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Nutritional Labelling and Purchase Intention:
A Qualitative Comparative Approach

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ABSTRACT

With the aim of preventing malnutrition, it has been proposed to provide information to consumers about the nutritional content of food using labelling on packages to promote healthier eating habits. Since the way in which the consumer uses the information available in the choice of healthy foods is not clear, this article aims to analyze the interrelationship between the different types of interpretative FOP labelling and the characteristics of consumers in the food purchase intention. Food purchase intention, or its negation, is determined by different combination of conditions were perceived healthiness plays an important role. Nutrition summary indicator labelling interacts with the nutrient-specific nutritional labelling, nutrition consciousness, perceived healthiness, age, and gender in different ways to determine purchase intention or negation of purchase intention. Governments must make additional efforts to ensure that the Nutri-Score guides citizens in making healthy food choices.

KEYWORDS

Front-of-Pack Labelling, Interpretative Labelling, Nutri-Score, Nutrition Consciousness, Nutrition Summary Indicator, Perceived Healthiness, Purchase Intention, QCA

1. INTRODUCTION

Dietary patterns reflect changes in the environment, and also in preferences of consumers, which make unhealthy diet one of the main health risk factors (Pichierri et al., 2021). The rate of overweight and obesity in the world increases due to consumption of products rich in energy, fat, added sugars, and salts (Da Silva et al., 2022; McCrickerd et al., 2020). For this reason, governments apply strategies to improve the health of the population based on a healthy diet (Arroyo et al., 2021; Pujara et al., 2022; Signal et al., 2022). Since global problems require global responses, healthy eating is one of the objectives of the Agenda 2030. The SDG 2 of this Agenda aims to improve eating habits through a better access to healthy and nutritious food as a formula for health improvement (Iazzi et al., 2022). A healthy diet and habits are a determining factor in the prevention of obesity and its related non-communicable diseases (de-Magritis et al., 2017; Goiana-da-Silva et al., 2019). However, only

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a minority of the population shows interest in information related to the food they consume (Arenas-Gaitán et al., 2022; Signal et al., 2022; Van der Merwe et al., 2022), so that changing inappropriate health habits requires recognizing that the behaviour of citizens is not rational (Arroyo et al., 2021; Pujara et al., 2022).

Since the shopping environment exposes the consumer to promotional communications that do not necessarily seek to encourage the consumer to opt for healthier products (Van der Merwe et al., 2022), the provision of information is one of the main strategies to enable consumers to make informed decisions about the quality of food and to improve eating habits (Lee & Sozen, 2020). This is essential to reduce malnutrition (de-Magritis et al., 2017) providing more benefit than the need of medical care (Goiana-da-Silva et al., 2019). However, although food labels are essential to avoid unhealthy diets (Cecchini & Warin, 2016), consumers trust promotional communications more than their knowledge when consulting food labels (Van der Merwe et al., 2022).

Any case, labelling is an effective way to provide information to consumers about the food content and promote healthier food choices (Da Silva et al., 2022; Kumar & Kapoor, 2017; Sarda et al., 2020; Thaivalappil et al., 2019). For this reason, many countries use nutritional labelling, a type of behavioural intervention closes to nudges and far from coercion and prohibitions (Awasthi, 2021; Salnikova & Stantan, 2021). While back-of-pack nutrition labelling is a widely accepted strategy, the relevance of the labelling leads the European Union to focus on the use of simplified front-of-pack (FOP) information on the nutritional properties of food (Da Silva et al., 2022; Sarda et al., 2020). In Spain, the nutrition information on the labels of packaged foods is compulsory since 2016, according to the Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011. Recently, the complement of the Nutri-Score summary indicator FOP labelling has been voluntarily established. Nutri-Score provides consumers with an easily understandable nutritional information summary of the products to guide consumers to healthier food choices, and serves as a discriminating criterion to encourage manufacturers to reformulate and improve the nutritional quality of their products (Sarda et al., 2020).

However, in the choice of food by the consumer, marketing information and personal knowledge are involved, and it is not clear how they evaluate the information available on the packaging to make healthy choices (Bryla, 2020; Van der Merwe et al., 2022). Thereby, consumers found difficult to understand the nutrition information on food labels, and many consumers do not read food labels when buying (Egnell et al., 2018). Over-labelling and the provision of incomplete information can create confusion to consumers instead of improving their decision-making capacity; thus, a harmonized FOP labelling system should be implemented (Goiana-da-Silva et al., 2019, Pereira et al., 2019).

The decision to purchase packaged foods is complex due to the different attributes used by consumers (Arroyo et al., 2021; Bryla, 2020; Da Silva et al., 2022; Van der Merwe et al., 2022), as well for the effect of different types of labels and contexts (Bryla, 2020). Regarding the coexistence of different types of labels on the packaging, both their joint effect and the way in which positive and negative claims are balanced have been analyzed (Acton et al., 2019; Medina-Molina & Pérez-González, 2021; Salnikova & Stanton, 2021). However, since the effectiveness of FOP labelling is conditioned by the preferences, attitudes, personal traits and intentions of consumers, its effect on food purchasing intention must be analyzed together (Limbu et al., 2019; Medina-Molina et al., 2021; Medina-Molina & Pérez-González, 2021). This is the gap to which the present work responds, to analyze the interrelationship between the different types of interpretative FOP labelling and the characteristics of consumers in the food purchase intention. The fact that Nutri-Score came into effect in 2022 makes it necessary to study how the different nutritional labels and the characteristics of consumers influence purchase intention, as they might not pay attention to all the information available in the FOP (Bello et al., 2020). Therefore, this paper answers the following research question: do the different types of interpretative FOP labelling and the characteristics of consumers interact in the explanation of the purchase intention?

The objective of this paper is to analyse the interaction between the different types of interpretative FOP labelling (nutrient-specific or summary indicator) and the characteristics of consumers (nutrition consciousness, perceived healthiness, age, and sex) in the purchase intention or negation of purchase intention. In this way, we respond to the need to study the consumers that have different nutrition consciousness and to verify the interrelationship of nutritional claims and other elements, as perceived healthiness. To respond to the objective, a field work was carried out in which 301 valid questionnaires were obtained. For the analysis we employ Qualitative Comparative Analysis (QCA) because it enables us to identify how the different elements interact. In fact, the use of QCA is recommended when the research interest focuses on the interaction between conditions beyond the net effect of individual conditions (Medina-Molina, et al., 2022; Medina-Molina & Pérez-Macías, 2022; Medina-Molina & Rey-Tienda, 2022). In this way, the interaction of the Nutri-Score with other elements will be deepened in determining the intention to purchase food.

The work is structured as follows. In the second section, the Literature Review is presented, which raises the need to jointly analyze the elements contemplated in the study. Next, the Methods, Analysis and Results, Discussion and finally Conclusions and Limitations are presented.

2. LITERATURE REVIEW

Companies can condition the decision to purchase food through the use of promotions or the presentation of information on the packaging (Beacom et al., 2022; Corallo et al., 2021). When consumers are exposed to the packaging, they value the specific food attributes and the ingredients, and health claims. To take advantage of the impact of these elements on consumers, food companies try to associate healthiness to several types of claims on packaging (Festila & Chrysochou, 2018; Plasek et al., 2020; Salnikova & Stantan, 2021). This is because nutrition and health claims reinforce consumers' behaviour and generates purchasing patterns (Cermin et al., 2019; Drichoutis et al., 2006; Medina-Molina et al., 2021). However, although the labels presented on the food packaging are an indispensable source of information in making healthy decisions (Cecchini & Warin, 2016; Corallo et al., 2021; Van der Merwe et al., 2022), relying solely on changes in nutrition labelling will have a modest effect on the healthiness of food choices (Signal et al., 2022).

Nutrition labelling FOP aims to ensure that consumers have access to information of the intrinsic quality food characteristics to enable them to make informed choices and to follow a balanced diet (Drichoutis et al., 2006; Salnikova & Stantan, 2021; Signal et al., 2022). The FOP label is applied to packaged foods to increase the knowledge of their nutritional quality, improve consumers' information and help them to identify healthier products, increasing the intention of purchasing healthier products. Several studies that compare different FOP formats reported an increased attractiveness and preference for Nutri-Score; however, its impact on consumers' behaviour is limited (Dubois et al., 2020; Egnell et al., 2018; Sarda et al., 2020).

Drichoutis et al. (2005, 2006) demonstrated the positive link between nutrition labelling and purchase intention, as a result of the influence of nutrition labelling on consumer values and perceptions. This approach is supported by the role played by credence factors, those that cannot be assessed prior to consumption of the product and that can be transformed into a search attribute when nutrition labelling is present (Drichoutis et al., 2006). These credence factors affect as much as the rational ones in consumer decisions (Sánchez-Carrera & González-Lara, 2019). However, the model of Drichoutis et al. (2005) is too theoretical and must be complemented with knowledge, attitudes, and consumption data.

Therefore, to explain the relationship between the information provided on FOP labelling and purchase intention, we employ the information-motivation behavioural (IMB) skills model (Fisher & Fisher, 1992). IMB explains the consequences of having relevant and specific information on the background of the targeted behaviour (Limbu et al., 2021). It states that information and motivation alone are not enough to evoke behaviour change but indirectly influence action through behavioural

skills (Limbu et al., 2019). This model was developed to explain the risk prevention and health promotion related behaviour (Limbu et al., 2021), based on three main assumptions. First, individuals need reliable information to respond to the desired behaviour; this information includes facts, heuristics, and implicit theories. Second, individuals must be motivated to be engaged in the desired behaviour; this motivation includes personal perspective -attitude towards a certain behaviour- and social perspective -subjective norm. Third, when appropriate information and motivation is available, individuals will be involved in the behavioural skills necessary to achieve the desired behaviour (Limbu et al., 2019; Limbu et al., 2021).

This model has been applied to food consumption, implementing socio demographic variables as moderators (Limbu et al., 2021). In their application to food choice based on the IMB, Limbu et al. (2019) propose a model that includes information/motivation (nutritional knowledge and attitude towards food label use), moderator (gender) and behavioural skills and trust (food label use self-efficacy and trust) as explanatory variables of behaviour (food label use). Similarly, van der Merwe et al. (2022) develop a model in which the consumer's purchase decision is determined by their knowledge, as well as by marketing impulses and personal factors.

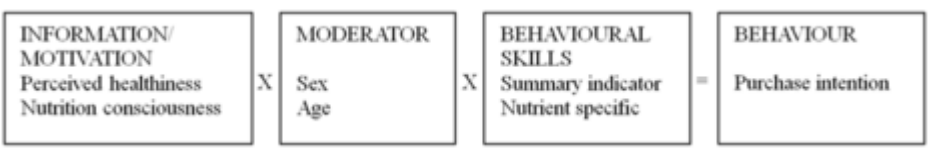
This paper proposes the following research model (Figure 1) following Limbu et al. (2019, 2021). The model is focused in the analysis of the interaction between information and motivation (perceived healthiness, nutrition consciousness), moderators (sex and age), and behavioural skills (interpretative labelling), determine the behaviour (purchase intention).

2.1 Interpretative Labelling: Nutritional Claims and Nutri-Score

A first classification of the labels differentiates them into non-interpretative and interpretative. Non-interpretative labels offer quantitative information on specific nutrients without any type of judgment, opinion, orientation or qualitative element to assist in the interpretation of the information (Da Silva et al., 2022). Interpretative labels provide an overall evaluation of the product healthiness, a compilation of information that can help consumer to evaluate food products effectively (Cecchini & Warin, 2016; Newman et al., 2018). Interpretative labels are divided into two categories based on the degree of aggregation of the information: (1) nutrient-specific indicators (e.g., "low in salt") and (2) summary indicators (e.g., Nutri-Score) (Ikonen et al., 2020; Newman et al., 2018).

Nutrient-specific interpretative labels incorporate an evaluation of the healthiness of one or more nutrients, evaluating whether a product is "good" or "bad" in the aspect analysed (Ikonen et al., 2019; Newman et al., 2018). This type of labelling can be encouraged by the fact that the more precise the nutritional claim on food package is, the greater the likelihood will be that consumer purchase it. Consumers positively value brief, clear, simple and familiar nutritional claims that do not use scientific terminology, accepting to a greater extent those products that incorporate them (Klopcic et al., 2020). Within the nutrient-specific, nutritional claims (favourable) and nutritional warnings (negative) can be presented. The nutritional claim highlights the benefits of foods and could lead to them being perceived as healthier. The halo effect can cause that nutritional claims may bias consumers' inferences, leading them to extend beyond the objective benefit related to the specific nutritional claim (Amos et al., 2019; Andrews et al., 2011; Cecchini & Warin, 2016; Drichoutis et al. 2005; Pichierri et al., 2021). Nutritional warnings highlight high nutrient content associated with non-communicable diseases and facilitate the identification of healthy products (Nobrega et al.,

Figure 1. Proposed model (Source: own study)



2020), although they only change consumer behaviour when they offer new information (Da Silva et al., 2022). However, it is inevitable that products with a higher content of fat, salt and sugar receive greater promotions from organizations enjoying greater visibility (Beacom et al., 2022), changing the purchase intention of the nutritional warning only for certain food categories (Da Silva et al., 2022). In any case, manufacturers highlight positive healthy associations in food packaging that can reduce the effectiveness of nutritional warnings (Nobrega et al., 2020).

Summary indicator interpretative labelling provides aggregated nutritional information, summarising the overall nutritional quality of the product. It combines different criteria to establish the healthiness of food products and provides a summary of the nutritional profile of food (Da Silva et al., 2022; Ikonen et al., 2020; Newman et al., 2018), leading to healthier nutritional decisions (Krešić et al., 2019; Sánchez-García et al., 2019). Nutri-Score improves consumers' ability to understand nutrition information and make healthier food choices (Goiana-da-Silva et al., 2019). In addition, Nutri-Score moderates the relationship between the attitude towards a brand and the purchase intention (Medina-Molina et al., 2021). When a food product is given positive -negative- evaluation from Nutri-Score, the nutrient-specific interpretative labelling reinforces -cancels- its effect (Medina-Molina & Pérez-González, 2021). Likewise, those foods that receive negative evaluations rely more on sales promotions (Beacom et al., 2022).

2.2 Perceived Healthiness and Nutrition Consciousness

The evaluation of health claims is determined, in part, by the perceived healthiness of a product (Plasek et al., 2020). Perceived healthiness is the consumers' perception or expectation of the influence that consuming a specific product has on their health (Da Silva et al., 2022; Francioni et al., 2022; Samoggiea, 2016), a relative concept established in relation to other products (Damen et al., 2022). Perceived healthiness is determined by six categories of elements (Da Silva et al., 2022; Lin et al., 2017; Plasek et al., 2020): communication information; product category, the shape and colour of the product packaging, the ingredients of the product, the organic origin of the product, and the taste and other sensory features of the product. However, products with less healthiness receive a greater number of promotions (Beacom et al., 2022). Consumers make inferences on food healthiness using nutritional information and claims of health benefits shown on labels, being strongly linked with the purchase intention (Medina-Molina & Pérez-González, 2021; Medina-Molina et al., 2021).

Nutrition consciousness is the general willingness to pay attention to nutritional information that shows interest in specific goals (Newman et al., 2018). Health-conscious consumers present a greater interest and concern in the nutritional information available and are more motivated by product evaluations, devoting greater effort to process the food information. Consequently, they will more easily recognize the differences between products more and less healthful. Nutrition consciousness affects processing, perception, and evaluation of the information provided on product packaging. Favourable nutritional values have a positive -reduced- effect on the attitude and purchase intention of products for less healthy-conscious consumers (Andrews et al., 2011; Newman et al., 2018). Consumers with limited nutritional knowledge tend to prefer foods with information that is easy to understand (Van der Merwe et al., 2022).

2.3 Demographic Variables: Age and Sex

Food choice is influenced by demographic variables such as age and sex. Age significantly influences food choice; the older consumers are more likely to make healthier food choices (Chambers et al., 2008), and accept foods with nutritional claims in their diet (Klopcic et al., 2020). They tend to rely only on the ingredients list, which is linked to "specific nutrients", while younger people pay attention to both specific nutrients and the ingredients list of food labels (Drichoutis et al., 2006). The Baby Boomers are the generation that shows the greatest interest in the health implications of the products they consume, with Generation Z showing the least interest (Arenas-Gaitán et al., 2022). Older and more health-conscious customer segments prefer health-related attributes over other utilitarian or

conventional ones (Arroyo et al., 2021). However, Nutri-Score is best understood by young population (Egnell et al., 2018; Sarda et al., 2020). Health is important, but not a priority in the choice of certain categories of products for young people (Damen et al., 2022).

There are differences on food choice according to sex (Rodriguez-Donate et al., 2019); it affects the search, evaluation, use, and understanding of the information on the labels (Cheng and Liu, 2019: Medina-Molina et al., 2021; Skubic et al., 2018). Women are more likely to pay attention to food labels (Drichoutis et al., 2006; Gupta & Dharmi, 2016; Limbu et al., 2019), and they prefer labelled food products (Skubic et al., 2018). Women, more than men, read labels and are more favourable to nutritional claims because they are more interested in their health (Klopcic et al., 2020). Women are more concerned about food, healthy diets, and the related health risks of unhealthy diets (Chambers et al., 2008; Thaivalappil et al., 2019). Women are more likely to detect, process and use less accessible and more relevant information when they evaluate the food products, while men rely on heuristics that simplify decisions (Mead & Richerson, 2018; Salnikova & Grunert, 2020). Sex moderates the effect of nutrition facts on purchase intention (Limbu et al., 2019) and the perceived healthiness of a food product. Women demonstrated a higher understanding of Nutri-Score (Egnell et al., 2018). Likewise, gender and knowledge of nutrition condition the rate of reading the labels. (Bryla, 2020).

Proposition 1: The interaction between perceived healthiness, interpretative nutrition labelling, nutrition consciousness, sex, and age is sufficient for the presence of purchase intention.

Proposition 2: The interaction between perceived healthiness, interpretative nutrition labelling, nutrition consciousness, sex, and age is sufficient for the negation of purchase intention.

3. METHODS

3.1 Constructs and Variables

Validated scales were used to measure the constructs: perceived healthiness (PH), 4 items (Bauer et al., 2013), nutrition consciousness (NC), 3 items (Andrews et al., 2011) and purchase intention (PI), 3 items (Cermin et al., 2019). A Likert (1-7 point) scale was used, where 1 point means strongly disagree, and 7 strongly agree, following the original design of scales. A pre-test was conducted to ensure that questions were understood correctly. Sex (0 = female; 1 = male) and age (years) were also included. A dichotomous variable (0 = No; 1 = Yes) was used to measure the presence of summary indicator (SI, Nutri-Score) and nutrient specific (NS) labelling.

To explain the interaction between the conditions that explain the purchase intention or its denial, two models were developed for a product of the same category. As the aim of this work is to explain the presence or negation of purchase intention, we present the results of the brand model with a positive Nutri-Score evaluation (B) to explain purchase intention and the brand with a negative Nutri-Score evaluation (D) to explain the negation of intention. The products were also presented by combining the presence and absence of the two types of interpretative labelling. Nutrient-specific interpretative labelling highlights the positive elements of the product. For this reason, in each case four different images of the food were presented: without NS neither SI; with NS but without SI; with SI without NS; and with NS and SI.

3.2 Data Collection and Sample

The fieldwork, through an online questionnaire, was carried out from 28 January to 4 March 2020 with a limitation of one response per respondent. A sample of 301 valid questionnaires was obtained.

3.3 Methodology

QCA is a technique that integrates elements of quantitative and qualitative analysis, which instead of dependent and independent variables contemplate conditions and results applying Boolean logic and

Set Theory. In this way, QCA identifies the combinations of conditions (necessary and sufficient) that explain the presence of a result (Medina-Molina, et al., 2022; Medina-Molina & Pérez-Macías, 2022), especially suitable when the focus of the research aims to establish a multiple and complex causality (Medina-Molina & Rey-Tienda, 2022). Unlike regression models that establish the net effect of the explanatory variables, QCA offers a set of combinations that explain the result. In other words, QCA is ideal for those studies that establish the way in which the interaction of different conditions explains the presence of a certain result (Medina-Molina, et al., 2022; Medina-Molina & Pérez-Macías, 2022). QCA assumes that the influence of the different attributes (conditions) on a specific result depends more on the way they interact than on the isolated impact of the individual attributes (Medina-Molina & Rey-Tienda, 2022). QCA is recommended to deepen the explanation of the effect of multiple and complex causality (Kumar et al., 2022; Medina-Molina, et al., 2022; Medina-Molina & Pérez-Macías, 2022), as in this article.

QCA enables us to identify the different combinations that explain both purchase intention, through high levels of purchase intention- and negation of purchase intention -established through low levels of purchase intention. QCA is based on causal asymmetry, whereby the presence of a phenomenon -purchase intention- and its negation –absence of purchase intention- require different and separate analyses and explanations. In addition, another differentiating characteristic of this technique is the equifinality, by which different combinations of factors may indicate the same outcome (Olaya-Escobar et al., 2020). In establishing the truth table, due to the high sample size, a frequency cut off of 3 was established. For the validation of scales, the principal components analysis (PCA) was carried out in order to group the items and extract the factors that will be used in QCA (Olaya-Escobar et al., 2020); suitability was established using the Barlett's Test of Sphericity. Orthogonal rotation method (varimax) was applied for consideration of the items included in each factor, to confirm that factors are not correlated.

4. ANALYSIS AND RESULTS

In this paper we studied the combination of conditions that determine food purchase intention and its negation, based on information and motivation elements. 38.54% of the respondents were men, and 61.46% women; 84.05% of the sample was undergraduate students, 14.62% were master's degree students, and 1.33% was students from other studies. The mean age of respondents was 37.30 years, with a median of 37, and a mode of 43 (see table 1).

4.1 Scale Validation

The Barlett's Test of Sphericity obtained a value of X^2=95.44 (18 degrees of freedom, p-value=0.000) for a positive Nutri-Score evaluation, and X^2=63.57 (18 degrees of freedom, p-value=0.000) for a

Table 1. Sample profile

Sex	Man	116
	Woman	185
Level of studies	Undergraduate	253
	Master	44
	Other studies	4
Age	Mean	37.3
	Median	37
	Mode	43

Source: own study

negative Nutri-Score evaluation. Hereunder, exploratory factor analysis (EFA) method was used. The items were grouped according to the expected dimensions, confirming the validity of the measurement of the different constructs used; these items explain the 78.20% of the variance in the model corresponding to a positive Nutri-Score evaluation and 79.40% in the case of a negative Nutri-Score evaluation (see table 2).

Hereafter, we analysed the unidimensional constructs included in the study. As we can see, reliability exceeds the threshold of 0.6 in all cases.

Table 3 shows that the three constructs exceeded the threshold required to establish unidimensionality in the positive Nutri-Score evaluation model. The same applies in the case of the negative Nutri-Score evaluation model (see table 4).

4.2 QCA Analysis

Table 5 describes the variables of interest and the calibration process. For anchoring, the 90th percentile was taken as the anchor for full-membership, the 10th percentile for full non-membership, and the median as maximum uncertainty (Miranda et al., 2018; Olalla-Escobar et al., 2020).

QCA analysed the study of the necessary conditions. As shown in table 6, there is no necessary condition, either in the case of positive Nutri-Score evaluation and outcome PI, or in the case of negative Nutri-Score evaluation and outcome ~PI. According to QCA notation, "~" indicates the

Table 2. Component loadings extracted using PCA

	Positive evaluation model			Negative evaluation model		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
NC1			0.994			0.995
NC2			0.423			0.420
NC3			0.614			0.615
PI1		0.748			0.710	
PI2		0.871			0.856	
PI3		0.863			0.841	
PH1	0.881			0.898		
PH2	0.901			0.906		
PH3	0.822			0.846		
PH4	0.834			0.831		
% Variance	0.361	0.261	0.160	0.382	0.248	0.164

NC= nutrition consciousness; PI= purchase intention; PH= perceived healthiness.
Source: own study

Table 3. Model for positive Nutri-Score evaluation

Constructs reliability			Principal components	
	Alpha reliability	Standarized alpha	% of variance explained	Standard deviation
NC	0.689	0.696	0.628	1.372
PH	0.966	0.967	0.936	1.676
PI	0.966	0.966	0.909	1.907

Source: own study

Table 4. Model for negative Nutri-Score evaluation

Constructs reliability			Principal components	
	Alpha reliability	Standarized alpha	% of variance explained	Standard deviation
NC	0.689	0.696	1.372	0.628
PH	0.970	0.970	1.682	0.943
PI	0.972	0.973	1.922	0.924

Source: own study

Table 5. Variables and calibration criteria

Model	Factors	Description	Membership threshold values		
			Full non-membership	Crossover point	Full membership
Positive evaluation	Outcome	PI[a]	-2.089	-0.340	2.282
	Antecedent conditions	SI[b]	0	-	1
		NS[b]	0	-	1
		Age[a]	25	37	50
		Gender[b]	0	-	1
		NC[a]	-1.605	0.328	1.069
		PH[a]	-2.184	-0.348	3.075
Negative evaluation	Outcome	PI[a]	-1.720	-0.452	2.412
	Antecedent conditions	SI[b]	0	-	1
		NS[b]	0	-	1
		Age[a]	25	37	50
		Gender[b]	0	-	1
		NC[a]	-1.605	0.328	1.069
		PH[a]	-1.844	-0.667	2.865

[a]Observations failing in the percentile-90 are considered to represent full set membership. Percentile-10 is the threshold value for indicating full non-membership. The crossover point is defined by the median.

[b]Variables expressed in crisp-set terms.

NS= nutrient specific; SI= summary indicator.

Source: own study

negation of a phenomenon. This is because none of the antecedent conditions reaches the threshold required for consistency and coverage (Mello, 2022).

Then, we present the configurations for positive Nutri-Score evaluation and PI outcome, through the intermediate solution (frequency cutoff: 4; consistency cutoff: 0.889). These configurations have a coverage of 0.749 and consistency of 0.911. Coverage indicates the empirical relevance of the solution; that is, how many cases with the result of interest of the total number of cases that compose the solution are covered by the solution (74.9%). Consistency quantifies the degree that cases sharing similar conditions show the same outcome, how many cases covered by the configurations have the result of interest. Both rates exceeded the required threshold and are therefore considered a valid solution (see table 7).

We used the raw coverage, the unique coverage, and the consistency to analyse the sufficient configurations of antecedent conditions for PI. Raw coverage (RC) refers to the proportion of the

Table 6. Analysis of Necessary Conditions

	Positive evaluation model Outcome PI		Negative evaluation model Outcome ~PI	
	Consistency	Coverage	Consistency	Coverage
NS	0.554	0.559	0.445	0.447
~NS	0.446	0.451	0.555	0.558
SI	0.524	0.530	0.474	0.476
~SI	0.476	0.481	0.526	0.529
Gender	0.409	0.537	0.360	0.470
~Gender	0.591	0.486	0.639	0.523
Age	0.613	0.623	0.579	0.585
~Age	0.593	0.596	0.609	0.610
NC	0.587	0.534	0.709	0.640
~NC	0.604	0.689	0.465	0.527
PH	0.827	0.882	0.371	0.381
~PH	0.439	0.422	0.856	0.845

Source: own study

Table 7. Sufficient configurations for PI

NS	SI	Age	Gender	PH	NC	RC	UC	Consistency
•				•		0.464	0.130	0.927
	•			•		0.441	0.113	0.904
		•		•	○	0.361	0.085	0.945

(•): presence of condition; (○): absence of condition
Source: own study

cases of interest explained by a configuration, its interpretation may be similar to R^2 (Medina-Molina et al., 2022; Medina-Molina & Pérez-Macías, 2022). The unique coverage (UC) indicates the proportion of the cases explained only by that configuration. Consistency is the proportion of cases that has both the conditions and outcome of interest among the total number of cases that show that outcome, its interpretation is similar to statistical tests in regression analysis (Medina-Molina et al., 2022; Medina-Molina & Pérez-Macías, 2022). PI is explained by three configurations which explain a high percentage of cases: NS*PH (RC=0.464; UC=0.130; Consistency=0.927); SI*PH (RC=0.441; UC=0.113; Consistency=0.904); PH*~NC*Age (RC=0.361; UC=0.085; Consistency=0.945). The set of these solutions that explain PI can be presented as PH(NS+SI+Age*~NC).

Table 8 shows the solutions corresponding to a negative Nutri-Score evaluation and the outcome ~PI, included in the intermediate solution (frequency cut-off: 4; consistency cut-off: 0.859). These configurations present a coverage of 0.809 and a consistency of 0.858. Again, the required thresholds are exceeded.

The negation of purchase intention is explained by six configurations: ~PH*~NS (RC=0.462; UC=0.063; Consistency=0.857); ~PH*NC (RC=0.629; UC=0.092; Consistency=0.886); ~Age*Gender*~PH (RC=0.173; UC=0.006; Consistency=0.875); Age*~Gender*~PH (RC=0.308;

Table 8. Sufficient configurations for ~PI

NS	SI	Age	Gender	PH	NC	RC	UC	Consistency
○				○		0.462	0.063	0.857
				○	●	0.629	0.092	0.886
		○	●	○		0.173	0.006	0.875
		●	○	○		0.308	0.012	0.883
	○		●	○		0.159	0.004	0.850
	○	●		○		0.261	0.006	0.884

Source: own study

UC=0.012; Consistency=0.883); Gender*~PH*~SI (RC=0.159; UC=0.004; Consistency=0.850), and Age*~SI*~PH (RC=0.261; UC=0.006; Consistency=0.884). The set of these solutions that explain the ~PI result can be presented as ~PH(~NE+NC +Gend*~Age +~Gend*Age+Gend*~SI+~SI*Age).

5. DISCUSSION

5.1 General Discussion

The introduction of Nutri-Score in Spain causes that the interest to clarify its effectiveness is reinforced, especially when it coexists in the food packaging with other information. For this reason, the effect that different information and personal characteristics have on the purchase intention or lack thereof has been analyzed. It is the analysis of said interaction that led to the choice of QCA.

The explanatory configurations of purchase intention with positive Nutri-Score evaluation indicate that multiple explanations are sufficient; with some of the settings explaining a large number of cases. Thus, the suitability of applying QCA to the study of the interrelationship of different factors in the determination of purchase intention seems to be confirmed. The relevance of the perceived healthiness as a precedent of purchase intention, combined with the rest of the antecedent factors should be highlighted.

We present the configurations based on the raw coverage. First and second, there is an interrelationship between perceived healthiness and interpretative, specific nutrient, and summary indicator labelling (Medina-Molina et al., 2021; Medina-Molina & Pérez-González, 2021). The third configuration involves the coexistence of perceived healthiness and the negation of nutrition consciousness, for consumers with high age. According to previous works, this relationship should be the opposite so that favourable nutritional values should lead to purchase intention for consumers with greater nutrition consciousness, which disagrees with previous works (Andrews et al., 2011; Newman et al., 2011). It may be age that causes this result, since is in agreement with those who reported that older people are more likely to associate food consumption to perceived healthiness (Chambers et al., 2008). Likewise, the proposed interaction between nutritional awareness and being older is not aligned (Arroyo et al., 2021).

The negation of purchase intention is also explained by six different configurations. We found again a high relevance of perceived healthiness, since the negation of perceived healthiness is related to the negation of purchase intention in the six cases. First, the negation of perceived healthiness together with the negation of a nutrient-specific interpretative labelling determines the negation of purchase intention, which confirms its interrelation in the case of inhibiting purchase intention (Medina-Molina et al., 2021; Medina-Molina & Pérez-González, 2021). In the second case, the negation of perceived healthiness together with nutrition

consciousness determines the negation of purchase intention, which is in agreement with previous works (Andrews et al, 2011; Newman et al, 2018). In this way, it can be confirmed that consumers with higher nutrition consciousness and lower perceived healthiness have no intention of purchasing. Thirdly, the relationship between the negation of perceived healthiness for young men is presented, it determines the negation of purchase intention. In this case, the results align us with those that indicate that healthiness is not a priority in the choice of food for young people (Damen et al., 2022), or how generation Z shows less interest in the healthiness of the products they consume (Arenas-Gaitán et al., 2022). Fourthly, there is a coexistence of the negation of perceived healthiness and older age for males, conjunction that shows the relevance of perceived healthiness as a determinant of the denial of purchase intention. Once again, older consumers pay greater attention to food healthiness in their decision-making process (Chambers et al., 2008). It has been proved that women are more concerned about health (Chambers et al., 2008; Thaivalappil et al., 2019), and that sex is related to the perceived healthiness of products. However, in this case we must have the mean age of the sample, since being a population of students with a median of 37 years, it causes the term "older" to be taken with caution. In fifth place, the negation of specific nutrient labeling together with the negation of perceived healthiness in the case of males, determines the negation of purchase intention. Because the specific nutrient labelling presented positive nutrition claim, its absence avoids that the halo effect increases the perception of the entire product (Amos et al., 2019; Andrews et al., 2011; Ikonen et al., 2019; Newman et al., 2019). Finally, there is a configuration of older consumers interacts with the negation of perceived healthiness and with the negation of an interpretative label summary indicator are presented.

5.2 Theoretical Implications

Concerning the theoretical contributions, it`s confirmed that QCA allows to analyse in depth the relationship between conditions that explain the food PI and ~PI. First of all, equifinality confirms that through different combinations of conditions a certain result, PI or ~PI, can be explained. Thus, it is confirmed that the binding of PH (for PI) or ~PH (for ~PI) with different conditions explains the presence of a result. In the explanation of PI, PH can be combined with NS, with SI, or with age and ~NC. A similar situation occurs for ~PI, where ~PH*~SI can be combined with sex or with age in two different conjunctions. Finally, joint causation shows how the different combinations of conditions are combined in the explanation of PI or ~PI. Thus, for example in the case of ~PI, ~PH can be combined with either ~Age*Gender or Age*~Gender. That is, the union of conditions in an inverse sense can lead to the presence of the same result.

Likewise, we have used a model supported by IMB. In the case of PI, while PH plays a fundamental role within the information/motivation conditions, the moderators and behavioural skills have a reduced role. In the explanation of ~PI, the role of ~PH is confirmed, as well as a greater relevance of the moderators that appear in four of the conjunctions. Again, behavioural skills only appear in half of the conjunctions that explain ~PI. In fact, the behaviour of 63% of the cases could be explained exclusively through information/motivation conditions.

5.3 Policy and Managerial Implications

Governments try to promote a healthy diet as a formula to improve health (Arroyo et al., 2021; Pujara et al., 2022; Signal et al., 2022). However, it should be borne in mind that this study confirms how a minority of consumers are interested in information related to the products they consume (Arenas-Gaitán et al., 2022; Signal et al., 2022; Van der Merwe et al. al., 2022). Although in this situation, the provision of information is used to assist the consumer in the decision to purchase food, betting on FOP in its different modalities (nutrient specific and summary indicator), the managers face the

fact that it is not clear how consumers evaluate the information available on the packaging (Arroyo et al., 2021; Bryla, 2020; Da Silva et al., 2022; Van der Merwe et al., 2022).

In both the case of PI and ~PI, we find a clear relevance of PH, or ~PH. Therefore, to promote a healthy food choice, it would be more effective to focus on the factors that determine PH set forth in the literature (Da Silva et al., 2022; Jin et al., 2017; Plasek et al., 2020). In the case of wanting to promote IP, it can be achieved from different combinations of conditions in which the two types of interpretative labelling studied do not appear simultaneously. In other words, if governments wish to favour the IP of healthy products, they must continue working on the development of new types of interpretative labelling, or else try to increase their knowledge by the population.

Nutri-Score model is not yet fully adapted to evaluate food and beverages characteristic of the Spanish diet, despite in 2019 a relevant modification in the calculation system was implemented. Any case, its influence is limited when it is analysed together with the other elements present on food labelling and the attitudes, motivations and skills of consumers. This reduced impact may be due to the lack of knowledge by the population. To develop communication campaigns would be advisable in this case. However, even after previous instructions on its duty, there are still doubts on the meaning of the label. But, once Nutri-Score becomes more known, consumers find easier to choose healthier products (Sarda et al., 2020).

As discussed above, ~PH plays a key role in explaining ~PI, with ~NS*~PH explaining 46% of ~PI cases. For this reason, a joint action would be effective that not only develops different types of labelling, but also establishes protocols that prevent the incorporation of health claims (NS) in the case of foods with a negative Nutri-Score (SI). Since nutritional warnings are the claim with the greatest impact to reduce perceived healthiness, they could help in the identification of products with an unfavourable nutrient profile and contribute to overcoming the positive effect on healthiness perceived generated the rest of claims (Nobrega et al., 2020). This is why the need to assess its incorporation as a complementary element to Nutri-Score in Spain arises. The lack of familiarity that citizens have with the Nutri-Score causes the impact of the halo-effect to be greater. In any case, to support healthier food consumption, both policy makers and food providers must offer foods linked to consumers' rapidly changing lifestyles (de Kervenoael et al., 2021). In the case of developing communication campaigns to promote healthy food choices, it could be used that the conjunctions that explain ~PI show complementary segments: ~Age*Gender or Age*~Gender. In the first case, campaigns could be carried out for young men and in the second for older women.

6. CONCLUSION AND CONTRIBUTIONS

6.1 Conclusion

The aim of this work was to analyse the effect of the interaction of several elements on the labelling of food on purchase intention or no purchase intention. As can be seen, PI and ~PI are explained by different combinations of conditions, results that could hardly have been achieved with classical models based on regression. When we analyse the results based on the IMB model, we see how the elements related to motivations and behavioural skills of consumers determine purchase intention or absence of purchase intention. However, the conditions are combined with each other, but through different combinations, so that the complex nature of consumer behaviour is verified. These results reduce the role played by interpretative nutrition labels, both summary indicator and specific nutrient labelling. In other words, interpretative labels are present in some of the configurations that explain purchase or absence of purchase intention, but not in others.

That is why, in response to the proposed objective, we can conclude that the different elements interact in the determination of purchase intention but, sometimes, purchase intention is determined

by configurations of the antecedent variables in which interpretative labels do not appear in any of their formats (summary indicator or specific nutrient). The impact of such labels is interrelated with the PH and with some combinations of the conditions contemplated in the model. The foregoing suggests that governments should work to achieve greater knowledge of FOP labelling, as well as to develop regulatory frameworks that manage to offer a framework that facilitates healthy choices by the consumer.

6.2 Limitations

Purchase intention was analysed in this work; however, the results may be improved if effective purchase is studied.

CONFLICT OF INTEREST

The authors of this publication declare there is no conflict of interest.

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