

# **Nutritional Information Approaches for Consumers in Menus**

## ***Abordagens de Informação Nutricional para o Consumidor em Ementas***

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TRABALHO DE INVESTIGAÇÃO

I.º CICLO EM CIÊNCIAS DA NUTRIÇÃO | UNIDADE CURRICULAR ESTÁGIO

FACULDADE DE CIÊNCIAS DA NUTRIÇÃO E ALIMENTAÇÃO DA UNIVERSIDADE DO PORTO

# **TC**

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## **Abstract**

Nutritional labeling, mandatory for pre-packed foods in the European Union, is one of public health's main tools to inform consumers and promote healthier choices. However, limited nutrition literacy remains a major barrier to its effectiveness, especially in food service settings where information is less standardized. To address this, Viegas and Rocha proposed an infographic (IFG) labeling format, which is designed according to the Mediterranean Diet and portion sizes of the Portuguese Food Guide. This study compared the IFG to the Nutritional Declaration (ND) among Portuguese adults using institutional food service. The ND scored higher in perceived meal balance and completeness. The IFG was also considered useful, and many respondents expressed interest in combining both formats. These findings suggest that the infographic format may serve as a promising complementary tool in food service settings.

**Keywords:** Food Labeling; Health Literacy; Consumer Behavior; Food Services; Diet, MediterraneanResumo

## **Resumo**

A rotulagem nutricional, obrigatória em alimentos pré-embalados na União Europeia, é uma ferramenta essencial de saúde pública para promover escolhas alimentares mais informadas. No entanto, a sua eficácia depende da capacidade do consumidor em interpretar corretamente as informações, o que continua a ser um desafio, sobretudo em contextos de alimentação coletiva. Com o objetivo de facilitar a compreensão da informação nutricional, Viegas e Rocha propuseram um modelo infográfico (IG) desenvolvido com base nos princípios da Dieta Mediterrânica e em porções alimentares definidas pela Roda dos Alimentos. Este estudo comparou a percepção dos consumidores sobre o equilíbrio das refeições quando apresentadas com o modelo IG ou com a Declaração Nutricional (DN), entre adultos portugueses que frequentam unidades de alimentação coletiva em instituições de ensino superior. Os resultados mostraram que, quando acompanhadas pela DN, as refeições foram percebidas como mais equilibradas e completas do que com o modelo IG. Os participantes também consideraram o IG útil e demonstraram interesse por uma abordagem que combine ambos os formatos. Estes dados sugerem que o modelo infográfico poderá representar uma ferramenta complementar promissora, sobretudo em contextos de restauração.

**Palavras-Chave:** Rotulagem Nutricional; Literacia em Saúde; Comportamento do Consumidor; Alimentação Coletiva; Dieta Mediterrânica.

## Lista de Siglas (Acronyms)

- **BOP** - Back-of-Pack
- **DV** - Daily Value
- **EU** - European Union
- **FCNAUP** - Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto
- **FOP** - Front-of-Pack
- **IFG** - Infographic
- **IPC** - Instituto Politécnico de Coimbra
- **IPL** - Instituto Politécnico de Lisboa
- **IPP** - Instituto Politécnico do Porto
- **Md** - Median
- **R** - R (Statistical Computing Software)
- **SD** - Standard Deviation
- **TCA** - Tabela de Composição de Alimentos (Portuguese Food Composition Table, 2023)
- **ND** - Nutritional Declaration
- **UPV/EHU** - Universidad del País Vasco / Euskal Herriko Unibertsitatea
- **WHO** - World Health Organization

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## Introduction

In 2011, the European Parliament adopted Regulation (EU) No 1169/2011, which standardized nutritional labeling across member states <sup>(1)</sup>. It requires clear disclosure of energy and key nutrients (e.g., fat, sugars, salt, protein) per 100g or 100ml on pre-packed foods, with the option to include serving sizes and reference intakes when clearly defined. However, in food service settings, such as restaurants or canteens, nutritional labeling remains non-mandatory unless provided voluntarily, in which case it must still comply with specific standards <sup>(1)</sup>.

Mandatory nutritional declaration has been shown to pressure manufacturers to improve the nutritional profile of their products <sup>(2)</sup>, reinforcing its role as a powerful public health tool. Evidence suggests that such labeling initiatives are linked to improvements in diet quality, such as increased intake of vegetables and reduced consumption of total energy and fat <sup>(3, 4, 5)</sup>. Food labels also tend to be more trusted by consumers than nutrition information from mass media, marketing, or unregulated claims <sup>(6)</sup>. Moreover, some studies suggest that labeling can promote adherence to healthy dietary patterns, including the Mediterranean Diet <sup>(7)</sup>, whose declining adoption, particularly among younger populations, raises concern. This reinforces the potential of visual communication strategies to foster healthier and more sustainable eating behaviors.

Despite these benefits, the Nutritional Declaration (ND) has faced growing criticism for its limitations. Studies have shown that consumers often struggle to

interpret quantitative information, especially when it is presented in a nutrient-focused format. This approach requires a high level of health and nutrition literacy to be effectively translated into healthier food choices<sup>(8, 9, 10)</sup>. A key critique is that long-term health outcomes are more strongly associated with overall dietary patterns than with individual nutrient intake<sup>(11)</sup>.

Portuguese consumers, despite demonstrating higher health consciousness compared to the European average<sup>(12)</sup>, still show gaps in nutrition literacy: only about 50% are able to identify the recommended intake values for salt and sugar set by the WHO, and just 20% fully understand all the information on nutritional labels<sup>(10)</sup>. This highlights the need for labeling systems that support informed choices across diverse segments of the population.

In the institutional food service sector, such as university or workplace canteens, nutritional information is often presented through printed menus or signage, rather than on food packaging. As such, consumers must rely on simplified visual formats or limited verbal cues to make meal choices. These contexts, where time is scarce and decisions are quick, highlight the need for labeling methods that are intuitive, food-based, and tailored to real-life consumption scenarios.

In response to these challenges, Viegas and Rocha proposed a novel, food-based labeling method designed to promote overall population health. This method draws from real portion sizes inspired by the Portuguese Food Guide - “Roda dos Alimentos” and uses a visually appealing, intuitive format to encourage conscious choices<sup>(13,14)</sup>.

## **Objectives**

The present study aims to explore consumer perceptions of this Infographic (IFG) labeling method compared to the ND among Portuguese adults attending institutional food service units.

## **Methods**

The present work was carried out under the supervision of Professor Doctor Ada Rocha and the co-supervision of Professor Doctor Cláudia Viegas. A cross-sectional observational study was conducted over a five-day period (during the academic term) in the cafeterias of three Portuguese public higher education institutions: Instituto Politécnico do Porto (IPP), Instituto Politécnico de Coimbra (IPC), and Instituto Politécnico de Lisboa (IPL). In two out of the three institutions, food services are operated by a private company under a leasing agreement, whereas in the third, they are self-managed.

A standardized weekly menu was assigned to all three of the institutions to maximize comparability. Data was collected simultaneously via an online questionnaire administered to individuals who attended one of the institution's cafeterias, consumed a meal during the study period, and voluntarily agreed to participate.

Participants who did not provide informed consent or did not complete the questionnaire were excluded from the analysis. Missing data were handled at the question level, with analyses conducted only on valid responses for each variable.



### Data Collection

The questionnaire was developed using Qualtrics© <sup>(15)</sup>, reviewed and validated by three researchers. Although no formal pilot testing was conducted, some of the questions had already been used in a previous stage of the study by Viegas and Rocha <sup>(13)</sup>.

### Materials

The ND was provided by a food service provider and followed the standards of Regulation (EU) 1169/2011 <sup>(1)</sup>. The food service provider also supplied the technical specifications, containing the precise ingredient measurements for each selected dish on the menu, and nutritional values were complemented using the Portuguese Food Composition Table (TCA, 2023) <sup>(16)</sup>, which served as a reference to define the serving sizes for each dish and ensure comparability between the methods.

The second method employed was the IFG developed by Viegas and Rocha <sup>(13)</sup>. It is designed according to the Mediterranean Diet keypoints and uses portion calculations based on the Portuguese Food Guide - “Roda dos Alimentos” <sup>(14)</sup>, aligned with a reference intake of 2000 kcal for a standard adult. Calculations also relied on the technical specifications, which were organized in an Excel spreadsheet and also converted into portion sizes.

Only fish and meat dishes were included in the analyses. Vegetarian, vegan, and diet dishes were excluded due to their lower frequency of consumption and to avoid information overload, which could hinder consumer understanding. To

ensure consistency in the IFG method, a standard portion of vegetables was systematically included in all meal calculations, as vegetables are an optional component in the institutional menu.

### Procedures

A QR code was placed on all tables throughout the cafeterias before the lunch period, encouraging participants to answer the questionnaire. Respondents could access the questionnaire via mobile phone.

This study was conducted in accordance with research ethical principles and was approved by the Ethics Committee of FCNAUP, under opinion no. 34/2021. Data collection was also authorized by the administrations of the participating higher education institutions and the respective cafeteria services. All participants were informed about the study's objectives, and participation was voluntary and anonymous.

### Data analysis

The dataset was exported from the Qualtrics <sup>(15)</sup> platform for statistical analysis in R software (version 4.5.0; R Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics were conducted to summarize sociodemographic and opinion-based data, including mean (M), median (Mdn), standard deviation (SD), and absolute and relative frequencies. Wilcoxon signed-rank tests were conducted to determine whether the differences in respondents ratings between the two methods were statistically significant ( $p < 0,05$ ).

## Results

A total of 611 individuals accessed the questionnaire, of whom 601 provided informed consent and were included in the analysis ( $N = 601$ ). Among the 470 valid responses on gender, 62.1% identified as male, 36% as female, 1.3% as “other,” and 0.6% preferred not to say. The participants’ ages ranged from 18 to 60 years ( $M = 22.0$ ,  $SD = 6.4$ ), and the majority were students (92.3%), as shown in Table 1.

**Table 1.** Sociodemographic Characteristics of Participants

Variable		n	%	Mean	Median	SD	Min	Max
Gender	Female	169	36					
	Male	292	62.1					
	Other	6	1.3					
	Prefer not to say	3	0.6					
Age		601	-	22	20	6.4	18	60
Role	Student	434	92.3					
	Staff	18	3.8					
	Other	18	3.8					
Total		601	100					

Most participants reported using the canteen between one and four times per week. Meat dishes were the most frequently selected, accounting for 67.3% of responses.

Although concern about diet scored moderately to highly ( $Md = 4.0$ ), only 15.7% reported frequently consulted nutritional information. Conversely, 24.7% never consulted it or were unaware of where to find it. Difficulty in interpreting labels also scored moderately ( $M = 2.4$ ), with main barriers including lack of technical

knowledge, difficulty interpreting values, and confusion regarding terminology, as summarized in Table 2.

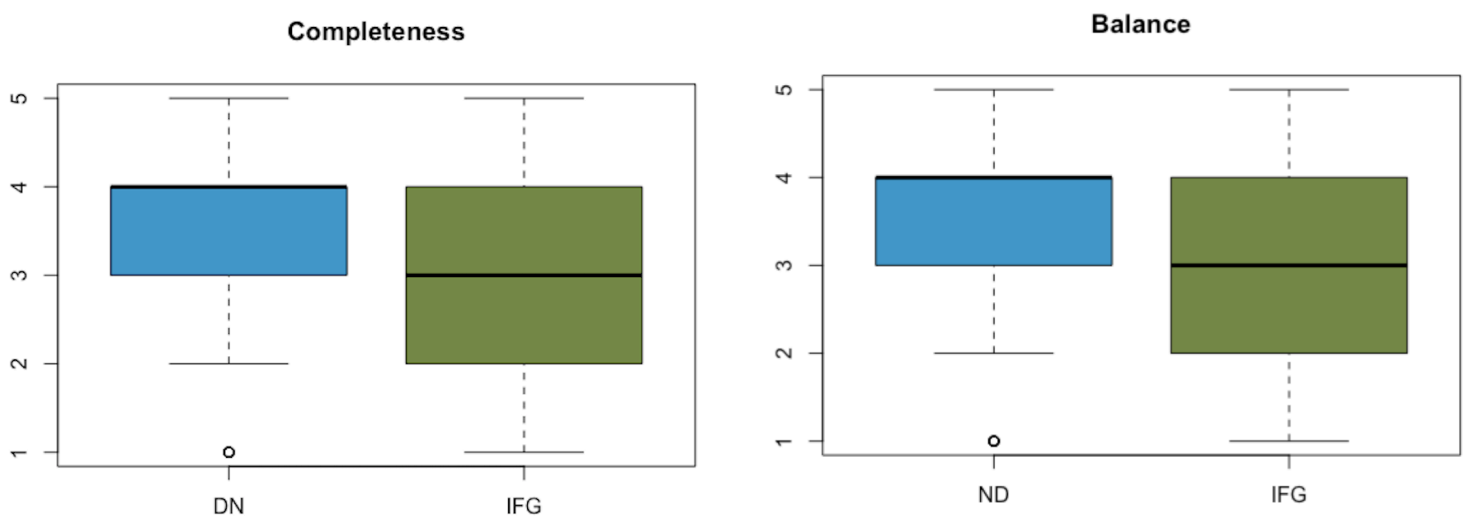
**Table 2.** Frequency of Canteen Use, Nutrition Information Consultation, and Label Interpretation Difficulty

Variable		N	%	Mean	Median	SD
<b>Frequency of using canteen</b>	Daily	100	21.3			
	3-4 times per week	134	28.5			
	1-2 times per week	147	31.3			
	Occasionally	89	18.9			
<b>Frequency of Consulting Nutrition Information</b>	Frequently	74	15.7			
	Occasionally	138	29.4			
	Rarely	142	30.2			
	Never	96	20.4			
	Don't know where to find it	20	4.3			
<b>Difficulty in Interpreting Nutritional Label</b>		470	-	2.4	2	1.1
<b>Concern about diet</b>		470	-	3.8	4	0.9
<b>Total</b>		470	100			

When asked about the main factors influencing their meal choices, the most commonly cited reason was personal food preference, followed by nutritional value and portion size. Visual appeal and price were also mentioned, while environmental concerns were least cited.

Perceptions of the labeling formats revealed that the ND scored slightly higher than the IFG in both perceived meal balance ( $M = 3.5$  vs.  $3.0$ ;  $SD = 0.9$  vs.  $1.0$ ;  $Md = 4$  vs.  $3$ ) and completeness ( $M = 3.6$  vs.  $3.1$ ;  $SD = 0.9$  vs.  $1.0$ ;  $Md = 4$  vs.  $3$ ). These differences were statistically significant according to the Wilcoxon test ( $W = 27667$ ,  $p < 0.001$  for balance;  $V = 20786$ ,  $p < 0.001$  for completeness), as shown in Figure 1 and Table 3.

**Figure 1.** Boxplots comparing perceived meal completeness (left) and balance (right) between the ND and IFG formats.



**Table 3.** Wilcoxon Signed-Rank Test: Comparison of Label Formats on Perceived Meal Balance and Completeness

Variable	N	W	p-value
Perception of completeness	462	20786	<0.001
Perception of balance	454	27667	<0.001

Despite the higher scores attributed to the ND, most participants (76.2%) indicated that they would not have chosen a different dish after viewing the labels. The IFG scored moderately to highly in terms of usefulness ( $M = 3.8$ ;  $Md = 4$ ), with 75% of respondents assigning it a score of 3 or higher. Additionally, 72%

(n = 390) considered a combination of both labeling formats the most effective approach.

## Discussion

The ND scored higher than the IFG in both perceived meal balance and completeness, possibly because it highlighted numerical values for nutrients that consumers typically associate with unhealthy eating. Since the meals analyzed were generally low in components such as sugar, fat, and energy, their presentation using the ND may have reinforced a more favorable perception. A study among Spanish consumers found that sugar content, total fat, saturated fat, and energy had a greater impact on food choices regardless of dietary habits <sup>(17)</sup>. By emphasizing macronutrients while overlooking broader aspects of nutritional quality, such as food variety or overall dietary patterns, the ND may contribute to a perception of balance that does not accurately reflect the true nutritional value of meals. A recent study analyzing kids' menus from fast-food restaurants in Portugal found that, although many meals complied with macronutrient targets, they failed to meet recommendations for key food groups like fruits and vegetables, highlighting inconsistencies between nutrient-based labeling and food-based dietary recommendations <sup>(18)</sup>.

The wider distribution of results for the IFG method suggests that there was no clear consensus among participants regarding the perceived balance and completeness of the meal using this method. This aspect may be justified by respondents' lack of familiarity with the format. The IFG method was designed to display the portions recommended for an adult on a 2000 kcal diet over the course of a whole day. Although this aspect was explained at the beginning of

the questionnaire, it could still have been a factor that hindered participants' understanding of the balance and completeness of the meal, as the interpretation may depend on the respondents' engagement with the instructions.

The IFG was applied to the technical specifications of preexisting dishes, which is a strength of this study as it represents a realistic setting, offering valuable ecological validity and practical insights; However, it also introduces a less controlled environment. For instance, the portion sizes of meat, fish and eggs on dishes significantly exceeded the recommendations of the IFG, which also may have contributed to the perception that these meals were unbalanced, which does not happen with the ND, reinforcing that the IFG may facilitate balance comprehension.

There was no prior qualitative evaluation of the weekly menu; so the relationship between balance and scoring of the menus was not explored. Nevertheless, considering that the current meal offer in canteens does not fully comply with recommendations <sup>(19)</sup>, and the fact that the IFG scored lower values than the ND, suggests that IFG may help consumers understand balance and completeness better than the ND. However, the majority of respondents answered 'no' when asked if they would choose a different dish after analyzing both methods, which suggests that understanding the nutritional information alone is not the only factor influencing food choices. A study on food choice determinants conducted within the community of the University of the Basque Country (UPV/EHU) in 2022 revealed that 98.6% of students cited "it tastes good" as a key factor, while 88.4% considered whether the meal was nutritious

<sup>(20)</sup>. This aligns with the findings of the present study, where food preference was the most frequently cited factor, followed by the energy or nutritional value provided.

Despite the IFG method's mixed findings regarding its perceived balance and completeness, the majority of respondents still considered the format to have moderate to high utility. Studies have reported that consumers prefer labels incorporating graphics and symbols <sup>(21)</sup>, and that enhanced label design may improve understanding and usability, particularly when compared to numerical formats like the ND <sup>(22, 23)</sup>.

Participants expressed interest in combining both methods, which may suggest an ongoing need for complementary information. Although research has shown that the general population struggles to interpret the ND, especially regarding DV (daily value) <sup>(24, 25)</sup>, it has also been reported that label inefficacy has less impact when the method is familiar, suggesting a comfort effect <sup>(26)</sup>. This could explain why consumers may still rely on the ND, while simultaneously showing interest in a visual method that, if well implemented and promoted, could support more balanced meal choices.

A major advantage of combining both methods is that, while the IFG's main limitation is its lack of information on salt, saturated fat, and sugar content, which is a key strength of the ND. Such information is especially important for individuals managing pre-existing health conditions. However, evidence suggests that interpretative formats, such as front-of-pack (FOP) labels, are more effective at supporting consumers in making informed choices and managing these conditions than purely quantitative formats like the ND <sup>(27)</sup>. This gap may



also present an opportunity to improve the IFG design by integrating both visual and critical nutrient information, thereby enhancing its utility and impact. Conversely, respondents in this study consistently cited excess information as a barrier, highlighting a potential challenge in combining both methods effectively.

“Lack of knowledge of technical information,” “difficulty understanding the relationship between the data presented,” and “confusion between terms” were respectively the most frequently cited barriers by participants. This aligns with existing literature that highlights the need for initiatives to empower consumers and improve nutrition literacy <sup>(28, 29)</sup>.

Although respondents reported a moderate to high concern about their diet, only a few claimed to check nutritional information frequently, reinforcing the idea that concern does not necessarily translate into behavior. This pattern may be partly explained by previous research suggesting that participants tend to overestimate their nutrition knowledge while performing poorly on functional tasks related to label comprehension <sup>(30)</sup>. This raises the question of why individuals may express an interest in healthy eating but still not actively engage with available resources such as nutritional labels.

The study presents some limitations related to the use of non-probabilistic convenience sampling <sup>(31)</sup>, as data was collected in canteens at three higher education institutions. This may have introduced both an educational and an age bias, as the majority of respondents were students from these institutions, a population that tends to have higher health literacy <sup>(32, 33)</sup> and greater familiarity with dietary guidelines. This context may also have produced an environmental effect, potentially influencing participants’ engagement when answering the

questionnaire. Additionally, respondents who identified as male represented more than half of the sample, which may introduce a confounding factor, as previous research has suggested that women tend to have higher nutritional literacy <sup>(34, 18)</sup>.

Despite nutritional labeling being a well-established topic in the literature, there is a lack of studies specifically focused on food service settings, as most research tends to address pre-packed food products. Additionally, the majority of scientific papers on user-friendly labeling methods focus on FOP labeling, whereas the ND is typically presented on the back-of-pack (BOP). The present study helps fill some of these gaps in the literature and underlines the importance of further exploring user-friendly labeling methods in public food services, while also providing a practical comparison between a visual (IFG) and a numerical (ND) method. It is also suggested that future research explores the application and validity of the IFG method in other contexts, such as pre-packaged foods or nutritional counseling sessions <sup>(13)</sup>, as part of an ongoing effort to promote the Mediterranean Diet and literacy on the Portuguese Food Guide among the population.

The IFG method proposes an alternative labeling approach that shifts the focus from individual nutrients to promoting a healthier dietary pattern, such as the Mediterranean Diet, which has been associated with improved health outcomes. Exploring the use of the IFG in a variety of settings could contribute to broader efforts to promote healthier eating habits and improve public health.

## Conclusions

ND scored generally higher in both balance and completeness, while the IFG scored lower values. Although no qualitative evaluation of the meals was performed, considering the current food offered, these results suggest that the ND may overestimate the nutritional balance and completeness of meals, whereas the IFG may encourage a more cautious assessment. Participants reported finding the IFG method useful and expressed interest in having it complement the ND, which indicates that consumers are open to more user-friendly labelling approaches.

These findings highlight the importance of further exploring accessible labelling methods. It will be essential to develop tools capable of accurately assessing the qualitative profile of meals and to examine whether the use of such formats can lead to meaningful changes in food choices.

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## Parecer do orientador do Trabalho Complementar

**U.PORTO**FACULDADE DE CIÊNCIAS DA NUTRIÇÃO E ALIMENTAÇÃO  
UNIVERSIDADE DO PORTO**PARECER**

A estudante **Manuela Bonito** realizou o seu estágio académico entre fevereiro e junho, na Cruz Vermelha Portuguesa Delegação de Matosinhos – Porto, sob a minha orientação.

A sua capacidade de trabalho e organização, empenho e motivação permitiram que levasse a bom termo o desafio a que se propôs, tendo conseguido cumprir com sucesso as várias etapas pré-definidas e ultrapassando as dificuldades que lhe foram surgindo.

Adaptou os seus objetivos e atividades com grande destreza e proatividade, evidenciando um grande entusiasmo em todas as tarefas que lhe foram solicitadas.

Pelo seu desempenho durante estes meses, pela sua disponibilidade e interesse, o seu trato afável, parece-me claro que a Manuela possui todas as características para vir a desempenhar a profissão de Nutricionista de forma exemplar.

FCNAUP – Porto, 16 de junho de 2025

A Orientadora de Estágio

(Professora Doutora Ada Rocha)