimentar e nutricional é uma importante ferramenta para os profissionais durante a sua prática profissional uma vez que disponibilizam informações sobre segurança alimentar e teor nutricional dos géneros alimentícios pré-embalados. Com a implementação do Regulamento (EU) N.º. 1169/2011, estabeleceu-se nova padronização da informação obrigatória a constar, legibilidade, apresentação, e conteúdo da informação nutricional.

OBJETIVOS: Os principais objetivos foram compreender a visão de uma *amostra de profissionais portugueses* da área alimentar sobre a rotulagem alimentar e nutricional e os requisitos estabelecidos com o Regulamento (EU) N.º. 1169/2011 para géneros alimentícios pré-embalados; avaliar as diferentes posições destes profissionais sobre a rotulagem alimentar e nutricional, e analisar as opiniões e sugestões dos profissionais no que respeita à rotulagem nutricional.

METODOLOGIA: Realizou-se um estudo transversal, usando uma amostra não probabilística de profissionais da área alimentar e nutricional, obtida após contacto com várias Entidades Portuguesas da área alimentar e nutrição. Os critérios de inclusão foram: ter 18 anos ou mais, viver e trabalhar em Portugal, e ter uma atividade profissional na área alimentar. Um questionário *online* de administração direta foi desenvolvido, que incluía questões sobre a rotulagem (importância, leitura, uso, confiança, satisfação e influências nas escolhas alimentares), e o nível de concordância com as alterações instituídas pelo Regulamento (EU) N.º. 1169/2011, relativamente ao conteúdo, apresentação e legibilidade da informação alimentar e nutricional obrigatória. A recolha de dados ocorreu de dezembro de 2016 a abril de 2017. A estatística descritiva foi realizada, usando IBM SPSS®, a fim de analisar as diferenças entre os grupos (testes t de amostras independentes, com nível de significância de 0.05) e padrões de resposta (análise de clusters).

RESULTADOS: A amostra foi constituída por 297 profissionais, 81.1% de mulheres, 53.2% casadas, com uma média de idades de 39 anos, com formação académica na área alimentar/nutrição. Os profissionais de diferentes áreas de atividade mostraram ter visões distintas no que concerne às alterações introduzidas pelo Regulamento (EU) N.º. 1169/2011. Particularmente, os **profissionais da área clínica** mostraram mais confiança nos valores apresentados na declaração nutricional, e reportaram mais influência da informação consultada na sua escolha alimentar. Os **profissionais dos cuidados de saúde primários, comunidade e saúde pública** revelaram maior importância e leitura mais frequente da informação nutricional, e que mais detalhe deve ser fornecido, acreditam que a rotulagem na frente da embalagem irá beneficiar a sua atividade profissional, e apoiam o uso de código de cores nesta informação. Os **profissionais da indústria alimentar, inovação, marketing e**

análises laboratoriais indicam ler mais frequentemente as menções - nome, operador e origem do alimento, e concordam mais com a inclusão da porção e fibra na declaração nutricional. Os **profissionais da restauração coletiva** indicam consultar mais vezes a informação sobre os alergénios, as condições de armazenamento e a data de durabilidade mínima, indicam usar mais frequentemente a rotulagem, e concordam que a informação obrigatória deva estar mais visível. Os **profissionais da investigação e ensino** não se destacam em nenhum dos aspetos estudados. Os **profissionais da qualidade e segurança alimentar, inspeção e consultadoria** leem mais frequentemente o lote, estão mais satisfeitos com a apresentação da informação, e concordam que a informação na frente da embalagem possa levar a uma repetição da informação.

Três diferentes posições foram encontradas na forma como a rotulagem alimentar e nutricional é percebida pelo profissional: cluster 1 - **Confiantes**, incluem profissionais que deram maior relevância à rotulagem nutricional, e concordam mais com o regulamento vigente; cluster 2 - **Céticos**, composto por profissionais que valorizam menos a rotulagem e estão menos satisfeitos com as modificações impostas pelo regulamento; e o cluster 3 - **Entusiastas**, inclui profissionais que usam a rotulagem alimentar e nutricional, estão mais satisfeitos com o seu conteúdo, apresentação, adição de nova informação e compreensão. Os profissionais, em cada posição, têm diferentes formações académicas, áreas de atividade e preocupações com o processamento, segurança e saúde veiculadas pelo alimento.

Dos 297 participantes, 33 (11.1%) responderam à questão aberta e propuseram melhorias na rotulagem nutricional. Surgiram duas opiniões principais: **a simplificação da informação e a promoção da sua compreensão e literacia nutricional**, ambas para favorecer o uso da rotulagem pelo consumidor e a sua saúde. Os profissionais que deram sugestões demonstram uma menor satisfação com a informação presente no rótulo, principalmente com os termos técnicos, a quantidade de informação, os símbolos usados e as alegações nutricionais.

CONCLUSÕES: Diferentes visões foram encontradas na forma como a rotulagem alimentar e nutricional é usada pelo profissional, sendo esta influenciada pela formação académica e área de atividade. Três diferentes posições emergiram (confiantes, céticos e entusiastas) conforme a rotulagem e respetiva legislação foi percebida pelos profissionais. Um em cada nove profissionais considera que a rotulagem nutricional e a literacia nutricional devem ser melhoradas a fim de promover o empoderamento do consumidor, de modo a fazer escolhas alimentares conscientes e saudáveis.

Palavras-Chave

- Informação nutricional
- Legislação dos géneros alimentícios
- Profissionais da área alimentar e nutrição
- Proteção do consumidor e da saúde
- Qualidade e segurança dos géneros alimentícios
- Rotulagem
- Rotulagem alimentar e nutricional
- Uso de rotulagem de alimentos

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List of abbreviations

ASAE	Portuguese Food Safety and Economic Authority (Autoridade de Segurança Alimentar e Económica)
BOP	<i>Back-of-pack</i> Nutrition Labelling
CAC	<i>Codex Alimentarius Commission</i>
DGS	Portuguese Directorate-General of Health (Direção-Geral de Saúde)
DG SANCO	Directorate-General for Health and Consumer Protection
EC	European Commission
EEC	European Economic Community
EFSA	European Food Safety Authority
EU	European Union
EUFIC	European Food Information Council
FAO	Food and Agriculture Organization of the United Nations-
FIC	Food Information to Consumers
FIPA	Portuguese Agrofood Industries Federation (Federação das Indústrias Portuguesas Agroalimentares)
FNL	Food and Nutrition Labelling
FNP	Food and Nutrition Professionals
FOP	<i>Front-of-pack</i> Nutrition Labelling
GDA	Guideline Daily Amounts
INSA	Portuguese National Institute of Health Doctor Ricardo Jorge (Instituto Nacional de Saúde Doutor Ricardo Jorge)
NRV	Nutrient Reference Value
NUTS-II	Portuguese Nomenclature of Territorial Units for Statistical purposes
QUID	Quantitative Ingredient Declaration
RI	Reference Intake
WHO	World Health Organization

List of acronyms

χ^2	Chi-Square
N	Sample size
SD	Standard Deviation
p	Statistical Significance

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INTRODUCTION

In this section, a contextualization will be done to provide an overview of the main topics regarding food labelling over the last thirty-five years. Secondly, the evolution of concepts of food and nutrition labelling will be presented. Thirdly, a perspective regarding food labelling as a turning point for the political relevance of prepacked foods will also be described, and lastly, the positive health outcomes of the use of food labelling will be addressed.

After the introduction of the topics, a rationale for this research will be provided, in order to justify its relevance, interest and scientific implications.

Food labelling is usually associated with prepacked foods and can be defined as *“any tag, brand, mark, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed or impressed on, or attached to the packaging or container of food”* (definition of terms taken from The Codex General Standard for the Labelling of Prepackaged Foods, adopted by the Codex Alimentarius Commission (CAC) and in the European Regulation (EU) No 1169/2011), additionally *“‘ Labelling’ means any words, particulars, trademarks, brand name, pictorial matter or symbol relating to food and placed on any packaging, document, notice, label, ring or collar accompanying or referring to such food”* ([Codex Alimentarius Commission, 1985a, Regulation \(EU\) No 1169/2011](#)).

Foods not packed for sale or display must also present some type of information that identifies the food itself. Several changes in the labelling of foods occurred in the last years, as a result of a different political strategy to provide positive health outcomes and a sense of responsibility towards the protection of consumers rights. These changes were achieved with the use of the information presented in food labelling. It was recognized that food and nutrition labelling is a channel of information to consumers and can be used to support healthy decision-making in relation to food consumption ([European Commission, 2007](#)).

In 1978, the European Union (EU) implemented the Council Directive 79/112/EEC to regulate the compulsory information of labelling on foodstuffs. The eight informative aspects which had to be present were: the name under which the product was sold, the list of

ingredients, the net quantity (in the case of prepacked foodstuffs), the date of minimum durability, any special storage conditions or conditions of use, the name or business name and address of the manufacturer or packager, the place of origin or provenance and the instructions for use ([Council Directive 79/112/EEC](#)).

In 1985, the *Codex Alimentarius Commission on Food Labelling* adopted the first international food labelling standards (in partnership with the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO)). The *Codex General Standard for the Labelling of Prepackaged Foods* (CODEX STAN 1-1985) identified which mandatory information should appear on the label of the prepacked foods. At that time, the required information included the name of the food, the list of ingredients, the net contents, the name and address of the manufacturer, the country of origin of the food, the lot identification, the date marking as “date of minimum durability” and storage instructions, as well as the instructions for use ([Codex Alimentarius Commission, 1985a](#), [Codex Alimentarius Commission, 2018](#)). Additionally, mandatory requirements such as presenting the quantitative labelling of ingredients and the use of the international food irradiation symbol, when used, were also included.

Therefore, a reflection on the evolution that occurred since the first recommendation on prepacked foods labelling, up to date will be provided.

FOOD LABELLING EVOLUTION FROM 1985 TO 2020

Over the last thirty-five years, changes in the food control systems occurred to protect the health of consumers, promoting good and harmonized procedures, and ensuring fair practices in the food trade ([Food and Agriculture Organization of the United Nations, 2021](#)). The establishment of common rules on standards procedures for food control and surveillance became more important, due to the integrated border management and cooperation of the European Union countries; the free movement of safe and wholesome food in the internal market; the nutrition transition - trends in food availability and consumption; the optimized response to non-communicable diseases; and the consumers' changing needs for information, which leads to conscious food choices ([Grace, 2016, Fanzo et al., 2020](#)). Around the year 2000, the relationship between the choice of an appropriate diet that suited individual needs, that could promote health improvements, started to emerge. Following this tendency, the WHO stated in the *Global Strategy on Diet, Physical Activity and Health* (2004), that “*accurate, standardized and comprehensible information on the content of food items in order to make healthy choices*” was a way of responding to consumers' requirements ([World Health Organization, 2004](#)). Food and nutrition labelling in the European Union started to be thoroughly studied ([Cheftel, 2005, Cowburn and Stockley, 2005, European Food Information Council, 2005, European Commission Directorate-General for Health and Consumer Protection, 2006](#)). The “EU Consumer Policy strategy 2007-2013” mentioned that empowering consumers can promote healthier life choices. As a result, it can effectively protect consumers, improve nutrition and prevent overweight and obesity ([European Parliament Resolution, 2007](#)). Also, the “**Commission White Paper**” showed through the strategy of Europe on Nutrition, Overweight and Obesity-related health issues that nutrition labelling is “one important method of informing consumers about the composition of foods and of helping them to make an informed choice” (30 May 2007) ([European Commission, 2007](#)). The EU consumer's policy strategy has therefore been delimited to hold the consumer accountable, guarantee access to information, improve their well-being, and effectively protect their health. A consultation on labelling was done to provide a reviewing of the options for nutrition labelling (mandatory back-of-pack nutrition labelling should be introduced, the nutrients that should be included in the label, and the regulation of front-of-pack nutrition labelling), such as reviewing and considering what food information should be included and be available nowadays ([European Commission Directorate-General for Health and Consumer Protection, 2006, Kasapila and Shaarani, 2016](#)). The improvements in diets and nutrition require educational initiatives and lifestyle changes to fight obesity and other non-communicable diseases, by adopting relevant

legislative frameworks, which ensure the safety and quality of the available foods ([González-Zapata et al., 2009](#)). On one hand, they contribute significantly to the health and well-being of consumers and their social and economic interests, while on the other hand avoiding inappropriate marketing and advertisement of foods ([Food and Agriculture Organization of the United Nations and World Health Organization, 2014b](#)). Standardizing is not exclusively a technical issue, but also involves creating durable and sustainable structures to maintain the viability of the accessible data in the entire agri-food sector, “from farm to fork”. The risk analysis process should be improved by adding a method for assessing the capacity of the EU Member States to face upcoming challenges, including present and future threats. A way of tackling this matter is to increase the transparency of the EU risk assessment in the food supply chain; and, strengthen the reliability and the objectivity of the food system in order to guarantee its long-term sustainability ([Regulation \(EU\) No 2019/1381, European Commission, 2020d](#)).

The European Commission (EC) has committed to ensuring the safety and quality of foods available, guaranteeing honest information and safeguarding consumer’s rights ([Regulation \(EU\) No 1169/2011, Food and Agriculture Organization of the United Nations, 2016](#)). Therefore, several adjustments in the law, concerning the regulation of food information on prepacked foods were performed. The following timeline and its contextualization support this commitment (**Figure 1** and **Figure 2**):

Figure 1 - The evolution of the European legislation concerning food labelling in the past thirty-five years.



1990



◐◐◆ In 1990, the **Council Directive 90/496/EEC** (24th of September) provided rules on the content and presentation of the nutrition labelling of foodstuffs. The inclusion of nutrition information was voluntary unless a nutritional claim was made related to the food itself ([Council Directive 90/496/EEC](#)). *No longer in force since 13/12/2014.*

1999



◐◐◆ The **Decree-Law n° 560/99**, of the 18th of December, constituted the legislative basis of general and nutritional labelling of foodstuffs in Portugal. It established the rules that should be followed on the labelling, presentation and advertisement of foodstuffs, packaged or not, and the lot indication ([Decreto-Lei n.º 560/99](#)). *No longer in force since 13/12/2011.*

2000



◐◐◆ On the 20th of March 2000, the European Union rules on food labelling applicable to all foods were implemented in the Directive 2000/13/EC of the European Parliament and Council (on labelling, presentation, and advertisement of foodstuffs). The provisions mentioned date back to 1978 ([Directive 2000/13/EC](#)). *No longer in force since 13/12/2014.*

◐◐◆ The **Regulation (EC) No 1760/2000** of the European Parliament and of the Council (17th of July 2000) established a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products (revoking the Council Regulation (EC) No 820/97) ([Regulation \(EC\) No 1760/2000](#)). *In force.*

2002



◐◐◆ **a) *** In 2002, according to the **Regulation (EC) No 178/2002** of the European Parliament and of the Council of the 28th of January, the general principles and requirements of food law were presented. The European Food Safety Authority (EFSA) was established and described the procedures in matters of food safety. A general principle of food law to provide a basis for consumers to make informed choices in relation to the food they consume and to prevent any practices that may mislead them was implemented ([Regulation \(EC\) No 178/2002](#)). *In force.*

◐◐◆ **b) *** The **Commission Directive 2002/46/EC** of the European Parliament and of the Council of the 10th of June 2002 on the approximation of the laws of the Member States related to food supplements ([Directive 2002/46/EC](#)). *In force.*

*a) ** EU general legislative texts applicable to all food products, *b) ** EU legislation applicable to certain categories of food products.

2003



◆ The Regulation (EC) No 1830/2003 of the European Parliament and of the Council (22nd of September 2003) concerning the traceability and labelling of genetically modified organisms and the traceability of food and feed products produced from genetically modified organisms (amending Directive 2001/18/EC) ([Regulation \(EC\) No 1830/2003](#)). *In force.*

◆ The Commission Directive 2003/120/EC of the 5th of December (amending Directive 90/496/ EEC) on nutrition labelling of foodstuffs ([Commission Directive 2003/120/EC](#)). *No longer in force since 13/12/2014.*

2004



◆ Decree-Law No. 167/2004 (7th of July), which transposes the Directive 2003/120/EC on nutritional labelling of foodstuffs to the Portuguese legislation ([Decreto-Lei n.º 167/2004](#)). *No longer in force.*

2005



◆ The European Parliament and of the Council with the Directive 2005/29/EC (11th May 2005) referenced certain aspects of the provision of information to consumers, specifically to prevent misleading actions, omissions of information and fair business-to-consumer commercial practices in the internal market ([Directive 2005/29/EC](#)). *In force.*

2006



◆ a) • The Regulation (EC) No 1924/2006 intended to harmonize and regulate the nutrition and health claims made on food packaging, aiming to ensure that they are based on reliable scientific evidence. So as not to mislead the consumers with inaccurate or confusing claims ([Regulation \(EC\) No 1924/2006](#)). *In force.*

◆ b) • The addition of vitamins and minerals and certain other substances to foods - fortified foods was regulated by the Regulation (EC) No 1925/2006 ([Regulation \(EC\) No 1925/2006](#)). *In force.*

2008



◆ The Regulation (EC) No 109/2008 of the European Parliament and of the Council of 15th of January 2008 (amending Regulation (EC) No 1924/2006) on nutrition and health claims made on foods ([Regulation \(EC\) No 109/2008](#)). *In force.*

◆ The Commission Regulation (EC) No 353/2008 (18th of April) implemented rules for the application of the authorization on health claims as provided in Article 15 of the Regulation (EC) No 1924/2006 ([Commission Regulation \(EC\) No 353/2008](#)). *In force.*

a) • EU general legislative texts applicable to all food products, b) • EU legislation applicable to certain categories of food products.
Nutrition and Health Claim Regulation.

2009

◉◉◆ The Directive 2009/39/EC of the European Parliament and of the Council of 6th of May on foodstuffs intended for particular nutritional uses ([Directive 2009/39/EC](#)). No longer in force since 19/07/2016.

◉◉◆ b) • The Commission Regulation (EC) No 1169/2009 of 30th of November (amending Commission Regulation (EC) No 353/2008), laid down the rules for the authorization of health claims, as provided in Article 15 of Regulation (EC) No 1924/2006 ([Commission Regulation \(EC\) No 1169/2009](#)). In force.

2010

◉◉◆ The Regulation (EC) No 66/2010 described the use of the voluntary EU ecolabel scheme ([Regulation \(EC\) No 66/2010](#)). In force.

◉◉◆ The Commission Regulation (EU) No 116/2010 of 9th of February (amending Regulation (EC) No 1924/2006 of the European Parliament and the Council), regarding the list of nutrition claims ([Commission Regulation \(EU\) No 116/2010](#)). In force.

◉◉◆ The Commission Regulation (EU) No 271/2010 (24th of March), amending Regulation (EC) No 889/2008, laid down detailed rules for the implementation of the Council Regulation (EC) No 834/2007, in regards to the organic production logo of the European Union ([Commission Regulation \(EU\) No 271/2010](#)). In force.

2011

◉◉◆ ◉◉◆ a) • In 2011, labelling rules of pre-packaged foods in European Union with the Regulation (EU) No 1169/2011 on the provision of food information to consumers (FIC) was updated ([Regulation \(EU\) No 1169/2011](#)). In force.

2012

◉◉◆ The Commission Regulation (EU) No 432/2012 of 16th of May established a list of permitted health claims made on foods, other than those referring to the reduction of disease risk and children's development and health ([Commission Regulation \(EU\) No 432/2012](#)). In force.

◉◉◆ The Commission Regulation (EU) No 1047/2012 (8th of November), amending Regulation (EC) No 1924/2006 about the list of nutritional claims ([Commission Regulation \(EU\) No 1047/2012](#)). In force.

2013

◉◉◆ The Commission Regulation (EU) No 536/2013 of the 11th of June (amending Regulation (EU) No 432/2012), established the list of permitted health claims made on foods other than those referring to the reduction of disease risk and children's development and health ([Commission Regulation \(EU\) No 536/2013](#)). In force.

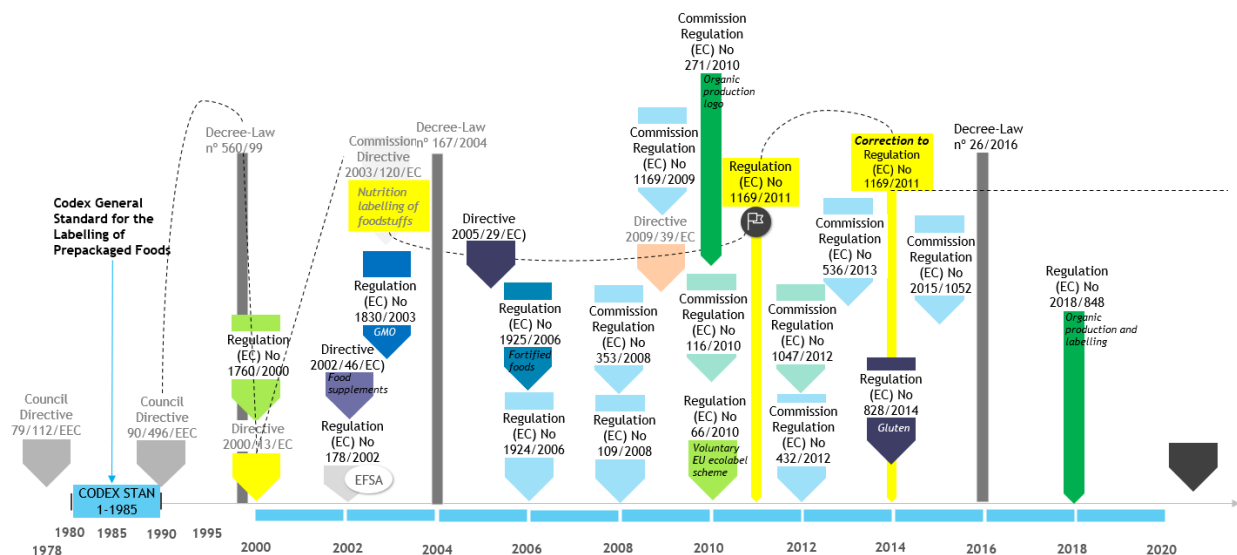
a) • EU general legislative texts applicable to all food products, b) • EU legislation applicable to certain categories of food products.
| Nutrition and Health Claim Regulation.

2014	↓	●●◆ Concerning the information on the absence or reduced presence of gluten in food, the Regulation (EU) No 828/2014 (30th of July) on the requirements for the provision of information to consumers was adopted (<i>Commission Implementing Regulation (EU) No 828/2014</i>). <i>In force.</i> ●●◆ On the 18th of November 2014, there was a rectification of the Regulation (EU) No 1169/2011 (<i>Correction to Regulation (EU) No 1169/2011</i>).
2015	↓	●●◆ The Commission Regulation (EU) No 2015/1052 of 1st of July 2015 refused to authorize certain health claims made on foods and referring to the reduction of disease risk (<i>Commission Regulation (EU) No 2015/1052</i>). <i>In force</i>
2016	↓	●●◆ The Decree-Law 26/2016 defined the general labelling requirements for non-prepacked foods. It also made it mandatory for them to indicate the substances, in their composition, that may cause allergies or intolerances, giving effect to the legal national system level, as referred in Article 44 of Regulation (EU) No 1169/2011 (<i>Decreto-Lei n.º 26/2016</i>). <i>In force in Portugal.</i> This sets the rules for the provision of information, as well as how substances or products that may cause allergies or intolerances must be communicated and presented, relating to the following non-prepacked foodstuffs: 1) foodstuffs presented for sale to the consumer or to collective catering establishments without packaging; 2) foodstuffs supplied by collective catering establishments, those pre-packaged in the establishment for direct sale; and 3) foodstuffs packaged at points of sale at the buyer's request.
2018	↓	●●◆ The Regulation (EU) No 2018/848 of the European Parliament and of the Council of (30th of May) on organic production and labelling of organic products (repealing Council Regulation (EC) No 834/2007) (<i>Regulation (EU) No 2018/848</i>). <i>In force.</i>

The legislation had to be updated so that the **food supply chain parties** (governments, regulatory authorities, food industries, food business operators, retailers and consumers) followed the same legal standards (*Bonsmann et al., 2010, Traill et al., 2014, Kerr et al., 2015, European Food Information Council, 2018, European Commission, 2019a*). Different parties were heard as a way to better recognize the implications related to the requirements and changes in food labelling. As a result, a series of transversal and guiding rules - “**food labelling policy**” was created to provide food information, to ensure a high level of consumer’s health protection and their interests in order to make informed choices and safe food usage (*European Commission Directorate-General for Health and Consumer Protection, 2006, Commission of the European Communities, 2008a, Commission of the*

European Communities, 2008b, Food and Agriculture Organization of the United Nations, 2016, European Commission, 2019a).

Figure 2 - Summary of labelling timeline.



Legislation written in grey, is no longer in force. The dotted line (-----) intercepts legislation on food and nutrition labelling (yellow). In lighter green, the Nutrition Claims regulations and Health Claims regulations are in lighter blue. The different colours refer to regulations associated with more specific labelling situations. The thin grey columns represent the transposition into Portuguese legislation.

Harmonization makes a positive contribution to global foods movements and business efficiency helps to minimize the development of different national labelling regulations and promotes access to food products by communicating the same type of food information and nutrition (Food and Agriculture Organization of the United Nations, 2016). Moreover, “**food information law**” requires the regulation of food information and in particular labelling. This includes rules of a general nature applicable to all foods, in particular to certain categories of foods and rules which apply only to specific foods. The transparency in the communication of the food information safeguards the consumers’ rights and gets comprehensive information about the content, quality, safety and composition of food products (Regulation (EU) No 1169/2011).

Thus, considering the dynamic and flexible role of labelling and its evolving policy issue, which is a result of the compliance in mandatory or voluntary information requirements and ensure a balance between the protection of the internal market and the differences in the perception of consumers. A real example of this context would be regularly reformulating or eliminating products of the food market and food industry with an inadequate nutritional profile.

▪ **FOOD LABELLING IN PORTUGAL**

Labelling in Portugal has not been a widely studied topic, although this tendency has been changing. One of the first studies took place in 1992, a questionnaire for consumers in a supermarket setting about food and nutrition labelling. The 217 Portuguese consumers interviewed in 4 supermarkets, in the Porto area, showed to be more sensitive towards food, nutrition and health. Furthermore, they demonstrated wanting and needing more and better information on the labels, despite the interest not being proportional to the usage (for example, one in five consumers read the composition of the food). It was also revealed that standardizing the presented information on the label and educating the consumer to read it could minimize the mentioned difficulties ([Guiomar, 1992](#), [Guiomar and de Almeida, 1993](#)). In recent years, Portugal followed all the improvements in labelling and since the current regulation was implemented, further developments have emerged. Several explanatory documents were arranged for a better understanding of the information conveyed through the EU regulation by the regulatory authorities ([Direção-Geral de Alimentação e Veterinária, 2016](#)), the distribution sector ([Federação das Indústrias Portuguesas Agro-Alimentares and Associação Portuguesa de Empresas de Distribuição, 2013](#), [Federação das Indústrias Portuguesas Agro-Alimentares and Associação Portuguesa de Empresas de Distribuição, 2021](#)) and other entities of the food sector ([Esteves et al., 2013](#), [Carrilho and Amaral, 2014](#), [Craveiro et al., 2017](#)). Furthermore, *The National Institute of Health Doctor Ricardo Jorge* (INSA) proposed a definition and quantitative analysis of food portions for nutrition labelling ([Brazão et al., 2014](#)).

The study “Evaluation of compliance with legal requirements for food labelling in Portugal” conducted by *Mil-Homens, A. S. et al* under the National Sampling Plan of the Portuguese Food and Economic Safety Authority (ASAE), between 2007 and 2011, “detected offences related mostly with incomplete mentions, followed by names not corresponding to the product, mandatory mentions not translated to Portuguese and the incorrect use of nutritional claims”. From this analysis, specific training on food labelling rules was conducted, aiming to encourage the economic operators and employees to have good practices. This strategy supports the need to verify compliance with the implemented EU legislation, ensuring a minor occurrence of non-compliance episodes and food fraud. Likewise, it was verified the need to attribute responsibility to all actors in the food supply chain, to guarantee that they assertively take action([Mil-Homens et al., 2015](#)).

From a more comprehensive food and nutrition perspective, several changes had to occur, for example, the establishment of the Integrated Strategy for the Promotion of

Healthy Eating (EIPAS) in 2017, in articulation with the National Program for Promotion of Healthy Eating (PNPAS) since 2012 of the Directorate-General for Health (DGS). It included research in the food and nutrition labelling area in the context of collecting information, such as the analysis of the possible front-of-pack nutrition labelling schemes usage and the elaboration of guidelines (*Resolução da Assembleia da República n.º 83/2018*, *Graça et al., 2018*, *Graça et al., 2020*). The main actions developed by the PNPAS to support political decision-making included: 1) Study of nutrition labelling in Portugal “Portuguese consumers’ attitudes towards food labelling” with the support of the WHO Study on nutrition labelling in Portugal (*Gomes et al., 2017*), and 2) the “Nutr-HIA| Improving Nutrition Labelling in Portugal - Health Impact Assessment - Final Report” with support from the WHO (*Graça et al., 2019*). The results from the first study, published with the support of DGS and WHO, were collected through a survey with a sample of 1127 Portuguese consumers and four focus groups (adults who were strongly conscious about healthy eating, adults who were weakly conscious about healthy eating, adults with a lower level of education and young people aged 15-18 years). It was revealed that mandatory nutrition declaration can be difficult to understand by Portuguese consumers and therefore there is a need to simplify the current information. The “traffic light” scheme, according to the results of the focus groups, was the front-of-pack nutrition labelling chosen as the best option by all groups at the point of the purchase (*Gomes et al., 2017*, *Gomes et al., 2020*).

Some studies with consumers have been carried out to understand the determinants of food and nutrition labelling use in the Portuguese context (*de Moura and Cunha, 2005*, *Nielsen, 2012b*, *Gregori et al., 2014*, *Ares et al., 2015*, *Schmidt et al., 2016*, *Gomes et al., 2017*, *Moreira et al., 2019*). For instance, a study with Portuguese consumers indicated that they usually do not read food labels, indicating the available time frame and excessive information on the label. Also, it evidenced that specific consumers’ groups (consumers with health problems, healthy lifestyles and regular physical activity) were more motivated to consult food labelling, due to a higher interest in the information (*Moreira et al., 2019*).

Although the system of nutritional traffic lights (partially used in Portugal), was the one with a greater percentage of participants selecting the correct option, the “*Impact assessment of a new food nutrition labelling policy in Portugal (Nutr-HIA)*” project demonstrated no statistically significant differences between the various systems of simplified nutrition labelling (*Santos et al., 2020*, *Feteira-Santos et al., 2020*, *Feteira-Santos et al., 2021*). The Portuguese Government endorsed a policy on interpretative nutrition labelling but to date, this has not yet been implemented, due to a lack of consensus and the need to take a concerted decision considering the impact of the implementation of these measures (*Graça et al., 2019*).

▪ **THE CURRENT EU REGULATION**

The **Regulation (EU) No 1169/2011** was approved on the 25th of October 2011 by the European Parliament and the Council, implementing new food labelling rules and general principles, requirements and responsibilities regarding “food information to consumers” (FIC) on prepacked foods in the European Union ([Regulation \(EU\) No 1169/2011](#)).

The right of consumers to information was assured, requiring clear, accurate, easy to understand and legible information on the content of the food product. The procedures for the provisioning of the information with particular regard to health, economic, environmental, social and ethical considerations were also ensured ([chapter II, article 3](#)) ([Regulation \(EU\) No 1169/2011](#), [Vaqué, 2013](#), [Kasapila and Shaarani, 2016](#), [Kirby, 2016](#), [Koen et al., 2016](#), [Buttriss, 2018](#), [Food and Agriculture Organization of the United Nations, 2019](#)).

This is applied to food business operators at all stages of the food supply chain where their activities concerned the provisioning of food information to consumers, even in foods available for immediate consumption ([chapter III](#)). Thus, this applies without disregarding the labelling requirements, already in use, specifically the legislation applicable to particular foods ([chapter I, article 1, point 4](#)).

FIC Regulation¹ replaces and combines into one piece the current and the previous legislation regarding labelling rules [Directive 2000/13/EC of the European Parliament and the Council regarding labelling, presentation and advertising of foodstuffs (applicable until 12 December 2014) and Council Directive 90/496/EEC on nutrition labelling of foodstuffs] ([Regulation \(EU\) No 1169/2011](#)). In Portugal, food products must be labelled in Portuguese, including those imported for national consumption.

Regulation (EU) No 1169/2011 took effect on the 13th of December 2014. The obligation to provide back-of-pack nutrition labelling started on the 13th of December 2016. The period of transition allowed all parties to progressively adapt and to provide time for changes to occur ([Commission of the European Communities, 2008b](#), [Vaqué, 2013](#)). A well-defined operational plan was created with the participation of the Member States, in order to largely contribute to a more harmonised *modus operandi*. In other words, strict rules were implemented to prevent misleading practices, with the final objective of public health protection; the protection of consumers; the prevention of fraud; the protection of industrial and commercial property rights, indications of provenance, registered designations of origin

¹ Regulation (EU) No 1169/2011 amended Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004 (*free translation*).

and the prevention of unfair competition. The key changes implemented were ([European Commission, 2014](#)):

- Attributing obligations and responsibilities on food sector operators in terms of food information on foodstuffs available to the consumer (*chapter III, article 8*);
- **Ensuring the content and presentation of the mandatory food information for the labelling of prepacked foods** - the name of the food; the list of ingredients (including allergen and food additive information in descending weight order); the quantities of certain ingredients or categories of ingredients used (Quantitative Ingredient Declaration - QUID); the net quantity of food; the minimum durability date², “use by date” and date of freezing; the special storage conditions and/or conditions of use; the business operator name and address³; the country of origin or place of provenance⁴; the instructions for use; the actual alcoholic strength by volume of beverages containing more than 1,2% by volume of alcohol; and, a nutrition declaration ([Commission Notice, 2017a](#)) (*chapter IV, section 1, article 9*);
- Improving the **legibility** of mandatory food information depending on the size of the packaging (*chapter IV, section 1, article 13*). This should be available, be easily accessible and presented in the same field of vision. The presentation of the information (name, allergens, net quantity and date of minimum durability or consumption limit date) for packaging with surface <10cm² is mandatory.
- Indicating the presence of ingredients, technological aids, derivatives of a substance, product causing allergies or intolerances become mandatory in prepacked, non-prepacked foods, prepacked for direct sale, and packed on the premises upon consumer request (*chapter IV, section 2, article 18*). It was necessary to highlight the allergens in a clear and distinguishing spelling from the rest of the ingredients list (through characters, style or background colour) or mentioning "it contains" followed by the name of the substance or product⁵ (*article 21 and ANNEX II*) ([Commission Notice, 2017b](#), [European Commission, 2019a](#)).

² Regulation (EU) No 1169/2011 requires the indication of the date of minimum durability 'best before', or the 'use by date' for *date marking*.

³ The food business operator responsible for the food information must be the operator under whose food name is marketed or, if that operator is not established in the EU, the importer to the European market (Regulation (EU) No 1169/2011, *Article 8, No. 1*).

⁴ The country of origin is determined in accordance with *Articles 23 to 26* of the Regulation (EEC) No 2913/92. The latter regulation has been replaced by Regulation (EU) No 952/2013 and the Commission Delegated Regulation (EU) No 2015/2446.

⁵ Substances or products causing allergies or intolerances - “**Cereals containing gluten**, namely wheat, rye, barley, oats, and products thereof; **Crustaceans** and products thereof; **Eggs** and products thereof; **Fish** and products thereof; **Peanuts** and products thereof; **Soybeans** and products thereof; **Milk** and products thereof; **Nuts**, namely almonds (*Amygdalus communis* L.), hazelnuts (*Corylus avellana*), walnuts (*Juglans regia*), cashews (*Anacardium occidentale*), pecan nuts (*Carya illinoensis* (Wangenh.) K. Koch), Brazil nuts (*Bertholletia excelsa*), pistachio nuts (*Pistacia vera*), macadamia or Queensland nuts (*Macadamia ternifolia*), and products thereof; **Celery** and products thereof; **Mustard** and products thereof; **Sesame seeds** and products thereof; **Sulphur dioxide** and sulphites at concentrations of more than 10 mg/kg or 10 mg/litre in terms of the total SO₂; **Lupin** and products thereof; **Molluscs** and products thereof” in *Annex II*, Regulation (EU) No 1169/2011.

- Providing the same labelling requirements for online, distance-selling, buying in a shop or at the moment of delivery, ensuring that the same food information available in the store is available online too (*article 14*).
- Presenting specific information about the processing of the food product: mention in the name of the food the existing process to which the food was subjected to (for example "defrosted"); a clear indication of "formed meat"/"formed fish" or the indication of substitute ingredient for 'imitation' foods; as well as, the obligation to indicate the date of freezing on meat, meat preparations and unprocessed frozen fishery products (*ANNEX VI*). All engineered nanomaterials used or specific information on the vegetable origin of refined oils and fats should be indicated in the list of ingredients.
- Providing mandatory origin information or place of provenance for fresh meat (beef, pigs, sheep, goat, and poultry), indicating the place of rearing and slaughter for fresh, chilled, and frozen meat (*article 26*).
- Including the mandatory 'nutrition declaration' or 'nutrition labelling' (energy value and the amounts of fat, saturates, carbohydrate, sugars, protein and salt (instead of the corresponding term of the nutrient 'sodium' to ensure that the final consumer easily understands the information provided on the labelling)), expressed per 100 g or 100 mL and, if appropriate, allow the additional portion-based declarations or per consumption unit (*section 3, article 29-34 and ANNEXE I/V/XV*) (excluding food supplements and natural mineral waters) (*Regulation (EU) No 1169/2011*)⁶. The content of the mandatory nutrition declaration may be supplemented with mono-unsaturates; polyunsaturates; polyols; starch; fibre; any vitamins or minerals (*listed in point 1 of part A of ANNEX XIII - Reference intake (RI)*) and presented in significant amounts in relation to the nutrient reference value (NRV)⁷ (*as defined in point 2 of Part A of Annex XIII*). If information is provided, the following additional statement needs to be closely located to it: "Reference intake of an average adult (8 400 kJ/ 2 000 kcal)" (*Lewis, 2019*).

The first version of the FIC regulation was revised by the current consolidated version of the 1st of January 2018. The main alterations were the voluntary food information on the absence

⁶ Annex V of Regulation (EU) No 1169/2011 includes a list of foods which are exempted from providing the mandatory nutrition declaration. Pertinent to this category, unprocessed products that comprise a single ingredient or category of ingredients are exempted. Those exemptions do not apply to foods for which nutrition and health claims are made, or to which vitamins and minerals have been added, in accordance with Regulations (EC) No 1924/2006 and (EC) No 1925/2006.

⁷ NRVs does not appear on the label but it is used in nutrition labelling to show its contribution for the healthy nutrient intakes in a portion of food (definition available in Lewis, J. 2019. Codex nutrient reference values [Online]. Rome: FAO and WHO. Available from: <http://www.fao.org/3/ca6969en/CA6969EN.pdf> [Accessed 2 January 2020].).

or reduced presence of gluten in food (*chapter V, article 36, point d*), the reference on novel foods (Regulation (EU) No 2015/2283 of the European Parliament and of the Council of 25 November 2015) and the ‘engineered nanomaterials’ (*section 2, article 18*) (*Consolidated text: Regulation (EU) No 1169/2011*).

The use of symbols on the *front-of-pack* nutrition labelling became possible and voluntary to convey the information in a more consumer-friendly way and lead to healthier products choice (*Cecchini and Warin, 2016, European Commission, 2019a*). Therefore, since 2016, the need to invest in a user-friendly way of presenting nutritional information to consumers began being discussed. The increasing use of nutrition labelling schemes has led to formal regulatory controls for both mandatory and voluntary schemes/ symbols/ pictograms/ logos/ claims since it has been advocated as part of a multi-layer strategy to tackle obesity. However, there is insufficient scientific evidence across the EU on how the average consumer understands and uses the alternative forms of expression or presentation of the information (*Temple, 2020*). Thus, it is appropriate to continue analysing the development of the use of these additional forms of expression and presentation, their effect on the internal market and the advisability of further harmonization, based on criteria established in the Regulation (EU) No 1169/2011 (*Regulation (EU) No 1169/2011, European Commission, 2020c*).

The application of Regulation (EU) No 1169/2011 and the Portuguese Decree-Law No 26/2016, on the 9th of June 2016, turned mandatory the provisioning of information about the substances and products causing allergies or intolerances present in the prepacked foods and non-prepacked foods (“*ready to eat*” foods that are offered for sale to the final consumer without pre-packaging, or foods which are packaged on the moment of the purchase per consumer's request, respectively) (*article 44, point 1 (a)*).

Foodservice, food industry, food management and food business operators, such as mass caterers, restaurants, supermarkets, canteens, travel settings, and coffee shops among others, have the responsibility to provide this information to the consumer. Furthermore, allergen-related information (the indication of the ingredient or processing aid causing allergies or intolerances and environmental food exposure) must be communicated, available and easily accessible to the consumer (*Directive 2009/39/EC, European Union, 2020*). This was the public-health strategy adopted to safeguard the individual's health, so as to avoid the possible hazards present in some food products, thus reinforcing the role of food labelling (*Nwaru et al., 2014*).

LABELLING: EVOLUTION OF CONCEPTS

“Food choices are made repetitively so that consumers form consumption habits and take mental shortcuts to make quicker decisions.” in Case of Studies on Food Experiences in Marketing, Retail and Events, 2020 (Steffen and Doppler, 2020). It is up to the consumer to have the decision-making power when buying a food product. This "power" comes from the ability to identify the advantages and disadvantages when acquiring a food product, and with this insight, the consumer is able to choose consciously. For this to happen, the consumer must have access to information about the qualitative and quantitative characteristics/ attributes of the food, which eventually leads to purchase with an acceptable cost and that meets their needs, possibilities and desires (Castres, 2015, van der Colff et al., 2016, Chen and Antonelli, 2020). The availability and accessibility, food information, and the social context are determinants in influencing food choices and can lead consumers to make healthier food choices, by keeping their interests in mind: cognitive factors such as food-related skills and knowledge, differences in individuals' habits or experiences and sociocultural factors (Truman et al., 2017, Chen and Antonelli, 2020).

The information concerning food is available through a label, accompanied by material or other forms, such as verbal communication or modern technological tools. The provision of food information should summarize data from production to consumption by respecting: 1) the identity, composition, properties or other characteristics of the food product; 2) the nutritional characteristics of the food, which can lead to informed choices (when there is a need to ensure specific dietary requirements); and, 3) the safe consumption by using the food information about its composition, storage, durability and use, which can prevent unbeneficial situations to the consumers' health (Regulation (EU) No 1169/2011).

Furthermore, the presence of more detailed and standardized food information can promote food product integrity, and consequently, lead to an increase in the consumer's trust (Food and Agriculture Organization of the United Nations, 2016).

Thereby, the labelling concepts that have arisen throughout the years, as well as the newer approaches, concerning food and nutrition information, were based on the adequate bibliography.

▪ **FOOD LABELLING OR FOOD LABELS**

Food labelling or **food labels** include all mentions of the word, which generally characterize the identity, composition, and properties of the food product. Likewise, it contains other detailed information on the exact nature and characteristics of the food, in response to labelling requirements.

On one hand, the information that identifies the food product is provided, specifically the name of the food, the net quantity, the country of origin or place of provenance, the name or business name and address of the food business operator, the barcode⁸, the lot indication⁹, the health and identification marks¹⁰ and the EU organic logo¹¹ (*Directive 2011/91/EU*).

On the other hand, the information that characterizes and composes the food itself is also presented through the list of ingredients, which includes the indication of the ingredient or also the processing aid responsible for causing allergies or intolerances (allergens and food additives, for example); the QUID; the actual alcoholic strength by volume in beverages containing more than 1.2 % by volume of alcohol; and, the EU quality schemes, such as the protected designation of origin (PDO) and the protected geographical indication (PGI) for food and wine, and the geographical indication (GI) for spirit drinks, aromatised wines and traditional speciality guaranteed (TSG)¹² (*Mozaffarian et al., 2018a, European Commission, 2020a*).

In addition, there is information that indicates the appropriate use in terms of food security for its consumption, such as the date marking or the date of minimum durability “best before”, or the “use by date”, the storage conditions and/or conditions and/or instructions of safe use.

⁸ The barcode: One-dimensional barcode consists of a pattern of parallel spaces (white) and (black) bars and 13 digits of optical reading. The bar code can identify the country of the producing company, the product within the company, serves to control stocks and sales. Two-dimensional barcodes offer more memory capacity (e.g., for packaging date, batch number, packaging weight, nutritional information, or preparation instructions), with the combination of dots and spaces arranged in an array or a matrix. This provides great convenience for retailers and consumers. For example, of 2D barcodes are QR (quick response) codes.

⁹ The Directive 2011/91/EU of the European Parliament and of the Council on the 13th of December 2011 on indications or marks identifying the lot to which a foodstuff belongs to. The **lot indication** (indicates with the letter “L” followed by figures) allows to recognize the provenance of the product (produced, manufactured, or packaged) and to identify any accident in the production and marketing circuit.

¹⁰ The health and identification mark is **only mandatory in products of animal origin**, consisting of 3 abbreviations, the country code or international code (PT), the approval number of the processing facility (XXX 000) and the acronym of the European Union (EU / EEC).

¹¹ The organic food product is identified by a symbol, which fulfils strict conditions on how it was produced, transported, and stored in the EU. This allows a coherent visual identity to the consumer and at the same time ensures certainty about its origin, quality and the respect for the environment, the species, and the natural resources, for example.

¹² EU quality policy aims to protect the names of the specific products that promote their unique characteristics, linked to their geographical origin, as well as traditional know-how. The food product can present the ‘geographical indication’ (GI) if it has a specific link to the place where they are made. This specific recognition helps producers to market their products better, while also enabling consumers to trust and distinguish quality products.

The label may contain additional information that conforms with the regulation for prepacked products, such as the CE markings, the estimated symbol ‘e’ mark¹³, the green dot symbol®¹⁴, the cup/fork symbol (material in contact with food), the eco-label (awarded to products meeting high environmental standards and eco-friendly best practices), the recycling marks, and GM-free label, allowing the consumer to know the product and make conscious choices (*ASAE, 2016, Regulation (EU) No 2018/848*).

There is still extra information present on the label, namely images, phrases, ads, commercial brand, and other related to the food.

¹³ It means the estimated quantity and certification in the measurements of weight and volume of the product, that happened according to the standards established by EU (signifies that the real weight of the product may vary from the minimum amount but must remain within the limits set by law). This metrological control identify with the conformity mark “e” should be presented next to the net quantity of the food product.

¹⁴ The green dot system is the integrated packaging waste management system, which exists to organize and manage a loop for collecting, recovering, and recycling non-reusable packaging waste, and to reduce the amount of waste going to landfills.

▪ **NUTRITION LABELLING OR NUTRITION LABELS**

Nutrition labelling or nutrition labels refer to all the information that identifies the nutritional nature of the food ([Codex Alimentarius Commission, 1985b, Regulation \(EU\) No 1169/2011](#)). In particular, the **back-of-pack (BOP) nutrition labelling** or “**nutrition declaration**” at the back of pack panels, the supplementary **front-of-pack (FOP) nutrition labelling**, which summarizes the *food nutritional quality* (the nutrient profile of the food, measured in terms of the density of essential nutrients) and content in a presentation system, and the **nutrition and health claims**.

The nutritional information characteristics of the food intent to clarify and inform the consumers at the point of purchase, including those with special dietary requirements, aiming to help consumers to make healthier food choices that can result in health gains. This informative tool should be based on public health priorities and be designed to enable consumers to compare products and judge if a product is high or low on a declared nutrient in the context of daily dietary patterns ([Lewis, 2019](#)).

The nutrition declaration is provided on the back of the food packaging, presented in a legible tabular format or a linear format of nutrition content when the packaged space does not permit it. In the European Union, the BOP nutrition labelling is mandatory. The FIC regulation stipulates the presentation of the nutrition declaration and the order in which these should be presented on the back of the pack, including the energy value of the product (both in kilojoules (kJ) and kilocalories (kcal), five nutrients (fat (g), saturated fat (g), carbohydrates (g), sugars (g), proteins (g)) and salt (g), expressed per 100g or 100mL of the product. This information can additionally be given *per portion* or *per consumption unit* and as a percentage of reference intakes. Its content may be supplemented with the indication of the amounts of mono-unsaturates, polyunsaturates, polyols, starch, fibre, vitamins, and minerals. This voluntary information must not be displayed instead of the mandatory information. The declared values must be average values, established, and which may result from: the analysis of foodstuff carried out by the manufacturer; the calculation made from the known or actual average values for the used ingredients; and the calculation made from generally established and accepted data ([Regulation \(EU\) No 1169/2011](#)).

Hence, over the past years, there have been several improvement trends in nutrition labelling on prepacked foods: increasing the implementation of the nutrition declaration provided on the back of food packaging; increasing the development of regulations on nutrient lists by country, following the guidelines provided by the *Codex Alimentarius Commission*; increasing the number of regulations requiring mandatory

nutrition declaration; and, revising the use of additional forms of expression and presentation of the nutrition declaration, the so-called **nutrient profiling system**, which evaluates the nutrition information for the consumer (e.g. through colours, grading indicator, symbol) (*Codex Alimentarius Commission, 1985a, Hawkes, 2004, Cheftel, 2005, Food and Agriculture Organization of the United Nations, 2019*).

The presence of **additional forms of expression and presentation** referred to as FOP nutrition labelling, became widespread, even though its comprehension and usage are still very uncertain. Nonetheless, this supplementary nutrition information, on the principal display panel, was conceived to help the consumers in the interpretation of nutrition information, as well as to lead to conscious choices by easy-to-understand schemes. The declaration in the same field of vision of the amounts of nutritional elements and comparative indicators in an easily recognizable form should be considered. Research is needed to validate its effectiveness and to fulfil its intended purpose for the consumer. Since 2004, the additional forms of expression and presentation in the front-of-pack were highlighted by the WHO, as part of a political priority, for promoting healthy diets, in response to the global epidemic of obesity and diet-related non-communicable diseases (*World Health Organization, 2004, Kelly and Jewell, 2018*).

The concept of **nutrient profiling**¹⁵ has increasingly been used as part of several nutrition policies across the EU, in particular for the development and implementation of the FOP nutrition labelling schemes or developing policies to restrict food marketing to children (*World Health Organization, 2015, World Health Organization, 2020c, European Commission, 2020c*).

The terms used by various governments that endorse the **front-of-package nutrition labelling schemes** include the provisioning of different types of information, such as the one presented in Figure 3 (*Kanter et al., 2018, World Obesity Federation, 2019, Jones et al., 2019, European Commission, 2020c, World Health Organization, 2020b*).

¹⁵ Nutrient profiling is the categorization of foods according to their nutritional composition using predefined factors such as fat, sugars, and salt above which nutrition and health claims are restricted or prohibited.

Figure 3 - The different categorizations of the available front-of-package nutrition labelling schemes.

		A reductive system that only indicates information, with no specific judgement, opinion, or recommendation (e.g., Guideline Daily Amount (GDA) system (%) by the Association of the European food and drink industry, later renamed Reference Intakes label).	Non-interpretive systems
Summary	Indicator systems	An interpretive nutrition rating system, which provides nutrition information as guidance rather than a specific overall indication of the product healthfulness (e.g., star-based systems as Health star rating, the <i>Nutri-score</i> system - 5-Color Nutrition Label in France (according to healthiness with A the healthiest));	Interpretive systems
	Endorsement logos	Summary/evaluative indicator system, which conjugates several criteria to establish one indication of the healthiness of a product and provides a judgement, opinion or recommendation with no specific information (e.g., <i>star-based systems</i> (Health Star Rating in Australia and New Zealand) and health logos, such as the keyhole logo in Sweden, Denmark, Norway, Iceland and Lithuania; the Choices Programme logo in The Netherlands; and the positive-sign logo systems developed in Finland and Slovenia, among others);	
	Nutrient-specific	A nutrient-specific system, which provides nutrition information that combines an overall symbol with numerical nutrient information (e.g., multiple traffic light symbols in the UK, the nutrInform battery in Italy (based on reference intake labels indicating the amounts of energy and nutrients in a single serving as a percentage of the daily intake) and Warnings or 'High in' labels in Finland or Chilean warning label).	

To summarize two major categories of FOP nutrition labelling: **Non-interpretive systems** (which are numerically based (probably less helpful, particularly for groups with low levels of food and nutrition literacy), and **Interpretive systems**, which includes the endorsement logos (positive directive overall assessment, which is applied only to products with higher nutritional quality), summary indicator systems (graded directive assessment), nutrient specific warning labels (negative directive assessment of nutrients) and nutrient-specific interpretive label (graded directive assessment of nutrients) ([Kelly and Jewell, 2018](#), [World Health Organization, 2020b](#)). The selection of the nutrition labelling objectives should be considered

in the strategy development, as a way of promoting healthier foods choices, avoiding less healthy foods, and comparing the nutritional quality of food products based on nutrient profiling approaches ([World Health Organization, 2020b](#)).

The **nutrition and health claims**, present on a food or beverage label in the EU, must be clear, reliable and corroborated by scientific evidence ([Regulation \(EC\) No 1924/2006](#)). The nutrition claim refers to any claim which states, suggests, or implies that food has particular beneficial nutritional properties. To date thirty nutrition claims are permitted, which are listed in the Annex of Regulation (EC) No 1924/2006, revised by Regulation (EU) No 1047/2012, for example, “low energy”, “fat-free”, “low sugars”, “high fibre”, “contains (name of the nutrient or other substance)” ([Regulation \(EC\) No 1924/2006](#)). Apart from promoting the nutritional properties of prepacked foods, their usage should be regulated in order to prevent any misleading conduct ([Hawkes, 2004](#)).

A health claim is a statement about the relationship between food and health (i.e., *Vitamin D contributes to the maintenance of normal bones*), which can be “function health claims”, “risk reduction claims” on reducing a risk factor in the development of diseases, and “claims referring to children’s development”. The scientific assessment of the evidence in support of health claims and the responsibility to present scientific advice to the EC is conducted by an independent scientific entity, the European Food Safety Authority (EFSA).

Nutrition and health claims are used to highlight specific food properties that contain beneficial ingredients or nutrients, and to guide consumers toward more healthy food choices, through an adequate energy intake, which will allow the maintenance of healthy body weight when used correctly ([Wills et al., 2012](#)).

Several studies suggested that the next trend will be intelligent packaging, which translates into the development of a system for consumers, that will control the quality of a product, allow its information to be shared and ensure the sustainability of the packaging in the food sector. The main advantage of this tendency is the reduction of food waste and the overall satisfaction of the consumer, through technological developments (data carriers, indicators, and sensors) ([Biji et al., 2015](#), [Müller and Schmid, 2019](#), [Torma and Thøgersen, 2021](#)).

According to what was mentioned above, related to the evolution of concepts, and in a schematic way, the food and nutrition differences in information on the label are presented in **Table 1**, indicating mandatory (#) and non-mandatory food information (*).

Table 1 - Summary of the type of information displayed in food and nutrition labels.

Type of information	Food labelling	Nutrition labelling
Information that identifies the food product	- The name of the food[#] - The net quantity[#] - The name or business name and address of the food business operator[#] - The country of origin or place of provenance[#] - The lot indication[#] - The barcode[*] - The health and identification marks[*] - EU organic logo[*]	---
Information that characterizes and composes the food product	- The list of ingredients (including additives) [#] - An indication of the ingredient or processing aid causing allergies or intolerances[#] - Quantitative Ingredient Declaration - QUID[#] - The actual alcoholic strength by volume in beverages containing more than 1.2 % by volume of alcohol[#] - EU quality schemes[*]	- The nutrition labelling[#] - FOP nutrition labelling[*] - Nutrition claims[*] - Health claims[*]
Information that indicates the appropriate use in terms of food security of the food product	- The date marking or the date of minimum durability[#] - Any special storage and/or conditions of use[#] - Instructions for use[#]	---
Additional information that conforms with the regulation	- Estimated symbol 'e' mark [#] - Green dot symbol®[*] - CE markings[*] - The presence of genetically modified organisms[#] and GM-free label[*] - Cup/fork symbol (material in contact with food) [*] - Eco-label[*] - Recycling Marks[*]	---

Legend: [#]mandatory information (the specifications that are required to be provided to the final consumer), ^{*}non-mandatory information.

FOOD LABELLING: A POLITICAL STRATEGY

According to *Branca et al*, the “food system” is an interconnection between ‘*food supply chains*’ (pre-production, production, processing, distribution, preparation and consumption), ‘*food environments*’ (food availability as food quality and safety; physical, advertising/information and economic affordability), ‘*consumer’s behaviour*’, ‘*diets*’ (based on quantity, quality, diversity and safety), ‘*nutrition and health outcomes*’, ‘*impacts*’ (social, economic and environmental), and ‘*political programme and institutional actions*’ (*Branca et al., 2019*). In this way, the label of a food is the result of several processes, stages and influences or the measures applied along with these circuits.

Therefore, food standards, guidelines, codes of practice and other recommendations have been re-evaluated and adopted about food labelling, aiming to prevent adulteration and misleading information of food products, resulting in the protection of the consumers from dishonest practices and marketing (*Food and Agriculture Organization of the United Nations, 2016*). Consequently, there is a growing need to enhance sustainable food systems by developing coherent public policies from production to consumption and across relevant sectors, which will promote safe and diversified healthy diets (*European Commission, 2020b*).

In the global food system, it is important to recognize the dynamic role of food labelling, not only for the health benefit of the individual but also its role in the reduction of food waste (the difference between “best before” and “use by” dates), in the prevention of food fraud (from misleading consumers through package false representations/mentions), its impact in the processing of food packaging (improving the handling, packaging, processing and labelling of food products) and its importance on the preservation of geographical indication by providing the place of origin. These can provide economic, social, and environmental value to the global food system, encouraging appropriate and sustainable food packaging and labelling systems. Nevertheless, the support and compliance with legal requirements established by all food supply chain actors (government authorities, food producers, food manufacturers, food sector entities, food supply chain business operators and consumers) are of the utmost importance (*Food and Agriculture Organization of the United Nations, 2019*).

Food information rules should be able to adapt to the rapidly changing social, economic, and technological environment. Consumers’ choices can be influenced by health, economic, environmental, social and ethical considerations (*Regulation (EU) No 1169/2011*).

An individual’s knowledge, preferences, and behaviours, for example, when it comes

to lifestyle and eating habits, are shaped by the surrounding environment. These concerns, on one hand, allow access to clear, consistent and evidence-based information when deciding which foods to buy and, on the other hand, the wider information environment which is in turn shaped by cultural factors, such as advertising, marketing and media (*European Parliament Resolution, 2007*). These are powerful sectors that aim to influence consumers behaviour toward more healthful food choices (*Storcksdieck Genannt Bonsmann and Wills, 2012*). Also, there are technical, legal, and economic aspects of developing specific label information, which will undoubtedly need additional information *prior to* the formulation of **food labelling policies**.

A *healthy food environment* is one in which nutritious foods are available, affordable, acceptable, and desirable to consumers and that will lead to healthier options. Food environments for healthy diets can be influenced through the production of diversified foods, food safety, food-based dietary guidelines, and food labelling. Food labelling policies can contribute to a healthy food environment by providing information to the consumer about the food and nutrition content of food products; drawing consumers attention to the benefits and/or risks of particular nutrients or ingredients of public health concern; and, encouraging manufacturers to produce and/or reformulate foods which have healthier nutrition profiles (*Food and Agriculture Organization of the United Nations, 2016, Grace, 2016, Federici et al., 2019, Thow et al., 2020*).

Food labelling is a political strategy and a population-based approach, that focuses on the consumer and in food security, especially concerning health-related outcomes, preventing misleading information and aiming for transparency of the food supply chain (*Cowburn and Stockley, 2005, Grunert and Wills, 2007, Food and Agriculture Organization of the United Nations, 2016, Craveiro et al., 2017*). The advantages of food and nutrition labelling are numerous, for example:

- provide all the information that allows the consumer to identify the product's characteristics, making conscious and sustainable food choices and endorsing their right to know what is in food products;
- support healthy eating while retaining consumer's freedom when it comes to food choices and allowing a comparison of products in order to reduce or avoid ingredients that can present risk (e.g., gluten, sodium);
- reduce the information search costs and work for consumers, showing how convenient it can be for them;
- respect traditional, local foods, of controlled origin, produced under sustainable conditions for the environment and species, as well as, under controlled conditions to be considered organic;

- expose the manufacturing process, ingredients, and technological conditions to which the food has been subjected;
- motivate the innovation and the development of new food products;
- help to sell the product (labels strongly influence consumer's choice, even if it is just for the brand or advertising);
- promote food literacy to the population, from the most concerned consumer to the least informed one, as it provides general and specific information about the packaged foods;
- improve the competitiveness, marketing, and fair trade of food products.

A *SWOT* analysis of food labelling based on the current regulations is shown in **Table 2** (*Hawkes, 2004, Cowburn and Stockley, 2005, Grunert and Wills, 2007, Regulation (EU) No 1169/2011, Esteves et al., 2013, Food and Agriculture Organization of the United Nations, 2016, Grace, 2016, European Commission, 2020c*). This analysis takes into consideration the strengths, weaknesses, opportunities, and threats that are favourable or unfavourable to the food labelling implementation strategy.

Table 2 - SWOT analysis of food labelling as a political strategy.

Strengths	Weaknesses
- Identifies the food product's characteristics - Harmonizes the mandatory food information in food products - Exposes the manufacturing process, ingredients, and technological conditions to which the food has been subjected - Respects traditional, local foods, of controlled origin, produced under sustainable conditions for the environment and species, as well as, under controlled conditions to be considered organic - Obligation to indicate the origin and/or the place of provenance - Provides nutrition information, the description of the ingredients and the identification of allergens to consumers - Contributes to the overall responsibility of the food sector - Allows for the conscientization of the consumer towards healthy foods and food safety requirements - Is seen as a vehicle for food information.	- Contains an excess of information in the label - Excessively technical terminology - Additional costs and efforts with its implementation - Lack of nutrition knowledge and food terminology to interpret the values and present information - Abundance of entities and stakeholders involved in the labelling process - Ineffective labelling jeopardizes the legibility of the information - Less legibility (appearance of information on the label) can compromise the accessibility - The availability of various symbols in the label can be confusing.
Opportunities	Threats
- Motivates the innovation, the development of new food products and fosters product reformulation - Influences competitiveness in the food market - Enriches the consumers' nutrition knowledge - Contributes to the safety and quality of the food product - Possibility of building the consumers' confidence - Offers the possibility of food reformulation into a healthier nutritional profile - Creates a healthier food selection environment which leads to improved dietary choices (even in distance selling) - Includes an attractive scheme of nutrient profiling in the front-of-pack nutrition labelling to grasp consumers' attention - Confirms the potential of front-of-pack nutrition labelling schemes to help consumers make conscious food choices.	- Misleading advertising and marketing - Lack of educational programmes and initiatives regarding food and labelling usage - Resistance of some actors of the food supply chain towards regulation statements - The non-correct use of the label may lead to unhealthy food choices - It can be seen as complex information when there is illiteracy and a lack of interest in the topic - The influence of brand marketing may influence consumers' perception of food quality.

POSITIVE HEALTH IMPLICATIONS OF THE USE OF FOOD LABELLING

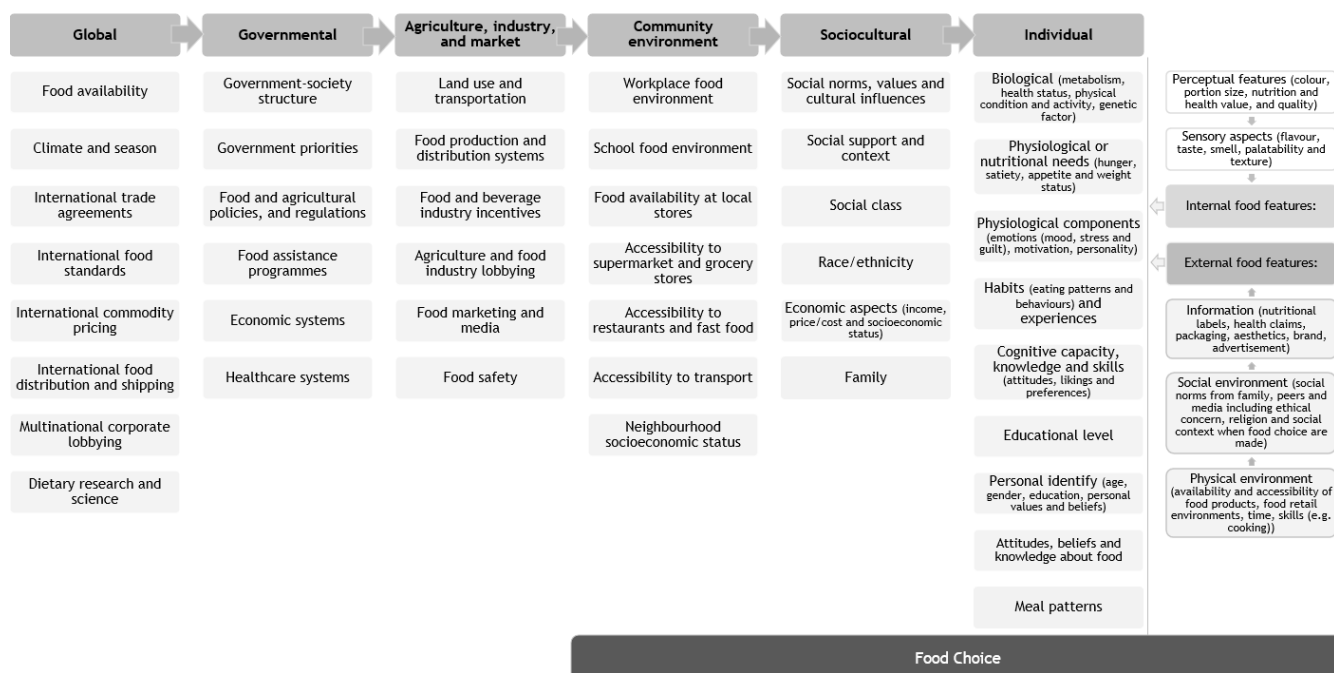
The growing social interest in issues related to food and health is currently a strong determinant of food choice, accentuating the interest in nutrition labelling information (Cowburn and Stockley, 2005, European Food Information Council, 2006, Craveiro et al., 2017, Leng et al., 2017). The consumer has an interest in the relationship between diet and health and in the choice of an appropriate diet to suit its individual needs. In recent decades, food labels have become a way to disseminate information about food, improving consumers' knowledge and the relationships between specific food products and health. There is a large and growing evidence based on the topic of food and nutrition label usage, including numerous literature reviews (Cowburn and Stockley, 2005, Wills et al., 2009, Campos et al., 2011, Miller and Cassady, 2015, Cecchini and Warin, 2016). The nutrition information on food labels has an **educational and informative potential**, which can result in informed choices and safe, conscious, and well-balanced dietary patterns (Bonsmann et al., 2010, Kerr et al., 2015). Once information about the product is provided, food and nutritional content (such as allergen presence and the amount/type of ingredients or nutrients), and other specific information about the use and conservation of the food, can lead to the protection of the consumer's health in terms of health security and food safety, as well as in the promotion of a better quality of life and nutritional well-being (Regulation (EU) No 1169/2011, Campos et al., 2011, Food and Agriculture Organization of the United Nations, 2019). Evidence suggests that food label information can be a cost-effective tool to fight non-communicable diseases, adopting healthy dietary choices and improving food literacy, as long as this information is available and used by consumers in general (Vidgen and Gallegos, 2014, Grunert et al., 2014, Vandevijvere and Swinburn, 2014, Miller and Cassady, 2015, Cecchini and Warin, 2016).

The increased prevalence of diet-related non-communicable diseases reflects the influence of food environments as a collective physical, economic, political and socio-cultural context that influences consumer's choices and nutritional status (Storcksdieck Genannt Bonsmann and Wills, 2012). This can be countered with the provision and promotion of healthy eating by the use and consumption of sustainable and nutritious foods, as well as by the adoption of conscious food practices and choices through food labelling. (Food and Agriculture Organization of the United Nations, 2016). At the Second International Conference on Nutrition (ICN2), in Rome, in November 2014, it was stated that "Empowerment of consumers is necessary through improved and evidence-based health and nutrition information and education to make informed choices regarding consumption of

food products for healthy dietary practices” (*Food and Agriculture Organization of the United Nations and World Health Organization, 2014b*). This challenge involves the most difficult part of the process because it implies a change in the consumer’s attitudes and behaviours in relation to food, specifically towards prepacked foods. Then, the strategy falls on **awareness campaigns and education programs** in order to help consumers, and understand and use labels appropriately, as well as to maximise the potential of nutrition labels and health claims to improve public health and prevent non-communicable diseases such as obesity. This need was exposed in the ICN2 Framework for Action when several governments and other stakeholders met to discuss food labelling and come up with a political strategy towards health-related outcomes and nutrition. The proposal stated, “nutrition education and information interventions based on national dietary guidelines and coherent policies related to food and diets, through improved school curricula, nutrition education in the health, agriculture and social protection services, community interventions and point-of-sale information” (19th recommendation). Furthermore, the possibility to adopt marketing, advertising and labelling policies, economic incentives or disincentives in order to promote healthy diets into a sustainable food system was also stated (15th recommendation) (*Food and Agriculture Organization of the United Nations and World Health Organization, 2014a*).

Before focusing on the present thesis, it is necessary to reflect on the current barriers and opportunities for healthy eating and food labels usage. Evidence has revealed the influence of multiple and complex determinants that strongly influence dietary choices and patterns, in addition to personal knowledge and decisions (*Leng et al., 2017*). Future research on public health nutrition should combine scientific improvements in the definition of food priorities with innovative methodologies to turn communication reliable and support the current scientific evidence. These adjustments should be done on the behavioural system level (*Mozaffarian et al., 2018b*). Current research has shown an increasing interconnection between the innermost, related to the individual, and the outermost, related to the forces and/or determinants, to which all individuals are subjected to (**Figure 4**) (*European Food Information Council, 2006, Leng et al., 2017, Mozaffarian et al., 2018a, Chen and Antonelli, 2020*). The scheme should be read from left to right, as it evolves from a global to an individual perspective, towards food choices.

Figure 4 - Multi-layered factors that influence food choices.



Adapted from EUFIC 2006, Leng et al., 2017, Mozaffarian et al, 2018, Chen and Antonelli, 2020.

The availability of food information is one of the aspects that can determine its use and influence food choices. Having been verified before the implementation of the regulation, that the nutrition declaration, even though not mandatory in the European Union, should be accessible to the consumer (González-Zapata et al., 2009, Bonsmann et al., 2010, Storcksdieck genannt Bonsmann et al., 2010). Although the price, brand, taste, habits, appearance and product familiarity continue to be determining factors in food choices, a meta-analysis of “food labelling effects on consumer diet behaviours and industry practices” found that nutrition labelling can lead to healthier food choices (with the reduction in the dietary intake of selected nutrients (total energy and fat consumption) and increase vegetable intake), and incentive product reformulation (reduction of product contents of sodium and artificial trans-fat by the food industry) (Shangguan et al., 2019).

The educational and technological development of the population has led to a greater understanding of the available information. However, there is still a gap between the provisioning of information and its comprehension, as shown by recent research, which suggests nutrition and food literacy are becoming increasingly more important concepts in health promotion because they endorse a healthier diet (Velardo, 2015, Gréa Krause et al., 2018). The relationship between education and health seems to include different concepts about food and nutrition literacy, emphasizing the distinct types of knowledge that promote

positive health-related outcomes and dietary behaviours (Truman *et al.*, 2020). Moreover, **consumer nutrition knowledge** is an important aspect to consider for effective communication of nutrition information through labels on prepacked foods (Moore *et al.*, 2018). The scientific reviews found that consumers with prior nutrition knowledge are more likely to use label information effectively (reading the information, understanding, and making healthful decisions based on it), as considered in the cognitive processing model. Notwithstanding, the evidence suggests that available information is typically underutilized by consumers, even though they value it (Miller and Cassady, 2015). The possible reason for this occurrence includes: a) the difficulties in understanding the complex and quantitative nutrition label information such as technical terms, the need to perform numerical calculations and percentages (Grunert and Wills, 2007, Campos *et al.*, 2011), b) distorted interpretations of the information available due to a lack of clarification, comprehension and capacity of making correct choices (Cowburn and Stockley, 2005, Grunert and Wills, 2008, Gregori *et al.*, 2014), c) valid information about the presented content (Raats and Wills, 2012), d) little motivation for the usage (Grunert and Wills, 2007), and e) lack of time, legibility and relevance to consult and read the information (European Food Information Council, 2005). However, measures aiming to fight these barriers could operate through educational efforts which contemplate an increase in consumers' knowledge and understanding of labels, resulting in individuals making changes in their food consumption, when combined with behavioural and motivational strategies. The attention, reading, liking, understanding and use by the consumers of different nutrition labelling presentation schemes were studied (Grunert and Wills, 2007, Grunert *et al.*, 2010, European Food Information Council, 2010). A theoretical framework has been described by Grunert *et al.*, exposing the consumers' process of food perception and attitude, as well as the labelling understanding and use in purchasing context towards healthy food choices (Grunert and Wills, 2007, Grunert *et al.*, 2010). The consumers seem to prefer, to search and find clear, credible and easy-to-understand information on the food label, aiming to integrate this information into their daily nutritional needs and dietary management (European Food Information Council, 2005, Grunert and Wills, 2007, van Kleef *et al.*, 2008).

Considering that the use of symbols on the front of the packaging is voluntary after the implementation of the FIC Regulation, many studies have been carried out in order to understand whether this measure would be effective in encouraging healthy eating (Hieke and Wills, 2012, Gregori *et al.*, 2014, European Commission, 2020c). Additionally, the impact of these schemes on food choice and healthy eating has been assessed, showing a lack of influence of FOP nutrition information on the intended food consumption (European Commission, 2020c, Temple, 2020), as well as, the association between dietary consumption

and use of ingredients lists, serving size information and front-of-pack labels ([Anastasiou et al., 2019](#)). Furthermore, other researchers showed that consumers might be influenced by a multitude of factors (time constraints, habit, and price) other than the nutritional value in the process of food decision-making ([Hieke and Wills, 2012](#), [Moreira et al., 2019](#)). FOP nutrition labelling has a positive effect on the ability of consumers to identify the healthier option compared to an unlabelled situation ([Hawley et al., 2013](#), [Cecchini and Warin, 2016](#)). This interpretive nutrition labelling can contribute to healthier food habits, however, its impact on consumers' food choices needs to be studied, namely at the purchase moment, considering the most vulnerable population subgroups (with lower literacy and/or limited economic resources) ([Feteira-Santos et al., 2020](#)). The studies reviewed to elaborate the “Report regarding the use of additional forms of expression and presentation of the nutrition declaration” validate the potential of FOP nutrition labelling schemes to help consumers make health-conscious food choices and their understanding increases when the label features colour-coding ([European Commission, 2020c](#)). Interpretative schemes, in the front-of-pack, appear to be the most helpful to consumers, as they provide some indication about the food product nutritional quality and simplify the nutritional information available at the BOP nutrition labelling ([World Health Organization, 2020b](#)).

Although nutrition labelling schemes are efficient investments, that increase awareness and availability of information, they have reduced effectiveness in what concerns lower socioeconomic classes (as a result of a lack of nutrition literacy) ([World Health Organization, 2020a](#)). The unsuccess of the implementation of nutrition labelling schemes can already be seen by the lack of consensus within the EU ([European Commission, 2020c](#)), with some countries already displaying inconsistency between the FOP nutrition label and the food itself (for example, traditional foods and foods related to the Mediterranean diet are considered a “C” or “E” on the Nutriscore, because they are classified purely on its macronutrient and not on its nutrient profile, which can be misleading on the food evaluation by the consumer and can lead to a misinterpretation of their nutritional value and quality content) ([Parliamentary questions, 2021](#)). Therefore, it is necessary to wait for more scientific evidence-based and improve the available information, in order to find a more consensual and harmonized approach, where the impact of the regulation of nutrition labelling can be optimized ([Thow et al., 2020](#)).

THE RATIONALE FOR EXPLORING THE SUBJECT

Data on **food and nutrition labelling** (FNL) can be interpreted through different perspectives, backgrounds, and levels of knowledge. This analysis depends on who does it, under what circumstances, for what purpose and needs. As explained previously, a large part of scientific research focuses on its use by consumers. However, consulting with groups that have a particular interest in food labelling policy (as the professionals in the food and nutrition area), can be seen as an opportunity to listen to other points of view about the issue, share opinions and understand different interests and concerns. The success of a food policy regarding the FNL requires the support of all of those who have a strong interest in it, relevant knowledge, and experience. This participation makes the process transparent and inclusive, which can lead to greater confidence and credibility in governing entities with decision-making power (*Directorate-General for Research and Innovation, 2007, Grace, 2016*).

Thus, there are several perspectives and implications concerning the label, which result from the availability, importance, reading, interpretation, and usage of the current information. From a European perspective, the information now provided on food packaging is considered to be broadly understood by consumers, however, it is not correctly utilised to make informed and healthier food choices (*Buttriss, 2018*).

While governments and other organisations should guide all actors of the food supply chain, more could be done to tackle the barriers to the usage of FNL and clarify areas around it. In the public health and nutrition science fields, the determinants of nutrition and eating are often combined with environmental factors, such as availability and accessibility of food options, economic constraints, and political regulations (*Stok et al., 2017, Mozaffarian et al., 2018a*). Information provided to consumers must be reliable and trustworthy, food entities (consumer's organizations, food experts and governmental bodies) argue that trust plays a crucial role in the utilisation of provided information (*Directorate-General for Research and Innovation, 2007, Wills et al., 2009*). The value of information becomes zero or even negative if it is not trusted, therefore, trust is an important determinant of information effectiveness. Often for trust to be consolidated, sources of information that are considered credible are used (*de Almeida et al., 1997, Food and Agriculture Organization of the United Nations, 2016*). The label is one of them, since the information it contains follows several requirements, is subjected to thorough supervision and validation, and its information is revised due to the need for its usage and consumption (*Tonkin et al., 2015, Brown et al., 2020*). Trust in the information that circulates is also established by

professionals who have the knowledge, experience, and the ability to distinguish the type of messages and useful information. The health professional is often the intermediary between the information available and the consumer, decoding the messages, explaining how to use it for an assertive and individual use and owing to their roles, may influence nutritional knowledge, attitudes and behaviours (*Tonkin et al., 2016, Graça et al., 2020*).

Given what was previously exposed about labelling and considering the key role of the professional in the food and nutrition area as a mediator in the flow of information to the consumer, there is a need to understand the views of different **food and nutrition professionals** (FNP) about food labelling and legislation (*Dodd et al., 2012, Carrilho and Amaral, 2014*). So far, there has been little research on this topic.

The professional in the food and nutrition area can develop its activity across the food supply chain, from production, processing industry, distribution, retail, foodservice to consumption (*Food and Agriculture Organization of the United Nations, 2017*). In addition to being able to perform as professionals that participate in food production processes, at different stages of the food supply chain, these professionals can also work in clinical care, public health sector, education, food regulation, development of governmental policies, marketing and research (*Food and Agriculture Organization of the United Nations, 2016, Doley et al., 2019, Hawkes and Ruel, 2020*). It is important to explore the work context of these professionals since they work in the food area, develop, and decode the available foods, contact directly or indirectly with the consumer, contact other actors in the food supply chain, reflect on the information available and communicate the result.

Previously, in 1996, the “Nutrition and Food Industry Professionals’ Opinions About the Nutrition Label and its Components” study exposed the combined effort of the government, nutrition professionals and food industry professionals, as well as, the consumers’ groups in the revision of the label (*Osborn et al., 1996*). It was suggested that food labels benefit the consumers and dietetics professionals, due to the fact that they are a direct source of information about prepacked food in the decision-making process, in comparison to products and the search for healthier food choices. A practical statement by a professional in 1999, detailed the opportunities for dietetic professionals, through their skills and knowledge of communication, to be able to work with the food market in producing healthier food products or less expensive ingredients, while preserving the food taste and quality for the label-conscious consumers (*Berning, 1998*).

Later, the study “Dietitians’ knowledge and perceptions of changes to food labelling” in Australia considered the professional’s perceptions of the requirements of nutrition-related

information on food labels. Although the results were not very favourable (still revealing some lack of knowledge from the sample of participants about the mandatory requirements implemented at the time on labelling), dietitians were recognized as having the necessary food and health knowledge and be in a privileged position to educate and decode the information available on the label so that it can be understood and used by consumers (*Lidgard and Yeatman, 2002*). The influence of current food and nutrition trends on dietitians' perceptions of the healthiness of prepacked foods (in Australia), exposing their ability to combine different elements (food safety, the wholeness of the ingredients and healthier marketing) to provide nutrition advice and counselling to the consumer by primary employment area in a dietetic related field (including foodservice, food industry, sports nutrition, pharmaceutical), private practice and community dietitian, hospital, university, research, and others (*Thurecht et al., 2020*).

The Portuguese food field allows for several professional contexts, which include numerous academic degrees, career opportunities, occupations, and positions. Therefore, FNP, with distinct knowledge and backgrounds involved in the food supply chain, can lead to different views, expertise, abilities, insights and decision/execution skills regarding the food and nutrition labelling (*Laureano and Empis, 2003, Graça, 2006, Sequali, 2008, Nutrição., 2011, Alves, 2016*).

Likewise, the professional's views regarding the main changes implemented by the Regulation (EU) No 1169/2011 should be studied (*European Commission, 2014, European Commission, 2019b*). Indeed, the perspective about the different food and nutrition professionals concerning food labelling and legislation may vary in their professional practice (*Dodd et al., 2012*).

In Portugal, several entities are in charge of managing certain professions, such as veterinarians, engineers and dietitians/ nutritionists, to safeguard the professional's rights and self-regulating the profession, which requires technical independence and integrity (*Conselho Nacional das Ordens Profissionais, 2020*).

“Creating standards that protect consumers, ensure fair practices in the sale of food and facilitate trade is a process that involves specialists in numerous food-related scientific disciplines, together with consumers’ organizations, production and processing industries, food-control administrators and traders.”, as mentioned in The Understanding the Codex Alimentarius 5th Edition, demonstrates the relevance of investigating and exploring areas of food consumption and nutrition, involving food-related scientific knowledge and professional research (*Food and Agriculture Organization of the United Nations and World Health Organization, 2018*).

By studying how labelling is perceived by the food and nutrition professionals that intervene in the food supply chain, new outputs can emerge to understand and analyse the existent barriers for the use of information presented in food and nutrition labelling. Labelling is expected to not mislead consumers but instead assure that food satisfies their expectations and turn all pertinent information available, so that they may use the product better in terms of safety, quality, and nutrition.

Food and nutrition labelling is an important information tool for professionals in the food and nutrition area since it provides information about the food to the consumer, which is easy to access and immediately available. The monitorization of the information on the label is often performed, resulting from a combined effort by government entities, consumer groups, food-related associations/entities (manufactures, industry, retail, and foodservice), and groups of professionals or experts in the field of food and nutrition, who independently investigate and analyse the relevance of the information available, so as to understand if the regulation is effective. In addition, the investigation results can provide valuable input for public health and nutrition strategies.

OBJECTIVES

Given the previous sections, the following general and specific objectives were defined:

1) To explore the views of a sample of Portuguese food and nutrition professionals about food and nutrition labelling and the legal requirements for prepacked food products.

- 1.1. To understand the importance of food and nutrition labelling for different groups of food and nutrition professionals.
- 1.2. To recognise the use of the available information on food and nutrition labelling by professionals of the field and the interest in their professional activity.
- 1.3. To understand if the professionals read, trust and are satisfied with the information presented in the label.
- 1.4. To know if the professionals' food choices are influenced by the labelling information.
- 1.5. To understand the level of agreement of the food and nutrition professionals with the main changes implemented by the Regulation (EU) No 1169/2011 about food information to consumers.

2) To assess the Portuguese food professionals' position regarding food and nutrition labelling.

- 2.1. To organize and categorize a sample of Portuguese food and nutrition professionals into groups, regarding their position about European food legislation and labelling.
- 2.2. To describe the different positions of the professionals towards food labelling and European legislation.

- 2.3. To compare the educational background (educational level and courses) and area of activity regarding the professionals' position towards food and nutrition labelling.

3) *To analyse the differences in food and nutrition professionals' opinions and suggestions regarding nutrition labelling on prepacked foods, established by Regulation (EU) No 1169/2011.*

- 3.1. To evaluate the professionals' opinion regarding the accessibility and clarity of nutrition labelling for the consumer.
- 3.2. To analyse the suggestions that could be seen as improvements to nutrition labelling.
- 3.3. To compare the professionals who gave suggestions with those who did not.

METHODOLOGY

A cross-sectional study was developed, considering an observational and descriptive design of a sample of Portuguese food and nutrition professionals aged 18 and over (**Figure 5**) (*von Elm et al., 2014, Steffen and Doppler, 2020*).

Figure 5 - Study design.

<i>Study population</i>	●●◆ The target population were the Portuguese professionals in the food and nutrition area. The recruitment strategy for the participation of the professionals was through contacting several Food and Nutrition Portuguese entities. The dissemination of the study was done through a formal invitation by email to each entity, which in turn distributed it to their members.
<i>Sample</i>	●●◆ A non-probabilistic and convenience sampling was applied to include Portuguese food and nutrition professionals, aged 18 and over.
<i>Research tool</i>	●●◆ A self-administered survey was developed, using the software LimeSurvey® available at the Faculty of Nutrition and Food Sciences of the University of Porto.
<i>Data survey collection</i>	●●◆ The investigation project started in October of 2014 and the data collection occurred from December 2016 to April 2017.
<i>Statistical analysis</i>	●●◆ Different methods and statistical tests were performed to analyse the data collected by the IBM SPSS Statistics software®, version 24.0.

STUDY POPULATION

The population under study, the *Portuguese professionals in the food and nutrition area*, is hard to delimitate and quantify, due to the wide variety and number of professionals involved in this broad professional area.

The food field acknowledges numerous professional contexts, which include professionals with several academic degrees, internships, occupations, career opportunities and positions. Therefore, the food and nutrition professionals work in multidisciplinary teams with different backgrounds, experience, and knowledge in the food supply chain, which can result in different views, expertise, abilities, insights and decision-making skills about the food and nutrition labelling ([Graça, 2006](#), [Sequali, 2008](#), [Real et al., 2011](#), [Alves, 2016](#)).

▪ *Dissemination of the study and recruitment of participants*

Considering what was mentioned above, the proposed recruitment strategy includes contact with several Portuguese Food and Nutrition entities, so as to obtain a sample of the target professionals. All information was anonymized, complying with the General Data Protection Regulation (GDPR) ([Regulation \(EU\) No 2016/679](#)). The selected and contacted entities that agreed to disseminate the survey are listed in **Table 3** (short form) and the appendix (descriptive format) (**APPENDIX 1**).

Table 3 - Portuguese entities in the food and nutrition area contacted to disseminate the study (N=45).

●●◆	Policy decision-makers and regulatory entities (governmental and non-governmental organizations) of food-related area (N=7)
●●◆	Public health associations in the food and nutrition area (N=5)
●●◆	Food business associations/ entities (N=3)
●●◆	Higher education institutions with bachelor's, post-graduate, master's, and doctoral degrees in the food area (N=18)
●●◆	Scientific journals or other communication channels (N=5)
●●◆	Certification Entities (N=7)

SAMPLE

Using the institutional or professional contact, the entities were asked to disseminate the study to their professionals and invite them to participate (via email with the *survey link*). The participants were gathered through these entities which included exclusively professionals of the food supply chain (food industry, foodservice, food business, food control and safety, food marketing, public health nutrition and food regulation, etc), and those professionals who work as researchers, analysts and process controllers, agronomists, chemists, chemical engineers, food engineers, veterinaries, dietitians, nutritionists, among others.

A non-probability (non-random) and convenience sampling was applied to recruit food and nutrition professionals. This method was chosen to cover as many professionals as possible and keeping in mind that not all professionals had an equal participation opportunity. Moreover, to avoid multiple responses by the same professional, a brief warning was given at the beginning of the survey: "In case of receiving this request through different organizations/ entities, please respond only once".

The eligibility criteria required was being 18 years and over, living and working in Portugal and having a professional activity in the food and nutrition area.

RESEARCH TOOL

A self-administered survey was developed as a way of collecting data. In its development, the relevant literature used in previous studies related to food labelling was accounted for, in order to better understand the approach to the questions ([Tieszen et al., 2008](#), [Mackison et al., 2010](#), [Campos et al., 2011](#)).

A set of general instructions were given at the beginning of the survey and the start of each section and question, to improve comprehension and provide structure to the survey.

There was special care in the formulation of the questions of the self-administered survey, intending to have answers that would reflect the professional's vision. Thus, participants were instructed to reply to all questions from a professional perspective.

Two strategies were used in the formulation of the questions: 1) writing the questions using expressions such as "from the perspective of the food professional ...", "as a food professional

...", "what is your opinion as a professional ...", and 2) having a "filter question", as the first one, to identify the main area of activity, within the professional group.

The survey, which was written in Portuguese, was organized in five sections (A to E as described in **Table 4**) and included twenty-four questions (fourteen closed questions on a 5-points *Likert* type scale, six multiple-choice and four open-ended questions) (**APPENDIX 2**).

Table 4 - The five sections of the survey.

Section A	The general perspective of the food professionals regarding labelling
Section B	The new regulation: content, presentation, and legibility
Section C	Mandatory "back-of-pack" nutrition labelling: comparisons of the main changes
Section D	Future uses of "front-of-pack" nutrition labelling: additional forms of expression and presentation of the nutrition declaration
Section E	Participants' sociodemographic characteristics

Firstly, in **section A**, the participants had to identify their main area of activity within the food area (fourteen options and an open field for "others"). Secondly, several questions were written to understand the general vision of food professionals regarding labelling. The following aspects were addressed:

- the given **importance** to food labelling by professionals (1 - "no importance" to 5 - "high importance"),
 - the **frequency of reading** the mandatory food information or other information presented in the label during professional practice (1 - "never" to 5 - "always"),
 - the **frequency of use** of food labelling in professional activity on a daily basis (1 - "never" to 5 - "always"),
 - the **level of confidence** regarding the information provided by food labelling (1 - "do not trust" to 5 - "totally trustworthy"),
 - the level of **satisfaction** with the presentation of information and with aspects pointed out as difficulties in the labelling usage (1 - "highly unsatisfied" to 5 - "highly satisfied"),
 - the **importance of the inclusion of nutrition labelling** with the FIC regulation (1 - "no importance" to 5 - "high importance"),
 - the **confidence** in the values presented in the nutrition labelling (1 - "do not trust" to 5 - "totally trustworthy"),
- Lastly, the **influence** of labelling on their **professional choices** was also included (1 - "never" to 5 - "always").

In **section B**, the professional's agreement level (1 - "strongly disagree" to 5 - "strongly agree") about the main changes introduced by the FIC Regulation, considered in Article 13 to 21 of the regulation:

- Improved legibility of the information (minimum font size for mandatory information),
- A clearer and more harmonised presentation of allergens (e.g., gluten, lactose, nuts, soy) in the list of ingredients for prepacked foods (emphasis on the font, style, or background colour), as well as in all the eating away-from-home menus,
- The mandatory requirement of nutrition declaration for the majority of prepacked processed foods,
- Mandatory origin information for fresh meat from pigs, sheep, goats, and poultry,
- Same labelling requirements for online distance-selling,
- List of engineered nanomaterials in the ingredients,
- Specific information on the origin of refined vegetable oils and fats,
- Strengthening rules to prevent misleading practices,
- Indication of substitute ingredient for "imitation" foods,
- A clearer indication of the name of the food by the designation 'defrosted' when it indeed occurs, or if the food is "formed meat/formed fish", or if protein or water was added.

The main changes in the content of the mandatory *back-of-pack* (BOP) nutrition labelling were introduced, before and after the FIC regulation, using a 5-point *Likert*-scale of agreement (1 - "strongly disagree" to 5 - "strongly agree") and an open-ended question in **section C** (related to Nutrition declaration (section 3 and *Article 29* of regulation)).

The future use, benefits, and implementation of additional forms of expression and presentation of the nutrition declaration in *front-of-pack* (FOP) nutrition labelling was questioned (1 - "strongly disagree" to 5 - "strongly agree") in **section D**. The professionals were requested to select a pictogram/ symbol as a possible representation on the FOP nutrition labelling from several options available at the time.

Sociodemographic data were collected in **section E**, which comprised the participants' sex, year of birth, marital status, residence area, academic degree, courses, and occupation.

An online survey was developed, using the software LimeSurvey® (*version 2.05+ build 140821*) available at the Faculty of Nutrition and Food Sciences of the University of Porto.

- ***Pre-test and Pilot study***

A convenient sample of 18 participants tested the first online version of the survey (2015/2016). Some adjustments in the question's sequence and the verbal content were done. Afterwards, some professionals in the food field were requested to provide a critical view of the final online version in face-to-face meetings.

A pilot study was conducted to test the survey length and design, grammar content, and the question's sequence and type. The purpose was to test the survey, namely the phrasing of the questions, sequence, difficulty, presentation, and time of completion. The pilot study was tested by a group of 8-10 participants under the same conditions as the survey would be applied. Some questions were adjusted to improve the survey validity online.

DATA SURVEY COLLECTION

The final version of the online survey was available through the software LimeSurvey® at the Faculty of Nutrition and Food Sciences of the University of Porto. The access was provided via a *link*, by an email sent to the Portuguese Entities of the food and nutrition area.

The data collection processed started in December 2016 and went on until April 2017.

The average time taken to complete the survey was 00:16:26 (SD=00:09:45), with a minimum completion time of 00:03:55 and a maximum of 01:17:00.

- ***Ethical considerations***

Several ethical considerations were performed:

- Disseminating the study through the entities, which was requested to each representative beforehand by email containing all the necessary information (objective of the study, an academical focused investigation, target population, safeguard of the collected information and the anonymity of the participants) to remain focused on the intention of the evaluation and what the collected data would be used for;
- Throughout the study and the data analysis, the individual's identities were safeguarded and remained anonymous;

- No incentives were given to respondents for participating in the survey, the participation being voluntary;
- In the introductory note of the survey, participants were asked to read the informed consent form, to participate in the study;
- Confidentiality was ensured, and the identifying information was not made available or accessible from any reports or published documents.

Hence, the main ethical aspects were followed according to the regulations established by the Alliance for Health Policy and Systems Research (WHO), and to the Helsinki Declaration of the World Medical Association ([World Medical Association, 1964, Alliance for Health Policy et al., 2019](#)). The Ethical Commission of the Faculty of Sciences of Porto University approved the survey.

STATISTICAL ANALYSIS

Data management and analysis were performed using IBM SPSS Statistics software® for Windows, Version 24.0. Armonk, NY: IBM Corporation, USA, using the database exported from Limesurvey®.

Further data processing was required to redefine some variables, mainly the sociodemographic characteristics of the sample:

- In the first question (“Identify the main area of professional activity, choosing only one answer”), participants selected their main area of activity, which allowed the following grouping:

○○◆ **G1** (Clinical care)

○○◆ **G2** (Primary health care, community, and public health)

○○◆ **G3** (Food industry, innovation, marketing, and laboratory analysis)

○○◆ **G4** (Foodservice)

○○◆ **G5** (Research, education, and training)

○○◆ **G6** (Quality control and food safety, inspection, and consulting)

Two answers were not considered as they did not fit into any of the provided categories (one of the professionals was unemployed and the other did not answer), but their answers to the other questions were still considered.

- The twenty districts were stratified according to the seven regions of Portugal as defined in NUTS-II (a hierarchical system that divides the Portuguese territories into regions ("nomenclature of territorial units for statistical purposes"), North, Centre, Lisbon Metropolitan Area, Alentejo, Algarve, Autonomous Region of Madeira and Autonomous Region of Azores) ([PORDATA, 2021](#)). However, there were two exceptions, the "South area" that included Alentejo and Algarve, and the "Islands" that included Autonomous regions of Madeira and Azores. Therefore, it resulted in five geographical areas: North, Centre, Lisbon Metropolitan Area, South and Islands.

- For the academic degree variable, the results were segmented into three levels: bachelor's degrees; master's degrees and PhD's degrees.

There were three professionals, who choose the option of the technical course in the survey, which were not considered in this variable, but their answers were still accounted for.

- The course variable was an open-ended question, so it was necessary to group the answers into academic areas: "Food and Nutrition Sciences" (FNS), "Food Engineering or Food Sciences" (FEFS) and "Others Engineering or Sciences" (except Food Engineering or Food Sciences) (ES). Ten answers were not accounted for, because they did not fit into any of these areas.

- The occupation variable was an open-ended question, similar answers were grouped, resulting in seven occupation groups: academic, engineer, nutritionist/ dietitian, food quality & safety, management, food technician, and others.

Statistical significance was set at 0.05. Data from participants with incomplete surveys were excluded from the analysis, thus being considered the answers of 297 respondents, in the various sections of the survey.

As the population and sample size were hard to control, a *post hoc* power analysis was performed. The statistical power was 0.831 when applying the Kruskal-Wallis test to compare the frequency of mandatory food information read in professional practice regarding the nutrition labelling, which had a maximum difference of 26.2% between professionals' groups (for a sample size of 297 individuals). More pronounced differences (in %) are associated with larger statistical power.

Descriptive statistics were used to describe the participant's characteristics and the frequencies of the survey results (N; %).

Initially, non-parametric Kruskal-Wallis tests were used to examine significant differences in the opinions regarding food labelling and Pearson chi-square (χ^2) tests were used to evaluate the independence between categorical variables.

Secondly, a cluster analysis was carried out aiming to create groups with common characteristics regarding the answers to questions 2 to 14 and 16 (see Appendix II). Hierarchical cluster analysis (among groups linkage and Ward's method, both using *z-scored* values and Euclidean distance as the measure) was used to determine the number of clusters. The agglomeration schedule's coefficients were analysed with the number of clusters in each stage. The analysis of the plots obtained through both methods (among groups linkage and Ward's method) led to the choice of a 3-cluster solution. The clusters were obtained through k-means cluster analysis. The professionals' positions concerning food and nutrition labelling were based on Pieniak *et al* (Pieniak *et al.*, 2007). Moreover, the association between the obtained clusters and sociodemographic variables was studied using non-parametric Kruskal-Wallis and Pearson chi-square (χ^2) tests. When comparing clusters, Mann-Whitney U and Pearson chi-square (χ^2) tests were applied with Bonferroni's correction, to adjust *p*-values for *post-hoc* analysis and to avoid the inflation of type I errors.

Lastly, a general analysis of the survey answers was conducted to evaluate specifically two questions, "As a food professional, do you consider that changes in the presentation and content of the nutrition information provide an accessible and clear reading/understanding for the consumer?" (a 5-points agreement *Likert* type scale) and the open-ended question "If you do not agree, what would you change?". The answers were categorized by subject. A comparison between the group of professionals who make suggestions and those who did not, regarding the survey's answers was done. Differences between groups were assessed using Mann-Whitney U and Pearson chi-square tests.

RESULTS

The results are constituted by the publications and main findings of this thesis, which provide an answer to the proposed objectives (general and specifics).

PUBLICATIONS

- 1) *To explore the views of a sample of Portuguese food and nutrition professionals about food and nutrition labelling and the legal requirements for prepacked food products.*

●●◆ *Paper 1* - “Portuguese Food Professionals’ view on food and nutrition labelling” - *Submitted for publication* >>> APPENDIX 3

●●◆ Food and nutrition professionals’ views and use of food and nutrition labelling (2018) *Acta Portuguesa de Nutrição, N. º 13* >>> APPENDIX 4
(*Resumos e Comunicações Oraís, pp.38-47*).

●●◆ Food related professional’s view on food and nutrition labelling (FNL). NUTRIMAD 2018 - XII Congreso de la Sociedad Española de Nutrición Comunitaria (SENC), IV World Congress of Public Health and Nutrition, 24 - 27th October 2018, Madrid, Spain. *Revista Española de Nutrición Comunitaria*, 160. >>> APPENDIX 5

2) *To assess the Portuguese food professionals' position regarding food and nutrition labelling.*

●●◆ *Paper 2 - "Confident, sceptical or enthusiasts: where do Portuguese food and nutrition professionals stand on food and nutrition labelling?" - Submitted for publication*

>>>

APPENDIX 6

●●◆ *The position of a sample of Portuguese of a sample of a Portuguese food and nutrition professionals towards food labelling and European Legislation.*

>>>

APPENDIX 7

3) *To analyse the differences in food and nutrition professionals' opinions and suggestions regarding nutrition labelling on prepacked foods, established by Regulation (EU) No 1169/2011.*

●●◆ *Paper 3 - "Nutrition labelling on prepacked foods: opinion and suggestions of food and nutrition professionals" - Submitted for publication*

>>>

APPENDIX 8

●●◆ *Opinion and Improvements regarding nutrition labelling by a sample of Portuguese Food and Nutrition Professionals.*

>>>

APPENDIX 9

SUMMARY OF THE MAIN FINDINGS

Characterization of the sample of Portuguese professionals who participated in the study is shown in **Table 5**. It includes women (81.1%), married (53.2%), with an average age of 39 years (SD=12.1), between 18 and 75 years old, with higher education (99.9%) and 46.0% from the “Food and Nutrition Sciences” course.

Table 5 - Sample characterization (N=297).

	N	%
Sex		
Female	241	81.1
Male	56	18.9
Marital status		
Single	127	42.8
Married/ Living with a partner	158	53.2
Divorced	12	4.0
Geographical area of residency		
North	90	30.3
Centre	65	21.9
Lisbon Metropolitan Area	82	27.6
South (Alentejo and Algarve)	31	10.4
Islands (Madeira and Azores)	29	9.8
Educational level		
Bachelor's degree	193	65.6
Master's degree	77	26.2
PhD degree	24	8.2
Courses		
Food and Nutrition Sciences (FNS)	133	46.0
Food Engineering or Food Science (FEFS)	75	28.0
Other Engineering or Sciences (ES)	81	26.0
Occupation		
Academic	22	7.4
Engineer	35	11.8
Nutritionist/ Dietitian	123	41.4
Food quality & safety	62	20.9
Management	28	9.4
Food technician	7	2.4
Others	18	6.7
Labelling positions		
1 - Confident	122	41.1
2 - Sceptical	70	23.5
3 - Enthusiast	105	35.4

According to the main area of activity, the participants were grouped into the following categories (N=295): **G1** - Clinical care (42, 14.2%); **G2** - Primary health care, community and public health (45, 15.3%); **G3** - Food industry, innovation, marketing and laboratory analysis (73, 24.7%); **G4** - Foodservice (22, 7.5%); **G5** - Research, education, and training (38, 12.9%); and **G6** - Quality control and food safety, inspection and consulting (75, 25.4%) (Table 6).

Table 6 - Participants' socio-demographic characteristics, according to the area of activity.

	Area of activity														p
	N	G1		G2		G3		G4		G5		G6			
		n	%	n	%	n	%	n	%	n	%	n	%		
Sex															
Female	239	41	17.2	40	16.7	50	20.9	20	8.4	23	9.6	65	27.2	<0.001*	
Male	56	1	1.8	5	8.9	23	41.1	2	3.6	15	26.8	10	17.9		
Marital status															
Single	127	29	22.8	22	17.3	28	22.0	13	10.2	11	8.7	24	18.9	0.002*	
Married/Living with a partner	156	13	8.3	20	12.8	39	25.0	9	5.8	26	16.7	49	31.4		
Divorced	12	0	0	3	25.0	6	50.0	0	0	1	8.3	2	16.7		
Geographical area of residency															
North	90	17	18.9	16	17.8	16	17.8	8	8.9	15	16.7	18	20.0	0.005*	
Centre	65	14	21.5	5	7.7	18	27.7	6	9.2	6	9.2	16	24.6		
Lisbon Metropolitan Area	81	4	4.9	9	11.1	25	30.9	4	4.9	13	16.0	26	32.1		
South (Alentejo and Algarve)	31	4	12.9	4	12.9	8	25.8	1	3.2	2	6.5	12	38.7		
Islands (Madeira and Azores)	28	3	10.7	11	39.3	6	21.4	3	10.7	2	7.1	3	10.7		
Educational level															
Bachelor's degree	192	29	15.1	37	19.3	44	22.9	15	7.8	18	9.4	49	25.5	<0.001#	
Master's degree	77	12	15.6	8	10.4	21	27.3	7	9.1	7	9.1	22	28.6		
PhD degree	24	1	4.2	0	0	7	29.2	0	0.0	13	54.2	3	12.5		
Courses															
Food and Nutrition Sciences	131	41	31.3	39	29.8	6	4.6	18	13.7	16	12.2	11	8.4	<0.003*	
Food Engineering or Food Science	75	0	0	1	1.3	29	38.7	4	5.3	7	9.3	34	45.3		
Other Engineering or Sciences	81	0	0	4	4.9	36	44.4	0	0	13	16.0	28	34.6		
Occupation															
Academic	22	0	0	2	9.1	7	31.8	0	0	12	54.5	1	4.5	<0.001*	
Engineer	35	0	0	1	2.9	15	42.9	0	0	8	22.9	11	31.4		
Nutritionist/ Dietitian	122	41	33.6	38	31.1	6	4.9	18	14.8	11	9.0	8	6.6		
Food quality & safety	62	0	0	0	0	16	25.8	2	3.2	4	6.5	40	64.5		
Management	28	0	0	0	0	19	67.9	2	7.1	2	7.1	5	17.9		
Food technician	7	1	14.3	0	0	2	28.6	0	0	0	0	4	57.1		
Others	19	0	0	4	21.1	8	42.1	0	0	1	5.3	6	31.6		
Labelling positions															
1 - Confident	121	36	29.8	35	28.9	13	10.7	8	6.6	13	10.7	16	13.2	<0.001*	
2 - Sceptical	69	1	1.5	3	4.3	29	42.0	4	5.8	9	13.0	23	33.3		
3 - Enthusiast	105	5	4.8	7	6.7	31	29.5	10	9.5	16	15.2	36	34.3		

Statistical analysis *Pearson χ^2 test and #Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

1. To explore the views of a sample of Portuguese food and nutrition professionals about food and nutrition labelling and the legal requirements for prepacked food products.

The needs and interests in using the available information on the food and nutrition labelling as a professional, are different according to the area of activity. Regarding the **views** of Portuguese professionals about food and nutrition labelling and the legal requirements for prepacked food products, several findings were considered. The statistically significant differences between areas of activity are presented in **Table 7** (more detailed results are described in **APPENDIX 3** - Tables 2, 3, 4, 5 and 6) with the following highlights:

- **G1 (Clinical care) group** have more confidence in the values presented on the nutrition declaration, and their food choices are more influenced by labelling information.
- **G2 (Primary health care, community, and public health) professionals:** the nutrition labelling was more frequently read in their professional practice, and they attributed the highest importance to this information becoming mandatory. Concerning the FIC Regulation (content, presentation, and legibility), they were the group that agreed the most with the mandatory specific information (in %) of the origin of refined oils and vegetable fats. Considering the changes in the nutrition labelling, they agreed more with the inclusion of salt in labelling, associating coloured traffic lights for better understanding this information and using FOP nutrition labelling to benefit their professional activity.
- **G3 (Food industry, innovation, marketing, and laboratory analysis) group** read more frequently “the name of the food”, “the country of origin or place of provenance” and “the name or address of the food business operator”. These professionals agreed more with the inclusion of the food portion size, and the voluntary declaration of the fibre on the BOP nutrition labelling.
- **G4 (Foodservice) professionals** consulted more often the “allergens’ information”, “special storage and/or use conditions” and “date of minimum durability or the use by date”. They were more likely to use labelling daily in their professional activity and they expressed more agreement with the mandatory information being on their field of vision and in a clear format.
- **G5 (Research, education, and training)** did not stand out in any of the studied aspects, although they read less frequently the “nutrition labelling” and used labelling less often on their professional activity. They showed less confidence in the values presented and claimed labelling influenced less their professional choices. They were among those who agreed the least with the salt instead of sodium alteration.

- **G6** (Quality control and food safety, inspection, and consulting) professionals read more frequently the lot number; showed more satisfaction with the layout information (mainly with the font size, dietary reference intakes and nutrition claims); and agreed the most with the front-of-pack nutrition labelling being a repetition of information on prepacked food labels.

To better understand the view of a sample of Portuguese food and nutrition professionals' regarding food and nutrition labelling on prepacked food products and its legal requirements, it is necessary to consider the outcomes towards the specific goals.

1.1. The importance of food and nutrition labelling for different groups of professionals.

The different groups attributed "some/high" importance to food labelling (97.3% to 100%) as professionals, without differences in statistical significance among them. Likewise, the sample of professionals attributed "some/high" importance to the nutrition declaration becoming mandatory on the label with the implementation of the Regulation (EU) No 1169/2011, specifically the **G1** (Clinical care) (97.6%) and **G2** (Primary health care, community, and public health) (97.8%) professionals, although the other groups also presented an agreement percentage of above 80%.

Table 7 - Main differences between the views of a sample of Portuguese professionals about food and nutrition labelling and the legal requirements for prepacked food products.

Survey Section		Area of activity (%)						Total (N=295)	P
		G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)		
A - The general perspective of the food professionals regarding labelling	Read frequency of mandatory food information in professional practice ²								
	- name of the food	57.1 ↓	60.0	89.0 ↑	77.3	65.8	85.3	75.3	<0.001
	- date of minimum durability or the 'use by' date	71.4	57.8 ↓	84.9	100.0 ↑	81.6	90.7	81.0	<0.001
	- storage conditions and/or conditions/ instructions of use	35.7 ↓	55.6	71.2	95.5 ↑	68.4	72.0	65.4	<0.001
	- allergens information	50.0 ↓	55.6	67.1	90.9 ↑	52.6	74.7	64.7	<0.001
	- country of origin or place of provenance	26.2 ↓	48.9	68.5 ↑	45.5	63.2	61.3	55.1	<0.001
	- lot number	4.8 ↓	15.6	52.1	68.2	31.6	69.3 ↑	42.7	<0.001
	- name or business name and address of the food business operator	7.1 ↓	17.8	63.0 ↑	50.0	47.4	56.0	43.4	<0.001
	- nutrition labelling	83.3	86.7 ↑	71.2	81.8	60.5 ↓	76.0	75.9	0.019
	Uses labelling in the professional activity on a daily basis ²	88.1	80.0	75.3	95.5 ↑	50.0 ↓	85.3	78.6	0.007
	Satisfaction with the layout information ⁴	42.9	40.0 ↓	60.3	54.5	42.1	62.7 ↑	52.5	0.042
	- font size	19.0	13.3 ↓	35.6	18.2	26.3	41.3 ↑	28.8	<0.001
	- dietary reference intakes	19.0 ↓	31.1	42.5	31.8	39.5	54.7 ↑	39.3	<0.001
	- nutrition claims	21.4	31.1	46.6	18.2 ↓	36.8	53.3 ↑	39.0	0.004
	Importance of mandatory nutrition labelling ¹	97.6	97.8 ↑	80.8 ↓	81.8	86.8	81.3	86.8	<0.001
	Confidence in the values presented ³	83.3 ↑	68.9	50.7	54.5	50.0 ↓	52.0	58.6	0.003
	Influence of labelling on professionals' choices ²	92.9 ↑	88.9	64.4	68.2	60.5 ↓	61.3	71.2	<0.001
B - FIC regulation: content, presentation, and legibility	Mandatory information in their field of vision and in a clear format ⁵	97.6	95.6	76.7 ↓	100.0 ↑	86.8	89.3	88.8	0.004
	Mandatory specific information (%) on vegetable origin of refined oils and fats ⁵	95.2	95.6 ↑	64.4 ↓	95.5	84.2	74.7	81.0	<0.001
C - Main changes BOP nutrition labelling	Additional food portion size (per portion or per consumption unit of the product) ⁵	21.4	17.8 ↓	54.8 ↑	27.3	28.9	44.0	36.3	<0.001
	Voluntary declaration of "supplementary" nutrients - fibre ⁵	11.9	8.9 ↓	38.4 ↑	27.3	26.3	37.3	27.5	<0.001
	Use salt rather than sodium ⁵	88.1	91.1 ↑	79.5	81.8	78.9 ↓	88.0	84.7	0.006
D - Future uses of FOP nutrition labelling	The colour of the traffic lights makes it easier to understand the nutrition labelling ⁵	81.0	86.7 ↑	57.5 ↓	86.4	81.6	78.7	75.9	0.032
	FOP nutrition labelling favours your professional activity ⁵	64.3	71.1	30.1 ↓	77.3 ↑	50.0	54.7	53.6	<0.001
	FOP nutrition labelling might be a repetition of information on prepacked food labels ⁵	47.6	44.4 ↓	64.4	45.5	52.6	65.3 ↑	56.3	0.016

Differences between groups - *Kruskal-Wallis test* with statistical significance ($p \leq 0.05$). ¹The values presented correspond to the sum of all positive answers namely "some importance" and "high importance". ²The values presented corresponded to the sum of the answers "often" and "always". ³The values presented correspond to the sum of all positive answers namely "very trustworthy" and "totally trustworthy". ⁴The values presented correspond to the sum of all positive answers namely "satisfied" and "highly satisfied". ⁵The values presented correspond to the sum of all positive answers namely "agree" and "strongly agree". G1 - Clinical care; G2 - Primary health care, community, and public health; G3 - Food industry, innovation, marketing, and laboratory analysis; G4 - Foodservice; G5 - Research, education, and training; and G6 - Quality control and food safety, inspection, and consulting. The arrow ↑ corresponds to the highest values and the arrow ↓ to the lowest values.

1.2. Use of the available labelling information and its interest during professional activity.

When asked directly, the professionals revealed they used the available labelling information “very often/always” (78.6%), on a daily basis, and during their professional activity. It was interesting to notice the difference between groups of professionals regarding labelling usage, with the highest use reported by the professionals of **G4** (Foodservice) (95.5%) and the lowest use by professionals of **G5** (Research, education, and training) (50.0%).

In an indirect analysis of the use of food and nutrition labelling in professional practice (“how often do you read the available information...”) the results showed an underlying interest and motivation in consulting this information, associated with a reading frequency. The following professional groups showed a more frequent reading of the respective information:

- **G2** (Primary health care, community, and public health) - nutrition labelling,
- **G3** (Food industry, innovation, marketing, and laboratory analysis) - the name of the food, the name of the food business operator and the country of origin or the place of provenance,
- **G4** (Foodservice) - allergens information, special storage and/or use conditions and date of minimum durability,
- **G6** (Quality control and food safety, inspection, and consulting) - the lot number,
- **G1** (Clinical care) and **G5** (Research, education, and training) did not stand out in any of the studied aspects.

It is worth mentioning that the **G3** (Food industry, innovation, marketing, and laboratory analysis), the **G4** (Foodservice) and the **G6** (Quality control and food safety, inspection, and consulting) professional groups read more frequently the same information in different percentages (“name of the food”, the “date of minimum durability”, the “special storage/use conditions”, the “allergens information” and the “lot number”).

1.3. The professionals read, trust and are satisfied with the presented label information.

The professionals from different areas of activity read distinct mandatory food information, considering their professional interests, as already mentioned.

This study has shown that all professional groups expressed low percentages of food labelling reliability when compared to other aspects. It is worth noticing that “trust in information” and “confidence in the values” on food and nutrition labelling was low across the whole sample (65.1% and 58.6%, respectively). Nevertheless, when comparing to the other professional groups, the **G1** (Clinical care) group reported significantly more reliability in the values of the nutrition labelling.

The “satisfaction with the layout presentation” had the lowest percentage values, with only half of the participants being “satisfied/very satisfied”, in comparison to other aspects. **G6** (Quality control and food safety, inspection, and consulting) (62.7%) and **G3** (Food industry, innovation, marketing, and laboratory analysis) (60.3%) groups were the ones who presented the highest percentage of satisfaction, whereas **G2** (Primary health care, community, and public health) and **G5** (Research, education, and training) professionals presented the lowest percentages, 40.0% and 42.1%, respectively.

Despite the low values with the satisfaction of the layout information, **G6** (Quality control and food safety, inspection, and consulting) professionals showed to be more satisfied (62.7%) when compared to other groups, mainly with the font size (41.3%), dietary reference intakes (54.7%) and nutrition claims (53.3%).

1.4. The professionals’ food choices are influenced by the labelling information.

The **G1** (Clinical care) participants (92.9%) were the group that reported that their food choices were “often/always” more influenced by labelling information, in contrast with **G3** (Food industry, innovation, marketing and laboratory analysis), **G4** (Foodservice), **G5** (Research, education and training) and **G6** (Quality control and food safety, inspection and consulting) groups that presented lower percentage values when comparing to the average value (71.2%).

1.5. Agreement with the main changes implemented by Regulation (EU) No 1169/2011 about food information to consumers by professionals.

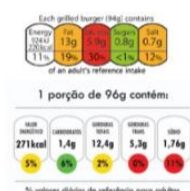
The food and nutrition professionals' agreement with labelling attributes (credibility, readability, comprehensibility, and adequacy) regarding the rules of content, layout and legibility implemented by the FIC regulation, were also considered. Among the food and nutrition professionals, 88.8% “agree/strongly agree” that the mandatory information in labelling should be in a clearer format and in the same field of vision, as a way to promote legibility. The G3 (Food industry, innovation, marketing, and laboratory analysis) professionals were the ones who revealed the least agreement (76.7%). The recognition of the importance of mandatory specific information (%) regarding the origin of refined oils and vegetable fats was accepted by all professionals (81.0%). The G3 (Food industry, innovation, marketing, and laboratory analysis) and G6 (Quality control and food safety, inspection, and consulting) groups were the ones who showed the lowest agreement with the specific information, 64.4% and 74.7%, respectively. The other mandatory alterations related to the FIC regulation did not show significant statistical differences between groups.

Regarding the mandatory “*back-of-pack*” nutrition declaration changes, only three studied aspects obtained results with statistical significance. The addition of supplementary information of the food portion size obtained a low average value of agreement (36.3%), while the G3 (Food industry, innovation, marketing, and laboratory analysis) and the G6 (Quality control and food safety, inspection, and consulting) professionals had an above-average level of agreement, 54.8% and 44.0%, respectively. The total percentage of agreement with the declaration of fibre content in the BOP nutrition labelling being voluntary was low among all professional groups (27.5%) and was above the average level, among the G3 (Food industry, innovation, marketing, and laboratory analysis, 38.4%) and G6 (Quality control and food safety, inspection, and consulting, 37.3%) professionals. Presenting the quantity of salt instead of sodium, in the nutrition declaration, registered a high agreement by the different groups, with the maximum value being 91.1% by the G2 (Primary health care, community, and public health) professionals and the minimum value being 78.9% by the G5 (Research, education, and training) professionals.

The professionals' opinions about the use, benefits, and implementation of the additional forms of expression and presentation of the nutrition declaration in the “*front-of-pack*” nutrition labelling were analysed. Among the participants, 75.9% agreed that a better understanding of nutrition labelling can be promoted if a coloured traffic lights

scheme was used, with the highest value being 86.7% by the **G2** (Primary health care, community, and public health) professionals and the lowest value being 57.5% by the **G3** (Food industry, innovation, marketing, and laboratory analysis) professionals. **G4** (Foodservice) professionals agreed that the FOP nutrition labelling information benefits their professional activity (77.3%), while the **G3** (Food industry, innovation, marketing, and laboratory analysis) professionals showed the least agreement with the previously mentioned aspects, 30.1%. Moreover, **G6** (Quality control and food safety, inspection, and consulting) professionals were the ones more likely to agree that FOP nutrition labelling could be a repetition of the information on the label (65.3%), contrasting with the **G2** (Primary health care, community, and public health) professionals (44.4% agreement).

The participants were invited to select, one out of ten examples of pictograms/FOP nutrition labelling. Their choice should be based on the one they found to portray the information in a clearer and understandable way. The first three most selected examples were: 1) option F (21.5%, N=64) which corresponded to a colour-coded nutrient-specific label (similar to the UK's voluntary traffic lights); 2) option H - Multiple Traffic Lights (the “*Continente*” voluntary FOP nutrition labelling scheme) chosen by 18.9% of the participants (N=56), and 3) option A (18.2%, N=54). Apart from these choices, 19 professionals responded that none of these examples would be their choice to appear on the front-of-pack (6.4%, N=19).



F



H



A

2. To assess the Portuguese food professionals' position regarding food and nutrition labelling.

The cluster analysis demonstrated **three different positions** in the way food and labelling were perceived by Portuguese food and nutrition professionals.

2.1. The sample of Portuguese food and nutrition professionals were organized and categorized into groups regarding their position about European food legislation and labelling.

All data regarding these aspects were considered in order to understand which features constituted the position of the individuals that participated in the survey. The assigning of names to the clusters was based on the following aspects: the food supply chain stage where the professionals intervene; the main concerns regarding food; and their position concerning food and nutrition labelling. The last aspect was based on *Pieniak et al (Pieniak et al., 2007)* and *Lidgard, D. and Heather, Y. (Lidgard and Yeatman, 2002)* studies. As an outcome, three different food and nutrition professionals' positions emerged (results presented in Table 2, 3, 4, 5 and 6 of APPENDIX 6).

A matrix was constructed to group the responses and interpret the features that characterize a position, concerning the European food labelling legislation, which corresponds to the results of a comparative analysis from the three clusters in relation to the total percentage (%). The positive symbol (+) corresponds to the value in percentage above the total percentage and the negative symbol (-) corresponds to the value in percentage below the total percentage. This analysis was done throughout the different sections of the survey (Table 8).

Table 8 - Matrix of the cluster analysis (allowed to organize participants in groups according to their answers) of data collected from sections A, B, C and D of the survey.

	Confident Cluster 1	Sceptical Cluster 2	Enthusiastic Cluster 3
A - The general perspective of the food professionals regarding labelling	+Reliance on labelling and in the values presented, +Importance of mandatory nutrition labelling, +Influence of labelling on professionals' food choices.	— -Importance of food labelling, -Frequency of mandatory food information reading (list of ingredients, net quantity of the food, nutrition claims, nutrition labelling, health claims, quantity ingredients), -Use of labelling in professional activity, -Reliance on labelling, -Satisfaction with the layout (portions), -Importance of mandatory nutrition labelling, -Confidence in the values presented, -Influence of labelling on professionals' choices.	+Importance of food labelling +Frequency of mandatory food information reading, +Use of labelling in professional activity, +Satisfaction with the layout (font size, symbols used, dietary reference intakes, nutrition claims and portions). —
B - The new regulation: content, presentation, and legibility	+Mandatory information in the field of vision and a clear format, +Highlighting of allergens (list of ingredients), +Mandatory specific information (%) on vegetable origin of refined oils and fats, +Rules to avoid misleading practices, +Availability of mandatory information when purchasing from a distance, +Specific information accompanying the name of the food (processing/treatment). —	— -Mandatory information layout visible, legible, and clear, -Mandatory information in the field of vision and a clear format, -Name, allergens, net quantity, and date of durability should always appear, -Highlighting of allergens (list of ingredients), -Mandatory specific information (%) on vegetable origin of refined oils and fats, -Rules to avoid misleading practices, -Availability of mandatory information when purchasing from a distance, -Specific information accompanying the name of the food (processing/treatment).	+Mandatory information layout visible, legible, and clear, +Name, allergens, net quantity, and date of durability should always appear. —

	Confident Cluster 1	Sceptical Cluster 2	Enthusiastic Cluster 3
	—	+Additional portion-based declaration (per portion and/or per consumption unit)	+ Positive change in the sequence of nutrition information, +Mandatory NI per 100g/ 100mL of the food (order of appearance), +Additional portion-based declaration advantage for consumers, +Energy/ nutrient amounts % reference intakes (RIs), +Vitamin and mineral values % nutrient reference values.
C - Mandatory “back-of-pack” nutrition labelling: comparisons of the main changes	-Additional portion-based declaration (per portion and/or per consumption unit).	- Positive change in the sequence of nutrition information, -Mandatory nutrition information per 100g/ 100mL of the food, - Additional portion-based declaration advantage for consumers, -Energy/nutrient amounts % reference intakes (RIs), -Vitamin and mineral values % nutrient reference values.	—
	+Declaration of salt rather than sodium, +Possibility of supplementing the mandatory nutrition labelling.	+Voluntary declaration of “supplementary” nutrients - fibre.	+Changes in nutrition labelling provide better reading and understanding for consumers.
	-Voluntary declaration of “supplementary” nutrients - fibre.	-Declaration of salt rather than sodium, -Possibility of supplementing the mandatory nutrition labelling, -Changes in nutrition labelling provide better reading and understanding for consumers.	—
D - Future uses of “front-of-pack” nutrition labelling: additional forms of expression and presentation of the nutrition declaration	+Advantage of FOP nutrition labelling for consumer's choice, + The colour of the traffic lights make FOP easier to understand the nutrition labelling, +FOP nutrition labelling favours professional activity.	+FOP might be a repetition of information.	+FOP makes it easier to read the nutrition labelling, +FOP promotes a better understanding of nutrition labelling.
	-FOP might be a repetition of information.	-Advantage of FOP nutrition labelling for consumer's choice, -FOP makes it easier to read the nutrition labelling, -FOP promotes a better understanding of nutrition labelling. -The colour of the traffic lights make FOP easier to understand the nutrition labelling, -FOP nutrition labelling favours professional activity.	—

2.2. Description of the three different positions of the professionals towards food labelling and European legislation that arose through the answers to the survey.

The creation of the clusters became possible through the analysis of the different answers provided by the professionals, in order to be able to group them according to the similarities or differences in their answers (**Table 9**). A more descriptive explanation of the formation of the clusters will follow (**APPENDIX 7**).

The **Confident** professionals (**Cluster 1**) were supported by relying on the food label information and presented values, although not satisfied with its presentation. However, they argued that labelling influenced their choices as professionals. They attributed greater importance to the mandatory nutrition declaration, the adjustment in the salt declaration and the possibility of complementing the presented nutritional information. The individuals of this group were the ones who agreed less with the voluntary declaration of fibre and with the indication *per* portion. These professionals showed a strong agreement with the information presented on the label and with the changes imposed by the EU law (e.g., information in the same field of vision and highlighting the allergens on the ingredients list). They also agreed with the future use of FOP nutrition labelling, considering it an advantage for consumer's choice. The use of colours could encourage consumer's understanding and these schemes could be useful to the professionals' activity since it is not viewed as a repetition of the information.

The **Sceptical** professionals (**Cluster 2**) attributed the least importance to food labelling in their professional activity, in comparison to the other professional groups. Their position was similar because they presented the lowest percentage in the labelling survey overview (attributed less importance, used less frequently, had lower trust in it, and were less influenced by labelling). They also agreed the least with the legal requirements/changes imposed and with the future use of FOP nutrition labelling (they argued that it could be a repetition of the nutrition information). The only positive outcome was that they had a higher level of agreement with the possibility of adding the food portion size and the fibre content to the label.

This sceptical position was supported by valuing labelling less and its related aspects, as well as, appearing to be resistant to the changes imposed by the regulation and were dissatisfied

with the proposed modifications. Transparency and compliance with regulations have implications in the developed work, and the information presented on the label.

The **Enthusiast** professionals (**Cluster 3**) were favourable towards the labelling survey overview (importance, reading, use and satisfaction), indicated a more frequent reading of the mandatory information and use of this information during their professional activity. Additionally, they were the most satisfied professional group with the current label layout (font size, symbols used, dietary reference intakes and nutrition claims), suggesting that the mandatory information (especially the food name, quantity, allergens and ‘use by’ date) should always be present, and available in a visible, legible, and clear layout. Furthermore, they agreed with the BOP nutrition labelling update by the FIC regulation and the future use of FOP nutrition labelling, showing that the main changes in nutrition labelling should encourage the usage and understanding of it by consumers. This enthusiastic position was endorsed by seeing food labels as a vehicle for information, that presented accurate and truthful data, guarantying the consumers’ rights to safe food.

2.3. Comparison between groups of different educational backgrounds (educational level and courses) and area of activity regarding the professional position towards food and nutrition labelling.

The cluster analysis demonstrated **three different positions** among food and nutrition professionals. Subsequently, it was necessary to understand, who composes each group/position, considering the different educational backgrounds (academic level and course) and areas of activity (**Table 8**), and their position concerning labelling, the food supply chain stage where they intervene, and their main concerns regarding food (**Table 9**).

Table 8 - Characterization of professionals' positions by different backgrounds, courses, and areas of activity.

	Confident Cluster 1		Sceptical Cluster 2		Enthusiast Cluster 3		Total		p
	N	%	N	%	N	%	N	%	
Educational level (N=294)									
Bachelor's degrees	79	64.8	42	60.0	72	68.6	193	65.6	0.403*
Master's degrees	33	27.0	17	24.3	27	25.7	77	26.2	
Doctoral degrees	10	8.2	9	12.9	5	4.8	24	8.2	
Courses (N=289)									
Food and Nutrition Sciences (FNS)	91	74.6	11	15.7	31	29.5	133	46.0	<0.001*
Food Engineering or Food Sciences (FEFS)	15	12.3	25	35.7	35	33.3	75	26.0	
Other Engineering or Sciences (ES)	15	12.3	29	41.4	37	35.2	81	28.0	
Main area of activity (N=295)									
G1 - Clinical care	36	29.5	1	1.4	5	4.8	42	14.2	<0.001*
G2 - Primary health care, community, and public health	35	28.7	3	4.3	7	6.7	45	15.3	
G3 - Food industry, innovation, marketing, and laboratory analysis	13	10.7	29	41.4	33	31.4	73	24.7	
G4 - Foodservice	8	6.6	4	5.8	10	9.5	22	7.5	
G5 - Research, education, and training	13	10.7	9	13.0	16	15.2	38	12.9	
G6 - Quality control, food safety, inspection, and consulting	16	13.1	23	33.3	34	32.4	75	25.4	

* Differences between groups Pearson χ^2 test with statistical significance ($p \leq 0.05$).

▪ Cluster 1 (Confident position)

This cluster includes individuals from the nutrition sciences course, working in the area of clinical nutrition and public/ community health. The professionals of this group intervene in one of the last stages of the food supply chain - consumption and dealing directly with consumers. They see food as a vehicle for treatment and therapy - **food health**. Therefore, the label could specifically help to protect and improve health, supporting the food choices made with nutritional knowledge, as it presents relevant information in the face of health concerns. These **Confident** professionals used labelling as a work tool, to analyse the food's characteristics, find better options and promote conscious **consumption**. Also, this group of professionals could use food and nutrition labelling to instruct consumers/patients on how to use, understand and make informed choices for their benefit through nutritional advice and educational interventions, so as to know how to read and better understand nutrition labels.

▪ **Cluster 2 (Sceptical position)**

This cluster includes individuals from the “Food Engineering or Food Sciences” and the “other Engineering or Sciences” courses, which intervene in the **production** stages of the food supply chain (G3 - Food industry, innovation, food marketing and laboratory analysis group; and/or G6 - Quality control, food safety, inspection and consulting group). Food is seen as the result of **food processing**, which is summarized on the label. This group of professionals could use food and nutrition labelling to reveal all the information about the production process, the identity, and its features.

This group is considered to be **sceptical** since they need to conform with the legal requirements and all alterations could have implications on their professional activity. This correlation is what makes this group more resistant to change.

▪ **Cluster 3 (Enthusiast position)**

This cluster gathers individuals with different backgrounds and working in different areas: G3 (Food industry, innovation, marketing, and laboratory analysis), G4 (Foodservice), G5 (Research, education, and training) and G6 (Quality control, food safety, inspection, and consulting). Food labelling is a way to provide safety in the food supply chain, in particular in the “**processing, trade and regulation**”, where they intervene. The **enthusiast** individuals from the “**Food safety**” cluster could use food and nutrition labelling to guarantee the safety in the trade of prepacked foods through a controlled process and in conformity with the legal and quality requirements.

Table 9 - Summary of the three different positions in the way food and labelling were perceived by food and nutrition professionals.

	Cluster 1 (122, 41.1%)	Cluster 2 (70, 23.5%)	Cluster 3 (105, 35.4%)
The professional's positions concerning labelling	Confident	Sceptical	Enthusiast
The food supply chain stages where the professionals intervene	Consumption	Production	Processing, trade, and regulation
The main concerns regarding food	Food health	Food processing	Food safety

3. To analyse the differences in food and nutrition professionals' opinions and suggestions regarding nutrition labelling on prepacked foods, established by Regulation (EU) No 1169/2011.

The opinion and suggestions of the professionals were collected through two questions, namely the question “As a food professional, do you consider that changes in the presentation and content of the nutrition information provide an accessible and clear reading/understanding for the consumer?” (a 5-points agreement *Likert* type scale) and the open-ended question “If you do not agree, what would you change?”.

3.1. Evaluation of the professionals' opinion regarding accessibility and clarity of nutrition labelling for the consumer.

One of the important aspects that were taken into consideration were the opinions of professionals in the food and nutrition area, regarding the changes implemented by Regulation (EU) No 1169/2011 in the presentation and content of the mandatory “back-of-pack” nutrition labelling (section C). Specifically, if nutrition labelling changes would favour a better reading and understanding by the consumers. As to compare between the professionals who replied and those who did not, only a minority of the professionals' sample was evaluated, corresponding to those who believed that alterations would not have the required impact.

Out of a total of 297 participants, 10.1% (N=30) strongly disagreed or disagreed that the nutrition labelling changes would favour a better reading and understanding by the consumers, and 11.1% (N=33) replied to the open-ended question with suggestions for improvements in nutrition labelling. It is important to mention that a question in section D of the survey regarding FOP nutrition labelling, similar to a question in section C, regarding BOP nutrition labelling did not provide significant differences between those who suggested and those who did not.

A comparison of the sociodemographic characteristics between the professionals who provided suggestions *versus* those who did not provide suggestions to the open-ended question was carried out. Apart from the geographical area of residency (Lisbon metropolitan

area and Islands), these two groups did not show statistically significant differences in their sociodemographic characteristics.

3.2. Analysis of the suggestions provided in the open-ended question to improve nutrition labelling.

A content analysis of the open-ended question was carried out, regarding what would change if professionals did not agree, and also to understand the differences in the responses to the survey between, those who answered and those who did not answer. However, no comparisons between subsets of suggestions are presented due to their small number. The given answers (N=33) were grouped, as seen below (APPENDIX 10):

- 1) Clear, simple, and concise language (N=7)
- 2) Difficulty in interpreting and teaching consumers (N=8)
- 3) Presentation of nutrition labelling (N=3)
- 4) Turn optional information into mandatory (N=10)
- 5) Improve the display using a nutrition symbol (traffic light type) (N=3)
- 6) Variation of the nutritional composition of the food (N=2).

From these categories, two improvements stood out “**simplify the information of the nutrition labelling**” and “**understand the usefulness of the nutrition labelling**” (APPENDIX 9).

The first improvement suggested was to simplify the information of the nutrition labelling, in order to promote the reading and use by the consumers with low nutritional literacy (subsets 1, 2 and 5).

These professionals suggested that it is necessary to turn the language into a clearer, simpler, and more concise one, as seen “*would simplify the language*” (subset 1) and improve the display by using a symbol, as cited “*The traffic light should become universal for all products*” (subset 5) since the current form of presentation is difficult to interpret (subset 2). This information has to be explained to the consumer “*to inform the consumer to read the label*” (subset 2) or the consumer should be instructed on how to read, interpret, and use the information available “*I would teach consumers to read the labels*” (subset 2).

The second improvement suggested the need to “understand the usefulness of the nutrition labelling” as it is currently presented (subsets 3, 4 and 6). In this case, the adjustment of the presentation of the nutrition labelling was advocated (subset 3), to turn

optional information into mandatory (subset 4), and to consider the variation of the nutritional composition of the food (subset 6). All these suggestions tend to propose more detailed information, related to the nutritional presentation, as mentioned: *“it should be mandatory depending on the fibre content of the foodstuff, as well as the different types of lipids and carbohydrates”* (subset 4) and *“order of the nutrients, sodium content and fibre content”* (subset 3). The aspects listed (what to present in the nutrition declaration, optional and/or mandatory presence of certain nutrients, forms of presentation, the indication of the portion, the dietary reference values (DRVs)) lead to the discussion of issues such as, the type, content, and presentation of the information on the label.

3.3. Comparison between the professionals who gave suggestions and those who did not.

The significant differences between groups of professionals who made suggestions (N=33, 11.1%) and those who did not (N=264, 88.9%) are presented in Table 3 of APPENDIX 8 (non-significant results were omitted for brevity).

The respondents who gave suggestions were more motivated to share their opinion and less satisfied with the current information on the label, namely the specific technical terms ($p=0.019$), the quantity of information ($p=0.047$), the used symbols ($p=0.014$) and the nutritional claims ($p=0.043$). Comparably, this group of professionals showed less agreement with the changes implemented by the Regulation (EU) No 1169/2011, such as the presentation order of the mandatory nutrition information ($p=0.028$) and the optional indication of the fibre content ($p=0.005$). They also showed less agreement with the alterations in the presentation and in the content of the nutrition declaration, which may provide a more accessible and enlightening reading for the consumer. They reported that the nutrition information provided, had unnecessary details for the consumers, that might have low nutrition literacy.

This analysis contributed to the understanding of the professionals' concerns in the food labelling scope, as an informative tool for the consumer.

GENERAL DISCUSSION

The scarcity of research regarding this topic limited the discussion of the results and the comparison with other studies within the same scope, mainly the use of the same target population. Although this thesis does not provide a discussion, like other similar studies, the different papers listed in it do. This fact does not jeopardize in any way, the integrity of the thesis and the accuracy of the results.

The highlights and its interpretations will be listed, as a way of summarizing the most important research results and the methodological considerations. Furthermore, implications and suggestions for future research, concerning food and nutrition labelling and its European legislation will also be presented.

HIGHLIGHTS AND INTERPRETATIONS

- **This study showed how the different areas of activity in the food and nutrition scope interfere with the professionals' view and positioning regarding labelling.**

Differences were found in the way food and nutrition labelling is used as a result of the different professional interests on the topic, education, fields of work and different backgrounds. The area of activity was the most trustworthy variable since it represented the courses, occupations and professionals' interests. The goal was to understand the professionals' views according to their daily practice and experience.

- **Different professional groups often read distinct information on the label, considering their professional interests.**

The professionals who use the mandatory food information available on the label, from the view of the user, are encouraged to read, interpret, and decode the available data, according to their field of work.

- **The professionals' opinions about the provisioning of food information to consumers showed an agreement with the Regulation (EU) No 1169/2011.**

They agreed that the mandatory food information should be in the same field of vision, in a clear format and in a specific displaying way, which will lead to a better presentation, legibility and content of food labelling.

They agreed with the mention of salt and additional food portion size, but they were not favourable with the voluntary fibre declaration on the BOP nutrition labelling.

The use of colours could encourage consumers' understanding and these schemes could be useful to the professionals' activity since it is not viewed as a repetition of the information on FOP nutrition labelling.

- **Enthusiasts, sceptical and confident positions arose related to food and nutrition labelling and its EU legislation.**

These positions were related to the academic background, professional activity, the food supply chain stages in which the professionals intervene ("production", "processing, trade, and regulation", and "consumption"), as well as their main concerns regarding food (food safety, food processing and food health).

- **Suggestions made by the least satisfied professionals about the presentation and content of the nutrition information established by the Regulation (EU) No 1169/2011, provided two improvements: the simplification of the nutrition labelling information and the understanding of the nutrition labelling usefulness, as it is currently presented.**

Some professionals are not satisfied with its presentation because it may provide too much detail for the consumers (the specific technical terms, the quantity of information, the used symbols, and the nutritional claims), which could have low nutrition literacy.

From a subjective analysis based on the view, position, and opinion of a sample of Portuguese professionals, they can see and perceive food and nutrition labelling as an important tool, from a users' perspective.

In this study, food and nutrition professionals showed interest and motivation in the use of the labelling, during their professional activity, but they also demonstrated the need to reflect on the information available to the consumer after 10 years of the European food labelling regulations being implemented.

METHODOLOGICAL CONSIDERATIONS

There are several methodological considerations to keep in mind throughout this study and in the analysis of the results.

Some limitations of the **study design** were the collection of data resulted in a convenience sample, thus non-probabilistic. Since the total number of professionals working in the food and nutrition area is unknown and there is no practical way to contact them, it is not possible to guarantee that all professionals were reached. Thus, the sample may not represent equitably the different food and nutrition areas of activity in Portugal.

Nevertheless, the major entities in this area were contacted to reach the largest possible number of professionals. The choice of entities in the food and nutrition area was done by researching which ones would be relevant and representative of the sector, authorities, and consumers' associations. The recruiting of the professionals was done by contacting the main entities of this field (Policy decision-makers and regulatory entities, Public health associations in the food and nutrition area, Food business associations, Higher education institutions, Scientific journals or other communication channels, and Certification Entities), which could reach a larger spectrum of professionals, instead of specific labour entities (such as hospitals, clinics, industries, city-hall, private practices, catering business, health centres, or laboratories). This methodology has already been used by other researchers, on this kind of approach and in more recent studies, when the target group were consumers ([Tiessen et al., 2008](#), [Gomes et al., 2017](#), [Moreira et al., 2019](#)).

Limitations regarding the **data collection procedure** were related to using an online self-administered survey since the comprehension errors could not be clarified by the research team. Furthermore, the fact that the survey was web-based, might constitute an accessibility limitation for some professionals, on one hand, but on the other hand, as advantages, an online procedure allowed the collection of a larger sample from different geographic locations of the country in a quick and convenient way.

The multiplicity of the professionals' background in the food supply chain, may increase the difficulty in formulating questions using generic technical language, simple enough to suit all respondents. Consequently, distinct individuals may have interpreted the questions differently. In addition, given the data requirements and the technical nature of the subject, the survey might be considered long and complex.

The professionals' background grouping criteria were defined using the available information given by the Portuguese professional entities and by the existing bibliography

(Sequali, 2008, Carrilho and Amaral, 2014, Alves, 2016), after informal discussions with experts in the food and nutrition field.

This study used cluster analysis, similar to other studies that used it to identify response patterns, specifically in other cross-sectional studies about food labelling, considering the number and complexity of variables (Méjean et al., 2013, Viola et al., 2016, Julia et al., 2017).

The **discussion of the main findings** was limited by the scarcity of prior research with this type of target group. Consumers' opinions on the use of food labels have been the most researched topic. Therefore, the difficulty of comparing and discussing the results with other studies shows the need for further investigation on this topic.

It is also important to notice that, even though there are some limitations to the research, some strong points should also be considered. The target population (food and nutrition professionals), up to date, has not been the focal point of many investigations on food consumption and nutrition. Nevertheless, these professionals can bring relevant health-related and political inputs, as users of the food and nutrition labelling information. Web-based surveys are being used in other studies in the same scope (such as those performed by the EUFIC and the European consumer market studies). One of the advantages of this type of data collection is that it is the most cost-effective and efficient way of gathering large amounts of data from different respondents (European Commission DG SANCO, 2006, Campos et al., 2011, European Food Information Council, 2011, Nielsen, 2012a). Although online data collection was not usually applied in 2016, nowadays, with the current COVID-19 pandemic, it became a common and reliable method for information gathering.

IMPLICATIONS AND FUTURE RESEARCH

The food and nutrition professionals have a key responsibility to mediate/ intervene in the flow of information to the consumers but can also determine the clarity of label information and can ensure the requirement conformity on the food supply chain stages, in which they intervene. Throughout this study, it was analysed how the different food and nutrition areas of activity related to the professionals' **view**, **positioning** and **opinion** regarding the provisioning of food information to consumers. Hence, when implementing health policies, the qualifying position and the professionals' concerns regarding food and nutrition labelling, should be considered.

The ongoing discussion concerning food labels should be done in an integrative way, taking into consideration the various positions (confident, sceptical, and enthusiastic) of the food supply chain actors. Several determinants of education and the main area of activity could affect the professionals' views and justify their position regarding labelling. Professionals have the knowledge, the practice, and the ability to distinguish the type of messages and usefulness of the information. Different perspectives, which may broaden the food and nutrition labelling strategies and policies, are needed. It is essential to provide direct and accurate information to consumers in general and all the food supply chain participants/actors. It is important to analyse and manage the different needs, expectations, requirements, and associated costs, when researching the currently available information on the label, as each consumer will use and interpret it differently. Those who control information streams can be powerful actors in facilitating or delaying the transition to healthy, sustainable, and affordable diets. Enforcing nutrition policies, which ensure reliance on food labelling, would require mechanisms of inspection and compliance for them to be implemented. In the future, further research in the current practices and strengthening regulations, information and transparency in food and nutrition labelling should be done to increase trust in the food system.

The development of health policies and interventions should consider how food labelling may empower conscious food choice and promote a healthier lifestyle rather than focusing on the label's information. More research should be conducted, in order to understand the usefulness of food packaged information and its effective communication.

Nutrition labelling educational tools should be developed or even health-related nutrition campaigns (on how to use the nutrition information), which can encourage the use of food labels, improve nutrition literacy and lead to consumer's empowerment.

CONCLUSIONS

Different **views** were found in the way food and nutrition labelling is used within a professional context, due to the diverse professionals' backgrounds and areas of activity. Clinical care (**G1**) professionals show a higher level of confidence in the values presented on the nutrition declaration and are more influenced by labelling information on their food choices. Primary health care, community, and public health (**G2**) professionals attributed the highest importance and read more frequently the specific changes in the BOP nutrition labelling; and have a higher agreement with FOP nutrition labelling benefits their professional activity and support colour coding. Food industry, innovation, marketing, and laboratory analysis (**G3**) professionals read more frequently the food name, operator, and origin, and were more likely to agree with the inclusion of the food portion size and fibre content. Foodservice (**G4**) professionals consulted more often the information on allergens, storage conditions and durability date; were more likely to use labelling and agreed with a more clear and visible mandatory information. Research, education, and training (**G5**) professionals did not stand out in any of the studied aspects. Quality control and food safety, inspection, and consulting (**G6**) professionals read more frequently the lot number, were more satisfied with the layout information and had a higher agreement with FOP nutrition labelling being a repetition of the information.

Three main **positions** arose concerning food and nutrition labelling and its legislation: I) Confident position, constituted by the professionals working in the health area (**G1** and **G2**), mostly with an academic background in nutrition sciences, that intervene in the consumption stage, demonstrate concerns with food and health, agreed more with the EU regulation and attributed greater importance to nutrition labelling, which they rely on their professional activity, even if not satisfied with its presentation; II) Sceptical position composed by the professionals that intervene in the food production and processing stage of the supply chain (**G3** and **G6**), with a background in Engineering or Sciences, valued labelling less and its related aspects, and were less satisfied with the proposed modifications, although they agreed more with the possibility of adding complementary information; and III) Enthusiast position constituted by professionals with different backgrounds, that intervene in the processing, trade and regulation stages (**G3**, **G4**, **G5** and **G6**) and were committed towards food safety, used both food and nutrition labelling, were more satisfied with its content, layout, the addition of new information and the improvement in understandability.

The professionals suggested two types of improvements regarding the presentation and content of the nutrition information, established by Regulation (EU) No 1169/2011. These **opinions** stated that nutrition labelling information should be simplified, or its accuracy and usefulness should be promoted, to provide more perceptible and user-friendly information to the consumer.

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APPENDICES

I. APPENDIX 1 - THE CONTACTED ENTITIES

Table 10 - The contacted Portuguese entities.

Entities	Description
Policy decision-makers and regulatory entities (governmental and non-governmental organizations) of food-related area (N=7)	- Directorate-General of Food and Veterinary Medicine (Direção Geral de Alimentação e Veterinária, DGAV) - Food Safety and Economic Authority (Autoridade de Segurança Alimentar e Económica, ASAE) - National Institute of Health Doctor Ricardo Jorge (Instituto Nacional de Saúde Doutor Ricardo Jorge, INSA) - Professional Association of Biologists (Ordem dos Biólogos) - Portuguese Council of Engineers (Ordem dos Engenheiros) - Portuguese Council of Nutritionists (Ordem dos Nutricionistas) - Portuguese Veterinary Medical Association (Ordem dos Médicos Veterinários)
Public health associations in the food and nutrition area (N=5)	- Portuguese Association for Consumer Protection (DECO) - Professional Association of Dietitians (ceased to exist) (Associação Portuguesa dos Dietistas, APD) - Portuguese Association of Nutritionist (Associação Portuguesa dos Nutricionistas atualmente designada por Associação Portuguesa de Nutrição, APN) - Portuguese Association of Parenteral and Enteral Nutrition (Associação Portuguesa de Nutrição Entérica e Parentérica, APNEP) - Portuguese Celiac Association (Associação Portuguesa dos Celíacos)
Food business associations/entities (N=3)	- Confederation of Portuguese Business (Confederação Empresarial de Portugal, CIP) - Portuguese Agrofood Industries Federation (Federação das Indústrias Portuguesas Agro-Alimentares, FIPA) - Portuguese Association of Distribution Companies (Associação Portuguesa de Empresas de Distribuição, APED)

Entities	Description
Higher education Institutions with bachelor's, post-graduate, master's, and doctoral degrees in the food area (N=18)	- Agrarian School of Polytechnic Institute of Beja (IPBeja) - Agrarian School of Polytechnic Institute of Bragança (IPB) - Agrarian School of Polytechnic Institute of Coimbra (ESAC) - Agrarian School of Polytechnic Institute of Santarém (SAN_ESA) - Agrarian School of Polytechnic Institute of Viana do Castelo (EPVC) - Agrarian School of Polytechnic Institute of Viseu (ESAV) - Atlantica University Institute, Lisbon - Cooperativa de Ensino Superior Politécnico e Universitário (CESPU) - Egas Moniz - Cooperativa de Ensino Superior - Faculty of Nutrition and Food Sciences of University of Porto (FCNAUP) - Instituto Superior of Agronomy (ISA), School of Agriculture, University of Lisbon - Lusófona University, Lisbon - Minho's university, Braga - Piaget Institute - School of Biotechnology (ESB) of the Porto Catholic University - School of Health (ESS) and Institute of Engineering (ISE), University of Algarve - School of Life and Environmental Sciences (ECVA), University of Trás-os-Montes and Alto Douro, Vila Real - School of Tourism and Maritime Technology, IPLeiria
Scientific journals or other communication channels (N=5)	- AGROTEC Magazine - Newsletter Agronegócios - Portal do Consumidor - Viver Saudável Magazine - TecnoAlimentar Magazine
Forming Entities (N=7)	- APCER Portugal - Centro de formação profissional para o setor alimentar, CFPSA - Empresa Internacional de Certificação (eiC) - ÉS Segurança - Consultoria Agro-Alimentar, Lda. - SAGILAB Laboratório Análises Clínicas Técnicas S.A. - SGS Portugal - Silliker Portugal, S.A.

II. APPENDIX 2 - THE SURVEY

FOOD LABELLING IN A FOOD AND NUTRITION PROFESSIONALS' VIEW

Introductory note

This study aims to understand the importance given to food labelling by professionals and to analyse your opinion on the content, usage, and interest in your professional activity.

The labelling provides information about the food to the consumer and can determine food choice when consulted and used. The view of the food professional, in relation to this information, may vary depending on the sector and main area of activity, so we would like to know your opinion on this subject.

Please, answer the questions from a professional perspective and not as a consumer:

- The survey takes about 15 minutes to complete.
- All the responses are anonymous, and the data collected is confidential.

The collected data will be analysed and will be part of a research of the Doctoral Program in Food Consumption and Nutrition Sciences at the University of Porto.

In the event of receiving this request through different organizations, please respond only once.

We appreciate your willingness to collaborate in this study.

There are 24 questions in this survey.

SECTION A: The general perspective of the food professionals regarding labelling

1. Identify the main sector/area of activity that corresponds to your professional practice, choosing one of the following options. *

- ☐ Clinical care (e.g., working as a food adviser and supporting with the description of the label in food adequacy)
- ☐ Primary health care (prescription of a well-balanced and healthy diet, according to the state of health and/or treatment of diseases, allergies, or intolerances for example)
- ☐ Public health (e.g., implementation of policies and programs design to enlighten the consumer in the food field)
- ☐ Food industry, development, and innovation (working in food product development and data collection that should appear on the label)
- ☐ Foodservice (menu labelling guidelines for writing menus where allergens are identified in a meal or other dietary and nutritional concerns)
- ☐ Community food intervention (nutrition education and communication project)
- ☐ Research and teaching (development of studies on food habits and consumption)
- ☐ Education and training (providing information about labels in the various sectors of the food supply chain)
- ☐ Food marketing (working on campaign development and adapting the product's image in compliance with current legislation)
- ☐ Food consulting network (providing technical support to companies as well as supporting the producers and manufacturers in the adapting of the label information)
- ☐ Inspection of the implemented systems of food safety and quality
- ☐ Laboratory analyses of food products
- ☐ Effective food safety and quality management systems (with the implementation of good practices)
- ☐ Engineering, Agronomy, Agriculture, Livestock, Fisheries and Veterinary studies that include sub-areas applied to human food
- ☐ Other _____

2. What is the importance you give to food labelling as a food professional? *

Please select only one of the following options:

- ☐ No importance
- ☐ Little importance
- ☐ Moderate importance
- ☐ Some importance
- ☐ High importance

Note: Regulation (EU) No 1169/2011 'Labelling' is defined as means any words, particulars, trademarks, brand name, pictorial matter or symbol relating to food and placed on any packaging, document, notice, label, ring, or collar accompanying or referring to such food.

3. How often do you read the following information on the label, in your professional practice? *

Please select an appropriate answer for each item:

	Never	Occasionally	Sometimes	Often	Always
Name of the food	☐	☐	☐	☐	☐
List of ingredients	☐	☐	☐	☐	☐
Date of minimum durability or the "use by" date	☐	☐	☐	☐	☐
Net quantity of the food	☐	☐	☐	☐	☐
Any special storage conditions and/or conditions of use or instructions for use	☐	☐	☐	☐	☐
Allergens' information	☐	☐	☐	☐	☐
Country of origin or place of provenance	☐	☐	☐	☐	☐
Nutrition claims	☐	☐	☐	☐	☐
Lot number	☐	☐	☐	☐	☐
Name or business name and address of the food business operator	☐	☐	☐	☐	☐
Nutrition labelling	☐	☐	☐	☐	☐
Health claims	☐	☐	☐	☐	☐
Quantitative Ingredient Declaration (QUID)	☐	☐	☐	☐	☐

4. Do you use labelling on a daily basis and during your professional activity? *

Please select only one of the following options:

- ☐ Never
- ☐ Occasionally
- ☐ Sometimes
- ☐ Often
- ☐ Always

Note: "Use"- the action to consult information and use knowledge to choose and/or inform/clarify the consumer/customer/user through the label for informed choices.

5. What is your level of confidence regarding the information provided by food labelling? *

Please select only one of the following options:

- ☐ Do not trust
- ☐ Little trust
- ☐ Trust reasonably
- ☐ Very trustworthy
- ☐ Totally trustworthy

6. As a food professional, are you satisfied with the presentation of the information on the labelling of foodstuffs? *

Please select only one of the following options:

- ☐ Highly unsatisfied
- ☐ Unsatisfied
- ☐ Neither Satisfied nor unsatisfied
- ☐ Satisfied
- ☐ Highly satisfied

7. The following aspects are pointed out as difficulties in the usage of labelling. From the perspective of a professional in the food field, express your degree of satisfaction with each of these aspects. *

Please select an appropriate answer for each item:

	Highly unsatisfied	Unsatisfied	Neither Satisfied nor unsatisfied	Satisfied	Highly satisfied
Specific technical terms	☐	☐	☐	☐	☐
Type of information packaging	☐	☐	☐	☐	☐
Quantity of information	☐	☐	☐	☐	☐
Font size	☐	☐	☐	☐	☐
Symbols used	☐	☐	☐	☐	☐
Dietary reference intakes	☐	☐	☐	☐	☐
Nutrition claims	☐	☐	☐	☐	☐
Portions	☐	☐	☐	☐	☐

8. With the implementation of the Regulation (EU) No 1169/2011, the nutrition declaration became mandatory on the label of most foodstuffs, as of December 13th, 2016. As food professionals, what importance do you attribute to this? *

Please select only one of the following options:

- ☐ No importance
- ☐ Little importance
- ☐ Moderate importance
- ☐ Some importance
- ☐ High importance

9. What is your level of confidence in the values presented in the nutrition declaration? *

Please select only one of the following options:

- ☐ Do not trust
- ☐ Little trust
- ☐ Trust reasonably
- ☐ Very trustworthy
- ☐ Totally trustworthy

10. As a food professional, is your food choice influenced by the information consulted on the labelling of a foodstuff? *

Please select only one of the following options:

- ☐ Never
- ☐ Occasionally
- ☐ Sometimes
- ☐ Often
- ☐ Always

SECTION B: The new regulation: content, presentation, and legibility

The new European Union rules on food labelling entered into application on the **13th of December 2014**, after approval by the European Parliament and the Council, with the aim of ensuring that consumers receive clear, complete, and accurate information about food, which allows them to make informed choices.

11. Consider the information contained in Regulation (EU) No 1169/2011 on the provision of food information to consumers. Mark your opinion as a professional in the food field, on a scale of 1 to 5 (1 corresponds to "completely disagree" and 5 "completely agree"), regarding the following mandatory alterations: *

Please select an appropriate answer for each item:

	Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
▪ Mandatory information layout visible, legible, and clear.	☐	☐	☐	☐	☐
▪ Mandatory information should be in the field of vision and in a clear format.	☐	☐	☐	☐	☐
▪ Name of the food, presence of allergens, net quantity and the date of durability should always appear independently of the size of the package.	☐	☐	☐	☐	☐
▪ Highlighting the allergens in the list of ingredients may lead to an easier identification and will contribute to further enlightenment for the consumer.	☐	☐	☐	☐	☐
▪ It becomes mandatory to specify information (%) on the origin of refined vegetable oils and fats.	☐	☐	☐	☐	☐
▪ It becomes mandatory in the prepacked food to rule any misleading practices, such as substitute ingredients in "imitation foods" (soy patty).	☐	☐	☐	☐	☐
▪ Mandatory food information should appear on the material supporting the distance selling (except the date of minimum durability or the use by date).	☐	☐	☐	☐	☐
▪ The name of the food should be accompanied by the designation 'defrosted' when it indeed occurs, or if the food is 'formed meat' / 'formed fish', or if protein or water was added.	☐	☐	☐	☐	☐

SECTION C: Mandatory “back-of-pack” nutrition labelling: comparisons of the main changes

As of the 13th of December 2016, the nutrition declaration on the labels of most prepacked foodstuffs became mandatory.

Previous Format					Current format according to Regulation (EU) No. 1169/2011			
Product X					Product X			
Nutrition Information	100g contains	per pack	per serving	GDA	Nutrition Declaration	per 100g	per Portion	
							Per serving (approx. 25g)	RI*
Energy	3100 kJ 743 kcal	7750 kJ 1858 kcal	775 kJ 186 kcal	9.3%	ENERGY	3100 kJ / 743 kcal	775 / 186	9,3%
Fat	42.18 g	105.49 g	10.55 g	15.07%	FAT	42.18 g	2.65 g	15.1%
of which saturates	10.48 g	65.56 g	2.62 g	13.15%	of which saturates	10.48 g	20.2 g	13.2%
Carbohydrate	80.6 g	201.78 g	20.2 g	7.77%	CARBOHYDRATE	80.6 g	20.07 g	7.8%
of which sugars	80.26 g	200.78 g	20.07 g	22.3%	of which sugars	80.26 g	10.55 g	22.3%
Protein	10.61 g	26.62 g	2.65 g	5.3%	PROTEIN	10.61 g	2.62 g	5.3%
Fibre	0.99 g	2.55 g	0.25 g	nil	SALT	0.318 g	0.075 g	1.25%
Sodium	0.127 g	0.318 g	0.03 g	0.005%	Vitamin C	0.05 mg (0.06%**)	0.025 mg (0.03%) **	
250 g					Magnesium	0.04 mg (0.01%**)	0.001 mg	
25 g per serving					Contains 10 portions (250 g).			
GDA – Guideline Daily Amounts					*Reference intake (RI) of an average adult (8 400 kJ/ 2 000 kcal)			
					**NRV – nutrient reference values			

Legend: The blue area corresponds to the mandatory information of the nutrition declaration and the grey area to the optional information.

12. The example above shows the main changes in the nutrition declaration that came into force with Regulation (EU) No 1169/2011. Compare the "old composition/ nutritional information" with the new one and mark your opinion as a professional in the face of these alterations. *

Please select an appropriate answer for each item:

	Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
▪ The sequence of the list of nutrients (energy value and amounts of nutrients) in the nutrition declaration changed positively.	☐	☐	☐	☐	☐
▪ The mandatory nutrition declaration, per 100g / 100mL of the foodstuff, presents the energy, fat, saturated fatty acids, carbohydrates, sugars, proteins, and salt, instead of the energy value, proteins, carbohydrates, lipids, fibre, and sodium.	☐	☐	☐	☐	☐
▪ Allow for an additional food portion size declaration (per portion or per consumption unit of the product).	☐	☐	☐	☐	☐
▪ Even though it is facultative information, a portion-based declaration can represent an advantage for the consumer.	☐	☐	☐	☐	☐
▪ Energy value and nutrient amounts expressed in % of the reference intakes (RIs) per 100g or 100mL with "reference intake on an average adult (8400 kJ//2000 kcal)" instead of guideline daily amounts (GDA).	☐	☐	☐	☐	☐
▪ Vitamins and mineral values expressed in % of nutrient reference values (NRVs) per 100g or 100mL (if present in significant amounts) instead of the recommended daily allowance (RDA).	☐	☐	☐	☐	☐

13. Regulation (EU) No 1169/2011 introduces several changes in the content of the nutrition declaration. Considering your professional practice, give your opinion regarding the aspects. *

Please select an appropriate answer for each item:

	Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
▪ The indication of the fibre on the nutrition information becoming voluntary.	☐	☐	☐	☐	☐
▪ Instead of declaring the sodium content, it became mandatory to declare the salt content.	☐	☐	☐	☐	☐
▪ The mandatory nutrition labelling can be supplemented with an indication of the amounts of one or more of the following: monounsaturated fatty acids, polyunsaturated fatty acids, polyols, starch, fibre, vitamins, and minerals.	☐	☐	☐	☐	☐

14. As a food professional, you consider that changes in the presentation and content of the nutrition declaration provide an accessible and enlightening reading for the consumer. *

Please select only one of the following options:

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither agree nor disagree
- ☐ Agree
- ☐ Strongly Agree

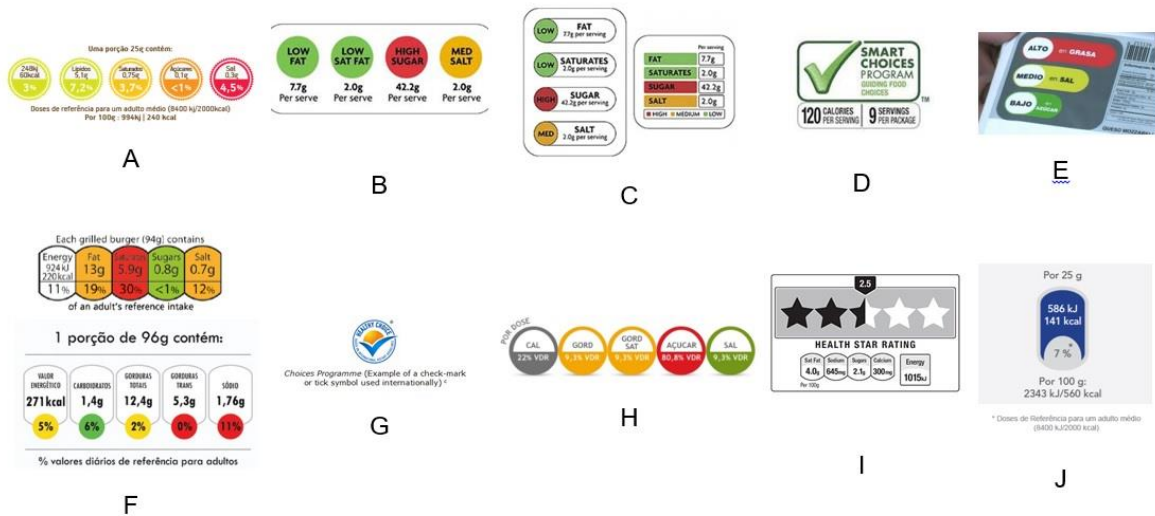
15. If you do not agree, what would you change?

Please write your answer here:

SECTION D: Future uses of “front-of-pack” nutrition labelling: additional forms of expression and presentation of the nutrition declaration

The pictograms or symbols, in a simple format, present information regarding the nutrition declaration on the front-of-pack (in the main field). These representations aim to support the consumer in food choice. Given the following questions, express your opinion on their future use.

(Note: many of these pictograms are presented as an example and are not in Portuguese).



16. Despite not reaching a consensus at a European level regarding the use of a symbol on the front-of-pack foodstuff by all Member States, the labels may have graphical forms or symbols that provide consumers with the information "at first sight". Consider the examples and express your opinion on the following aspects, as a food professional. *

Please select an appropriate answer for each item:

	Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree
▪ This type of graphical forms or symbols on the front-of-pack can be advantageous for the consumer's food choice.	☐	☐	☐	☐	☐
▪ These representations facilitate the reading of the nutrition declaration by the consumer.	☐	☐	☐	☐	☐
▪ These representations promote the understanding of the nutritional declaration by the consumer.	☐	☐	☐	☐	☐
▪ The consumer understands the simple information associated with the colour of the traffic lights (colour relative to the nutrient content present in 100 g or 100 mL of food. For example, green corresponds to an adequate content of a certain nutrient, yellow to moderate content and red to excessive content).	☐	☐	☐	☐	☐
▪ In your professional activity, the information on the front-of-pack is advantageous.	☐	☐	☐	☐	☐
▪ This type of representation can lead to a repetition of the information on the packaging label.	☐	☐	☐	☐	☐

17. In your opinion, which of these pictograms or symbols would you choose as a graphical form or symbol on the "front-of-pack" nutrition labelling? *

Please select only one of the following options:

- | | |
|-------------------------|--------------------------------------|
| ☐ A | ☐ F |
| ☐ B | ☐ G |
| ☐ C | ☐ H |
| ☐ D | ☐ I |
| ☐ E | ☐ J |
| | ☐ None of these. |

SECTION E: Participants' sociodemographic characteristics

Finally, answer the following questions.

18. Sex *

Please select only one of the following options:

- ☐ Female
- ☐ Male

19. Year of birth *

Please write your answer here:

20. Marital status *

Please select only one of the following options:

- ☐ Single
- ☐ Married / Living with a partner
- ☐ Divorced
- ☐ Widowed

21. Area of residence *

Please select only one of the following options:

- | | | | |
|--------------------------------------|-------------------------------|----------------------------------|--|
| ☐ Açores | ☐ Coimbra | ☐ Lisboa | ☐ Setúbal |
| ☐ Aveiro | ☐ Évora | ☐ Madeira | ☐ Viana do Castelo |
| ☐ Beja | ☐ Faro | ☐ Portalegre | ☐ Vila Real |
| ☐ Braga | ☐ Guarda | ☐ Porto | ☐ Viseu |
| ☐ Bragança | ☐ Leiria | ☐ Santarém | ☐ Other |
| ☐ Castelo Branco | | | |

22. What is the highest academic degree you have? *

Please select only one of the following options:

- ☐ Technological Specialization Courses (CET) (non-higher post-secondary training)
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ PhD degree
- ☐ Other

23. Course *

Please write your answer here:

24. Occupation *

Please write your answer here:

We appreciate the collaboration in this study.

If you are interested in knowing the results of the study, you can contact us at

up200405497@fcna.up.pt

III. APPENDIX 3 - 1ST PAPER

1 Abstract

2 To explore the views of a sample of Portuguese food and nutrition professionals
3 concerning food and nutrition labelling and the EU regulation for prepacked foods.

4 A cross-sectional observational study was done by a self-administered online survey for
5 data collection. Food and nutrition Portuguese entities were contacted to obtain
6 Portuguese food and nutrition professionals.

7 The 297 professionals (81.1% women, 53.2% married, average age 39 years old, with
8 higher education (99.9%), grouped by area of activity, differing in:

- 9 - Clinical care: more confident in the values presented on the nutrition declaration,
10 and more influenced by labelling information on their food choices.
- 11 - Primary health care, community, and public health: highest importance and frequent
12 reading of the specific changes in the back-of-pack nutrition labelling; and front-of-
13 pack nutrition labelling will benefit their professional activity and support colour
14 coding.
- 15 - Food industry, innovation, marketing, and laboratory analysis: more frequent read of
16 the food name, operator and origin, agreed more with the inclusion of the food
17 portion size and fibre.
- 18 - Foodservice: consulted more often the information on allergens, storage conditions
19 and durability date; more likely to use labelling and agreed with a more visible
20 mandatory information.
- 21 - Research, education, and training: did not stand out in any of the studied aspects.
- 22 - Quality control and food safety, inspection, and consulting: more frequent reading of
23 the lot number, more satisfaction with the layout information and agree front-of-pack
24 nutrition labelling is a repetition of information.

25 Different professional views were found concerning the use of food and nutrition labelling,
26 due to diverse professionals' backgrounds and areas of activity.

28 Keywords:

29 Food and nutrition labelling; Food and nutrition professionals; Food label use; Prepacked
30 food labels; FIC Regulation.

33 INTRODUCTION:

34 Evidence suggests that information on prepacked food labels can have an
35 educational and informative potential, which can promote informed choices and safe,
36 conscious and well-balanced dietary patterns (Bonsmann, Celemin, Grunert, &
37 consortium, 2010; Campos, Doxey, & Hammond, 2011; Cowburn & Stockley, 2005; Kerr,
38 McCann, & Livingstone, 2015). Since it is available to the public in general, this might be a
39 useful tool to prevent chronic diseases (Branca et al., 2019; Popkin, Adair, & Ng, 2012;
40 Storcksdieck Genannt Bonsmann & Wills, 2012).

41 Over the last thirty years, there have been some changes in the food control systems, to
42 promote good and harmonized practices. Across Europe, there has been an effort to
43 ensure the safety and quality of foods entering international trade and to safeguard
44 consumer's rights, the availability of safe foods and honest information (Food and
45 Agriculture Organization of the United Nations, 2016). The legislation had to be updated so
46 that the food supply chain parties followed the same legal standards (Bonsmann et al.,
47 2010; European Commission, 2019; European Food Information Council, 2018; Kerr et al.,
48 2015; Traill, Mazzocchi, Shankar, & Hallam, 2014). The Regulation (EU) No 1169/2011
49 was implemented by the European Parliament and Council, on the provisioning of "food
50 Information to consumers" (FIC). New food labelling rules were applied with better and
51 simplified regulation, as well as, nutrition labelling becoming mandatory for prepacked
52 foods (Vaqué, 2013). The different parties were heard, to better understand the different
53 implications regarding the requirements and changes in food labelling. The changes were
54 not immediate, so as to provide time for well-targeted changes to happen (Buttriss, 2018;
55 Commission of the European Communities, 2008; Food and Agriculture Organization of
56 the United Nations, 2019; Kasapila & Shaarani, 2016; Kirby, 2016; Koen, Blaauw, &
57 Wentzel-Viljoen, 2016; Regulation (EU) No 1169/2011). Food and nutrition labelling (FNL)
58 provides information about the product, nutritional content, and other compulsory data
59 (Campos et al., 2011; European Commission, 2014a; Food and Agriculture Organization
60 of the United Nations, 2019; Regulation (EU) No 1169/2011).

61 The educational and technological development of the population has led to a
62 greater understanding of the available information. There is also a gap between the
63 provisioning of information and its comprehension, as shown by recent research, which
64 suggests nutrition and food literacy are becoming increasingly more important concepts in
65 health promotion because they endorse a healthier diet (Krause, Sommerhalder, Beer-
66 Borst, & Abel, 2018; Velardo, 2015). The relationship between education and health
67 seems to include different concepts about food and nutrition literacy, emphasizing the

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68 distinct types of knowledge that promote positive health-related outcomes (Truman,
69 Bischoff, & Elliott, 2019).

70 The Portuguese food field allows for several professional contexts, which include
71 numerous academic degrees, career opportunities, professions, and positions. Thus, food
72 and nutrition professionals (FNP) with distinct training, knowledge and backgrounds are
73 involved in the food supply chain parties, which can lead to different views, expertise,
74 abilities, insights and decision/execution skills regarding the topic (Associação Portuguesa
75 de Nutrição, 2011; Graça, 2006; Laureano & Empis, 2003; Sequali, 2008). In Portugal,
76 there are entities in charge of managing certain professions, such as veterinarian,
77 engineer and dietitian, to safeguard the professional's rights and self-regulating the
78 profession, which requires technical independence (Conselho Nacional das Ordens
79 Profissionais, 2020).

80 So far, there has been little discussion about the views and uses of FNL by
81 professionals working in the food and nutrition areas. Therefore, the aim of this research
82 was to explore the views of a sample of Portuguese food and nutrition professionals
83 concerning food and nutrition labelling and the legal requirements for prepacked food
84 products.

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METHODOLOGY

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• Study design

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In this cross-sectional observational study, a self-administered online survey was developed for data collection, using the software LimeSurvey®, which was available at the Faculty of Nutrition and Food Sciences of the University of Porto.

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Several Food and Nutrition Portuguese entities were contacted through institutional or professional email: governmental and non-governmental organizations, professional associations, higher education institutions and business associations in the food area. The participants of this survey were acquired through these entities which allowed for replies exclusively of professionals of the food supply chain, such as food industry, foodservice, food business, food control, food investigation, as well as food and processes analyst, agronomist, food chemist, chemical engineer, food marketer, food lawyer, food engineer,

102 veterinary, dietitians and nutritionist. A non-probabilistic sampling was applied to include
103 Portuguese food and nutrition professionals, aged 18 and over.

104 105 ▪ **Survey**

106 The survey was developed after reviewing the relevant literature used in previous studies
107 related to general food labelling (Mackison, Wrieden, & Anderson, 2010; Thurecht, Pelly, &
108 Cooper, 2018). Also, new food labelling rules - Regulation (EU) No 1169/2011 were taken
109 into consideration in the development of this survey (European Commission, 2014a, 2019;
110 Regulation (EU) No 1169/2011).

111 The final online questionnaire was organized into five sections: 1) **Section A** – General
112 perspective of the food professionals regarding labelling; 2) **Section B** – The new
113 regulation: content, presentation and legibility; 3) **Section C** – Back-of-pack (BOP)
114 Nutrition labelling: comparisons of the main changes; 4) **Section D** – Future uses of front-
115 of-pack (FOP) nutrition labelling: additional forms of expression and presentation of the
116 nutrition declaration; lastly, 5) **Section E** – Participants' socio-demographic characteristics.
117 Participants were instructed to give their opinion as professionals. There was special care
118 in the formulation of the questions, focusing on the professional context of activity so that
119 the answers would reflect their vision.

120 A pilot study was carried out, under the same conditions as the survey, with 8-10
121 respondents to test the survey length and design, the grammar content and the questions
122 model.

123 124 ▪ **Data collection**

125 The FNP were invited to participate through a survey link sent by email. The privacy rights
126 of the participants were reserved, and all responses were anonymous. The average
127 survey length was 12-15 minutes, and it was available from December 2016 to April 2017.
128 The inclusion criteria required participants to be 18 years old or over, living and working in
129 Portugal with professional activity in the food and nutrition area.

130 131 ▪ **Statistical analysis**

132 Data management and analysis of the collected data were performed using
133 IBM/SPSS statistics, v. 24.0. Descriptive statistics were used to describe the participant's
134 characteristics and the frequencies of the survey results (N; %). Non-parametric Kruskal-
135 Wallis tests were used to examine significant differences in the opinions regarding food
136 labelling and Pearson chi-square (χ^2) tests were used to evaluate the independence

137 between categorical variables. Statistical significance was set at 0.05. From the first
138 question ("Identify the main area of professional activity, choosing only one answer"),
139 participants selected their area of activity, which allowed the following groups: **G1** (Clinical
140 care), **G2** (Primary health care, community, and public health), **G3** (Food industry,
141 innovation, marketing and laboratory analysis), **G4** (Foodservice), **G5** (Research,
142 education and training), and **G6** (Quality control and food safety, inspection and
143 consulting).

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147 RESULTS

148 ▪ Participant characteristics

149 The sample (N=297) was comprised of 81.1% women, 53.2% married, with an
150 average of 39 years old (SD=12.1) (between 18 and 75 years old), with higher education
151 courses (99.9%) and almost 50% of them were from the "Food and Nutrition Sciences".
152 Table 1 provides the results obtained from the participants' socio-demographic
153 characteristics, according to the area of activity.

154 Furthermore, it was necessary to identify and specify the courses of each professional
155 group as to better understand the different opinions. The "Food and Nutrition Sciences"
156 course has the highest representation, close to 50% of the participants. All G1
157 professionals had an academic degree description in "Food and nutrition sciences", as well
158 as the majority of G2 and G4 professionals. G3 and G6 professionals had an academic
159 background in "Engineering/Sciences or Food Engineering/Food Sciences". The G5 group
160 was comprised of researchers and university professors of all courses.

161 According to the main area of activity, the participants were grouped into categories
162 (N=295): G1 - Clinical care (42, 14.2%); G2 - Primary health care, community and public
163 health (45, 15.3%); G3 - Food industry, innovation, marketing and laboratory analysis (73,
164 24.7%); G4 - Foodservice (22, 7.5%); G5 - Research, education, and training (38, 12.9%);
165 and G6 - Quality control and food safety, inspection and consulting (75, 25.4%)

167 ▪ The general perspective of a sample of Portuguese FNP regarding FNL

168 In general, all groups indicated FNL as an important topic in their daily practice
169 (97.3% to 100%), without significant differences between groups (Table 2). The questions
170 "importance of FNL" (98.3%), "importance of mandatory nutrition labelling" (86.8%), "uses
171 labelling" (78.6%) and "influence of labelling on the professional's food choices" (71.2%)
172 were those that comparatively presented the highest percentage of the sum of all positive
173 answers.

174 The data showed that 78.6% of participants used labelling "very often/always" in
175 their professional activity. The highest percentage of "uses labelling" was shown by G4
176 (95.5%) and the lowest percentage was from G5 (50%). It is worth noticing that "trust in
177 information" and "confidence in the values" on FNL was low across the whole sample
178 (65.1% and 58.6%, respectively). Regarding "importance of mandatory nutrition labelling",
179 97.6% of participants in G1 and 97.8% in G2 considered it "important/very important",
180 although the other groups revealed a percentage above 80%. Moreover, the participants of
181 G1 (92.9%) and G2 (88.9%) were the professionals who reported that their food choice

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was influenced by information, with both presented values above the average (71.2%). It is worth noticing that "satisfaction with the layout presentation" had the lowest percentages with only 52.5% of participants being "satisfied/very satisfied. G6 (62.7%) and G3 (60.3%) were the ones who showed the highest percentage of satisfaction, whereas G2 and G5 presented the lowest with the percentages of 40% and 42.1%, respectively. G6 professionals showed the highest percentage of satisfaction with labelling (62.7%), dietary reference intakes (54.7%), nutrition claims (53.3%) and font size (41.3%) when compared to the other groups.

Concerning the usage of food and nutrition labelling and its interest in their professional activity, the professional groups showed the following results: G2 showed a more frequent reading of the "nutrition labelling"; G3 expressed the highest percentage of reading frequency of "name of the food", "name of the food business operator" and "country of origin/place of provenance"; G4 referred reading more frequently the "allergens information", "special storage/use conditions" and "date of minimum durability"; lastly, G6 presented the highest values for the "lot number".

It is worth mentioning that the "name of the food", the "date of minimum durability", the "special storage/use conditions", the "allergens information" and the "lot number" were the aspects more frequently read by G3, G4 and G6 professional groups in different percentages.

▪ The professional's opinions about the provisioning of food information to consumers

Regarding the new EU food labelling legislation (Table 3), 88.8% of FNP "agree/strongly agree" that the mandatory information in labelling should be in a clear format and in the same field of vision. The recognition of the importance of mandatory specific information (%) regarding the origin of refined oils and vegetable fats by G1, G2, G4 and G5 professionals, with all percentages above the average value (81%). Although the results were not significant in statistical terms, it seems that the six groups agreed with all the topics presented in the FIC Regulation.

The main changes in the content of nutrition labelling (Table 4) were subjected to analysis. The only statistically significant results in "additional food portion size" were: G3 and G6 agreed with this supplementary information, with 54.8% and 44% respectively (nevertheless, the total percentage of agreement from the professional perspective was only 36.3%). Even though the results did not present statistical significance, 85.8% of all groups recognized this additional information as a plus for the consumer. Regarding other

217 changes in the presentation/content of the nutrition labelling (Table 5), the different
218 professional groups expressed little agreement (27.5%) with the declaration of fibre being
219 arbitrary. However, 84.7% of all FNP showed agreement with the indication of salt rather
220 than sodium on the BOP nutrition labelling.

221 The professionals' opinions about the use, benefits, and implementation of the
222 additional forms of expression and presentation of the nutrition declaration in FOP nutrition
223 labelling were analysed (Table 6). The colours of the traffic lights label were also identified
224 to improve comprehension by the G2 group (86.7%). Additionally, 53.6% of participants
225 agreed that this information can favour their professional activity, G4 professionals showed
226 the highest percentage (77.3%) and only 30.1% of G3 professionals shared the same
227 opinion. However, G3 and G6 professionals (64.4 and 65.4% respectively) agreed that
228 FOP nutrition labelling might be a repetition of information on the label, contrary to the
229 opinion of the G2 group.

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231 DISCUSSION:

232 The view of a sample of Portuguese food professionals regarding food and nutrition
233 labelling and its legal requirements for prepacked food products was studied. This
234 research was carried out to define the professional groups without conflicts of interest,
235 bearing in mind the Portuguese context (Associação Portuguesa de Nutrição, 2011;
236 Carrilho & Amaral, 2014; Laureano & Empis, 2003; Sequali, 2008).

237 In general, all groups indicated food and nutrition labelling as an important topic in
238 their daily practice. In order to provide up-to-date and evidence-based dietary and
239 nutritional advice on a personal and populational level, the available and accessible
240 information contained on the label is crucial in the scope of the practice of **G1** (Clinical
241 care) and **G2** (Primary health care, community and public health) professionals. These
242 groups of professionals can teach and encourage people to carefully read food labels
243 before choosing or purchasing food products. The mandatory nutrition labelling was
244 considered "important/very important" by most participants in the **G1** (Clinical care) and **G2**
245 (Primary health care, community, and public health) group, although the other groups also
246 revealed high percentages. This has already been shown by *Ravasco P. et al*, who
247 emphasise the essential role of these professionals, academically and professionally, in
248 the promotion of basic principles of food and health (Ravasco, Ferreira, & Camilo, 2011).
249 Hence the possibility to improve health and the quality of health services provided to the
250 population (public health scope) and the patients (clinical practice scope), as well as to
251 optimize costs in healthcare (European Federation of the Associations of Dietitians, 2012,
252 2016; Póinhos et al., 2017; Regulamento No 587/2016; Truman et al., 2019).

253 When directly asked, more than three-quarters of participants responded to using
254 labelling "very often/always" in their professional activity. The **G4** (Foodservice)
255 professionals presented the highest percentage of "uses labelling" and the lowest
256 percentage was showed by **G5** (Research, education, and training). This might be related
257 to their professional activity, which in the case of **G4** (Foodservice) professionals there is a
258 higher dependency on the usage of labels. Therefore, they may feel more motivated to
259 read, understand, interpret and evaluate the information due to their professional interests
260 and are more likely to improve food and nutritional quality of meals consumed away from
261 home (Pinto & Ávila, 2015; Saulais, 2015).

262 The professionals from different areas of activity read distinct mandatory food
263 information, considering their professional interests. It is worth mentioning that "name of
264 the food", the "date of minimum durability", the "special storage/use conditions", the
265 "allergens information" and the "lot number", were more frequently read by **G3** (Food

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266 industry, innovation, marketing, and laboratory analysis), **G4** (Foodservice), and **G6**
 267 (Quality control and food safety, inspection, and consulting) professionals in different
 268 reading percentages. The **G2** (Primary health care, community and public health)
 269 professional group showed they read more frequently the "nutrition labelling", which can be
 270 related to the need to understand the information content in order to advise, educate and
 271 inform the population (European Federation of the Associations of Dietitians, 2012;
 272 Thurecht et al., 2018). Education focuses mainly on general nutrition knowledge and
 273 health literacy, optimizes reading, comprehension and the usage of food and nutrition
 274 labelling. As a result, it might improve dietary health (Koen et al., 2016; Moore, Donnelly,
 275 Jones, & Cade, 2018; Truman et al., 2019). The **G3** (Food industry, innovation, marketing,
 276 and laboratory analysis) professional group demonstrated they read more frequently the
 277 "name of the food", the "name of the food business operator" and "country of origin or
 278 place of provenance". The new EU food labelling legislation requires the presence of the
 279 origin, the provenance and the ingredients' composition on the labelling of prepacked
 280 foods. Therefore, acting according to the law will allow a tracking down of the food process
 281 (European Commission, 2019; Regulation (EU) No 1169/2011). **G4** (Foodservice)
 282 professionals, whose tasks are more dependent on the use of labelling, referred reading
 283 more frequently the "allergens information", "special storage/use conditions" and "date of
 284 minimum durability". This information is crucial in ensuring the used food provides safe
 285 meals, not only regarding the quality of foodservice (access, availability, and utilization),
 286 but also the responsibility to declare the presence of allergens in the menu and to
 287 guarantee their absence in the served meals (Pinto & Ávila, 2015). The need to track down
 288 and inspect the food process, by **G6** (Quality control and food safety, inspection, and
 289 consulting) professionals, makes the lot number essential in their professional activity and
 290 food traceability. Therefore, they read more frequently this information, which enables
 291 them to act in case of a food supply chain alert (Viola, Bianchi, Croce, & Ceretti, 2016).
 292 **G1** (Clinical care) professionals reported that their food choices are influenced by
 293 labelling information. These professionals are directly involved in the health promotion
 294 environment, so they are constantly aware of the effects of food choices, which ultimately
 295 translates into better individual counselling (European Federation of the Associations of
 296 Dietitians, 2012; Koen et al., 2016). Recent research concerning a nutrition labelling
 297 intervention trial perceived that the use of nutrition labels may lead to healthier food
 298 purchases (Ni Mhurchu, Eyles, Jiang, & Blakely, 2018). This could suggest that the
 299 professionals pay attention not only to the other person's food choices but also to their

own, demonstrating the importance and influence of nutrition literacy (Carbone & Zoellner, 2012; Gibbs, 2012).

Labelling has been a source of food and nutrition information, mainly with the implementation of the FIC regulation as it became widespread on food packages across Europe. Nevertheless, there are still uncertainties about the reliance on the available information. The fast-technological development, the proliferation of food information from an expanding variety of sources, the increasing consumers' demand for credible information and an ongoing health concern, brought up the need for more and clearer information (Food and Agriculture Organization of the United Nations, 2019). This study has shown that all professional groups expressed low percentages of reliability when compared to other aspects of the general perspective of food labelling. This can be explained by the lack of clarity, transparency and compliance in the way information is included on the label, which also can affect the use/ choice under uncertainty (Pappalardo, 2012; TNS European Behaviour Studies Consortium final report, 2014).

Regarding the confidence in labelling by food professionals, the **G1** (Clinical care) group reported significantly more reliability in FNL than the other five groups, in this study. This might be associated with the fact that they work directly on the prevention and treatment of diseases and their need to convey credible information to patients/ consumers (Baute, Sampath-Kumar, Nelson, & Basil, 2018; Poínhos et al., 2017). According to the Technical Report: *"Consumer Trust of Food Product Information and its Sources"*, "health professionals, scientists, governmental sources and health-related associations are the most trusted parties to provide food product information" (Chan, Pereira, Kam, Coulthard, & Button, 2012). Furthermore, the credibility and proximity in Portuguese healthcare is being reinforced and personalized care was found to be the preferred communication channel (European Federation of the Associations of Dietitians, 2012; Poínhos et al., 2017), suggesting the trust in health professionals and governmental agencies as sources of information (de Almeida et al., 1997). Other researches showed that the main trusted sources of information, reported by Portuguese consumers, were food labels, health professionals, family members and friends, Internet, newspapers, magazines, television and radio, in descending order (Gomes, Nogueira, Ferreira, & Gregório, 2017). The role food labelling has in influencing consumers' trust in the food systems may be distinguished between trust in food labelling itself and the consumers' trust in the food supply chain (Tonkin, Wilson, Coveney, Webb, & B Meyer, 2015). The inclusion of consumers' opinions in the reformulation of the law may not be acknowledged by the "consumers" themselves, however, this was a strategy to make consumers feel as if they are part of the food

process. Thus, confidence could be improved if there was transparency in the process of collecting and reporting food and nutrition information is ensured. Enforcing policies, which guarantees reliance on food labelling, would require mechanisms of inspection and compliance to be established (Food and Agriculture Organization of the United Nations, 2016; Pappalardo, 2012). The FIC regulation brought transparency to the mandatory available information as the description of the ingredients list, presence of allergens and the origins product. The rebuilding of trust in the food system should be considered to enhance transparency, proactivity, consistency, the collaboration of the intermediaries and consider consumers' opinions, timing, and implementation of procedures/protocols, as suggested by these authors (Wilson et al., 2017).

The "satisfaction with the layout presentation" had the lowest percentages, with only half of the participants being "satisfied/very satisfied", in comparison to the aspects assessed in the first section. **G6** (Quality control and food safety, inspection, and consulting) and **G3** (Food industry, innovation, marketing, and laboratory analysis) professionals were those who presented the highest percentage of satisfaction. This was expected because they are associated with ensuring compliance with the specific requirements of the presentation and content of label information (Food and Agriculture Organization of the United Nations, 2016). Particularly, **G6** (Quality control and food safety, inspection, and consulting) professionals indicated to be more satisfied with the layout information, specifically, dietary reference intakes, nutrition claims and font size when compared to other professional groups. Regarding the attitudes towards satisfaction of nutrition information, available evidence showed that food and nutrition labelling should focus on ways to capture consumers' attention, decrease label complexity, and convey numeric nutrition information in a simpler and more meaningful way (Cowburn & Stockley, 2005; Directorate-General Health & Consumer protection, 2006; Grunert & Wills, 2007; Roberto & Khandpur, 2014). This may be done by providing a complete interpretation of food labels with simpler text, reducing the use of percentages and "easy-to-understand" presentation of portion sizes information, consequently, this may lead to an increase in the motivation to use it and in the label layout satisfaction (Gomes et al., 2017; Gregori et al., 2014; Grunert & Wills, 2007; Van der Colff, Van der Merwe, Bosman, Erasmus, & Ellis, 2015). There has been an ongoing effort made by the EU in committing to a harmonization of the legal content of the label, and subsequently developing a consumer-friendly form of labelling presentation (Direção-Geral da, Graça, & Gregório, 2019; European Commission, 2020; Regulation (EU) No 1169/2011).

369 The agreement with label attributes (credibility, readability, comprehensibility and
370 adequacy) by the FNP about the new rules of content, layout and legibility had to be
371 considered (European Commission, 2014a; Kasapila & Shaarani, 2016). A harmonised
372 legislation on nutrition labelling might reduce the discrepancy in the provisioning of
373 nutrition information and mediate the consumers' expectations. With regards to the EU
374 food labelling rules, the Portuguese professionals "agree/strongly agree" that the
375 mandatory information in labelling should be in a clear format and in the same field of
376 vision. Another significant result was the importance of the declaration of the mandatory
377 specific information on the origin of refined oils and vegetable fats in the list of ingredients
378 by all professionals' groups. Nevertheless, **G3** (Food industry, innovation, marketing and
379 laboratory analysis) professional groups agreed the least with it, as it had already been
380 shown (European Commission, 2017). This seems to reveal that professionals agreed with
381 the strengthening of the rules to prevent misleading practices and promote food safety.

382 Apart from understanding the frequency of reading mandatory food information and
383 its interest in their professional practice, it is important to consider the changes in the
384 presentation and/or content of the BOP nutrition labelling. Mandatory nutrition labelling
385 makes the declaration of food composition and the harmonization of its content imperative,
386 which allows for product comparison. This rule favours the implementation of effective
387 reduction strategies on food reformulation, so as to limit the quantity of ingredients such as
388 salt, *trans*-fatty acids, saturated fatty acids and sugar, which are associated with negative
389 health effects (Commission of the European Communities, 2008; Graça et al., 2018). Such
390 changes will be useless unless they are understood and/or used by the consumer.
391 Previous research showed that there are higher mindfulness and understanding of the salt
392 rather than sodium information (European Commission's science and knowledge service,
393 2018; European Commission, 2014b; Kloss, Meyer, Graeve, & Vetter, 2015). The term salt
394 must be used since the FIC Regulation was applied (Regulation (EU) No 1169/2011). In
395 this study, a considerable number of professionals agreed with this change, mostly by the
396 **G2** (Primary health care, community, and public health) group, as it would lead to informed
397 choices.

398 Furthermore, to understand the real use of BOP information, the available scientific
399 evidence and experimental studies with consumers were analysed. Even though they can
400 understand some of the terms used when looking at nutrition labels, they are still confused
401 by other types of information. Most consumers appear to be able to retrieve simple
402 information, make calculations and establish comparisons between products (presentation
403 of the information must be *per* 100g/ 100mL). However, their ability to interpret the nutrition

label accurately reduces as the complexity of the data increases (Cowburn & Stockley, 2005). This way, the voluntary portion size of prepacked foods may be determinant in the quantity of buying, eating, or preparing, so it can help consumers to monitor their nutritional intake. The variety of measuring methods and specifications used to determine the food portion size has brought disagreements on establishing portion size recommendations by policymakers, health professionals, manufacturers, food distributors and foodservice (Kliemann et al., 2018). In this study, almost fifty per cent of the **G3** (Food industry, innovation, marketing, and laboratory analysis) professionals agreed with this supplementary information. This measure has not yet been implemented due to the lack of consensus in defining the food portion size and the risk of making the message confusing to the consumer, even though it may have a beneficial effect on health (Almiron-Roig, Navas-Carretero, Emery, & Martinez, 2018; Kirk, de Looy, Fletcher, & Ruxton, 2007; Kliemann et al., 2018). The FIC Regulation allows for the fibre content declaration on the nutrition label, to be voluntary. This study showed that different professional groups expressed little agreement with this change, and they shared some concerns about this non-obligatory amendment. Prior to the implementation of the FIC Regulation, there was a period of discussion regarding the strategies that would be considered. It was also mentioned that the fibre content could have an impact on product reformulation. On one hand, the fibre content on BOP nutrition labelling remained optional, to simplify and provide only essential information, which prevents consumers from getting confused when making food choices. On the other hand, these requirements do not completely correspond to the nutritional elements that consumers value the most (Commission of the European Communities, 2008).

The use of additional forms of expression and presentation of the nutrition declaration in the front-of-pack may be an alternative format for providing nutritional information, helping consumers to more easily understand and use the essential information when purchasing foods (Roberto & Khandpur, 2014). Although the potential was recognised, there were still divergent opinions on the best way to apply this strategy, which is why it remains optional (Directorate-General Health & Consumer protection, 2006; European Food Information Council, 2018; Kanter, Vanderlee, & Vandevijvere, 2018; TNS European Behaviour Studies Consortium final report, 2014). In this study, divergent opinions were also found, **G6** (Quality control and food safety, inspection and consulting) professionals expressed that FOP nutrition labelling might be a repetition of information on the label (European Commission, 2020; Kirby, 2016). The colours of the traffic lights scheme were also recognised by all groups of professionals, excluding **G3** (Food industry,

439 innovation, marketing, and laboratory analysis), as being a way to improve nutrition
440 labelling comprehension. It was found that consumers want FOP nutrition labelling to
441 evaluate nutrition and food quality by promoting guidance, information and help with food
442 choices (Kleef & Dagevos, 2015). Instead, many consumers either do not read nutrition
443 labels or are not able to interpret the information on these labels correctly (Gregori et al.,
444 2014; Kasapila & Shaarani, 2016). A colour-coded scheme might be a useful strategy to
445 help consumers identify products containing high levels of sugar, salt, fat and saturated
446 fat, and to facilitate the comparison between similar products (Gomes et al., 2017; Gregori
447 et al., 2014; The European Consumer Organization (BEUC), 2015). Additionally, in this
448 study, at least half of the professionals agreed that this information can favour their
449 activity, although **G3** (Food industry, innovation, marketing and laboratory analysis)
450 professionals do not share the same opinion. This has already been stated by a
451 researcher (Roberto & Khandpur, 2014).

452 The limitations of this study are related to using an online self-administered survey
453 since the comprehension errors could not be clarified by the research team. Furthermore,
454 the fact that the survey was web-based, might constitute an accessibility limitation for
455 some professionals, on one hand, but on the other hand, as advantages, an online
456 procedure allowed the collection of a larger sample from different geographic locations of
457 the country in a quick and convenient way. The multiplicity of the professionals'
458 background in the food supply chain, may increase the difficulty in formulating questions
459 using generic technical language, simple enough to suit all respondents. Consequently,
460 distinct individuals may have interpreted the questions differently. In addition, given the
461 data requirements and the technical nature of the subject, the survey might be considered
462 long and complex. Even though there are some limitations to the research, some strong
463 points should also be considered. The target population (food and nutrition professionals),
464 up to date, has not been the focal point of many investigations on food consumption and
465 nutrition. Nevertheless, these professionals can bring relevant health-related and political
466 inputs, as users of the food and nutrition labelling information.

467 Web-based surveys are being used in other studies in the same scope (such as
468 those performed by the EUFIC and the European consumer market studies). One of the
469 advantages of this type of data collection is that it is the most cost-effective and efficient
470 way of gathering large amounts of data from different respondents (Campos et al., 2011;
471 European Commission DG SANCO, 2006; European Food Information Council, 2011;
472 Nielsen, 2012).

473 It was considered a professional "view" since professionals can see and perceive
474 food and nutrition labelling as an important tool of their professional activity. Differences
475 were found in the way it is used, as a result, of the different professional/ academic
476 backgrounds and areas of activity. Thus, food and nutrition professionals showed interest
477 and motivation in the usage of labelling, during their professional activity.
478 Health policies should consider how food labelling may empower nutrition education and
479 promote a healthier lifestyle, rather than focusing exclusively on the label's information. It
480 is important to manage the different needs, expectations and requirements of parties when
481 reading the currently available information on the label, as each of them will use and
482 interpret it differently. Those who control information streams can be powerful actors in
483 facilitating or retarding the transition to healthy, sustainable, and affordable diets.

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Table 1. Participants' socio-demographic characteristics, according to the area of activity.

Area of activity (N=295)	G1		G2		G3		G4		G5		G6		p
	Clinical care		Primary health care, community, and public health		Food industry, innovation, marketing, and laboratory analysis		Foodservice		Research, education, and training		Quality control and food safety, inspection, and consulting		
	N	%	N	%	N	%	N	%	N	%	N	%	
	42	14.2	45	15.3	73	24.7	22	7.5	38	12.9	75	25.4	
Sex													
Female (N=239)	41	17.2	40	16.7	50	20.9	20	8.4	23	9.6	65	27.2	<0.001
Male (N=56)	1	1.8	5	8.9	23	41.1	2	3.6	15	26.8	10	17.9	
Marital status													
Single	29	22.8	22	17.3	28	22.0	13	10.2	11	8.7	24	18.9	0.002
Married /Living with a partner	13	8.3	20	12.8	39	25.0	9	5.8	26	16.7	49	31.4	
Divorced	0	0.0	3	25.0	6	50.0	0	0.0	1	8.3	2	16.7	
Residence area													
North	17	18.9	16	17.8	16	17.8	8	8.9	15	16.7	18	20.0	0.005
Centre	14	21.5	5	7.7	18	27.7	6	9.2	6	9.2	16	24.6	
Lisbon Metropolitan Area	4	4.9	9	11.1	25	30.9	4	4.9	13	16.0	26	32.1	
South (Alentejo and Algarve)	4	12.9	4	12.9	8	25.8	1	3.2	2	6.5	12	38.7	
Islands (Madeira and Azores Islands)	3	10.7	11	39.3	6	21.4	3	10.7	2	7.1	3	10.7	
Educational level													
Bachelor's degree	29	9.9	37	12.6	43	14.6	15	5.1	18	6.1	49	16.7	<0.003
Master's degree	12	4.1	8	2.7	21	7.1	7	2.4	7	2.4	22	7.5	
PhD degree	1	0.3	0	0.0	7	2.4	0	0.0	13	4.4	3	1.0	
Courses													
Food and Nutrition Sciences (FNS)	41	31.3	39	29.8	6	4.6	18	13.7	16	12.2	11	8.4	<0.001
Food Engineering or Food Science (FEFS)	0	0.0	1	1.3	29	38.7	4	5.3	7	9.3	34	45.3	
Engineering or Sciences (except Food Engineering or Food Sciences) (ES)	0	0.0	4	4.9	36	44.4	0	0.0	13	16.0	28	34.6	
Occupation													
Academic	0	0.0	2	9.1	7	31.8	0	0.0	12	54.5	1	4.5	<0.001
Engineer	0	0.0	1	2.9	15	42.9	0	0.0	8	22.9	11	31.4	
Dietitian	41	33.6	38	31.1	6	4.9	18	14.8	11	9.0	8	6.6	
Food quality & safety	0	0	0	0	16	25.8	2	3.2	4	6.5	40	64.5	
Management	0	0	0	0	19	67.9	2	7.1	2	7.1	5	17.9	
Food technician	1	14.3	0	0	2	28.6	0	0	0	0	4	57.1	
Others	0	0.0	4	21.1	8	42.1	0	0.0	1	5.3	6	31.6	

Differences between groups - Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

Table 2. The general perspective of a sample of Portuguese food and nutrition professionals regarding food and nutrition labelling (N=295).

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	p
Importance of food labelling for professionals¹	100	100	97.3	100	97.4	97.3	98.3	0.114
Frequency of mandatory food information read in professional practice²								
- name of the food	57.1	60.0	89.0	77.3	65.8	85.3	75.3	<0.001
- list of ingredients	97.6	95.6	82.2	81.8	76.3	88.0	87.1	0.455
- date of minimum durability or the 'use by' date	71.4	57.8	84.9	100	81.6	90.7	81.0	<0.001
- net quantity of the food	64.3	60.0	63.0	54.5	63.2	64.0	62.4	0.443
- storage conditions and/or conditions/ instructions of use	35.7	55.6	71.2	95.5	68.4	72.0	65.4	<0.001
- allergens information	50.0	55.6	67.1	90.9	52.6	74.7	64.7	<0.001
- country of origin or place of provenance	26.2	48.9	68.5	45.5	63.2	61.3	55.1	<0.001
- nutrition claims	76.2	77.8	61.6	68.2	65.8	66.7	68.5	0.515
- lot number	4.8	15.6	52.1	68.2	31.6	69.3	42.7	<0.001
- name or business name and address of the food business operator	7.1	17.8	63.0	50.0	47.4	56.0	43.4	<0.001
- nutrition labelling	83.3	86.7	71.2	81.8	60.5	76.0	75.9	0.019
- health claims	64.3	71.1	45.1	59.1	65.8	57.3	58.6	0.335
- quantity of certain ingredients or categories of ingredients - Quantitative Ingredient Declaration (QUID)	90.5	82.2	68.5	63.6	68.4	64.0	72.2	0.109
Uses labelling in the professional activity on a daily basis²	88.1	80.0	75.3	95.5	50.0	85.3	78.6	0.007
Trust in information / labelling³	78.6	68.9	58.9	77.3	52.6	64.0	65.1	0.047
Satisfaction with the layout information⁴	42.9	40.0	60.3	54.5	42.1	62.7	52.5	0.042
- specific technical terms	40.5	20.0	50.7	45.5	47.4	46.7	42.9	0.058
- type of information packaging	45.2	44.4	57.5	45.5	44.7	50.7	49.7	0.149
- quantity of information	42.9	37.8	49.3	40.9	42.1	36.0	41.7	0.096
- font size	19.0	13.3	35.6	18.2	26.3	41.3	28.8	<0.001
- symbols used	23.8	28.9	43.8	31.8	36.8	44.0	36.9	0.125
- dietary reference intakes	19.0	31.1	42.5	31.8	39.5	54.7	39.3	<0.001
- nutrition claims	21.4	31.1	46.6	18.2	36.8	53.3	39.0	0.004
- portions	28.6	35.6	43.8	40.9	44.7	50.7	42.0	0.335
Importance of mandatory nutrition labelling¹	97.6	97.8	80.8	81.8	86.8	81.3	86.8	<0.001
Confidence in the values presented³	83.3	68.9	50.7	54.5	50.0	52.0	58.6	0.003
Influence of labelling on professionals' choices²	92.9	88.9	64.4	68.2	60.5	61.3	71.2	<0.001

Differences between groups - Crosstabs ¹(χ^2) Pearson and ²Kruskal-Wallis test with statistical significance ($p < 0.05$).

¹ The values presented correspond to the sum of all positive answers namely "some importance" and "high importance".

² The values presented corresponded to the sum of the answers "often" and "always".

³ The values presented correspond to the sum of all positive answers namely "very trustworthy" and "totally trustworthy".

⁴ The values presented correspond to the sum of all positive answers namely "satisfied" and "highly satisfied".

G1 (Clinical care), **G2** (Primary health care, community and public health), **G3** (Food industry, innovation, marketing and laboratory analysis), **G4** (Foodservice), **G5** (Research, education and training), and **G6** (Quality control and food safety, inspection and consulting).

Table 3. Food professionals' view about the new EU regulation: content, presentation, and legibility.

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	P
Mandatory information layout visible, legible and clear	100	100	98.6	95.5	97.4	98.7	98.6	0.060
Mandatory information in their field of vision and in a clear format	97.6	95.6	76.7	100	86.8	89.3	88.8	0.004
Name, allergens, net quantity and the date of durability should always appear	100	97.8	87.7	100	89.5	94.7	93.9	0.361
Highlighting allergens in the list of ingredients	97.6	95.6	79.2	86.4	86.8	96.0	90.2	0.507
Mandatory specific information (%) on vegetable origin of refined oils and fats	95.2	95.6	64.4	95.5	84.2	74.7	81.0	<0.001
Rules to avoid misleading practices ex: substitute ingredient in "imitation foods"	92.9	93.3	82.2	86.4	89.5	88.0	88.1	0.685
Availability of mandatory information when purchasing from distance	100	84.4	86.3	100	86.8	86.7	89.2	0.086
Specific information accompanying the name of the food (processing/ treatment)	97.6	95.6	91.8	90.9	92.1	94.7	93.9	0.124

Differences between groups - Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

The values presented correspond to the sum of all positive answers namely "agree" and "strongly agree".

Table 4. Mandatory "back-of-pack" nutrition labelling: comparison of the main changes.

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	P
Positive change in the sequence of nutrition information (energy value and amounts of nutrients)	59.5	75.6	63.0	59.1	63.2	72.0	66.4	0.304
Mandatory nutrition information per 100g / 100mL of the food (order of appearance)	69.0	80.0	69.9	86.4	68.4	80.0	74.9	0.838
Additional food portion size (per portion or per consumption unit of the product)	21.4	17.8	54.8	27.3	28.9	44.0	36.3	<0.001
Additional portion-based declaration as an advantage for the consumer	85.7	86.7	80.8	86.4	94.7	85.3	85.8	0.177
Energy value and nutrient amounts expressed in % of the reference intakes (RIs) per 100g or 100ml with "reference intake on an average adult (8400 kJ/2000 kcal)"	57.1	57.8	60.3	50.0	63.2	66.0	61.0	0.376
Vitamin and mineral values expressed % of nutrient reference values (NRVs) per 100g or 100ml (if present in significant amounts)	69.0	53.3	60.3	59.1	57.9	60.0	60.0	0.810

Differences between groups - Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

The values presented correspond to the sum of all positive answers namely "agree" and "strongly agree".

Table 5. Mandatory “back-of-pack” nutrition labelling: Other changes in the presentation/ content.

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	p
Voluntary declaration of “supplementary” nutrients – fibre	11.9	8.9	38.4	27.3	26.3	37.3	27.5	<0.001
Use salt rather than sodium	88.1	91.1	79.5	81.8	78.9	88.0	84.7	0.005
Mandatory nutrition labelling may be supplemented with an indication of the amounts of one or more of the following: monounsaturated fatty acid, polyunsaturated fatty acid, polyols, starch, fibre and vitamins or minerals	85.7	93.3	69.9	81.8	84.2	80.0	81.0	0.316
Cholesterol is not included on the list of mandatory or voluntary nutrients	31.0	35.6	23.3	27.3	31.6	29.3	29.2	0.726
Changes in nutrition labelling provide better reading and understanding for consumers	66.7	68.9	74.0	72.7	65.8	70.7	70.2	0.648

Differences between groups - Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

The values presented correspond to the sum of all positive answers namely “agree” and “strongly agree”.

Table 6. Future uses of “front-of-pack” nutrition labelling: additional forms of expression and presentation of the nutrition declaration

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	p
Advantage of the graphical forms or symbols on the FOP nutrition labelling for consumer's choice	90.5	88.9	65.8	86.4	84.2	86.7	82.0	0.168
They make it easier to read the nutrition labelling	85.7	88.9	68.5	81.8	78.9	85.3	80.7	0.435
They promote a better understanding of the nutrition labelling	78.6	82.2	58.9	72.7	68.4	78.7	72.5	0.060
The colour of the traffic lights makes it easier to understand the nutrition labelling	81.0	86.7	57.5	86.4	81.6	78.7	75.9	0.046
FOP nutrition labelling favours your professional activity	64.3	71.1	30.1	77.3	50.0	54.7	53.6	<0.001
FOP nutrition labelling might be a repetition of information on prepacked food labels	47.6	44.4	64.4	45.5	52.6	65.3	56.3	0.020

Differences between groups - Kruskal-Wallis test with statistical significance ($p \leq 0.05$).

The values presented correspond to the sum of all positive answers namely “agree” and “strongly agree”.

G1 (Clinical care), **G2** (Primary health care, community, and public health), **G3** (Food industry, innovation, marketing and laboratory analysis), **G4** (Foodservice), **G5** (Research, education and training), and **G6** (Quality control and food safety, inspection and consulting).

IV. APPENDIX 4 - 1ST ABSTRACT AND POSTER

Figure 6 - “Food and nutrition professionals’ views and use of food and nutrition labelling” abstract.

CONCLUSÕES: Os pacientes do Hospital 2 avaliaram melhor a dieta hospitalar, mostrando que as refeições em cook-chill podem ser bem aceitas por idosos hospitalizados, prevenindo a desnutrição hospitalar.

PO105. O PROJETO DE EXTENSÃO UNIVERSITÁRIA “ALIMENTAÇÃO, NUTRIÇÃO E ENVELHECIMENTO”: 25 ANOS DE EXPERIÊNCIA DO TRABALHO EDUCATIVO COM IDOSOS – UERJ, RIO DE JANEIRO, BRASIL

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Diante do crescimento da população idosa, o Instituto de Nutrição, em parceria com a Universidade Aberta da Terceira Idade, criou o Projeto de Extensão Alimentação, Nutrição e Envelhecimento para desenvolver ações assistenciais e educativas. A valorização do diálogo, respeito aos diferentes saberes, estímulo à autonomia, atenção às necessidades específicas do idoso e utilização de metodologia lúdica e interativa são nortes metodológicos. O objetivo do presente trabalho é compartilhar a experiência das ações educativas com idosos ao longo dos 25 anos de existência. Realizou-se análise documental no acervo do projeto. O material escrito inclui formulários de planejamento e cadernos de campo. Há consentimento informado dos participantes. A trajetória será apresentada sob a forma de linha temporal, destacando-se: perspectivas teóricas que fundamentam as ações, modalidades de ações educativas, temas selecionados, estratégias metodológicas e recursos utilizados. A orientação alimentar individualizada e “palestras” baseadas na prevenção de doenças marcaram o início do projeto. A experiência ampliou seu escopo e foram desenvolvidas diferentes ações coletivas: “Grupo Sala de Espera”, “Grupo Nutrição e Psicologia”, “Curso Nutrição e Terceira Idade”, “Grupo Roda da Saúde”, “Rodas de Conversa”, que apoiadas no referencial teórico da promoção da saúde e da educação popular em saúde valorizaram a vertente do alimento, a troca de saberes entre profissionais e idosos e a problematização do comer na vida cotidiana. A criatividade e a ousadia na seleção de temas, estratégias e recursos foram desafios e frutos de reflexão e avaliação do trabalho. São exemplos de temas: alimentação e marketing, alimentos da moda, alimentação e sustentabilidade; e, nas estratégias metodológicas: dramatização, jogos, oficinas culinárias. Produção de mural, apostilas e folders também integram essa trajetória. A experiência possibilitou um debate instigante sobre a complexidade do campo da Alimentação e Nutrição, sua inter-relação com a saúde e a valorização do trabalho educativo para a formação profissional.

PO106. FOOD AND NUTRITION PROFESSIONALS' VIEWS AND USE OF FOOD AND NUTRITION LABELLING

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INTRODUCTION: Food and nutrition labelling (FNL) can be an important information

tool for food-related professionals. However, professionals' views and use of FNL remains to be studied.

OBJECTIVES: 1) To explore the importance of FNL among different groups of professionals; 2) To understand the use and interest of FNL in their professional activity.

METHODOLOGY: A cross-sectional study was conducted from 12/2016 to 4/2017, using a self-administered online questionnaire developed with LimeSurvey®. Professional overview on FNL included: frequency of reading of mandatory information, recognised importance, use, confidence and satisfaction with the presentation of information. Eligible criteria were: to be >=18 years, to live in Portugal and to have a professional activity in the food/nutrition area. Request to participate was sent by email to governmental/non-governmental agencies, professional and business associations, and higher education institutions in the food area. Respondents were grouped according to their professional expertise as it follows: G1 “Clinical care”, G2 “Primary health care, community and public health”, G3 “Food industry, innovation and laboratory analysis”, G4 “Food service”, G5 “Research, education and training” and G6 “Quality control, food safety, inspection and consulting”. Responses were analysed using IBM/SPSS (version 24). Non-parametric Kruskal-Wallis and X2 tests were used to identify differences amongst groups.

RESULTS: The sample includes 295 participants (241 women; 81%), married (53.2%), average age 39 years, and with high level of education. All professional groups indicate FNL as an important issue in their daily practice (97-100%). 95% of “Food service” professionals use “almost always/often/always” labelling in their activity. Compared to others, this group stands out by reading, “use by date”, “special conditions of storage and/or use”, “presence of allergens” and “nutrition labelling”. G2 were more likely to read the “nutrition declaration”, G3 the “the name of the food” and “country of origin”, and G6 the “food operator data”.

CONCLUSIONS: FNL was considered to be important by all professional groups under research. However significant differences were found amongst the various groups, which seem to reflect the scope of their daily activity.

PO107. RELACIONAM-SE OS CONHECIMENTOS CULINÁRIOS COM OS HÁBITOS ALIMENTARES SAUDÁVEIS DE ESTUDANTES UNIVERSITÁRIOS?

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INTRODUÇÃO: Durante a fase universitária os estudantes tendem a adotar condutas alimentares pouco saudáveis caracterizadas pelo baixo consumo de frutas e verduras e alta ingestão de alimentos ricos em gorduras e açúcares.

OBJETIVOS: Pesquisar a diferença em ter conhecimentos culinários e não tê-los em variáveis antropométricas e hábito alimentar.

METODOLOGIA: 145 participantes (51 homens e 84 mulheres) entre 20 e 50 anos (média= 25,33) participaram nesta pesquisa. Registrou-se peso, percentagem de gordura corporal e visceral. A relação cintura/quadril e o Índice de Massa Corporal (IMC) foram calculados. Para avaliar a ingestão alimentar recorreu-se à aplicação de um questionário de frequência alimentar (QFA), onde foi feita a pergunta: ‘Você tem conhecimentos culinários?’ (Alternativas de resposta: Sim ou Não) e divididos em dois grupos (grupo 1 = Conhecimento; grupo 2 = Sem conhecimento).

RESULTADOS: Os grupos foram comparados com as variáveis indicadas observando uma dependência de género ($p=0,016$), por tanto, realizaram-se as análises por género. Os homens do grupo 1 apresentaram diferenças em relação ao grupo 2, maior consumo de verduras ($p=0,002$) e o grupo 2 mostrou significativamente maior consumo de açúcares ($p=0,03$), gordura visceral ($p=0,002$) e índice cintura/quadril ($p=0,007$). As mulheres mostraram diferenças entre os grupos em consumo de pão ($p=0,01$) e gorduras ($p=0,004$) e alimentos elaborados ($p\leq0,001$) com pontuações maiores no grupo 2.

Figure 7 - “Food and nutrition professionals’ views and use of food and nutrition labelling” poster.

FOOD AND NUTRITION PROFESSIONALS' VIEWS AND USE OF FOOD AND NUTRITION LABELLING



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Objectives

2

- To explore the importance of food and nutrition labelling among different groups of professionals,
- To understand the use and interest of food and nutrition labelling in their professional activity.

Introduction

1

Food and nutrition labelling (FNL) is an important information tool for food-related professionals. Professionals' views and use of FNL need therefore to be explored.

Results

4

The sample includes 295 participants (241 women; 81%), married (53.2%), with an average age of 39 years, and a high level of education.

All professional groups indicate FNL as an important issue in their daily practice (97% to 100%). Comparing professionals groups, G4 professionals stand out by reading use by date, special conditions of storage and/or use, presence of allergens. G2 were more likely to read the nutrition labelling, G3 the name of the food, the country of origin and the food operator data, and G6 the lot. 95% of G4 professionals use "often/always" labelling in their activity. G1 professionals have higher reliance on information and in the values presented in the labelling. G6 was the group more satisfied with FNL presentation. Professionals from G1 and G2 considered very important the mandatory nutrition labelling. Furthermore, G1 professionals' food choice was influenced by information presented in labels (Table).

Conclusions

5

- Food and nutrition labelling was considered to be important by all professional groups under research.
- Significant differences among the various professional groups were found, which reflect the scope of their daily activity.

Methods

3

A cross-sectional study was conducted from December|2016 to April|2017, using a self-administered online questionnaire developed with LimeSurvey®. Professional overview on FNL included: frequency of reading mandatory information, recognised importance, use, confidence and satisfaction with the presentation of information. Eligible criteria were: to be ≥18 years, to live in Portugal and to have a professional activity in the food/nutrition area. Invitation to participate was sent by email to governmental/non-governmental agencies, professional and business associations, and higher education institutions in the food area. Respondents were grouped according to their professional expertise as it follows:

G1 Clinical care | G2 Primary health care, community and public health | G3 Food industry, innovation and laboratory analysis | G4 Food service | G5 Research, education and training and G6 Quality control, food safety, inspection and consulting.

Responses were analysed using IBM/SPSS (version 24). Non-parametric *Kruskal-Wallis* and *chi-square* tests were used to identify differences amongst groups.

Table - Professional overview on Food and Nutrition Labelling .

%	G1 (14.1)	G2 (15.2)	G3 (25.3)	G4 (7.4)	G5 (12.8)	G6 (24.6)	Total (N = 295)	P
Importance of food labelling by professional	100	100	97.3	100	97.3	97.2	98.3	0.108
Frequency of consultation in professional practice								
- the name of the food	57.1	60	89.3	77.3	65.8	84.9	75.3	0.000
- the list of ingredients	97.7	95.6	82.7	81.8	76.3	87.6	87.1	0.463
- the date of minimum durability or the 'use by' date	71.4	57.8	85.3	100	81.6	90.4	81	0.000
- the net quantity of the food	64.3	60	64	54.5	60.1	63	62.4	0.410
- any special storage conditions and/or conditions of use or instructions for use	35.8	55.6	70.7	95.4	68.4	72.6	65.5	0.000
- allergens present in the food	50.3	55.6	68	90.9	52.7	74	64.7	0.000
- the country of origin or place of provenance	26.2	48.9	68	45.5	63.2	61.6	55.3	0.000
- the nutrition claims	76.2	77.8	62.5	68.2	65.8	65.8	68.5	0.535
- the lot	4.8	15.5	52	68.2	31.6	69.9	68.5	0.000
- the name or business name and address of the food business operator	7.1	17.8	62.7	50	47.3	56.2	43.4	0.000
- the nutrition labelling	83.3	86.7	72	81.8	60.5	75.3	76	0.020
- the health claims	64.3	71.1	46.7	59.1	65.8	56.2	58.7	0.443
- the quantity of certain ingredients or categories of ingredients	90.4	82.3	68	63.7	68.4	64.3	72.2	0.108
Uses labelling in day-to-day / professional activity	88.1	80	76	95.5	50	84.9	78.7	0.007
Reliance on information / labelling	78.6	68.8	60	77.3	52.6	63	65.1	0.049
Satisfaction with the presentation of information	42.9	40	61.3	54.5	42.1	61.6	52.6	0.039
Importance of mandatory nutrition labelling	97.7	97.7	81.4	81.8	86.9	80.9	86.8	0.000
Confidence in the values presented in the nutrition labelling	83.3	68.9	50.6	54.6	50	52.1	58.6	0.003
Food choice influenced by information on labelling as a professional	92.9	88.9	64	68.1	60.5	61.7	71.2	0.000

The percentages correspond to the sum of positive answers. The groups with the highest percentage are highlighted.

V. APPENDIX 5 - 2ND ABSTRACT AND POSTER

Figure 8 - "Food-related professional's view on food and nutrition labelling" abstract

ast meat from E group (5.01 g fat/100 g dry matter) compared to C group (7.53 g fat/100 g dry matter). Group E also recorded the best values for the alpha linolenic fatty acid, essential to human health, determined in the breast meat (2.86 g /100 g total fatty acids) compared to C group (0.55 g /100 g total fatty acids).

Conclusions: In conclusion, the level of alpha-linolenic fatty acid obtained in the breast meat from broilers fed diet with full fat soy has increased 5 times more than in C group.

Keywords: Linolenic acid. Full fat. Meat.

156 Food related professional's view on food and nutrition labelling (FNL)

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Introduction: The views and use of FNL in their area of occupation by professionals working in the food and nutrition related areas have been scarcely investigated.

Objectives: To explore and compare the importance of FNL by different groups of professionals.

Methods: A cross-sectional study was conducted in 2016/2017, using one online questionnaire (LimeSurvey®). Eligible criteria were: to be >= 18 years, to live in Portugal, to have a professional activity in the food/nutrition area. Invitations were sent to governmental/non-governmental agencies, professional, business associations, and higher education institutions. Respondents were grouped according to their professional expertise: G1 "Clinical care", G2 "Primary health care, community and public health", G3 "Food industry, innovation and laboratory analysis", G4 "Food service", G5 "Research, education and training" and G6 "Quality control, food safety, inspection and consulting". Responses were analysed using IBM/SPSS (version 24). Non-parametric Kruskal-Wallis and X2 tests were used to identify differences amongst groups.

Results: 295 participants (241 women; 81%), married (53.2%), average age of 39 years, and highly educated. All groups indicate FNL as an important issue in their daily practice (97% to 100%). 95% of G4 professionals use "often/always" labelling in their activity. G1 have higher reliance on information and values presented in the labelling. G6 were the more satisfied with FNL presentation. 92.9% of G1 considered food choice to be influenced by information.

Conclusion: FNL was considered to be important by all groups but differences in the way it is used professionally differs according to the background education and area of work.

Keywords: Food labelling. Nutrition labelling. Food-related professionals.

157 Nutritional evaluation, including phenolic components, and the risk of exposure to contaminants of the diet, in students of the degree in biotechnology, of the university of Granada

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Introduction: The Mediterranean diet has been linked to health benefits and lower risk of mortality (Trichopoulou et al., 2014). Likewise, the high concentration of polluting chemical products present in food generates serious health risks (Rather et al., 2017).

Objective: To analyze the nutritional status of a representative sample of students of the Degree in Biotechnology of the University of Granada, through the assessment of dietary intake of nutrients, contaminants and phenolic components of the diet.

Method:

1. Diet assessment questionnaires: Food Frequency Questionnaire (CFCA), PREDIMED (14 items), repeated 24 hours recall.
2. Food and Health Program (v. 2.0) (nutritional evaluation).
3. Ribefood Software (2007) (evaluation of contaminants).
4. PhenolExplorer 3.6 Database (<http://phenol-explorer.eu/>) (determination of phenolic compounds).
5. Anthropometric measurements (height (m), weight (kg) and body mass index (BMI)).
6. Excel and R-statistics 3.5 (<http://r-statistics.co/>) (statistical treatment).

Results: The subjects surveyed showed an imbalance in the intake of energy and some nutrients. The questionnaire for prevention with DIET MEDiterránea (DMe) (PREDIMED) revealed the relationship between DMe adherence and a better intake profile of phenolic components. The levels of contaminants did not exceed the established maximum limits, but they were related to foods of habitual consumption in the population studied.

Conclusions: The increase in adherence to the Mediterranean Diet, the improvement in the intake profile of certain nutrients and the decrease in the content of contaminants in the diet are necessary nutritional intervention guidelines for students of the University of Granada.

Keywords: Nutritional Evaluation. Mediterranean Diet. Contaminants. Students. University of Granada.

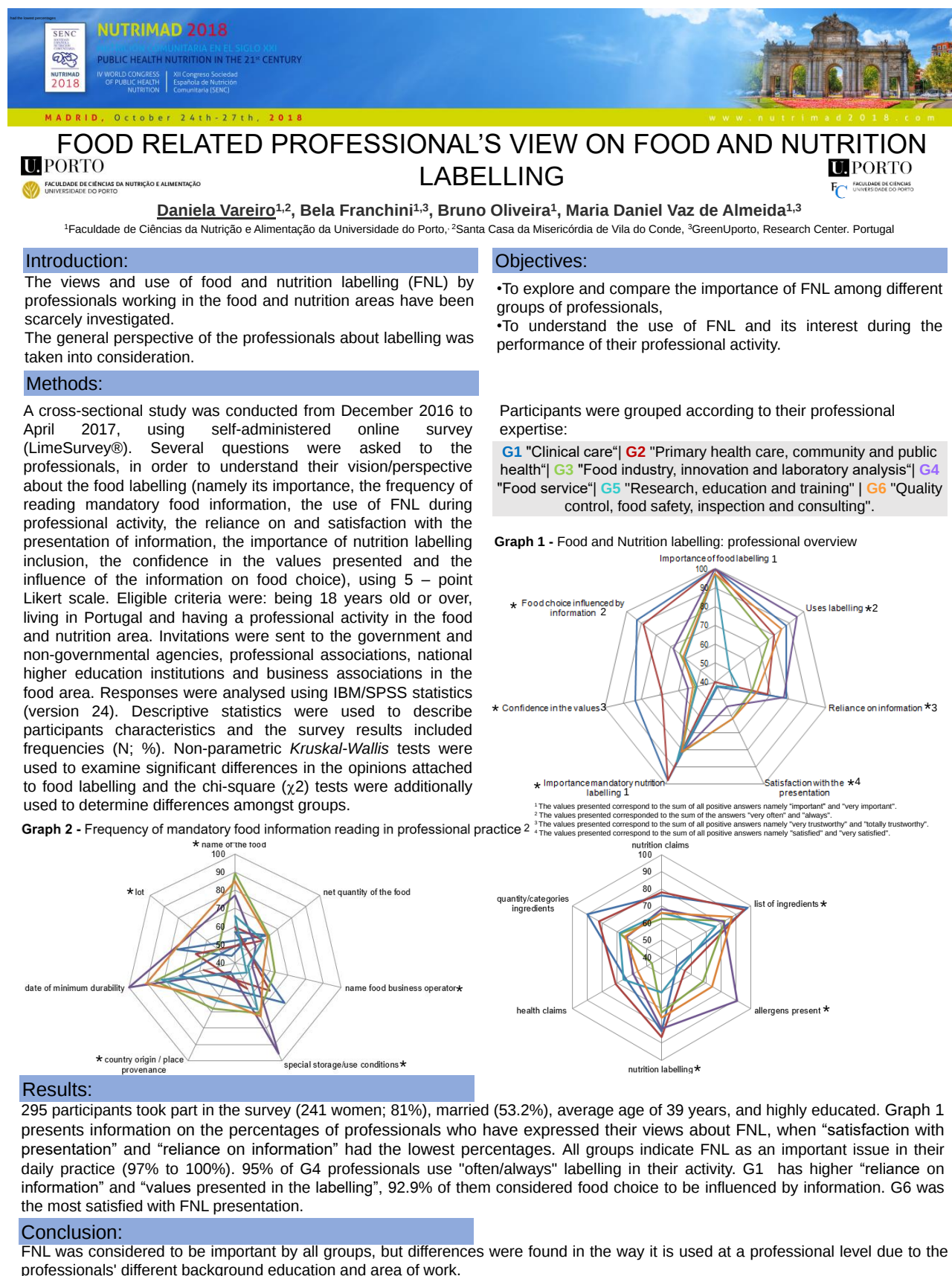
158 New recipe calculation procedure included in Spanish food composition database (BEDCAP)

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Introducción: Analytical data of food composition is the best way to obtain nutritional information of a food or composite food, but it is expensive and time consuming (Bell et al., 2006). This limitations could be avoid using a recipe calculation procedure in order to obtain the "missing values", but nutrients losses and gains factors after cooking should be considered (Bognár et al., 2002).

Figure 9 - “Food-related professional’s view on food and nutrition labelling” poster.



1 **Abstract:** Objective: The present study aims to assess the position of a
2 sample of Portuguese food and nutrition professionals' regarding food and
3 nutrition labelling for pre-packaged food products - Regulation (EU) No
4 1169/2011.

5 Design: A cross-sectional study was conducted. The agreement level towards
6 European food labelling and general overview of labelling (importance, reading,
7 use, trust and satisfaction) was explored via Likert-scale and open-ended
8 questions through a self-administered online survey.

9 Setting: Portuguese Food and nutrition professionals.

10 Participants: Several Portuguese Food and Nutrition entities were contacted
11 using institutional or professional emails and were asked to disseminate the
12 study through their members within the food and nutrition area.

13 Results: The sample was constituted of 297 participants, 81.1% women, the
14 average age of 39 years old, with academic degrees in the food area. A cluster
15 analysis was carried out. Three different positions were found in the way food
16 and nutrition labelling was perceived by professionals: cluster 1 - confident
17 (122, 41.1%), cluster 2 - sceptical (70, 23.5%) and cluster 3 - enthusiast
18 (105, 35.4%). In line with their education background, professional activity,
19 the food supply chain stages where the professionals intervene, according to
20 their main area of activity ("production", "processing, trade, and regulation",
21 and "consumption") and their main concerns regarding food (food processing,
22 food safety and food health), the positions may vary.
23 Conclusions: Three different positions emerged (confident, sceptical and
24 enthusiast) regarding the way food and nutrition labelling and the Regulation
25 (EU) No 1169/2011 were perceived by professionals.

26

27 INTRODUCTION:

28

29 The expansion of the European Union, the ongoing increase in cross border trade and
30 cooperation on standardization of food labelling is nowadays more important than ever.
31 Standardization is not solely a technical issue, but also involves creating durable and sustainable
32 structures to maintain the viability of the accessible data in the entire agri-food sector, 'from farm to
33 fork'. According to *Branca et al*, the "food system" is an interconnection among 'food supply
34 chains' (pre-production, production, processing, distribution, preparation and consumption), 'food

environments' (food availability as food quality and safety; physical, advertising/information and economic affordability), 'consumer's behaviour', 'diets' (based on quantity, quality, diversity and safety), 'nutrition and health outcomes, 'impacts' (social, economic and environmental), and 'political program and institutional actions'. The information presented in packaged food, which results in a combination of all the entities/interventive/ stages of the food system, should be available to the consumers, as it could be a weapon in fighting non-communicable diseases (1). This could be obtained through a combination of numerous synergies, that must follow a series of transversal and guiding rules - food labelling policy (2). Labelling, if used consciously by the general public may improve food literacy, as long as this information is available, which will lead to healthy dietary choices (3-7).

Food labels provide information about the product's identity: the name of the food, the amount of food, the information regarding the food manufacturer and lot number; the ingredients list, which includes information about the relative amounts and composition - quantitative ingredient declaration (QUID), mentioning, as well, food additives and also allergens; the nutrition information on back-of-pack and front-of-pack labels; and the nutrition and health claims. Also, it provides information about product usage conditions, date of minimum durability, quality, origin, processing, preparation, and preservation, regarding food safety (2, 8, 9).

In Europe, the general principles, requirements and responsibilities regarding food labelling were applied when the "Food Information to Consumers" (FIC) regulation was implemented (10, 11). This Regulation was imposed to all food business operators, at all stages of the food supply chain, where their activities concerned the provisioning of food information to consumers. The back-of-pack nutrition labelling (BOPNL) has become mandatory for pre-packed foods since December 13th, 2016, including the energy value of the product and 6 nutrients (fat, saturated fat, carbohydrates, sugars, proteins and salt), expressed per 100 g or 100 ml of the product. The use of symbols on the front-of-pack nutrition labelling (FOPNL) became possible and voluntary, with the aim of conveying the information in a more consumer-friendly way and lead to healthier product choices (7, 10, 12). Over the past 20 years, there have been several improvements in trends regarding nutrition labelling of packaged foods (2, 8, 9).

Data on **food and nutrition labelling** (FNL) can be interpreted through different perspectives, backgrounds, and levels of knowledge. Some data is more or less important, it may or may not be read by the different stakeholders: professionals of public health nutrition and clinical field, researchers, industry and foodservice, development of governmental policies, as well as consumers (2, 13). From a European perspective, the information now provided on food packaging is considered to be broadly understood by the users. However, it is not correctly used to make informed choices, as it should be (14). Governments and other organizations could improve their

70 guidance and find better ways to tackle the barriers of the usage of FNL and clarify areas around it,
71 especially those who deal directly with the source of information.

72 The food and nutrition professionals have a key role in mediating the flow of food and
73 nutrition information presented in labels to the consumers. There is a need to study the position of
74 different **food and nutrition professionals** (FNP) about food labelling and legislation (15, 16). So
75 far, there has been little research on this subject.

76 The present study aims to assess the Portuguese food and nutrition professionals' position regarding
77 food and nutrition labelling and its Regulation (EU) No 1169/2011.

78

79

For Peer Review

81 **METHODOLOGY:**

82

83 **Study design:** A cross-sectional study was developed through a self-administered *online* survey,
84 using the software LimeSurvey®, available at the Faculty of Nutrition and Food Sciences of the
85 University of Porto. Professionals of the food and nutrition area were included in this study.

86

87 **Measures:** After reviewing the relevant literature and considering the FIC Regulation, the survey
88 was developed using previous studies related to general food labelling (17, 18). The professional's
89 perceptions regarding the requirements for nutrition-related information on food labels was also
90 considered (19).

91 The participants were instructed to answer all questions from a professional perspective. The first
92 question intended to identify the main area of activity, within the professional group. Later the
93 answers were sorted into groups which were named G1-G6: **G1** (Clinical care), **G2** (Primary health
94 care, community and public health), **G3** (Food industry, innovation, marketing and laboratory
95 analysis), **G4** (Foodservice), **G5** (Research, education and training) and **G6** (Quality control, food
96 safety, inspection and consulting) from the first question ("Identify the main area of professional
97 activity, choosing only one answer").

98 The survey was organized into five sections and participants were asked to indicate their opinions
99 based on a 5-points *Likert* type scale:

100 - Section A included questions about: the importance given to food labelling by professionals (1 -
101 no importance to 5 - high importance); the frequency of reading the mandatory food information
102 during professional practice (1 - never to 5 - always); the frequency of use of food labelling in
103 professional activity and on a daily basis (1 - never to 5 - always); the level of confidence regarding
104 the information provided by food labelling (1 - do not trust to 5 - totally trustworthy); the level of
105 satisfaction with the presentation of information (1 - highly unsatisfied to 5 - highly satisfied); the
106 importance of the inclusion of nutrition labelling with the FIC regulation (1 - no importance to 5 -
107 high importance); the level of confidence in the values presented in the nutrition labelling (1 - do
108 not trust to 5 - totally trustworthy); and, the influence of labelling on their professional choices (1 -
109 never and 5 - always).

110 - In section B, the professional's opinion about the provision of food information to consumers
111 (with the FIC Regulation) was enquired (1 - strongly disagree to 5 - strongly agree).

112 - The main changes in the content of the nutritional label, before and after the regulation, using a 5-
113 point *Likert* scale of agreement in section C were asked.

114 - In section D, their opinion about the use, benefits and implementation of pictograms or symbols
115 on the FOPNL was considered (1 - strongly disagree to 5 - strongly agree).

116 - In section E, sociodemographic data were collected, which included participants' sex, year of
 117 birth, marital status, geographical area of residency, academic degree, courses and occupation. A
 118 pilot study with a group of 10 participants was carried out in order to test the survey design,
 119 question-wording, sequence and grammar.

120

121 **Participants:** Several Portuguese Food and Nutrition entities were contacted using their
 122 institutional or professional email, such as governmental and non-governmental organizations,
 123 professional associations, higher education institutions and business associations in the food area.
 124 Entities were asked to disseminate the study through their professionals, presenting the object of the
 125 study and inviting them to participate (via a survey *link*).

126 The participants of the survey were food and nutrition professionals working in the food industry,
 127 foodservice ("catering industry"), food business, food control and safety, as well as food
 128 researchers, analysts and process controllers, agronomy, food chemists, chemical engineers, food
 129 marketers, food regulators, food engineers, veterinaries, dietitians and nutritionists.

130

131 **Data collection:** The survey was available from December 2016 to April 2017. It took an average
 132 filling-in time of 12-15 minutes. All responses were anonymous, preserving the confidentiality and
 133 privacy of the participants. For the data analysis, the only participants considered were the ones
 134 who fitted the eligibility criteria, which were: being 18 years old or older, living in Portugal and
 135 having a professional activity in the food and nutrition area.

136

137 **Statistical analysis:** Data management and analysis were conducted using IBM/SPSS statistics
 138 (version 24, IBM Corporation, Chicago, IL, USA).

139 Firstly, the descriptive statistical analysis was performed, followed by an analysis of the multiple
 140 dimensions of the FNP opinions (different sections of the survey). Nonparametric tests were applied
 141 when necessary, in particular, the Kruskal-Wallis test and Chi-square test.

142 A cluster analysis was carried out aiming to explain the common characteristics of the group.
 143 Hierarchical cluster analysis (among groups linkage and Ward's method, both using *z-scored* values
 144 and Euclidean distance as the measure) was used to determine the number of clusters. The
 145 agglomeration schedule's coefficients were analysed with the number of clusters in each stage. The
 146 analysis of the plots obtained through both used methods (among groups linkage and Ward's
 147 method) led to the choice of a 3-cluster solution. The clusters were obtained through k-means
 148 cluster analysis. The professionals' positions concerning food and nutrition labelling were based on
 149 *Pieniak's et al (20)*.

150 The statistical level was set at 0.05. When comparing clusters, Bonferroni's correction was used to
151 adjust p -values for *post-hoc* analysis, in order to avoid the inflation of type I errors.

For Peer Review

153 **RESULTS:**

154

155 The sample was constituted by 297 participants, 81.1% were women, 53.2% married, with an
156 average of 39 years old, with an academic degree and almost 50% of them were from the *food and*
157 *nutrition sciences*.

158

159 • **Survey answers analysis using clusters**

160 The sample was divided into groups: first cluster (122, 41.1%), second cluster (70, 23.5%) and third
161 cluster (105, 35.4%). The socio-demographic characteristics of the sample are presented in **table 1**.

162

163 *Insert table 1 here*

164

165 In section A, 97.9% of the professionals who constituted the different clusters considered food
166 labelling “important/ very important” in their professional activity (**table 2**). It is worth noting that
167 the three clusters presented a low percentage in the “satisfaction with the layout information”, with
168 only 52.5% of the sum of all positive answers. Cluster 1 individuals replied that they were “totally
169 trustworthy/ extremely trustworthy” regarding labelling information and on the presented values of
170 nutrition labelling (69.7% both), they gave more importance to the mandatory nutrition labelling
171 (97.5%) and they were influenced “very often/ always” by labelling on their professional choices
172 (85.3%). When compared to the other two clusters, the individuals of cluster 1 presented the lowest
173 percentage of frequency reading of mandatory food information (name, ‘use by’ date, special
174 storage/use conditions, allergens, origin, lot number and food business operator) and the lowest
175 percentage of satisfaction with the layout information (45.9%), namely font size, symbols, dietary
176 reference intakes and nutrition claims. Among the individuals of cluster 3, 99% gave more
177 importance to food labelling and 94.3% used the information in their professional activity
178 (presenting the highest percentage in all parameters analysed in comparison with the other groups).
179 More than 80% read frequently all the mandatory information and 59% were satisfied with the
180 layout labels (specifically font size, symbols used, dietary reference intakes, nutrition claims and
181 portions). Even though 95.7% of individuals of cluster 2 gave high importance to food labelling,
182 they were the ones who presented the lowest percentage in relation to the other groups, as seen on
183 the reading frequency of mandatory food information (ingredients list, net quantity, nutrition
184 claims, nutrition labelling, health claims and ingredients quantity) in their professional practice.
185 Furthermore, these individuals also had the lowest percentage when compared to the other two
186 clusters, namely 62.9% used food labelling, 32.9% were satisfied with the layout - portions, 52.9%
187 “totally trustworthy/ extremely trustworthy” in the information, 62.9% gave importance to the

188 mandatory nutrition labelling, 41.4% trusted “totally trustworthy/extremely trustworthy” in the
 189 values and 42.9% were influenced “very often/ always” by labelling on their professional choices
 190 (table 2).

191

192 *Insert table 2 here*

193

194 In section B, table 3, the professionals’ opinions about the availability of food information to the
 195 consumers with the FIC Regulation are displayed. More than 90% of cluster 1 individuals
 196 “agreed/strongly agreed” with the main changes regarding the new EU food labelling rules.
 197 However, in the following parameters: “mandatory information layout visible, legible and clear”
 198 and “name, allergens, net quantity and the date of durability should always appear”, they did not
 199 show the highest percentage of agreement, which were the answers with the highest percentage by
 200 cluster 3 participants. Cluster 2 showed the lowest percentages of agreement on all parameters.

201

202 *Insert table 3 here*

203

204 In section C (table 3), regarding the updating of the mandatory BOPNL, there was a parameter that
 205 stood out, due to its low percentage, which was “additional portion-based declaration (per portion
 206 and/or per consumption unit)”. Only 36% of the individuals “agree/ strongly agree” with the
 207 parameter. From these individuals, 18.9% were from cluster 1, 50% were from cluster 2, and lastly,
 208 46.7% were from cluster 3. When comparing to a similar parameter “additional portion-based
 209 declaration as an advantage for the consumer”, the individuals of cluster 1 (91.0%) and cluster 3
 210 (91.4%) are those who “agree/ strongly agree” with this additional information. Cluster 3
 211 individuals also presented the highest agreement values in the following parameters: “Positive
 212 change in the sequence of nutrition information” and “energy value and nutrient amounts expressed
 213 in percentage of the reference intakes per 100g or per 100ml”, with 76.2% in both, 80% on the
 214 “mandatory nutrition information per 100 g/100 ml” and lastly, 67.7% of “vitamin and mineral
 215 values expressed in percentage of nutrient reference values per 100g or per 100ml”.

216

217 Concerning the main changes in the presentation/ content of mandatory BOPNL (table 3),
 218 individuals of cluster 1 demonstrated the highest agreement with the declaration of salt rather than
 219 sodium (89.3%). The same cluster also showed the highest values when it came to the possibility of
 220 supplementing the mandatory nutrition labelling when compared to the other two clusters (90.2%).
 221 Only 27.3% of the total of the professionals “agree/strongly agree” with the parameter “voluntary
 222 declaration of supplementary nutrients - fibre” being optional. Of the individuals of cluster 2, only

223 42.9% agreed with this additional information. 80% of individuals of cluster 3 agreed that the
 224 “changes in nutrition labelling provide better reading and understanding for consumers” when
 225 comparing to the other clusters.

226

227 Finally, in section D (**table 3**), the professionals of the different clusters showed a high percentage
 228 of agreement in relation to possible future uses of front-of-pack nutrition labelling. However, when
 229 it came to the parameters of “FOPNL favours your professional activity” and “FOPNL might be a
 230 repetition of information on pre-packed food labels”, the professionals presented over 50% rate of
 231 agreement. 91.8% of the individuals of cluster 1 considered that the usage of additional forms on
 232 the front-of-pack nutrition labelling may be an advantage for the consumer’s choice. 87.6% of
 233 cluster 3 individuals agreed that the use of FOPNL could facilitate the reading of the nutrition
 234 information. These are also the same individuals who think that the use of FOPNL could promote a
 235 better understanding of the nutritional information (82.9%). The individuals of cluster 1 were the
 236 ones who considered that the use of traffic light colours might favour the understanding of the
 237 nutritional information when compared to the other clusters (82%). Only 66.3% of the cluster 1
 238 professionals agreed that the FOPNL favoured their professional activity. Lastly, cluster 2
 239 professionals agreed that the addition of FOPNL on pre-packaged food might be unnecessary
 240 repetition of information (70%). Additionally, the professionals of cluster 1 and 3 agreed with the
 241 claim, with an over 50% agreement rate among them.

242

243 • The professional’s positions

244 The cluster analysis showed three different positions in the way food and nutrition labelling were
 245 perceived by food professionals (**table 4**). Regarding the food supply chain stages, the professionals
 246 can be part of these stages: cluster 1 professionals - “consumption”; cluster 2 professionals -
 247 “production”, and cluster 3 professionals - “processing, trade and regulation”. In relation to the
 248 concerns of the professional’s regarding food, the professionals were divided into cluster 1
 249 professionals - “Food health”, cluster 2 professionals - “Food processing” and cluster 3
 250 professionals - “Food safety”. It led to an assortment of professional’s positions, resulting in:
 251 “Confident”, “Sceptical” and “Enthusiast”, respectively.

252

253 *Insert table 4 here*

254

DISCUSSION:

The present study was carried out to assess the position of a Portuguese professionals' sample regarding food and nutrition labelling and its Regulation (EU) No 1169/2011. All data regarding these aspects were considered, in order to understand which features, constitute the position of the individuals that participated in the survey. As a result, food and nutrition professionals presented different positions, regarding the way food and nutrition labelling is perceived. The assignment of names to the clusters was based on: the food supply chain stages where the professionals intervene, according to their main area of activity; the main concerns regarding food; and their position concerning food and nutrition labelling. The last aspect was based on Pieniak's *et al* (20) and Lidgard, D. and Heather, Y. (19).

Cluster 1 contained individuals from the nutrition sciences course, working in clinical nutrition and public/ community health. It was associated with **Food health**, for the individuals of this group, food was perceived as a vehicle for treatment and therapy. In this case, the label could specifically help to protect and improve health, since choices were supported by nutritional knowledge and healthy eating pattern (6, 9, 21, 22). Participants in this cluster used labelling as a work tool, in order to analyse the food's characteristics, find healthier ones and promote conscious food choices and **consumption**. Also, this group of professionals could use FNL to instruct consumers/patients on how to use, understand and make informed choices for their benefit through nutritional advice and educational interventions, aiming to know how to read and better understand nutrition labels (23-25).

This group of professionals was characterized by relying on the food label information and presented values, although not satisfied with its presentation. However, they claimed that labelling influenced their choices as professionals. The individuals of this group attributed greater importance to the mandatory nutrition declaration, the adjustment in the salt declaration and the possibility of complementing the presented nutritional information. They were the ones who agreed less with the voluntary declaration of fibre and with the indication *per* portion, possibly due to its inconsistent definition (26). They agreed with the requirements imposed by the EU Regulation (e.g., information observable in the same field of view and highlighting of allergens on the ingredients list) and their changes in the process. The professionals also supported the future use of FOPNL, considering it an advantage for consumer's choice. The use of colours could favour consumer's understanding and these representations could be useful on the professional's activities since they are not viewed as a repetition of the information. In other words, these professionals showed a strong agreement with the information presented on the label, with the changes imposed by the EU law and with the future use of FOPNL. Thus, they presented a **confident position** regarding FNL.

Cluster 2 constituted by individuals of the G3 (food industry, innovation, food marketing and laboratory analysis) and G6 (Quality control, food safety, inspection and consulting) areas, and from the “Engineering or Sciences” and the “Food Engineering or Food Sciences” courses. It was associated with **food processing** because from the point of view of this group of professionals, food was the result of the development process of a product (concept, research, analysis, development, and market launching). Throughout the **production** processes, certain aspects should also be taken into consideration, such as the quality assurance, packaging, technical aspects of production, nutritional value labelling, raw materials, used technology and marketing (27). The label summarizes the result of all the processes the food underwent, presenting the final product characteristics, which are crucial for the final consumer (22, 28). When comparing to the other clusters, the individuals of this cluster did not see food labelling as something important in their professional activity, even though they attribute a high percentage of importance to it. The study showed that the professionals from this group presented the lowest percentage in the general survey overview of labelling, which seemed to demonstrate low satisfaction with food labelling, as Kirby mentioned (29). The Food Industry is one of the most affected ones when it comes to food political changes due to the considerable investment of time, money and resources, they must spend, which ultimately result in higher resistance to change (17, 30, 31). Furthermore, the need to trace and ensure food safety has been leading to increase pressure, in order to guarantee transparency on the development of packaged products and in the food production line (32-34). This study showed that the individuals of Cluster 2 are the ones who attributed less importance, use less frequently, have lower trust and are less influenced by labelling. In general, they also agree the least with the legal requirements/ changes imposed and with the future use of FOPNL. Compared to the other clusters, they contrasted by having a higher level of agreement with the possibility of adding the food portion size and the fibre content to the label. This position was identified in the report “Assessing the impact of revisions to the EU horizontal food labelling legislation” written by RAND Europe, which mentioned the industries’ preferences for a set of important and mandatory information, as well as voluntary options around it (17). Moreover, they claimed that the FOPNL may repeat the nutritional information, which Jones, A. *et al* has also shown (35). The trend will be the development of clear labels and working towards decreasing consumer’s misconceptions (36). There has been an effort to increase the sense of responsibility in the food retail, marketing, and industry sectors, in order to improve the level of knowledge of the nutrient profiling and food labels (37-39). Additionally, it is important to implement measures that promote food quality, for instance, food reformulation, promotion of healthier food products, reduction of package and the clearer definition of portion sizes (34, 39-41).

325 The Portuguese professionals that belong to cluster 2 valued labelling less and its related aspects,
 326 possibly due to lower influence on their professional activity. This might be attributed to them
 327 working in product development, even if they are not directly involved in its presentation. They
 328 appeared to be resistant to the changes imposed by the legislation and dissatisfied with the proposed
 329 modifications. Thus, transparency and compliance with regulations have implications in the work
 330 developed, as well as in the information presented on the label (2). As refereed by *Gardner et al.*,
 331 different levels of transparency mediate how information is used to shape decisions for a sustainable
 332 food supply chain, and its influence in the consumer's behaviour, which determines social, health
 333 and environmental outcomes (42). As a result, cluster 2 professionals showed a **sceptical position**
 334 about FNL.

335 Finally, the professionals in cluster 3 have different backgrounds and work in the following
 336 areas: G3 (Food industry, innovation, marketing and laboratory analysis), G4 (Foodservice), G5
 337 (Research, education and training) and G6 (Quality control, food safety, inspection and consulting).
 338 This cluster was called "**Food safety**" since the individuals considered that pre-packaged food is a
 339 way to provide safety in the food supply chain, in particular in the "**Processing, trade and**
 340 **regulation**". The safety is ensured through a controlled food process, which is in line with the legal
 341 and quality requirements for the trade of pre-packaged foods. Hence, food labels are considered a
 342 vehicle of information that should present accurate and truthful data, in order to guarantee the
 343 consumer's rights to safe food. As a result, it may help them make informed choices and protect
 344 them from unfair commercial practices (14, 43). The professionals of this cluster showed a
 345 favourable opinion towards the general survey overview of labelling (importance, reading, use and
 346 satisfaction), indicating that they read more frequently the mandatory information and use this
 347 information during their professional activity. They were also the most satisfied professional group
 348 with the current label layout (font size, symbols used, dietary reference intakes and nutrition
 349 claims). Similarly, these professionals considered that the presented mandatory information
 350 (especially the food name, quantity, allergens and 'use by' date) should always be presented, and
 351 available in a visible, legible and clear layout. Furthermore, they agreed with the BOPNL update
 352 (according to Regulation (EU) No 1169/2011) and the future use of FOPNL, showing that the main
 353 changes in nutrition labelling should encourage the usage and understanding of food and nutrition
 354 labelling. This regulation aims to protect consumers by preventing fraud and misleading
 355 information (10). The professionals in cluster 3 seemed to defend the existence of food regulations
 356 and support the consumers' perspectives, such as changes that enhance clarity, transparency,
 357 comparability and reliability of the information provided on food labels (17, 30, 44). Consequently,
 358 labelling acts as a way to minimize the vulnerability of the food system by containing aspects, such
 359 as origin, lot, date of minimum durability, detailed list of ingredients and allergens. These can lead

360 to the development, reinforcement, or the complete lack of trust in the food system (45). Therefore,
361 it is important to work towards a more standardized and “accessible” label in order to transform it
362 into an effective communication tool (46). Hence, professionals in cluster 3 presented an
363 **enthusiastic position** about FNL.

364 This study had several limitations, namely the use of an *online* tool for data collection that
365 resulted in a non-probabilistic sample. Another limitation was the multiplicity of the professionals’
366 background in the food supply chain, which increased the difficulty in formulating questions using
367 generic technical language simple enough to suit all respondents. Consequently, different
368 respondents may have interpreted the questions differently. However, the low cost, the quick
369 accessibility and the convenience associated with quantitative data collection that occurred in this
370 study have been referred to as its major advantages (17, 18).

371

372

374 **CONCLUSION:**

375

376 A cluster analysis was carried out, accounting for the different educational backgrounds;
377 professional activities; food supply chain stages where the professionals intervene, according to
378 their main area of activity and the main concerns regarding food. From it, three different positions
379 (*confident, sceptical and enthusiast*) emerged regarding the way food labelling and Regulation No.
380 1169/2011 was perceived.

381 The present study intends to provide input about food and nutrition labelling and the
382 positions of a sample of Portuguese professionals working alongside this regulation and food
383 labelling policies. The purpose of researching areas of food consumption and nutrition, considering
384 the different positions of the food supply chain intervenient and scientific knowledge, should be
385 taken into consideration. Hence, the food policies to be implemented should also consider these
386 professionals' different positions and concerns regarding food and nutrition labelling.

387 Furthermore, this study highlights the need for future research in the current practices and
388 encourages the strengthening of regulations, information, and transparency in food labelling, as well
389 as consider the various positions of the food supply chain intervenient.

390

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505 TABLES

506

507 Table 1. Sociodemographic characteristics of the sample, according to cluster analysis.

	Cluster 1		Cluster 2		Cluster 3		Total		<i>p</i>
	N	%	N	%	N	%	N	%	
	122	41.1	70	23.5	105	35.4	297	100	
Sex									
Female	108	88.5	50	71.4	83	79.0	241	81.1	<0.001*
Male	14	11.5	20	28.6	22	21.0	56	18.9	
Marital status									
Single	68	55.7	21	30.0	38	36.2	127	42.8	0.004*
Married / Living with a partner	49	40.2	46	65.7	63	60.0	158	53.2	
Divorced	5	4.1	3	4.3	4	3.8	12	4.0	
Geographical area of residency									
North	52	42.6	16	22.9	22	21.0	90	30.3	0.002*
Centre	22	18.0	12	17.1	31	29.5	65	21.9	
Lisbon	24	19.7	27	38.6	31	29.5	82	27.6	
South (Alentejo and Algarve)	10	8.2	11	15.7	10	9.5	31	10.4	
Islands (Autonomous region of Madeira and Azores)	14	11.5	4	5.7	11	10.5	29	9.8	
Educational level									
Bachelor degrees	79	64.8	42	60.0	72	68.6	193	65.0	0.403*
Masters degrees	33	27.0	17	24.3	27	25.7	77	25.9	
Doctoral degrees	10	8.2	9	12.9	5	4.8	24	8.1	
Courses									
Food and Nutrition Sciences (FNS)	91	75.2	11	16.9	31	30.1	133	46.0	<0.001*
Food Engineering or Food Sciences (FEFS)	15	12.4	25	38.5	35	34.0	75	26.0	
Engineering or Sciences (except Food Engineering or Food Sciences) (ES)	15	12.4	29	44.6	37	35.9	81	28.0	
Main area of activity									
G1 - Clinical care	36	29.8	1	1.4	5	4.8	42	14.2	<0.001*
G2 - Primary health care, community, and public health	35	28.9	3	4.3	7	6.7	45	15.3	
G3 - Food industry, innovation, marketing, and laboratory analysis	13	10.7	29	42.0	33	31.4	72	24.5	
G4 - Foodservice	8	6.6	4	5.8	10	9.5	22	7.5	
G5 - Research, education, and training	13	10.7	9	13.0	16	15.2	38	12.9	
G6 - Quality control, food safety, inspection, and consulting	16	13.2	23	33.3	34	32.4	75	25.5	

508 Analyse-Descriptive Statistics-Crosstabs *(X2) Pearson.

509

Table 2. General perspective of the food and nutrition professional regarding labelling (section A), according to cluster analysis.

		Cluster			Total	P
		1	2	3	%	
		%	%	%		
Importance of food labelling for professionals¹		98.4	95.7	99.0	97.9	<0.001
Frequency of mandatory food information reading in professional practice²	- name of the food	54.1	80.0	96.2	75.1	
	- list of ingredients	88.6	71.4	95.3	86.9	
	- date of minimum durability or the 'use by' date	67.3	78.6	98.1	80.8	
	- net quantity of the food	47.6	40.0	93.4	62.0	
	- any special storage conditions and/or conditions of use or instructions for use	42.6	62.8	93.4	65.3	
	- allergens information	45.1	51.4	95.2	64.3	
	- country of origin or place of provenance	35.2	45.7	84.7	55.2	<0.001
	- nutrition claims	71.3	27.1	91.4	68.0	
	- lot number	8.2	41.5	82.9	42.4	
	- name or business name and address of the food business operator	6.6	48.6	82.9	43.4	
	- nutrition labelling	81.9	37.1	95.3	76.1	
	- health claims	65.5	14.3	80.0	58.5	
	- quantity of certain ingredients or categories of ingredients	80.3	21.4	95.3	71.7	
Uses labelling in professional activity on a daily basis²		72.9	62.9	94.3	78.1	<0.001
Trust in information / labelling³		69.7	52.9	68.6	65.3	0.007
Satisfaction with the layout information⁴		45.9	54.3	59.0	52.5	0.029
	- specific technical terms	34.4	41.4	52.4	42.4	0.011
	- type of information packaging	43.4	48.6	58.1	49.9	0.011
	- quantity of information	38.5	37.1	48.6	41.7	0.036
	- font size	17.2	34.3	39.0	29.0	<0.001
	- symbols used	28.7	35.7	46.7	36.7	0.004
	- dietary reference intakes	23.8	38.6	59.1	39.7	<0.001
	- nutrition claims	27.0	32.9	58.1	39.4	<0.001
	- portions	33.6	32.9	59.1	42.4	0.001
Importance of mandatory nutrition labelling¹		97.5	62.9	89.5	86.6	<0.001
Trust in the values of nutrition labelling³		69.7	41.4	58.1	58.9	<0.001
Influence of labelling on professionals' choices²		85.3	42.9	74.3	71.3	<0.001

The highest significant results are indicated in bold.

¹ The values presented correspond to the sum of all positive answers namely "some importance" and "high importance".

² The values presented corresponded to the sum of the answers "often" and "always".

³ The values presented correspond to the sum of all positive answers namely "very trustworthy" and "totally trustworthy".

⁴ The values presented correspond to the sum of all positive answers namely "satisfied" and "highly satisfied".

519 **Table 3.** Cluster analysis of data collected from sections B, C and D of the survey.

		Cluster			Total %	p
		1 %	2 %	3 %		
B The new regulation: content, presentation and legibility	Mandatory information layout visible, legible and clear	99.2	95.7	100	98.5	
	Mandatory information in their field of vision and in a clear format	94.3	77.2	88.6	88.2	
	Name, allergens, net quantity and the date of durability should always appear	97.5	80	99.1	94	
	Highlighting allergens in the list of ingredients	97.5	77.1	90.4	90.2	
	Mandatory specific information (%) on vegetable origin of refined oils and fats	92.7	52.9	85.7	80.8	
	Rules to avoid misleading practices ex: substitute ingredient in "imitation foods"	94.3	70	93.4	88.2	
	Availability of mandatory information when purchasing from distance	94.3	74.2	93.3	89.2	
	Specific information accompanying the name of the food (processing/treatment)	95.9	87.2	95.3	93.6	
C Mandatory "back-of-pack" nutrition labelling: Update (according to Regulation (EU) No 1169/2011) Other changes in the presentation / content.	Positive change in the sequence of nutrition information (energy value and amounts of nutrients)	67.3	50	76.2	66.4	<0.001
	Mandatory nutrition information per 100 g / 100 ml of the food (order of appearance)	76.2	65.7	80	75.1	0.001
	Additional portion-based declaration (per portion and/or per consumption unit)	18.9	50	46.7	36	<0.001
	Additional portion-based declaration as an advantage for the consumer	91	67.1	91.4	85.6	<0.001
	Energy value and nutrient amounts expressed in % of the reference intakes (RIs) per 100g or per 100ml with "reference intake on an average adult (8400 kJ/2000 kcal)"	54.9	48.6	76.2	61	<0.001
	Vitamin and mineral values expressed % of nutrient reference values (NRVs) per 100g or per 100ml (if present in significant amounts)	62.3	44.3	67.7	59.9	0.010
	Voluntary declaration of "supplementary" nutrients - fibre	10.6	42.9	36.2	27.3	<0.001
	Declaration of salt rather than sodium	89.3	72.9	87.6	84.8	0.012
	Mandatory nutrition labelling may be supplemented with an indication of the amounts of one or more of the following: mono-unsaturated fatty acid, polyunsaturated fatty acid, polyols, starch, fibre and vitamins or minerals	90.2	52.9	87.6	80.5	<0.001
	Cholesterol is not included on the list of mandatory or voluntary nutrients	30.3	30	26.7	28.9	0.806
	Changes in nutrition labelling provide better reading and understanding for consumers	64.8	64.3	80	70.1	0.003
	Advantage of the Pictogram /symbol on the FOPNL for consumer's choice	91.8	57.2	87.6	82.2	
	They make it easier to read the nutrition labelling	86	60	87.6	80.5	
D Future uses of "front-of-pack" (FOP) nutrition labelling	They promote a better understanding of the nutrition labelling	80.3	42.9	82.9	72.4	<0.001
	The colour of the traffic lights make it easier to understand the nutrition labelling	82	57.1	80.9	75.7	
	FOPNL favours your professional activity	66.3	20	61.9	53.9	
	FOPNL might be a repetition of information on pre-packed food labels	50.8	70	52.3	55.9	0.007

520 The highest significant results are indicated in bold.

521 The values showed correspond to the sum of all positive answers namely "agree" and "strongly agree".

522

524 **Table 4.** Different positions in the way food and labelling were perceived by food professionals.

	Cluster 1 (122, 41.1%)	Cluster 2 (70, 23.5%)	Cluster 3 (105, 35.4%)
The food supply chain stages where the professionals intervene, according to their main area of activity	Consumption	Production	Processing, trade and regulation
The main concerns regarding food	Food health	Food processing	Food safety
The position concerning labelling	Confident	Sceptical	Enthusiast

525

For Peer Review

VII. APPENDIX 7 - 3RD ABSTRACT

Figure 10 - 1st Abstract accepted to be presented at the XX Congress of Food and Nutrition & II International Congress of Food and Nutrition (23 and 24 September 2021).



THE POSITION OF A SAMPLE OF PORTUGUESE FOOD AND NUTRITION PROFESSIONALS TOWARDS FOOD LABELLING AND EUROPEAN LEGISLATION

INTRODUCTION: The position of food and nutrition professionals regarding labelling, according to Regulation (EU) No 1169/2011, it is not usually studied.

AIMS: To identify and to describe the different positions of the professionals towards food labelling and European legislation.

METHODOLOGY: A non-probabilistic sample of Portuguese food and nutrition professionals (working on this field) was obtained by contacting several Portuguese entities. The participation in this cross-sectional study was done through an online self-administered survey, which included *Likert-scale* and open-ended questions regarding professional labelling view (importance, reading, use, trust, satisfaction and influence in the food choices) and European labelling legislation (content, presentation and legibility of the mandatory food and nutrition information). A cluster analysis was carried out to assess the position of the professionals concerning labelling.

RESULTS: The sample was constituted of 297 participants, 81.1% women and with an average age of 39 years old. Three different clusters arose:

>*Confident position* (N=122, 41.1%): attributed greater importance to the mandatory nutrition declaration and the salt indication; showed a strong agreement with the changes imposed by the EU law; not satisfied with the presentation of food label information; and agreed less with the voluntary fibre declaration.

>*Sceptical position* (N=70, 23.5%): attributed the least importance to food labelling in their activity; used, trusted and were less influenced by labelling; and agreed the least with the EU law changes and the future use of front-of-pack nutrition labelling.

>*Enthusiast position* (N=105, 35.4%): consulted more often the mandatory information; most satisfied with the current label layout; considered that mandatory information should always be clear; agreed with the nutrition declaration and the future use of front-of-pack nutrition labelling.

CONCLUSION: The professionals' position on food and nutrition labelling and the current European legislation was categorised in three clusters "confident", "sceptical" and "enthusiast".

VIII. APPENDIX 8 - 3RD PAPER

1 Nutrition labelling on prepacked foods: opinion and suggestions of Portuguese 2 food and nutrition professionals

3

4 Rotulagem nutricional dos alimentos pré-embalados: opiniões e sugestões dos
5 profissionais da área alimentar e nutrição

6

7 ABSTRACT

8 INTRODUCTION: Labelling is an important tool for food and nutrition professionals
9 since it provides information on food safety and nutrition.

10 OBJECTIVE: The aim was to analyse the differences in food and nutrition
11 professionals' opinions regarding nutrition labelling on prepacked foods.

12 METHODS: A cross-sectional study was conducted, using a non-probability sample
13 of professionals, by contacting several Portuguese entities in food and nutrition. The
14 eligibility criteria included being 18 years old and over, living and working in Portugal,
15 and having a professional activity in this area. An online self-administered survey
16 was developed, including questions about labelling (importance, reading, use, trust,
17 satisfaction, and influence in food choices). The main changes in the European
18 Union labelling rules about the content, presentation and legibility of the mandatory
19 information were analysed. The present paper focuses on the answers to the open-
20 ended question on suggestions to improve nutrition labelling.

21 RESULTS: From the 297 participants, 33 (11.1%) provided answers to the open-
22 ended question, which were subsequently grouped into six categories. These
23 professionals demonstrated the least satisfaction with the label information namely
24 the specific technical terms, the quantity of information, the symbols used and the
25 nutritional claims. They showed the least agreement with the presentation and
26 content of the nutrition information, implemented by Regulation (EU) No 1169/2011.
27 Two improvements were proposed: the simplification of the labelling information and
28 the understanding of its usefulness as it is currently presented, to provide perceptible
29 and useful information to the consumer.

30 CONCLUSIONS: Nutrition labelling educational tools should be developed, in order
31 to promote nutrition literacy and lead to consumer's empowerment.

32

33 KEYWORDS:

34 Food label use, Food legislation, Nutrition labelling.

35 **RESUMO**

36 **INTRODUÇÃO:** A rotulagem é uma ferramenta importante para os profissionais de
37 alimentação e nutrição, pois fornece informações sobre segurança alimentar e
38 nutrição.

39 **OBJETIVO:** Foi analisar as diferenças nas opiniões dos profissionais de alimentação
40 e nutrição em relação à rotulagem nutricional em alimentos pré-embalados.

41 **MÉTODOS:** Um estudo transversal, com amostra não probabilística de profissionais,
42 por contacto com diversas entidades portuguesas da alimentação e nutrição, foi
43 realizado. Os critérios de elegibilidade incluíram ter idade igual ou superior a 18
44 anos, residir e trabalhar em Portugal e exercer uma atividade profissional na área.
45 Foi desenvolvido um questionário disponível online de administração direta,
46 incluindo questões sobre rotulagem (importância, leitura, uso, confiança, satisfação e
47 influência nas escolhas alimentares). Foram analisadas as principais alterações nas
48 regras de rotulagem da União Europeia sobre o conteúdo, apresentação e
49 legibilidade das informações obrigatórias. Neste artigo serão apresentadas as
50 respostas à pergunta aberta sobre sugestões para melhorar a rotulagem nutricional.

51 **RESULTADOS:** Dos 297 participantes, 33 (11,1%) responderam à questão aberta,
52 tendo sido estas posteriormente agrupadas em seis categorias. Estes profissionais
53 demonstraram uma menor satisfação com a informação presente no rótulo,
54 nomeadamente os termos técnicos específicos, a quantidade de informação, os
55 símbolos utilizados e as alegações nutricionais. Estes apresentaram uma menor
56 concordância com a apresentação e o conteúdo das informações nutricionais
57 implementadas pelo Regulamento (UE) n.º 1169/2011. Foram propostas duas
58 melhorias: a simplificação da informação na rotulagem e a compreensão da sua
59 utilidade, tal como se apresenta atualmente, para fornecer informações percetíveis e
60 úteis ao consumidor.

61 **CONCLUSÕES:** Ferramentas educacionais de rotulagem nutricional devem ser
62 desenvolvidas, a fim de promover a educação nutricional e o empoderamento do
63 consumidor.

64

65 **PALAVRAS-CHAVE:**

66 Legislação alimentar, Rotulagem nutricional, Uso de rótulos de alimentos.

68 **INTRODUCTION:**

69 Food and nutrition labelling in prepacked foods is a source of information to the
70 consumer in terms of food safety and nutrition (1, 2). The food product label conveys
71 a set of mandatory information that defines it, namely the name of food, the country
72 of origin or place of provenance, the lot number, the net quantity, the name or
73 business name and address of the food business operator, the ingredient list, the
74 allergens information, the type, quality and quantity of the ingredients and categories
75 of ingredients (QUID), the nutrition labelling, the date of minimum durability, special
76 storage conditions and/or instructions for use, as compulsory (3-6). The nutrition or
77 health claims, the front-of-pack nutrition labelling and others are non-mandatory
78 information (3, 7, 8). In recent years, labelling has gained significant importance as
79 an effective tool in protecting consumer's health, since it has information that, when
80 properly used, can lead to conscious and healthy food choices (9). The influence of
81 food environments as a collective physical, economic, political, and socio-cultural
82 context can influence individuals' consumption choices and nutritional status, leading
83 to a healthier diet and general well-being through food labelling (4, 10, 11).
84 Consequently, it must be a requirement to create food labels that are clear and can
85 be trusted. Regarding this situation, the European Parliament and of the Council on
86 the 25th of October 2011 implemented the Food Information to Consumers (FIC) -
87 Regulation (EU) No 1169/2011 (3, 12, 13). The focus of the existing guidelines has
88 been changing, in order to safeguard the consumer's well-being through transversal
89 rules in the entire food system and its operators. Since the implementation of the FIC
90 Regulation, food and nutrition labelling rules were harmonized and became
91 necessary to study the possible simplification of the nutrition declaration. Therefore, a
92 smaller risk of the prevalence of non-communicable diseases can be avoided by
93 choosing energy-dense foods, sugar-sweetened drinks, processed and prepacked
94 foods, encouraged by consumption trends and/or individual food choices (14-16).
95 While the regulation was in the development stage, a series of investigations were
96 occurring in order to understand how information can be used and interpreted (17).
97 Labelling is an important tool for professionals in the food and nutrition area (12).
98 However, the reading and usage of the label information may vary, according to the
99 area of activity, professional backgrounds, interests, motivations, and individual
100 knowledge. Nevertheless, there was a need to study the vision and position of the
101 professionals in the food area regarding this matter. It is known that they can be

102 direct or indirect intervenient in the food supply chain, directly in the food production
103 process or in the consumption stage (with an underlining role as food educators,
104 researchers, or regulators), or indirectly in both.
105 This paper aimed to analyse the differences in food and nutrition *professionals'*
106 *opinions and suggestions regarding nutrition labelling* on prepacked foods,
107 established by Regulation (EU) No 1169/2011.

108

109 **METHODOLOGY:**

110 A cross-sectional study was conducted, using an observational design (18, 19).

111 **Study population:** The target population were Portuguese professionals in the food
112 and nutrition area. The recruitment strategy for the obtainment of the sample was
113 done by contacting several Portuguese entities in the food and nutrition area.

114 **Sampling:** A non-probability sampling was collected to include Portuguese food and
115 nutrition professionals. The eligibility criteria required was being 18 years old and
116 over, living and working in Portugal and having a professional activity in the food and
117 nutrition area. **Data collecting tool:** An online self-administered survey was
118 developed, using the software LimeSurvey® available at the Faculty of Nutrition and
119 Food Sciences of the University of Porto. The survey, which was written in
120 Portuguese, was organized into five sections and 24 questions (fourteen closed
121 questions on a 5-points *Likert* type scale, six multiple-choice and four open-ended
122 questions). This was developed after reviewing the relevant literature used in
123 previous studies related to general food labelling and included the new food labelling
124 rules(3). The five sections included: 1) Section A – General perspective of the food
125 professionals regarding labelling; 2) Section B – The new regulation: content,
126 presentation, and legibility; 3) Section C – Mandatory “back-of-pack” nutrition
127 labelling: comparisons of the main changes; 4) Section D – Future uses of “front-of-
128 pack” nutrition labelling: additional forms of expression and presentation of the
129 nutrition declaration; and 5) Section E – Participants’ sociodemographic
130 characteristics. The average survey completion time was twelve to fifteen minutes. It
131 was available from December 2016 to April 2017. **Participants:** Several Food and
132 Nutrition Portuguese entities (Policy decision-makers and regulatory entities
133 (governmental and non-governmental organizations (N=8)); Public health
134 associations in the food and nutrition area (N=5); Food business associations (N=3);
135 Higher education institutions (N=8); Scientific magazines or other communication

channels (N=4); and Certified Entities (N=8)) were contacted, through the institutional or professional email. The entities responsible were contacted to assist in the dissemination of the study through its members, clarifying the study's setting (study objective, an academical focused investigation, target population, safeguard of the collected information and the anonymity of the participants) and appealing to their participation (via email with the *survey link*). Participants were instructed to give their professional opinion according to their area of activity. The privacy rights of the participants were reserved. **Evaluated data:** Firstly, a general analysis of the survey answers was conducted. Secondly, for this paper, two questions were analysed in deep, namely, the question "As a food professional, do you consider that changes in the presentation and content of the nutrition information provide an accessible and clear reading/understanding for the consumer?" (a 5-points agreement *Likert* type scale) and the open-ended question "If you do not agree, what would you change?". The answers were categorized by subject. Lastly, a comparison between the group of professionals who make suggestions and those who did not, regarding the survey's answers was done. **Statistical data analysis:** Different methods and statistical tests were performed, using IBM SPSS® Statistics version 24 software. Statistical significance was set at 0.05. A descriptive statistical analysis was carried. Differences between groups were assessed using the *Mann-Whitney* U test and the chi-square test.

RESULTS:

• *Evaluation of the professionals' opinion regarding accessibility and clarity of nutrition labelling for the consumer.*

Out of a total of 297 participants, 10.1% (N=30) strongly disagreed or disagreed that the nutrition labelling changes would favour a better reading and understanding by the consumers, and 11.1% (N=33) replied to the open-ended question, with suggestions for improvements in nutrition labelling.

• *Analysis of the suggestions provided in the open-ended question to improve nutrition labelling.*

The given answers (N=33) were grouped by subject (Table 2): 1) Clear, simple and concise language (N=7), 2) Difficulty in interpreting and teaching consumers (N=8),

170 3) Presentation of nutrition labelling (N=3), 4) Turn mandatory the optional
171 information (N=10), 5) Improve the display using a nutrition symbol (traffic light type)
172 (N=3), and lastly, 6) Variation of the nutritional composition of the food (N=2).

173

174 *Insert Table 1*

175

176 • ***Comparison between the professionals who gave suggestions and those***
177 ***who did not.***

178 A comparison of the sociodemographic characteristics between the professionals
179 who answered *versus* those who did not answer the open-ended question was
180 carried out. Significant differences were not found (Table 1), except for the
181 geographical area of residency, verifying that the probability of those who made
182 suggestions is greater in the Lisbon metropolitan area and Islands.

183

184 *Insert Table 2*

185

186 The significant differences between groups of professionals who made suggestions
187 (N=33, 11.1%) and those who did not (N=264, 88.9%) are presented in Table 3 (non-
188 significant results were omitted for brevity). A comparative analysis of the positive
189 survey answers (by positive it entails only the levels of agreement 4 and 5 in the
190 *Likert* scale) between both professional groups was performed.

191

192 *Insert Table 3*

193

194 Those who made suggestions were less satisfied with the current information on the
195 label, namely the specific technical terms ($p=0.019$), the quantity of information
196 ($p=0.047$), the symbols used ($p=0.014$), and the nutritional claims ($p=0.043$). They
197 agreed less with the changes in the presentation order of the mandatory “back-of-
198 pack” nutrition labelling ($p=0.028$), as well as the fibre content being voluntary
199 ($p=0.005$). Furthermore, only a minority of those who made suggestions believed that
200 adjustments in the presentation and content of the nutrition labelling provided a more
201 accessible and clear reading to the consumer (9.1%) ($p<0.001$).

202

203 DISCUSSION OF THE RESULTS:

204 The professionals' suggestions given by the open-ended question regarding
205 nutrition labelling on prepacked food were analysed, resulting in six categories which
206 were grouped by subject. From these categories, two sets of suggestions were
207 proposed. The first one was to **simplify the information of the nutrition labelling,**
208 **in order to** promote the reading and usage by the consumers with low nutritional
209 literacy (subject 1, 2 and 5). These professionals suggested that it is necessary to
210 turn the language into a clearer, simpler, and more concise one as presented "*would*
211 *simplify the language*" (subject 1) and improve the display by using a symbol as cited
212 "*The traffic light should become universal for all products*" (subject 5) since the
213 current form of presentation is difficult to interpret (subject 2). This information **has to**
214 be explained to the consumer "*to inform the consumer to read the label*" (subject 2)
215 or the consumer should be instructed on how to read, interpret and use the
216 information available "*I would do is teaching consumers to read the labels*" (subject
217 2). Both suggested actions focus on the consumer's education and its empowerment
218 regarding the use of food and nutrition labelling, as it had already been mentioned (1,
219 12, 20). The difficulties on label usage have been previously reported, mainly in
220 studies with consumers (21-24). While the EU regulation harmonizes food labelling
221 rules, it is necessary to improve the reading, usage and understanding of the
222 available information to the consumer. Given the complexity of the information and
223 the low nutritional literacy, the most favourable option becomes a symbol on the
224 front-of-pack, as a mean of simplifying nutritional information and leading conscious
225 food choices (25, 26).

226 The second improvement included the need to **promote the accuracy and the**
227 **usefulness of the nutrition labelling** as it is currently presented (subject 3, 4 and
228 6). In this case, it was advocated the adjustment of the presentation of the nutrition
229 labelling (subject 3), to turn optional information into mandatory (subject 4), and to
230 consider the variation of the nutritional composition of the food (subject 6). All these
231 suggestions tend to propose more detailed information related to the nutritional
232 presentation as mentioned "*it should be mandatory depending on the fibre content of*
233 *the foodstuff, as well as the different types of lipids and carbohydrates*" in subject 4
234 and "*Order of the nutrients, sodium content and fibre content*" in subject 3). The
235 aspects listed (what to present in the nutrition declaration, optional and/or mandatory

236 presence of certain nutrients, forms of presentation, the indication of the portion,
 237 DDR) lead to the discussion of issues such as the type, content, and presentation of
 238 the information that appears on the label. Since December 2014, the implementation
 239 of the mandatory nutritional information by the FIC regulation showed that there is
 240 not relevant data that allows the evaluation of the usefulness and relevance of it in
 241 the back-of-pack (25, 27). The previous studies before the implementation of the
 242 regulation raised a series of needs, expectations and uses regarding the information
 243 available to the consumers (28-30). It was assumed that having unanimous
 244 information would be difficult, but the commitment would be to simply the information
 245 considered most important on a first phase. In the second phase, the public health
 246 goal was the priority, it aimed to provide accurate and easy-to-understand front-of-
 247 pack nutrition information (26, 31). The analysis of the mandatory information on
 248 labelling became a secondary matter (25). In this study, a relevant concern was "the
 249 *nutritional composition varies a lot, such as traditional processed meat ...*" and "*The*
 250 *veracity of the values about the reality of each food is very fallible. There are many*
 251 *fluctuations throughout the year in products of animal origin (as meat and milk) and*
 252 *for that reason the values should have a reasonable and realistic margin, foreseen.*",
 253 demonstrating a need to consider the nutritional variation of the food composition.
 254 Regarding the differences between the group of food and nutrition professionals who
 255 made suggestions and those who did not, it was found that those who gave
 256 suggestions were less satisfied with the current information on the label, namely the
 257 specific technical terms, the quantity of information, the used symbols, and the
 258 nutritional claims. Comparably, this group of professionals showed less agreement
 259 with the changes implemented by the Regulation (EU) No. 1169/2011, such as the
 260 presentation order of the mandatory nutrition information and the optional indication
 261 of the fibre content. They also presented less agreement with the alterations in the
 262 presentation and in the content of the *back-of-pack* nutrition labelling, which may
 263 provide a more accessible and enlightening reading for the consumer. Some
 264 professionals are not still that satisfied with its presentation because it may provide
 265 too much detail for the consumers (the specific technical terms, the quantity of
 266 information, the used symbols, and the nutritional claims), possibly because they
 267 may have low nutrition literacy.
 268 This study had several limitations, namely the multiplicity of the professionals'
 269 background in the food supply chain, which increased the difficulty in formulating

270 questions using generic technical language simple enough to suit all respondents,
271 could be considered. As a result, different respondents may have interpreted the
272 questions differently. However, the low cost, the quick accessibility and the
273 convenience associated with quantitative data collection that occurred in this study
274 have been referred to as its major advantages (1, 32).

275

276 CONCLUSIONS:

277 This analysis contributed to the understanding of the professionals' concerns
278 regarding the changes in food and nutrition labelling scope since they have the ability
279 to see and perceive food and nutrition labelling as an important tool as users, as to
280 be used by the consumer.

281 According to the suggestions of the food and nutrition professionals about the
282 presentation and content of the nutrition information established by Regulation (EU)
283 No 1169/2011, two sets of suggestions were proposed. The **simplification of the**
284 **nutrition labelling information** and the **promotion of the accuracy and the**
285 **usefulness of the nutrition labelling** as it is currently presented, in order to provide
286 more perceptible and useful information to the consumer. The development of
287 nutrition labelling educational tools, as a way of promoting consumer's
288 empowerment, which ultimately leads to healthier food choices and improves
289 nutrition literacy.

290

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376 **Table 1** – Description of the open-ended question answers by subject (N=33) (free
377 translation).

1	Clear, simple and concise language (N=7) • "Firstly, I would require labels to use clear language for any consumer to be able to understand them, thus preventing the use of "substitute foods" that become more harmful to their health. Example: the use of palm oil fats and its derivatives." • "The improvement of the information through its simplification and conciseness, by changing the sequence, but it ends up losing information as it broadens, becomes more diversified and specific." • "Language." • "Greater transparency and clearer language." • "Simplify because most consumers don't understand the meaning." • "I would simplify - the language since it is too technical and not part of the popular lexical." • "If we follow the regulation exactly, we will have to declare "Lipids", for example. Most consumers do not know the meaning of it, so I would turn it mandatory to declare "Fats"."
2	Difficulty in interpreting and teaching consumers (N=8) • "Most consumers have no idea how to read a nutrition declaration." • "Most consumers do not have enough knowledge to be able to interpret the information available on the label and make healthy choices." • "The quantity/ quality of the information is satisfactory. I think that the consumer does not have enough training to read and interpret this information." • "Too much information it is difficult to interpret." • "The consumer has a hard time understanding what the label contains and conveys, and how they can use the information to their benefit. The changes are positive for technicians and more transparent communication of the foodstuff information, but difficult for the consumer." • "I believe it is necessary to inform the consumer to read the label." • "I wouldn't change anything, what I would do is teaching consumers to read the labels because if they knew there would not be a war between the opportunists about sugar and fats." • "It will always be difficult for the consumer regarding the reading of the label. More community intervention is needed in this area. I would change - larger letters, specifically in the list of ingredients, nutritional information and allergenic substances. - The traffic light scheme I believe will be the easiest method of reading for the consumer, with a more positive, clear and succinct response. - When appropriate, the nutrition information must be mandatory per serving (ex: biscuit pack)."
3	Presentation of nutrition labelling (N=3) • "The order of the macronutrients and the information of salt makes sense for foods that are high in fat and salt, which means, that it is a measure that focuses solely on obesity and can confuse other categories of products that have nothing to do with obesity. I give a clear example of foods for specific medical purposes, in which it is important to focus on protein and the mention of salt confuses the consumer, since they are products that have no added salt, but sodium, micronutrient." • "Not all of the sodium in a food comes from salt, so in my opinion, it should contain the sodium content instead of salt (or both)." • "Order of the nutrients, sodium content and fibre content."
4	Turn optional information into mandatory (N=10) • "I would make supplementary information mandatory. The regulation is general for the whole of Europe, not focusing on the deficiencies that may exist in terms of micronutrients per country. If it <u>was</u> mandatory, it would fill this gap." • "It should be mandatory to mention the content of hydrogenated fats." • "Trans fats, cholesterol and fibre are missing." • "What is in grey should be mandatory." • "I consider the presence of data referring to "one serving" to be important, and it should be mandatory."

-
- *"The mention of the fibre should be mandatory."*
 - *"The mention of the fibre content should be mandatory."*
 - *"In my opinion, it should be mandatory depending on the fibre content of the foodstuff, as well as the different types of lipids and carbohydrates. Reference doses for an average adult (2000kcal) should not appear on the label because it misleads the notion of the amount that should be ingested by the population. Most people should consume less than 2000kcal."*
 - *"What was indicated in the previous points of the survey."*
 - *"A more detailed list of ingredients."*
-

5 Improve the display by using a symbol (traffic light type) (N=3)

- *"To complement the mandatory information, I would put a more graphic and visual form, universally used (regardless of the brand), more easily perceived by the consumer."*
 - *"Font size or form of presentation more appealing, clearer and enlightening in the common sense (essential items - fat, salt and sugar highlighting this as an idea (Brilliant! The traffic light should become universal for all products)."*
 - *"Using the traffic light scheme (which some foodstuffs already have) would be very advantageous for less informed consumers."*
-

6 Variation of the nutritional composition of the food (N=2)

- *"There are products in which the nutritional composition varies a lot, such as traditional processed meat, the nutritional information being merely indicative."*
 - *"Not to add anything to question 14, but I would like to mention the following: a) The veracity of the values about the reality of each food is very fallible. There are many fluctuations throughout the year in products of animal origin (as meat and milk) and for that reason the values should have a reasonable and realistic margin, foreseen. The oscillations are higher than the recommended values; b) The vast majority of consumers do not read and do not understand the various 'notes' that the tables have, DDR, RDV."*
-

378

379

Table 2 - Sociodemographic characteristics of the participants who answered *versus* those who did not answer the open-ended question.

	Participants (N=297)				p
	who answered		who did not answer		
	N	%	N	%	
Sex	33	11.1	264	88.9	0.813
Female	28	84.8	213	80.7	
Male	5	15.2	51	19.3	
Marital status					0.784 [‡]
Single	13	39.4	114	43.2	
Married / living with a partner	18	54.5	140	53.0	
Divorced	2	6.1	10	3.8	
Geographical area of residency					0.020 [‡]
North	8	24.2	82	31.1	
Centre	2	6.1	63	23.9	
Lisbon Metropolitan Area	13	39.4	69	26.1	
South (Alentejo and Algarve)	3	9.1	28	10.6	
Islands (Madeira and Azores Islands)	7	21.2	22	8.3	
Educational level					0.838 [‡]
Bachelor's degree	21	63.6	175	66.3	
Master's degree	10	30.3	67	25.4	
PhD degree	2	6.1	22	8.3	
Courses					0.294 [‡]
Food and Nutrition Sciences (FNS)	18	58.1	115	44.6	
Food Engineering or Food Sciences (FEFS)	8	25.8	73	28.3	
Engineering or Sciences (except Food Engineering or Food Sciences) (ES)	5	16.1	70	27.1	
Occupation					0.738 [‡]
Academic	2	6.1	20	7.6	
Engineer	4	12.1	31	11.7	
Nutritionist/ Dietitian	18	54.5	105	39.8	
Food quality & safety	4	12.1	58	22.0	
Management	2	6.1	26	9.8	
Food technician	1	3.0	6	2.3	
Others	2	6.1	18	6.8	
Main area of activity					0.332 [‡]
G1 - Clinical care	2	6.3	40	15.2	
G2 - Primary health care, community and public health	7	21.8	38	14.4	
G3 - Food industry, innovation, marketing and laboratory analysis	6	18.8	69	26.2	
G4 - Food service	1	3.1	21	8.0	
G5 - Research, education and training	6	18.8	32	12.2	
G6 - Quality control, food safety, inspection and consulting	10	31.2	63	24.0	
Unemployed	1	3.1	21	8.0	

Analyse Descriptive Statistics-Crosstabs ^f(X2) Pearson or ^fFisher's Exact Test.

Table 3 – A comparative analysis of the positive survey answers between those professionals who suggested and those who did not suggest in the open-ended question.

Sections of the survey	Questions	Participants (N=297)				p
		Positive answers among those who suggested (N = 33)		Positive answers among those who did not suggest (N = 264)		
Section A - General perspective of the food professionals regarding labelling	Question 7: The following aspects are pointed out as difficulties in the usage of labelling.					
	From the perspective of a professional in the food field, express your degree of satisfaction with each of these aspects: ¹					
	- Specific technical terms	10	30.3	116	43.9	0.019 [*]
	- Quantity of information	13	39.3	111	42.0	0.047 [*]
	- Symbols used	9	27.2	100	37.9	0.014 [*]
	- Nutrition claims	9	27.3	108	40.9	0.043 [*]
Section C - Mandatory "back-of-pack" nutrition labelling: comparisons of the main changes	Question 12: The example above shows the main changes in the nutrition information that came into force with Regulation (EU) No. 1169/2011. Compare the "old composition/ nutritional information" with the new one and mark your opinion as a professional in the face of statements: ²					
	2nd item - The mandatory nutrition declaration, per 100g / 100mL of the foodstuff, presents the energy, fat, saturated fatty acids, carbohydrates, sugars, <u>proteins</u> and salt, instead of the energy value, proteins, carbohydrates, lipids, fibre and sodium.	23	69.7	200	75.7	0.028 [*]
	Question 13: Regulation (EU) No. 1169/2011 introduces several changes in the content of the nutrition declaration. Considering your professional practice, give your opinion regarding the statements: ²					
	1st item - The indication of the fibre on the nutrition information becoming voluntary.	6	18.2	75	28.4	0.005 [*]
	Question 14: As a food professional, you consider that changes in the presentation and content of the nutrition information provide an accessible and clear reading for the consumer. ²	3	9.1	205	77.7	<0.001 [*]

*Analyse Descriptive Statistics - Mann-Whitney Test.

¹The values presented correspond to the sum of all positive answers namely "satisfied" and "highly satisfied".

²The values presented correspond to the sum of all positive answers namely "agree" and "strongly agree".

IX. APPENDIX 9 - 4TH ABSTRACT

Figure 11 - 2nd Abstract accepted to be presented at the XX Congress of Food and Nutrition & II International Congress of Food and Nutrition (23 and 24 September 2021).



OPINION AND IMPROVEMENTS REGARDING NUTRITION LABELLING BY A SAMPLE OF PORTUGUESE FOOD AND NUTRITION PROFESSIONALS

INTRODUCTION: Labelling, according to Regulation (EU) No 1169/2011, provides information on food safety and nutrition and is an important tool for food and nutrition professionals.

AIMS: To understand the opinions of food and nutrition professionals' regarding nutrition labelling on prepacked foods, and their suggestions for improvements.

METHODOLOGY: A cross-sectional study was conducted on a non-probabilistic sample of Portuguese adults and working in food and nutrition area. An online self-administered survey was developed to collect the opinion on labelling (importance, reading, use, trust, satisfaction, and influence in the food choices) and on the main changes in EU food labelling rules (content, presentation and legibility of the mandatory food and nutrition information).

Two questions were analysed: "As a food professional, do you consider that changes in the presentation and content of the nutrition information provide an accessible and clear reading/ understanding for the consumer?" (5-points agreement *Likert* type scale); and "If you do not agree, what would you change?" (open-ended question).

RESULTS: From a total of 297 participants, 10.1% (N=30) strongly disagreed or disagreed that the nutrition labelling changes would favour a better reading and understanding by the consumers, and 11.1% (N=33) replied to the open-ended question, about suggestions for improvements in nutrition labelling. These suggestions were grouped into two main categories: 1) simplification of the nutrition labelling information, and 2) understanding the current usefulness of nutrition labelling.

These 33 professionals agreed less with the presentation and content of the nutrition information e. g. the specific technical terms ($p=0.019$), the quantity of information ($p=0.047$), the symbols used ($p=0.014$), the nutritional claims ($p=0.043$), the order of mandatory nutrition declaration ($p=0.028$), and non-mandatory fibre information ($p=0.005$).

CONCLUSIONS: Some professionals considered that the nutrition information provided has unnecessary details for the consumers, that might have low nutrition literacy.

X. APPENDIX 10 - THE OPEN-ENDED QUESTION DESCRIPTION

Table 11- Description of the open-ended question, categorized by subject (N=33).

(Free translation)

1	Linguagem clara, simples e concisa (N =7) 1 - 1º Obrigava a que as rotulagens utilizassem uma linguagem clara para qualquer consumidor impedindo assim que fossem utilizados "alimentos substitutos" que se tornam mais prejudiciais à saúde. Ex: a utilização de gorduras á base de óleo de palma e seus derivados. 2 - A informação melhora pela simplificação e concisão, assim como pela alteração da sequência, mas perde enquanto informação mais ampla, diversificada e específica. 19 - Linguagem 20 - Maior transparência e linguagem mais clara. 30 - Simplificar pois a maioria dos consumidores não entende o significado 31 - Simplificaria - a linguagem é demasiado técnica e não faz parte do léxico popular 29 - Se cumprimos exatamente o Regulamento, teremos que declarar "Lípidos", por exemplo. A maioria dos consumidores não sabe o seu significado, pelo que tornaria obrigatório declarar "Gorduras"	Clear, simple, and concise language (N =7) ▪ <i>"Firstly, I would require labels to use clear language for any consumer to be able to understand them, thus preventing the use of "substitute foods" that become more harmful to their health. Example: the use of palm oil fats and its derivatives."</i> ▪ <i>"The improvement of the information through its simplification and conciseness, by changing the sequence, but it ends up losing information as it broadens, becomes more diversified and specific."</i> ▪ <i>"Language."</i> ▪ <i>"Greater transparency and clearer language."</i> ▪ <i>"Simplify because most consumers don't understand the meaning."</i> ▪ <i>"I would simplify - the language since it is too technical and not part of the popular lexical."</i> ▪ <i>"If we follow the regulation exactly, we will have to declare "Lipids", for example. Most consumers do not know the meaning of it, so I would turn it mandatory to declare "Fats"."</i>
2	Dificuldade na interpretação e ensinar os consumidores (N=8) 3 - A maior parte dos consumidores não faz a mínima ideia como ler uma declaração nutricional. 4 - A maioria dos consumidores comuns não tem conhecimentos suficientes para conseguir interpretar as informações disponíveis na rotulagem e fazer escolhas saudáveis. 8 - A quantidade/qualidade da informação é satisfatória. Penso que o consumidor não tem formação suficiente para ler e interpretar esta informação. 12 - Demasiada informação difícil de interpretar 25 - O consumidor tem dificuldade em perceber o que o rótulo contém e transmite, e como pode usar a informação para seu benefício. As alterações são positivas para técnicos e comunicação mais transparente de informações do g.a., mas difíceis para o consumidor comum. 11 - Considero que seja necessário informar o consumidor sobre como ler o rótulo. 15 - Eu não alterava o que fazia era ensinar os consumidores a ler os rótulos e se eles soubessem não havia guerra dos oportunistas quanto ao açúcar e gorduras.	Difficulty in interpreting and teaching consumers (N=8) ▪ <i>"Most consumers have no idea how to read a nutrition declaration."</i> ▪ <i>"Most consumers do not have enough knowledge to be able to interpret the information available on the label and make healthy choices."</i> ▪ <i>"The quantity/ quality of the information is satisfactory. I think that the consumer does not have enough training to read and interpret this information."</i> ▪ <i>"Too much information it is difficult to interpret."</i> ▪ <i>"The consumer has a hard time understanding what the label contains and conveys, and how they can use the information to their benefit. The changes are positive for technicians and more transparent communication of the foodstuff information, but difficult for the consumer."</i> ▪ <i>"I believe it is necessary to inform the consumer to read the label."</i> ▪ <i>"I wouldn't change anything, what I would do is teaching consumers to read the labels because if they knew there would not be a war between the opportunists about sugar and fats."</i>

18 - Haverá sempre dificuldade de leitura por parte do consumidor. É necessária mais intervenção comunitária nesta área. Mudaria: -Letras maiores, principalmente, a lista de ingredientes, declaração nutricional e substâncias alergénicas. - Esquema em semáforo julgo que será o método de leitura mais fácil para o consumidor, com uma resposta mais positiva, clara e sucinta. - Quando adequado a declaração nutricional deve ser obrigatória por porção, unidade, unidose (ex.: pacotinhos de bolacha).

▪ *"It will always be difficult for the consumer about the reading of the label. More community intervention is needed in this area. I would change - larger letters, specifically in the list of ingredients, nutritional information, and allergenic substances. - The traffic light scheme I believe will be the easiest method of reading for the consumer, with a more positive, clear, and succinct response. - When appropriate, the nutrition information must be mandatory per serving (ex: biscuit pack)."*

Apresentação da declaração nutricional (N=3)

7 - A ordem dos macronutrientes e a declaração de sal fazem sentido para alimentos que alto teor de gordura e sal, ou seja, é uma medida que foca meramente a obesidade e pode confundir outras categorias de produtos que nada se relacionam com obesidade. Dou o exemplo claro dos alimentos para fins medicinais específicos, no quais é importante focar a proteína e a menção de sal confunde o consumidor, já que são produtos que não têm sal adicionado, mas sim sódio um micronutriente.

23 - Nem todo o sódio presente num alimento provém do sal, pelo que na minha opinião deveria constar o teor de sódio em vez de sal (ou os dois).

27 - Ordem dos nutrientes, teor em Na, teor em fibra.

Presentation of nutrition labelling (N=3)

▪ *"The order of the macronutrients and the information of salt makes sense for foods that are high in fat and salt, which means, that it is a measure that focuses solely on obesity and can confuse other categories of products that have nothing to do with obesity. I give a clear example of foods for specific medical purposes, in which it is important to focus on protein and the mention of salt confuses the consumer, since they are products that have no added salt, but sodium, micronutrient."*

▪ *"Not all of the sodium in a food comes from salt, so in my opinion, it should contain the sodium content instead of salt (or both)."*

▪ *"Order of the nutrients, sodium content and fibre content."*

Colocar informação facultativa como obrigatória (N=10)

9 - Colocaria as informações complementares como obrigatória. O regulamento está feito de forma geral para toda a Europa não focando as carências que possam existir a nível de micronutrientes por país. se fosse obrigatória, já colmatava esta falha.

13 - Deveria ser obrigatório referir o teor de gorduras hidrogenadas.

17 - Faltam as gorduras *trans*, colesterol e fibra

26 - O que está a cinzento deveria ser obrigatório

10 - Considero importante a presença dos dados referentes a "uma porção", e como tal deveria ser obrigatória a sua presença.

5 - A menção da fibra deveria ser obrigatória.

6 - A menção do teor de fibra deveria ser obrigatória.

21 - Na minha opinião deveria ser obrigatório consoante o género alimentício o teor de fibra assim como os diferentes tipos de lípidos e de hidratos de carbono. As doses de referência para um adulto médio (2000kcal) não deviam constar no rótulo pois induz em erro a noção da quantidade a ingerir pela população. A maioria deve consumir menos de 2000kcal.

24 - O assinalado nos pontos anteriores do questionário.

Turn optional information into mandatory (N=10)

▪ *"I would make supplementary information mandatory. The regulation is general for the whole of Europe, not focusing on the deficiencies that may exist in terms of micronutrients per country. If it was mandatory, it would fill this gap."*

▪ *"It should be mandatory to mention the content of hydrogenated fats."*

▪ *"Trans fats, cholesterol and fibre are missing".*

▪ *"What is in grey should be mandatory".*

▪ *"I consider the presence of data referring to "one serving" to be important, and it should be mandatory."*

▪ *"The mention of the fibre should be mandatory."*

▪ *"The mention of the fibre content should be mandatory."*

▪ *"In my opinion, it should be mandatory depending on the fibre content of the foodstuff, as well as the different types of lipids and carbohydrates. Reference doses for an average adult (2000kcal) should not appear on the label because it misleads the notion of the amount that should be ingested by the population. Most people should consume less than 2000kcal."*

▪ *"What was indicated in the previous points of the survey."*

14 - DR obrigatória. Lista de ingredientes mais pormenorizada.

- *"A more detailed list of ingredients."*

Melhorar a apresentação num símbolo (tipo semáforo) (N=3)

28 - Para complementar a informação obrigatória, colocaria uma forma mais gráfica e visual, universalmente utilizada (independentemente da marca), mais facilmente perceptível pelo consumidor.

32 - Tamanho da letra ou forma de apresentação mais apelativa, clara e esclarecedora no senso comum (itens essenciais - gordura, sal e açúcar com destaque como a ideia (Brilhante! do semáforo que deveria tornar-se universal para todos os produtos).

33 - Utilizar a sinalização do tipo semáforo (que alguns géneros alimentares já apresentam) seria muito vantajosa para consumidores mais leigos.

Improve the display by using a symbol (traffic light type) (N=3)

- *"To complement the mandatory information, I would put a more graphic and visual form, universally used (regardless of the brand), more easily perceived by the consumer."*

- *"Font size or form of presentation more appealing, clearer and enlightening in the common sense (essential items - fat, salt and sugar highlighting this as an idea (Brilliant! The traffic light that should become universal for all products)."*

- *"Using the traffic light scheme (which some foodstuffs already have) would be very advantageous for less informed consumers."*

Variabilidade da composição nutricional do alimento (N=2)

16 - Existem produtos em que a composição nutricional varia muito, como os enchidos tradicionais, sendo a informação nutricional meramente indicativa.

22 - Não para acrescentar nada à questão 14, mas gostaria de referir o seguinte: a) A veracidade dos valores face à realidade de cada alimento é muito falível. Há muitas oscilações ao longo do ano em produtos de origem animal (ex. carne e leite) e por esse motivo os valores deveriam ter uma margem razoável e realista, prevista. As oscilações são superiores aos valores da recomendação; b) A grande maioria dos consumidores não lê e não percebe as várias "notas" que as tabelas têm, DDR, VDR.

Variation of the nutritional composition of the food (N=2)

- *"There are products in which the nutritional composition varies a lot, such as traditional processed meat, the nutritional information being merely indicative."*

- *"Not to add anything to question 14, but I would like to mention the following: a) The veracity of the values about the reality of each food is very fallible. There are many fluctuations throughout the year in products of animal origin (as meat and milk) and for that reason the values should have a reasonable and realistic margin, foreseen. The oscillations are higher than the recommended values; b) The vast majority of consumers do not read and do not understand the various "notes" that the tables have, DDR, RDV."*

SEDE ADMINISTRATIVA

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