ORIGINAL ARTICLE

THE FACTORS AND ISSUES AFFECTING FOOD LABELLING AND THE NEED FOR LABELLING DESIGN FRAMEWORK: A REVIEW

Kasturi Perumal [1]; Balamuralithara Balakrishnan [2*]; Muhammad Zaffwan bin Idris [3]; Koshila Raja Sandow [4]

[1] Faculty of Art, Computing and Creative Industry, University Pendidikan Sultan Idris, Malaysia.
 Email: kasturi@tarc.edu.my

[2] Faculty of Art, Computing and Creative Industry, University Pendidikan Sultan Idris, Malaysia.
 Email: balab@fskik.upsi.edu zaffwan@fskik.upsi.edu.my

[3] Faculty of Art, Computing and Creative Industry, University Pendidikan Sultan Idris, Malaysia.
 Email: zaffwan@fskik.upsi.edu.my

[4] Faculty of Communication and Creative Industries, Tunku Abdul Rahman University of
 Management and Technology, Malaysia. Email: koshilars@tarc.edu.my

*Corresponding author

Abstract

Food labelling is critical in facilitating the exchange of information about a food product between users and the food industry or system. The food label information enables consumers to understand the food better and make healthier food choices based on the food labelling information. Given the critical role of food labelling in consumer decision-making, the industry must understand how the design elements of food labelling influence the consumer's perception of food selection. Understanding consumers' perspectives and needs regarding labelling is critical for effective information delivery and thus creating a need for a labelling design framework. Therefore, this study aims to highlight the need for food labelling frameworks, issues, and factors affecting labelling from past study viewpoints. The study's findings hope to contribute to developing new food label designs that emphasise effective communication, design selection, and the application of design elements to convey ingredient and nutritional information.

Keywords: food labelling; Issues; labelling framework; labelling design

Introduction

When it comes to consumers, food labelling is crucial since it helps them make purchasing decisions about their food choice (Chen, P. J, 2020)[1]. According to several studies, consumer behaviour can be influenced by the information provided on food labels. Besides, this information can assist consumers in making more informed decisions and contribute to disease prevention and population well-being (Moreira et al.,2019)[2]. Chen, P. J, 2020)[1] reports that consumers read labels to determine whether things meet their tastes and are appropriate for specific nutrition programmes, like vegetarians or health conditions. Thus, the research also reveals that consumers must be informed about the specific nature and qualities of the food product to make a more informed decision.

According to Corolla et al. (2021)[3], food labelling aims to communicate information to consumers to meet their expectations for both social and economic goals. Furthermore, this researcher recommended designing a sufficiently informative label while not misleading consumers because consumers rely on the food label as their primary reference source without face-to-face interaction. However, in the current situation, universally accepted and well-defined principles on food labels that are instructive and non-deceptive have not yet been designed for a resolution. This raises the question of what exactly establishes "food labelling" from the general public's perspective.

It is worth noting that Australia, England, Chile and Singapore have reliable food labelling laws (Yamaguchi, M,2022)[4]. In 2014, the U.S. Food and Drug Administration recommended various modifications to the 199Koda2 nutrition data labelling requirements (Christoph, M. J, 2018)[5]. The law enhanced the legibility of information by establishing a minimum font size for mandatory information, uniform and precise allergen information, and information on the origin of fresh meat from pigs, sheep, goats, and poultry. The act regulates the labelling, presentation, advertising, and nutrition labelling of foodstuffs to ensure consumer protection. The primary goals of food legislation are to emphasise food safety and to safeguard the consumer's health. Consumers can make an informed decision when purchasing foodstuffs if they have access to information such as ingredient lists, nutrition information, and allergies and nutrition information (Vaqué, L. G., 2019)[6]. Thus, it is critical to correct a bad diet to have dependable and simple-to-understand food labelling. However, the issues and factors that need to be considered to ensure effective labelling arise.

Apart from that, Corolla et al. (2021)[3] mention that the majority of research examines the issue from the consumer's perspective, which focuses on nutrition and health, daily foodstuffs and meal effects on health, food industry, and related products, market and social implications, and child nutrition. Nevertheless, to the best of the researcher's knowledge, only a few research has been done on food label design. As a result, it is crucial to consider the need to improve future food labelling design.

Thus, it is clear that awareness and understanding of food labelling among consumers are necessary to ensure food safety. The study by Melesse, M. B (2019)[7] also assessed consumer awareness of food labelling in Ethiopia and revealed that the participants were reasonably knowledgeable about the value of food label information and understood its importance. In contrast, according to a study by Christoph, M. J, 2018[5] and colleagues, 68.6 % of the participants stated that they had never used nutrition labels while shopping for food in the previous year. Nonetheless, there are no definitive statistics available to date to demonstrate the level of public

understanding of food labelling, despite reports indicating that consumer views of the nutritional value of foods are fast increasing. As the plenty of information, some of which is superfluous risks misleading consumers throughout their food selection process (Wilson, L., & Lusk, J. L., 2020)[8], it thus highlights the need to come up with a good food labelling design framework to ensure information can be delivered accurately.

Furthermore, the consumers' ability to accurately interpret the information on product labels may be critical for their health and safety or simply for making an informed choice according to their principles and values, thus ensuring essential information is delivered accurately. However, the issues associated with the understandability of food label information are primarily connected to food label perception, intelligibility, and interpretation, all of which are affected by various factors such as purchase conditions. Nevertheless, a minimal study has been conducted in the context of suitable food labelling design Corolla et al. (2021)[3].

Hence, this study aims to highlight issues and factors associated with food labelling design and the need for a framework from various literature perspectives. The outcomes hope to contribute to the identification of food labelling best practices.

Factors Affect the Use of Food Labelling

Consumers frequently exaggerate or underestimate the hazards associated with hazardous eating choices. One reason diet-related disease has increased in recent decades is a decline in natural food consumption. As a result, consumers have become more aware of the relationship between diet, nutrition, and disease in recent years and are looking for complete, accurate, and reliable information about the foods they eat. Thus, it is not surprising when a variety of literature on food labelling has listed Individual qualities, situations, attitudes, behaviour, nutrition knowledge, and motivation as elements that influence food labelling use (Topolska, K. 2021)[9]

Besides that, demographic factors like age, gender, and education influence the use of food labels. Among the other factors, age is crucial in determining how food labels are used (Miller et al. (2017)[11]. The study discovered that a lack of understanding of food labels might contribute to increased heart-related health problems among seniors. Additionally, to lower the risk of chronic diseases, educating the senior population on the proper use and interpretation of food labels when shopping is critical (M Jeruszka-Bielak (2018)[10]. This fact demonstrates that food labels contribute to improving dietary variables in the older age group to prevent chronic diseases.

Miller et al. (2017)[11] study also discovered that older adults pay less attention to food serving size information than younger consumers. The authors find that elderly persons rarely use serving-size information. However, to determine which characteristics are most likely to contribute to older folks' inability to comprehend serving-size information, they conducted a study involving adults aged 20 to 80 years. The study investigated the effects of basic literacy and age on the usage of serving size information on product labels. Participants were asked to compare two brands of identical products and choose the healthier option if forced to consume all. After two weeks, participants were given the same product and asked to choose the one with the lowest sodium or saturated fat content. Participants were also asked to complete questions about their demographic characteristics, use of food labels, basic literacy, and nutrition knowledge. The study's findings

indicate that young people who are educated and knowledgeable about food are more likely to read food labels Miller et al. (2017) [11].

However, research by M Jeruszka-Bielak (2018)[10] has revealed a surprising effect of age. This study reveals that the older Canadian population commonly refers to food labels as the most trustable source of information. Thus, this result demonstrates that the prior study's results were inconsistent. Furthermore, poor numeracy, regardless of age, might make reading serving-size information more difficult. It is critical to provide detailed nutrient counselling to older adults to raise consumer awareness and influence them to read serving-size information and choose healthier foodstuffs. Compared to younger consumers, elderly persons must manage diet-related chronic diseases.

Additionally, gender is a strong predictor of consumer utilisation of food labels. M Jeruszka-Bielak (2018)[10] reported that consumers' age, gender, and education level influence their food label usage. This research indicates that ladies and those with a higher level of education are more likely to use nutritional labels than males. They examined food labelling practices and their association with socioeconomic, behavioural, psychological, and nutritional variables. The study's findings indicate that women, older adults, and overweight consumers were more likely to use the nutrition label. Additionally, consumers with a higher education level read food labels more attentively and thoroughly than participants with a lower education level M Jeruszka-Bielak (2018)[10].

Similarly, (Christoph, M. J, 2018)[5] revealed that food labelling is primarily employed by well-educated, female, and young persons, although it was designed for general usage. The decreased level of nutrition awareness may be associated with people's underutilisation of food labels, which increases chronic diseases such as hypertension, diabetes, and heart problems. Furthermore, the research also discovered that women with higher education were more likely to use food labels than males or persons with lower education. Tierney et al. (2017)[12] investigation of consumer knowledge and understanding found that females are more likely to read product labels than males. However, over one-fifth of respondents reported rarely checking the label for macronutrients. It shows that the participant is not paying close attention to the nutrition table, such as the total sugar, calories, total fat, salt, and a saturated fat level of their meals. Additionally, this study discovered a lack of awareness of the WHO guidelines, even among highly educated consumers and nutrition experts (Tierney et al., 2017)[12].

In addition, (Christoph, M. J, 2018)[5] examined the association between nutrition label use and health and its correlation with gender using a population-based survey, revealing a strong correlation between health and nutritional label utilisation among participants, which is more pronounced in males than in women. The study examined the usage of nutrition labels using five variables: health status, demography, socioeconomic status, behaviour, and access to health care. Men reported using nutrition labels at a lower rate than women, at approximately 40.7 and 54.3 %, respectively. Male participants with chronic diseases such as high blood pressure, heart disease, or diabetes were shown to be more likely than female participants to use the nutrition label. However, this study demonstrates that this connection is not significant among females. The link between chronic illness and nutrition label use among males was established to educate them about nutritional values in a therapeutic context.

Meanwhile, (Christoph, M. J, 2018)[5] stated that using food labelling has positively associated with education. The finding proves that highly educated individuals are inclined to refer to nutrition

labels compared with low-education individuals. This statement shows that individuals with low levels of education demonstrated a little effect in using food labels. Nonetheless, Hakim, M. P, (2020)[13] stated that younger consumers with higher levels of education recognise and understand the food labels. Thus, in these demographic factors, high levels of education were associated with increased recognition of food labelling.

Additionally, consumers may use a food label for various purposes, including assisting in consuming healthier foods and disease prevention. In the past, it has been demonstrated that increased awareness of nutrition labels aids in selecting healthy foods by individuals with varying health needs. According to (Christoph, M. J, 2018)[5], food label usage is connected with improved dietary factors among adolescents. It is reported that 50 % of adults referred to the Nutrition Facts panel, and 51.6 % consulted the ingredient list while making food purchases. Compared to non-food label users, food label users consume less total fat, saturated fat, cholesterol, salt, dietary fibre, and sugar.

Issues with Food Labelling

Nowadays, greater attention has been paid to food labelling. Even if an individual does not have a particular health aim, a valid label can entice them to examine a product's nutritional content. It is critical to examine the effects of food labels in order to foster the habit of making healthy food choices. It is critical to comprehend, elaborate, and integrate information on food labels. While consumers are becoming more aware of labels, their nutrition and ingredient information knowledge remains a significant issue. According to previous surveys, consumers are frequently confused by technical words, and many ignore the information by seeing it as unimportant (Karakaya, F 2018)[14].

According to earlier studies, the primary reason consumers did not use food labelling was an inability to comprehend the language used, which could be attributed to a lack of health understanding. The font size, on the other hand, made it difficult for the elderly to read. Thus, simple-to-understand vocabulary, the veracity of the information provided, and larger font size are the major issues for encouraging consumers to use food labelling when grocery shopping. Having a visible nutrient and ingredient list while purchasing or consuming is critical. This information is not always prominently shown on the front of some foods but rather on the back. The researcher discovered a variety of approaches for improving food label utilisation. To improve nutritional labels and prevent chronic nutrition-related diseases, the WHO international organisations have recommended using multiple food labelling strategies (Egnell, M., 2018)[15]. These include improving the graphical display, reference information, summary descriptors, and category-specific mean nutritional values. This paper advises additional research on the customer's capacity to interpret product information via various labelling forms. Educating a diverse set of individuals through educational programs and materials tailored to a specific customer's needs is vital. This is because an older consumer may have more difficulty interpreting the information than a younger one. The fixed position on the food label is also one technique to assist consumers, particularly older folks, in reading the labels and making good food choices. Additionally, it is critical to assess current health education activities and determine the need for nutrition and food-label literacy programmes. Given the strong correlation between the usage of food labels and healthy dietary choices, researchers and clinicians should incorporate nutritional and product labelling into nutrition education programmes.

In assumption, this study used the information processing model to establish a framework for a sound labelling system to increase consumer awareness of food labelling. According to the information processing model by DeJoy, 1991, the information must go through five stages before affecting behaviour (Chen, R., Bello, 2018)[16]. The label should be designed to maximise exposure, attract attention, and be simple to encode and grasp, and only then should it be able to impact decision-making. The five serialised processing stages have been constructed in this work utilising the model of the information processing approach. (see Table 1)
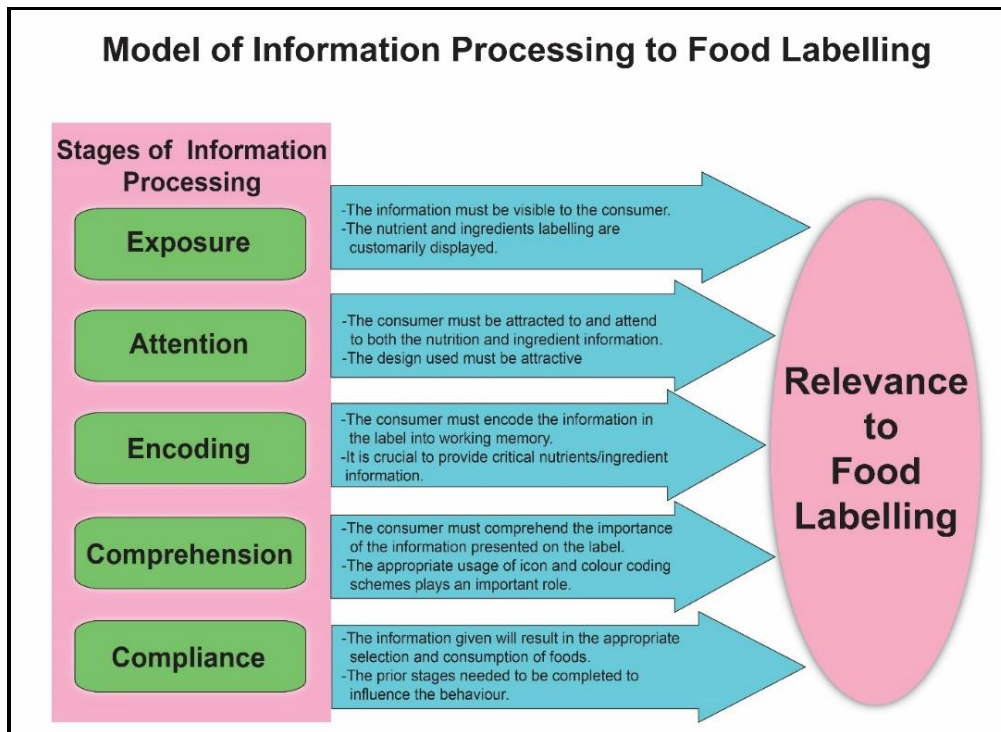

Model of Information Processing to Food Labelling

Stages of Information Processing

Exposure
-The information must be visible to the consumer.
-The nutrient and ingredients labelling are customarily displayed.

Attention
-The consumer must be attracted to and attend to both the nutrition and ingredient information.
-The design used must be attractive

Encoding
-The consumer must encode the information in the label into working memory.
-It is crucial to provide critical nutrients/ingredient information.

Comprehension
-The consumer must comprehend the importance of the information presented on the label.
-The appropriate usage of icon and colour coding schemes plays an important role.

Compliance
-The information given will result in the appropriate selection and consumption of foods.
-The prior stages needed to be completed to influence the behaviour.

Relevance to Food Labelling

Figure 1 Model of information processing approach to Food labelling

The Need for Better Food Labelling Design

Several studies included recommendations for improving the design of food labels. In instigating, it is essential to remember that label messages are examined and evaluated concurrently with the rest of the package by the consumer (Rosenblatt, D. H. et al., 2019)[17]. Thus, both the written and pictorial material should be taken into account. The basic concept is that the information on a food label should be user-friendly, facilitating the consumer's comprehension of food specifics. From a textual content perspective, food information should be given in a manner that is orderly, clear, straightforward, brief, and non-technical (Schiro, J. L. et al., 2020)[18], with a bigger readable font size being preferable (Koen, N. et al., 2018)[19], to boost subjective hedonic expectations.

In order to achieve attractiveness and message transmission, Liang. Z (2021)[20] argues that images, pictographs, and standardised synthesis graphical systems outperform textual contents. Specifically, standardised synthesis graphical systems (such as the traffic light system or the choices checkmark sign) may help consumers perceive the healthiness of products by guiding them

through the selection and purchasing procedures (Chan, F. F. Y. et al., 2016)[21]. Concerning warning labels, the triangular symbol on a white background and the signal word "High in" is more noticeable to consumers, attracting their attention and informing their food choices more effectively than the signal words "A lot of" and the octagonal symbol (Khandpur et al., 2019)[22]. Additionally, greater attention might be paid to selecting aspects such as the background, text style, and image.

Besides, it assumed that food containers in light blue enhance not only the appearance of the products but also their consumption (Wood & Tenbensel, 2018)[23]. Moreover, Corolla et al. (2021)[3] mention that increased colour contrast improves the readability of food labels. Indeed, it debated that "the vast majority of consumers focus their attention on four critical aspects of product labels (image, brand, ingredients, and nutritional information)." Several of these aspects take up space on the front of the packaging, enabling the food label a dual purpose of informing the buyer about the contents of the meal while also serving as a poster hoarding. Given that consumers place a higher premium on public labels (which are regulated by the EU, Corolla et al. (2021)[3] than on private labels.

Consumers most frequently request and value the following information on food labels: designation of origin followed by an organic logo or Country of Origin (COO) label, nutritional panel, and warnings better if calculated per 100 g of product expiry date or maximum shelf life date (de-Magistris et al., 2017)[24] with a preference for the latter. It is worth noting that additional information was deemed beneficial to consumers. The use of claims, preferably brief ones, has been shown to improve perceptions of food quality, healthiness, and trust and affect food selection (Nobrega et al., 2020)[25]. Similarly, regarding certified food products like organic food, GMO-free food, Protected Geographical Indication, and Protected Designation of Origin, information about the authentication source or food quality can help raise consumer awareness about food and the associated authentication mechanisms Corolla et al. (2021)[3].

Concerning food information that has not yet been disclosed on a label, it should go beyond fundamental consumer demands and represent consumers' lifestyles and ideologies, so improving the product's appeal is indeed necessary.

Conclusion

In conclusion, the review gave important information for future study and development of theoretical and empirical research, as well as for developing research methods. We found that various factors influence the usage of food labelling, including personal characteristics, situational factors such as attitudes and behaviours, product class engagement, nutrition knowledge, and other factors such as incentive factors and other features. On the other hand, these characteristics have contradicting effects because of the various research variances and diversity in technique, data collection, location, and scope.

Besides, according to the literature review findings, food labels differ depending on demographic criteria such as gender, income, age, and educational background. Consequently, it is recommended that more comprehensive research on food labelling be carried out to frame and improve the ineffective regulation. The research data also reveals that many consumers pay attention to food labels, but how additives are presented on the labels confuses the general public.

Apart from that, it is noteworthy that limited studies on the design of a virtual label were found, indicating a void in the literature on the design of virtual labels in the food business. In this case, the lack of awareness about their function, like using QR codes to extend label contents, is not perceived as providing value by consumers, and it could be linked to a lack of understanding about their purpose. Further research studies might examine whether consumers are aware of virtual labelling to determine whether food firms could benefit from the same best practices in food label design.

References

1. Chen, P. J., & Antonelli, M. (2020). Conceptual models of food choice: influential factors related to foods, individual differences, and society. *Foods*, *9*(12), 1898.
2. Moreira, M. J., García-Díez, J., De Almeida, J. M. M. M., & Saraiva, C. (2019). Evaluation of food labelling usefulness for consumers. *International Journal of Consumer Studies*, *43*(4), 327-334.
3. Corallo, A., Latino, M. E., Menegoli, M., & Pizzi, R. (2021). Assuring effectiveness in consumer-oriented traceability; suggestions for food label design. Agronomy, 11(4), 613.
4. Yamaguchi, M., Nomura, M., Arai, Y., Vandevijvere, S., Swinburn, B., & Nishi, N. (2022). An assessment of implementation gaps and priority recommendations on food environment policies: the Healthy Food Environment Policy Index in Japan. Public Health Nutrition, 25(6), 1720-1732.
5. Christoph, M. J., Larson, N., Laska, M. N., & Neumark-Sztainer, D. (2018). Nutrition facts panels: who uses them, what do they use, and how does use relate to dietary intake?. Journal of the Academy of Nutrition and Dietetics, 118(2), 217-228.
6. Vaqué, L. G. (2019). Nutritional information for consumers–is it really useful? Limits and future prospects. In *The functional field of food law: Reconciling the market and human rights* (pp. 331-344). Wageningen Academic Publishers.
7. Melesse, M. B., de Brauw, A., & Abate, G. T. (2019). Understanding urban consumers' food choice behavior in Ethiopia: Promoting demand for healthy foods (Vol. 131). Intl Food Policy Res Inst.
8. Wilson, L., & Lusk, J. L. (2020). Consumer willingness to pay for redundant food labels. Food Policy, 97, 101938.
9. Topolska, K., Florkiewicz, A., & Filipiak-Florkiewicz, A. (2021). Functional food—Consumer motivations and expectations. International Journal of Environmental Research and Public Health, 18(10), 5327.
10. Jeruszka-Bielak, M., Kollajtis-Dolowy, A., Santoro, A., Ostan, R., Berendsen, A. A., Jennings, A., ... & Pietruszka, B. (2018). Are nutrition-related knowledge and attitudes reflected in lifestyle and health among elderly people? A study across five European countries. Frontiers in physiology, 9, 994.
11. Miller, L. M. S., Applegate, E., Beckett, L. A., Wilson, M. D., & Gibson, T. N. (2017). Age differences in the use of serving size information on food labels: numeracy or attention?. Public health nutrition, 20(5), 786-796.
12. Tierney, M., Gallagher, A. M., Giotis, E. S., & Pentieva, K. (2017). An online survey on consumer knowledge and understanding of added sugars. Nutrients, 9(1), 37.
13. Hakim, M. P., Zanetta, L. D. A., de Oliveira, J. M., & da Cunha, D. T. (2020). The mandatory labeling of genetically modified foods in Brazil: Consumer's knowledge, trust, and risk perception. Food Research International, 132, 109053.

14. Karakaya, F., & Saracli, S. (2018). Impact of perceived risk of food nutrients and serving size on consumer involvement with food labels. Nutrition & Food Science.

15. Egnell, M., Ducrot, P., Touvier, M., Allès, B., Hercberg, S., Kesse-Guyot, E., & Julia, C. (2018). Objective understanding of Nutri-Score Front-Of-Package nutrition label according to individual characteristics of subjects: Comparisons with other format labels. PloS one, 13(8), e0202095.

16. Chen, R., Bello, N. M., Becker, M. W., & Bix, L. (2018). Chasing red herrings: Can visual distracters extend the time children take to open child resistant vials?. Plos one, 13(12), e0207738.

17. Rosenblatt, D. H., Dixon, H., Wakefield, M., & Bode, S. (2019). Evaluating the influence of message framing and graphic imagery on perceptions of food product health warnings. Food Quality and Preference, 77, 32-42.

18. Schiro, J. L., Shan, L. C., Tatlow-Golden, M., Li, C., & Wall, P. (2020). # Healthy: smart digital food safety and nutrition communication strategies—a critical commentary. NPJ science of food, 4(1), 1-11.

19. Koen, N., Wentzel-Viljoen, E., Nel, D., & Blaauw, R. (2018). Consumer knowledge and use of food and nutrition labelling in South Africa: A cross-sectional descriptive study. International Journal of Consumer Studies, 42(3), 335-346.

20. Liang, Z., Hu, H., Xu, C., Tao, C., Geng, X., Chen, Y., ... & Jiang, D. (2021). Maria: A visual experience powered conversational agent. arXiv preprint arXiv:2105.13073.

21. Chan, F. F. Y., Lowe, B., & Petrovici, D. (2016). Processing of product placements and brand persuasiveness. Marketing Intelligence & Planning.

22. Khandpur, N., Mais, L. A., de Morais Sato, P., Martins, A. P. B., Spinillo, C. G., Rojas, C. F. U., ... & Jaime, P. C. (2019). Choosing a front-of-package warning label for Brazil: A randomised, controlled comparison of three different label designs. Food Research International, 121, 854-861.

23. Wood, A., & Tenbensel, T. (2018). A comparative analysis of drivers of collaborative governance in front-of-pack food labelling policy processes. *Journal of Comparative Policy Analysis: Research and Practice*, *20*(4), 404-419.

24. De-Magistris, T., Gracia, A., & Barreiro-Hurle, J. (2017). Do consumers care about European food labels? An empirical evaluation using best-worst method. British Food Journal.

25. Nobrega, L., Ares, G., & Deliza, R. (2020). Are nutritional warnings more efficient than claims in shaping consumers' healthfulness perception?. Food Quality and Preference, 79, 103749.