



Research Article

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# Portuguese Food Professionals View on Food and Nutrition Labelling

Daniela Vareiro<sup>1,2\*</sup>, Bela Franchini<sup>1,4</sup>, Bruno Oliveira<sup>1,3</sup> and Maria Daniel Vaz De Almeida<sup>1,4</sup>

<sup>1</sup>Faculty of Nutrition and Food Sciences, University of Porto, Portugal

<sup>2</sup>Santa Casa da Misericórdia de Vila do Conde, Porto, Portugal

<sup>3</sup>LIAAD-INESC TEC, Porto, Portugal

<sup>4</sup>GreenUporto-Sustainable Agrifood Production Research Centre, Vila do Conde, Porto, Portugal

\*Corresponding author: Daniela Vareiro, Faculty of Nutrition and Food Sciences University of Porto, Rua do Campo Alegre, 823 4150-180, Portugal.

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## Abstract

To explore the views of a sample of Portuguese food and nutrition professionals concerning food and nutrition labelling and the EU regulation for prepacked foods. A cross-sectional observational study was done by a self-administered online survey for data collection. Food and nutrition Portuguese entities were contacted to obtain Portuguese food and nutrition professionals.

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 Regulation (EU) No 1169/2011. Clinical care professionals were more confident in the values presented in 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 fiber. 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. 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.

**Keywords:** Food and nutrition labelling, Food and nutrition professionals, Food label use, Prepacked food labels, FIC regulation

## Introduction

Evidence suggests that information on prepacked food labels can have an educational and informative potential, which can promote informed choices and safe, conscious, and well-balanced dietary patterns [1-4]. Since it is available to the public in general, this might be a useful tool to prevent chronic diseases [5-7].

Over the last thirty years, there have been some changes in the food control systems, to promote good and harmonized practices. Across Europe, there has been an effort to ensure the safety and quality of foods entering international trade and to safeguard consumer's rights, the availability of safe foods and honest information [8]. The legislation had to be updated so that the food

supply chain parties followed the same legal standards [1,4,9-11]. *Regulation (EU) No 1169/2011* [12] was implemented by the European Parliament and Council, on the provisioning of “food information to consumers” (FIC). New food labelling rules were applied with better and simplified regulation, as well as nutrition labelling became mandatory for prepacked foods [13]. The different parties were heard, to better understand the different implications regarding the requirements and changes in food labelling. The changes were not immediate, to provide time for well-targeted changes to happen [12,14-18]. Food and nutrition labelling (FNL) provides information about the product, nutritional content, and other compulsory data [2,12,16,19].

The educational and technological development of the population has led to a greater understanding of the available information. There is also 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 [20,21]. 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 [22].

The Portuguese food field allows for several professional contexts, which include numerous academic degrees, career opportunities, professions, and positions. Thus, food and nutrition professionals (FNP) with distinct training, knowledge and backgrounds are involved in the food supply chain parties, which can lead to different views, expertise, abilities, insights, and decision/execution skills regarding the topic [23-26]. In Portugal, there are entities in charge of managing certain professions, such as veterinarian, engineer, and dietitian, to safeguard the professional's rights and self-regulating the profession, which requires technical independence [27]. So far, there has been little discussion about the views and uses of FNL by professionals working in the food and nutrition areas. Therefore, this research aimed to explore the views of a sample of Portuguese food and nutrition professionals concerning food and nutrition labelling and the legal requirements for prepacked food products.

## Methodology

### Study Design

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.

### Participants

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

### Survey

The survey was developed after reviewing the relevant literature used in previous studies related to general food labelling [28,29]. Also, new food labelling rules - *Regulation (EU) No 1169/2011* [12] were taken into consideration in the development of this survey [9,12,19]. The final online questionnaire was organized into five sections:

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

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

### Data Collection

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

### Statistical Analysis

Data management and analysis of the collected data were performed using IBM/SPSS statistics, v. 24.0. Descriptive statistics were used to describe the participant's characteristics and the

frequencies of the survey results (N; %). Non-parametric Kruskal-Wallis tests were used to examine significant differences in the opinions regarding food labelling and Pearson chi-square ( $\chi^2$ ) tests were used to evaluate the independence between categorical variables. Statistical significance was set at 0.05. From the first question ("Identify the main area of professional activity, choosing only one answer"), participants selected their area of activity, which allowed the following groups: 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).

## Results

### Participant Characteristics

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

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

Area of Activity	G1			G2		G3		G4		G5		G6		p
	N	Clinical care		Primary health care, community, and public health		Food industry, innovation, marketing, and laboratory analysis		Food service		Research, education, and training		Quality control and food safety, inspection, and consulting		
		n	%	n	%	n	%	n	%	n	%	n	%	
	295	42	14.2	45	15.3	73	24.7	22	7.5	38	12.9	75	25.4	
<b>Sex</b>														
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	
<b>Marital status</b>														
Single	127	29	22.8	22	17.3	28	22	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	9	5.8	26	16.7	49	31.4	
Divorced	12	0	0	3	25	6	50	0	0	1	8.3	2	16.7	
<b>Geographical area of residency</b>														
North	90	17	18.9	16	17.8	16	17.8	8	8.9	15	16.7	18	20	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	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	
<b>Educational level</b>														
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	13	54.2	3	12.5	
Courses														
Food and Nutrition Sciences (FNS)	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 (FEFS)	75	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)	81	0	0	4	4.9	36	44.4	0	0	13	16	28	34.6	
<b>Occupation</b>														

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	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	

**Note\*:** Statistical analysis \*Pearson  $\chi^2$  test an \*Kruskal-Wallis test with statistical significance ( $p \leq 0.05$ ).

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

According to the main area of activity, the participants were grouped into 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%).

### The General Perspective of a Sample of Portuguese FNP Regarding FNL

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

**Table 2:** Main differences between the views of a sample of Portuguese professionals about food and nutrition labelling and the legal requirements for prepacked food products.

%	G1 (14.2)	G2 (15.3)	G3 (24.7)	G4 (7.5)	G5 (12.9)	G6 (25.4)	Total (N=295)	p
<b>Importance of food labelling for professionals<sup>1</sup></b>	100	100	97.3	100	97.4	97.3	98.3	0.114
<b>Frequency of mandatory food information read in professional practice<sup>2</sup></b>								
Name of the food	57.1	60	89	77.3	65.8	85.3	75.3	<0.001
List of ingredients	97.6	95.6	82.2	81.8	76.3	88	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	<0.001
Net quantity of the food	64.3	60	63	54.5	63.2	64	62.4	0.443
Storage conditions and/or conditions/ instructions of use	35.7	55.6	71.2	95.5	68.4	72	65.4	<0.001
Allergens information	50	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	50	47.4	56	43.4	<0.001
Nutrition labelling	83.3	86.7	71.2	81.8	60.5	76	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	72.2	0.109
<b>Uses labelling in professional activity on a daily basis<sup>2</sup></b>	88.1	80	75.3	95.5	50	85.3	78.6	0.007
<b>Trust in information / labelling<sup>3</sup></b>	78.6	68.9	58.9	77.3	52.6	64	65.1	0.047
<b>Satisfaction with the layout information<sup>4</sup></b>	42.9	40	60.3	54.5	42.1	62.7	52.5	0.042

Specific technical terms	40.5	20	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	41.7	0.096
Font size	19	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	36.9	0.125
Dietary reference intakes	19	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	0.004
Portions	28.6	35.6	43.8	40.9	44.7	50.7	42	0.335
<b>Importance of mandatory nutrition labelling<sup>1</sup></b>	97.6	97.8	80.8	81.8	86.8	81.3	86.8	<0.001
<b>Confidence in the values presented<sup>3</sup></b>	83.3	68.9	50.7	54.5	50	52	58.6	0.003
<b>Influence of labelling on professionals' choices<sup>2</sup></b>	92.9	88.9	64.4	68.2	60.5	61.3	71.2	<0.001

**Note\*:** Differences between groups - Kruskal-Wallis test with statistical significance ( $p \leq 0.05$ ). <sup>1</sup>The values presented correspond to the sum of all positive answers namely "some importance" and "high importance". <sup>2</sup>The values presented corresponded to the sum of the answers "often" and "always". <sup>3</sup>The values presented correspond to the sum of all positive answers namely "very trustworthy" and "totally trustworthy". <sup>4</sup>The values presented correspond to the sum of all positive answers namely "satisfied" and "highly satisfied". <sup>5</sup>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. The arrow  $\uparrow$  corresponds to the highest values and the arrow  $\downarrow$  to the lowest values.

The data showed that 78.6% of participants used labelling "very often/always" in their professional activity. The highest percentage of "uses labelling" was shown by G4 (95.5%) and the lowest percentage was from G5 (50%). It is worth noticing that "trust in information" and "confidence in the values" on FNL was low across the whole sample (65.1% and 58.6%, respectively). Regarding the "importance of mandatory nutrition labelling", 97.6% of participants in G1 and 97.8% in G2 considered it "important/very important", although the other groups revealed a percentage above 80%. Moreover, the participants of G1 (92.9%) and G2 (88.9%) were the professionals who reported that their food choice 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 percentage 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 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 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 changes in the presentation/content of the nutrition labelling (Table 5), the different professional groups expressed little agreement (27.5%) with the declaration of fibre being arbitrary. However, 84.7% of all FNP showed agreement with the indication of salt rather than sodium on the BOP nutrition labelling.

**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	0.06
Mandatory information in their field of vision and a clear format	97.6	95.6	76.7	100	86.8	89.3	88.8	<b>0.004</b>
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	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	<b>&lt;0.001</b>
Rules to avoid misleading practices ex: substitute ingredients in "imitation foods"	92.9	93.3	82.2	86.4	89.5	88	88.1	0.685
Availability of mandatory information when purchasing from a 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

**Note\*:** 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	59.1	63.2	72	66.4	0.304
Mandatory nutrition information per 100g / 100mL of the food (order of appearance)	69	80	69.9	86.4	68.4	80	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	36.3	<b>&lt;0.001</b>
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	63.2	68	61	0.376
Vitamin and mineral values expressed % of nutrient reference values (NRVs) per 100g or 100ml (if present in significant amounts)	69	53.3	60.3	59.1	57.9	60	60	0.81

**Note\*:** 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 - fiber	11.9	8.9	38.4	27.3	26.3	37.3	27.5	<b>&lt;0.001</b>
Use salt rather than sodium	88.1	91.1	79.5	81.8	78.9	88	84.7	<b>0.005</b>
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, fiber and vitamins or minerals	85.7	93.3	69.9	81.8	84.2	80	81	0.316
Cholesterol is not included on the list of mandatory or voluntary nutrients	31	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	72.7	65.8	70.7	70.2	0.648

**Note\*:** 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".

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

## Discussion

The view of a sample of Portuguese food professionals regarding food and nutrition labelling and its legal requirements for prepacked food products was studied. This research was carried out to define the professional groups without conflicts of interest, bearing in mind the Portuguese context [23,25,26,30].

In general, all groups indicated food and nutrition labelling as an important topic in their daily practice. To provide up-to-date and evidence-based dietary and nutritional advice on a personal and populational level, the available and accessible information contained on the label is crucial in the scope of the practice of G1 (Clinical care) and G2 (Primary health care, community and public health) professionals. These groups of professionals can teach and encourage people to carefully read food labels before choosing or purchasing food products. The mandatory nutrition labelling was considered "important/very important" by most participants in the G1 (Clinical care) and G2 (Primary health care, community, and public health) groups, although the other groups also revealed high percentages. This has already been shown by *Ravasco P, et al.*, [31] who emphasize the essential role of these professionals, academically and professionally, in the promotion of basic principles of food and health. Hence the possibility to improve health and the quality of health services provided to the population (public health scope) and the patients (clinical practice scope), as well as to optimize costs in healthcare [22,32-35].

**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	0.168
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	0.06
The color of the traffic lights makes it easier to understand the nutrition labelling	81	86.7	57.5	86.4	81.6	78.7	75.9	<b>0.046</b>
FOP nutrition labelling favors your professional activity	64.3	71.1	30.1	77.3	50	54.7	53.6	<b>&lt;0.001</b>
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	<b>0.020</b>

**Note\*:** 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).

When directly asked, more than three-quarters of participants responded to using labelling "very often/always" in their professional activity. The G4 (Foodservice) professionals presented the highest percentage of "uses labelling" and the lowest percentage was shown by G5 (Research, education, and training). This might be related to their professional activity, which in the case of G4 (Foodservice) professionals there is a higher dependency on the usage of labels. Therefore, they may feel more motivated to read, understand, interpret, and evaluate the information due to their professional interests and are more likely to improve the food and nutritional quality of meals consumed away from home [36,37].

The professionals from different areas of activity read distinct mandatory food information, considering their professional interests. It is worth mentioning that "name of the food", the "date of minimum durability", the "special storage/use conditions", the "allergens information" and the "lot number", were more frequently read by G3 (Food industry, innovation, marketing, and laboratory analysis), G4 (Foodservice), and G6 (Quality control and food safety, inspection, and consulting) professionals in different reading percentages. The G2 (Primary health care, community, and public health) professional group showed they read more frequently the "nutrition labelling", which can be related to the need to understand

the information content in order to advise, educate and inform the population [29,32].

Education focuses mainly on general nutrition knowledge and health literacy, and optimizes reading, comprehension and the usage of food and nutrition labelling. As a result, it might improve dietary health [18,22,38]. The G3 (Food industry, innovation, marketing, and laboratory analysis) professional group demonstrated they read more frequently the “name of the food”, the “name of the food business operator” and “country of origin or place of provenance”. The new EU food labelling legislation requires the presence of the origin, the provenance and the ingredients’ composition on the labelling of prepacked foods. Therefore, acting according to the law will allow a tracking down of the food process [9,12]. G4 (Foodservice) professionals, whose tasks are more dependent on the use of labelling, referred reading more frequently the “allergens information”, “special storage/use conditions” and “date of minimum durability”.

This information is crucial in ensuring the used food provides safe meals, not only regarding the quality of foodservice (access, availability, and utilization), but also the responsibility to declare the presence of allergens in the menu and to guarantee their absence in the served meals [36]. The need to track down and inspect the food process, by G6 (Quality control and food safety, inspection, and consulting) professionals, makes the lot number essential in their professional activity and food traceability. Therefore, they read more frequently this information, which enables them to act in case of a food supply chain alert [39].

G1 (Clinical care) professionals reported that their food choices are influenced by labelling information. These professionals are directly involved in the health promotion environment, so they are constantly aware of the effects of food choices, which ultimately translates into better individual counselling [18,32]. Recent research concerning a nutrition labelling intervention trial perceived that the use of nutrition labels may lead to healthier food purchases [40]. This could suggest that the 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 [41,42].

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 [16]. 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 [43,44].

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 [34,45]. 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” [46] Furthermore, the credibility and proximity in Portuguese healthcare is being reinforced and personalized care was found to be the preferred communication channel [32,34], suggesting the trust in health professionals and governmental agencies as sources of information [47]. Other research 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 [48].

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 [49]. 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 [8,43]. 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 [50].

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



[8]. 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 with 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 [3,51-53]. 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 [48,52,54,55]. 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 [12,56,57].

The agreement with label attributes (credibility, readability, comprehensibility, and adequacy) by the FNP about the new rules of content, layout and legibility had to be considered [17,19]. A harmonized legislation on nutrition labelling might reduce the discrepancy in the provisioning of nutrition information and mediate the consumers' expectations. With regards to the EU food labelling rules, the Portuguese professionals "agree/strongly agree" that the mandatory information in labelling should be in a clear format and the same field of vision. Another significant result was the importance of the declaration of the mandatory specific information on the origin of refined oils and vegetable fats in the list of ingredients by all professional groups. Nevertheless, G3 (Food industry, innovation, marketing, and laboratory analysis) professional groups agreed the least with it, as had already been shown [58]. This seems to reveal that professionals agreed with the strengthening of the rules to prevent misleading practices and promote food safety.

Apart from understanding the frequency of reading mandatory food information and its interest in their professional practice, it is important to consider the changes in the presentation and/or content of the BOP nutrition labelling. Mandatory nutrition labelling makes the declaration of food composition and the harmonization of its content imperative, which allows for product comparison. This rule favors the implementation of effective reduction strategies on food reformulation, to limit the quantity of ingredients such as salt, trans-fatty acids, saturated fatty acids and sugar, which are associated with negative health effects [15,59]. Such changes will be useless unless they are understood and/or used by the consumer. Previous research showed that there are higher mindfulness and understanding of salt rather than sodium information [60-62]. The term salt must be used since the FIC Regulation was applied [12]. In this study, a considerable number of professionals agreed with this change, mostly the G2 (Primary health care, community, and public

health) group, as it would lead to informed choices.

Furthermore, to understand the real use of BOP information, the available scientific evidence and experimental studies with consumers were analyzed. Even though they can understand some of the terms used when looking at nutrition labels, they are still confused by other types of information. Most consumers appear to be able to retrieve simple information, make calculations and establish comparisons between products (presentation 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 [3]. 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 [63].

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 [63-65]. The FIC Regulation allows for the fiber 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. Before 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 fiber content could have an impact on product reformulation. On one hand, the fiber 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 [15].

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 understand and use the essential information when purchasing foods [53] more easily. Although the potential was recognized, there were still divergent opinions on the best way to apply this strategy, which is why it remains optional [10,44,51,66]. 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 [57,67]. The colors of the traffic lights scheme were also recognized by all groups of professionals, excluding G3 (Food

industry, innovation, marketing, and laboratory analysis), as being a way to improve nutrition labelling comprehension. It was found that consumers want FOP nutrition labelling to evaluate nutrition and food quality by promoting guidance, information and help with food choices [68]. Instead, many consumers either do not read nutrition labels or are not able to interpret the information on these labels correctly [17,54]. A color-coded scheme might be a useful strategy to help consumers identify products containing high levels of sugar, salt, fat, and saturated fat, and to facilitate the comparison between similar products [48,54,69]. Additionally, in this study, at least half of the professionals agreed that this information can favor their activity, although G3 (Food industry, innovation, marketing, and laboratory analysis) professionals do not share the same opinion. This has already been stated by a researcher [53].

The limitations of this study are 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 advantage, an online procedure allowed the collection of a larger sample from different geographic locations of the country quickly and conveniently. 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. 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 [2,70-72].

It was considered a professional "view" since professionals can see and perceive food and nutrition labelling as an important tool of their professional activity. Differences were found in the way it is used, as a result, of the different professional/ academic backgrounds and areas of activity. Thus, food and nutrition professionals showed interest and motivation in the usage of labelling, during their professional activity. Health policies should consider how food labelling may empower nutrition education and promote a healthier lifestyle, rather than focusing exclusively

on the label's information. It is important to manage the different needs, expectations and requirements of parties when reading the currently available information on the label, as each of them will use and interpret it differently. Those who control information streams can be powerful actors in facilitating or retarding the transition to healthy, sustainable, and affordable diets.

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## Conflict of Interest

None.

## References

- Bonsmann SS, Celemin LF, Grunert KG, Consortium F (2010) Food labelling to advance better education for life. *Eur J Clin Nutr* 64(Suppl 3): 14-19.
- Campos S, Doxey J, Hammond D (2011) Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr* 14(8): 1496-1506.
- Cowburn G, Stockley L (2005) Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutr* 8(1): 21-28.
- Kerr MA, McCann MT, Livingstone MB (2015) Food and the consumer: could labelling be the answer? *Proc Nutr Soc* 74(2): 158-163.
- Branca F, Lartey A, Oenema S, Aguayo V, Stordalen GA, et al. (2019) Transforming the food system to fight non-communicable diseases. *BMJ* 364: l296-l296.
- Popkin BM, Adair LS, Ng SW (2012) Global nutrition transition and the pandemic of obesity in developing countries. *Nutr rev* 70(1): 3-21.
- Storcksdieck Genannt Bonsmann S, Wills JM (2012) Nutrition Labeling to Prevent Obesity: Reviewing the Evidence from Europe. *Curr Obes Rep* 1(3): 134-140.
- (2016) Food and Agriculture Organization of the United Nations. Handbook on food labelling to protect consumers.
- (2019) European Commission. Food information to consumers-legislation.
- (2018) European Food Information Council. Global update on Nutrition Labelling.
- Traill WB, Mazzocchi M, Shankar B, Hallam D (2014) Importance of government policies and other influences in transforming global diets. *Nutrition reviews* 72(9): 591-604.
- (2011) Regulation (EU) No 1169/2011 of the European Parliament and the Council, Food Information to Consumers OJEL 304: 18-63.
- Vaqué LG (2013) The New European Regulation on Food Labelling: Are we Ready for the "D" day on 13 December 2014? *European Food and Feed Law Review* 8(3): 158-167.
- Buttriss JL (2018) The role of nutritional labelling and signposting from a European perspective. *Proceedings of the Nutrition Society* 77(3): 321-330.
- (2008) Commission of the European Communities. Impact assessment report on nutrition labelling issues.
- (2019) Food and Agriculture Organization of the United Nations. Food Labelling.
- Kasapila W, Shaarani SM (2016) Legislation-Impact and Trends in Nutrition Labeling: A Global Overview. *Crit Rev Food Sci Nutr* 56(1): 56-64.

18. Koen N, Blaauw R, Wentzel Viljoen E (2016) Food and nutrition labelling: The past, present and the way forward. *South African Journal of Clinical Nutrition* 29: 13-21.
19. (2014a) European Commission. Infographic-New EU food labelling.
20. Krause C, Sommerhalder K, Beer Borst S, Abel T (2018) Just a subtle difference? Findings from a systematic review on definitions of nutrition literacy and food literacy. *Health promotion international* 33(3): 378-389.
21. Velardo S (2015) The Nuances of Health Literacy, Nutrition Literacy, and Food Literacy. *J Nutr Educ Behav* 47(4): 385-389 e1.
22. Truman E, Bischoff M, Elliott C (2019) Which literacy for health promotion: health, food, nutrition or media? *Health Promot Int* 35(2): 432-444.
23. (2011) Associação Portuguesa de Nutrição. *Nutricionista-Uma profissão de futuro saudável*, APN.
24. Graça P (2006) Compromissos actuais da formação e pedagogia nas ciências da nutrição e alimentação. O impacto das modificações na cadeia alimentar. *Nutricias* 6: 8-11.
25. Laureano O, Empis J (2003) Valorizar a Engenharia Alimentar. *Segurança e Qualidade Alimentar-suplemento*.
26. Sequali (2008). Valorização profissional na cadeia alimentar (suplemento). *Segurança e Qualidade alimentar Lisboa* : 4.
27. (2020) Conselho Nacional das Ordens Profissionais. *A função das ordens profissionais*.
28. Mackison D, Wrieden W L, Anderson AS (2010). Validity and reliability testing of a short questionnaire developed to assess consumers' use, understanding and perception of food labels. *Eur J Clin Nutr* 64(2): 210-217.
29. Thurecht RL, Pelly FE, Cooper SL (2018) Dietitians' perceptions of the healthiness of packaged food. *Appetite* 120: 302-309.
30. Carrilho T, Amaral F (2014) Da Rotulagem de Géneros Alimentícios à Informação ao Consumidor. *Nutricias (APN)* 23(6-7).
31. Ravasco P, Ferreira C, Camilo ME (2011) Food for health: primary-care prevention and public health--relevance of the medical role. *Acta Medica Portuguesa* 24 Suppl 4: 783-790.
32. (2012) European Federation of the Associations of Dietitians. Report on the role of the dietitian in effective health promotion to reduce health inequalities. *EFAD Health Promotion Report*: 1-37.
33. (2016) European Federation of the Associations of Dietitians. *The role of European public health dietitians*.
34. Póinhos R, Oliveira B, van der Lans IA, Fischer ARH, Berezowska A, et al. (2017) Providing Personalised Nutrition: Consumers' Trust and Preferences Regarding Sources of Information, Service Providers and Regulators, and Communication Channels. *Public Health Genomics* 20(4): 218-228.
35. (2016) Regulamento No 587/2016. Código Deontológico da Ordem dos Nutricionistas. *Diário da República* 2 série: 18664-18666.
36. Pinto AH, Ávila H (2015) Os Desafios da Restauração Coletiva e o Nutricionista Como Impulsionador do Seu Desenvolvimento. *Acta Portuguesa de Nutrição*: 22-32.
37. Saulais L (2015) Foodservice, Health and Nutrition: responsibility, strategies and perspectives. In: Philip Sloan, Willy Legrand, Clare Hindley (2015) *The Routledge Handbook of Sustainable Food and Gastronomy*, London: pp. 253-266.
38. Moore SG, Donnelly JK, Jones S, Cade JE (2018) Effect of Educational Interventions on Understanding and Use of Nutrition Labels: A Systematic Review. *Nutrients* 10(10): 1432.
39. Viola GCV, Bianchi F, Croce E, Ceretti E (2016) Are Food Labels Effective as a Means of Health Prevention? *J Public Health Res* 5(3): 768.
40. Ni Mhurchu C, Eyles H, Jiang Y, Blakely T (2018) Do nutrition labels influence healthier food choices? Analysis of label viewing behaviour and subsequent food purchases in a labelling intervention trial. *Appetite* 121: 360-365.
41. Carbone E, Zoellner J (2012) Nutrition and Health Literacy: A Systematic Review to Inform Nutrition Research and Practice. *J Acad Nutr Diet* 112(2): 254-265.
42. Gibbs H, Chapman Novakofski K (2012) Exploring nutrition literacy: Attention to assessment and the skills clients need. *Health* 04: 120-124.
43. Pappalardo J (2012) Product Literacy and the Economics of Consumer Protection Policy, *Journal of Consumer Affairs* 46 (2): 319-332.
44. (2014) TNS European Behaviour Studies Consortium final report. *Impact of Food Information on Consumers' Decision Making*.
45. Baute V, Sampath Kumar R, Nelson S, Basil B (2018) Nutrition Education for the Health-care Provider Improves Patient Outcomes. *Glob Adv Health Med* 7: 2164956118795995.
46. Chan C, Pereira S, Kam B, Coulthard D, Button P (2012) Consumer Trust of Food Product Information and its Sources.
47. de Almeida MD, Graça P, Lappalainen R, Giachetti I, Kafatos A, Remaut de Winter A, et al (1997) Sources used and trusted by nationally representative adults in the European Union for information on healthy eating. *Eur J Clin Nutr* 51 Suppl 2: S16-22.
48. Gomes S, Nogueira M, Ferreira M, Gregório M (2017) Portuguese consumers attitudes towards food labelling.
49. Tonkin E, Wilson A, Coveney J, Webb T, B Meyer S (2015) Trust in and through labelling-a systematic review and critique. *British Food Journal* 117: 318-338.
50. Wilson AM, Withall E, Coveney J, Meyer SB, Henderson J, et al. (2017) A model for (re)building consumer trust in the food system. *Health promotion international* 32(6): 988-1000.
51. (2006) Directorate-General Health & Consumer protection. *Labelling: competitiveness, consumer information and better regulation for the EU*.
52. Grunert KG, Wills JM (2007) A review of European research on consumer response to nutrition information on food labels. *Journal of Public Health* 15(5): 385-399.
53. Roberto CA, Khandpur N (2014) Improving the design of nutrition labels to promote healthier food choices and reasonable portion sizes. *Int J Obes* 38 Suppl 1(Suppl 1): S25-S33.
54. Gregori D, Ballali S, Vogele C, Gafare CE, Stefanini G, et al. (2014) Evaluating food front-of-pack labelling: a pan-European survey on consumers' attitudes toward food labelling. *International journal of food sciences and nutrition* 65(2): 177-186.
55. Van der Colff N, Van der Merwe D, Bosman M, Erasmus A, Ellis S (2015) Consumers' prepurchase satisfaction with the attributes and information of food labels. *International Journal of Consumer Studies* 40(2): 220-228.
56. Direção Geral da S, Graça P, Gregório M (2019) *Nutr-HIA Improving nutrition labelling in Portugal-Health Impact Assessment-Final Report*.
57. (2020) European Commission. Report from the Commission to the European Parliament and the Council regarding the use of additional forms of expression and presentation of the nutrition declaration.
58. (2017) Commission Notice on the application of the principle of quantitative ingredients declaration (QUID). *OJC* 393(5): 5-12.

59. Graça P, Gregório MJ, de Sousa SM, Brás S, Penedo T, et. al (2018) A new interministerial strategy for the promotion of healthy eating in Portugal: implementation and initial results. *Health Res Policy and Syst* 16(1): 102.
60. (2018) European Commission's science and knowledge service. Health promotion & Disease prevention-Dietary salt/sodium. Defining dietary salt and sodium.
61. (2014b) European Commission. Survey on Members States' Implementation of the EU Salt Reduction Framework.
62. Kloss L, Meyer J, Graeve L, Vetter W (2015) Sodium intake and its reduction by food reformulation in the European Union-A review. *NFS Journal* 1: 9-19.
63. Kliemann N, Kraemer MVS, Scapin T, Rodrigues VM, Fernandes AC, et. al (2018) Serving Size and Nutrition Labelling: Implications for Nutrition Information and Nutrition Claims on Packaged Foods. *Nutrients*, 10(7): 891.
64. Almiron Roig E, Navas Carretero S, Emery P, Martinez JA (2018) Research into food portion size: methodological aspects and applications. *Food & Function* 9(2): 715-739.
65. Kirk TR, de Looy A, Fletcher R, Ruxton CH (2007) Nutritionists in industry can play a key role in helping to achieve Health of the Nation targets for nutrition. *J Hum Nutr Diet* 20(3): 202-207.
66. Kanter R, Vanderlee L, Vandevijvere S (2018) Front-of-package nutrition labelling policy: global progress and future directions. *Public Health Nutr* 21(8): 1399-1408.
67. Kirby T (2016) Nutrient labelling: legislating against too much information? *Lancet Diabetes Endocrinol* 4(7): 568.
68. Kleef EV, Dagevos H (2015) The Growing Role of Front-of-Pack Nutrition Profile Labeling: A Consumer Perspective on Key Issues and Controversies. *Crit Rev Food Sci Nutr* 55(3): 291-303.
69. (2015) The European Consumer Organization (BEUC). Informed food choices for healthier consumers.
70. (2006) European Commission DG SANCO. Summary of results for the consultation document on: Labelling: competitiveness, consumer information and better regulation for the EU. Unit E4-Food law, nutrition and labelling, Directorate E-Safety of the Food Chain.
71. (2011) European Food Information Council. Consumer response to portion information on food and drink packaging-A pan-European study, Forum n°5, EUFIC.
72. Nielsen (2012) Global Food Labeling Report-Battle of the Bulge & Nutrition Labels Healthy Eating Trends Around the World.