Evidence on consumers' perceptions, understanding and uses of the Nutri-Score to improve communication about its update: a qualitative study with shopping observations in France

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Abstract

Background The Nutri-Score is a front-of-pack nutrition label widely used in several European countries to improve the overall quality of consumers' diets. In the view of the upcoming update of the Nutri-Score algorithm, this study evaluates consumers' perceptions, understanding and uses of this label as well as their expectations or criticisms and opinions regarding the algorithm update.

Methods Two complementary qualitative approaches were used in 2023. Six focus group discussions with a total of 51 participants as well as 20 individual shopping observations with real purchase conditions followed by in-depth interviews were conducted among French adults. The sessions were recorded, transcribed and then analysed using a thematic approach.

Results Participants were familiar with the Nutri-Score but used it for food purchasing in a secondary way due to other more important criteria such as price or habits. They were aware that the label aimed to help them choose healthier products and to protect consumers. However, the lack of awareness about some aspects of the label such as the entity responsible for it or the calculation method of the score created a sense of mistrust about the Nutri-Score. Nevertheless, consumers did not report hearing criticism about the label in the media. Finally, they considered the updating of the label to be relevant.

Conclusions Participants had a rather positive image of the Nutri-Score and its forthcoming update. Notwithstanding, to improve consumers' trust in the label, this study recommends launching an information campaign to explain its calculation method and reassure them that the Nutri-Score is a government-endorsed scheme as part of the national public health nutrition policy.

Keywords Nutri-Score, Front-of-pack nutrition label, Shopping observations, Focus groups, Information campaign

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Background

Non-communicable diseases such as cardiovascular diseases represent a major burden responsible for 74% of deaths worldwide [1]. These diseases result from a combination of genetic, physiological, environmental and behavioural factors [2]. One major way to tackle this leading global cause of death is to reduce these risk factors, especially by addressing behavioural factors such as a lack of physical activity and unhealthy diet [1, 2]. To improve the nutritional quality of the general population's diet, the World Health Organisation Regional Office for Europe (WHO Europe) provided governments with guidelines to promote a healthy food and drink environment [3, 4]. One of its recommendations was the use of easy-to-understand or interpretative front-of-pack nutritional labelling (FOPNL) to help consumers understand the nutritional content of food, limit their consumption of unhealthy products and encourage manufacturers to reformulate their products [3–5]. Such a public health tool should be included in multi-component policies and combined, for example, with public education and awareness campaigns, fiscal policies, and so on [6].

Among the different FOPNL used in Europe (e.g., Multiple Traffic Light, Keyhole), one of the most common is the Nutri-Score [7]. This label is a graded summary indicator system that uses combined colours and letters ranging from dark green (A) to dark orange (E) [8] to indicate the overall nutritional quality of foods and beverages in a way that is easy to interpret. To date, seven European countries (i.e., France, Belgium, Spain, Switzerland, Germany, Luxemburg and the Netherlands) have adopted the Nutri-Score as their official FOPNL [7]. Even though the Nutri-Score is currently not mandatory in the European Union (EU), as of June 2023 almost 1,000 companies in France representing 62% of sales volumes have already added this label to their products [9]. In the framework of the Farm to Fork Strategy, the European Commission was to propose a harmonised and mandatory FOPNL, although no label has yet been selected [10].

To assess the performance of FOPNL, a conceptual framework was developed in the scientific literature [11–13]. In short, the first step is to validate the nutrient profiling model underlying the FOPNL by demonstrating its ability to adequately classify food items and its association with healthier diets and better health outcomes. The second step is to validate the graphical format of the label in terms of its ability to attract people's attention and to improve consumers' perceptions, understanding and uses of the FOPNL in order to help them choose products with a better nutritional quality.

FOPNL are the subject of an extensive body of literature. In its recent review, the Joint Research Centre of the European Commission highlighted consumers' preference for simple, colourful and directive FOPNL [14].

Semi-directive labels like the Multiple Traffic Lights are often considered trustworthy as they provide the necessary nutritional information, whereas directive labels like the Nutri-Score are often viewed as easy to understand [14]. However, limited data are available regarding the impact of FOPNL on food purchases in real-life settings [14–17].

The adoption of the Nutri-Score in different European countries may be explained by its strong scientific support, with more than 100 studies to date demonstrating the effectiveness of the label according to the aforementioned conceptual framework in terms of both its nutrient profiling model [18–25] and graphical format [26–29]. Since its implementation, however, only a few studies have evaluated consumers' perceptions of this FOPNL and its use in real life. A previous quantitative study repeated over time among French consumers showed that Nutri-Score awareness has increased since its implementation in 2017, with 81.5% of consumers being familiar with the logo in 2019; the Nutri-Score has also had a positive impact on healthier self-reported purchasing behaviours [30]. In addition, several studies from European countries and abroad have shown that consumers like the Nutri-Score and that this FOPNL is better understood than other FOPNL such as the Reference Intakes and the Multiple Traffic Lights [27, 28]. However, these online studies were quantitative, and to date, no qualitative study has carried out an in-depth evaluation of consumer perceptions of the Nutri-Score. Some studies based on focus groups were conducted on specific labels like the Multiple Traffic Lights or on FOPNL in general. They studied consumers' understanding of these FOPNL, how they are used, their influence on purchasing choices and their perceived reliability, although none examined the Nutri-Score [31–36]. No study has analysed the purchasing behaviour of consumers in relation to these labels and especially the Nutri-Score in real purchase conditions in order to better understand how it is used in everyday life. Before the adoption of the Nutri-Score in France, an *ex ante* study was conducted in real setting but the latter focused on the comparison of the impact of four FOPNL on the nutritional quality of the food purchase, and did not analyse how the labels influence consumers [16]. Moreover, no *ex post* study has been performed to evaluate how the Nutri-Score is used since it is displayed on a large part of food products on the market. Finally, according to a recent study that compares the issues raised about the Nutri-Score on Twitter and the scientific literature, more research is needed to better understand and address the concerns reported in social media [37].

Additionally, given the dissemination of the Nutri-Score in Europe, a transnational governance initiative composed of steering and scientific committees was set

up in 2021 to coordinate and manage the implementation of the label in Europe [38]. The scientific committee proposed updating the Nutri-Score algorithm to make it more relevant and to improve the overall nutritional quality of diets in the European context [39–41]. These proposed modifications will allow a better discrimination between food products according to their nutritional composition, both within and across food categories, and a better alignment with the food-based dietary guidelines of the concerned countries [41–43] as well as other European countries like Sweden [44] and Norway [45]. A 2-year period beginning in January 2024 will allow manufacturers in the different countries to update the Nutri-Score labelling of their products.

Nonetheless, there are currently no data on consumers' opinions regarding the update of the Nutri-Score algorithm and its potential impact on their food purchases. Therefore, in anticipation of the updating of the Nutri-Score by food business operators, it seemed crucial to evaluate consumers' current perceptions, understanding, and uses of the Nutri-Score to design public health campaigns aimed at consumers and adapt the messages disseminated in them.

In the view of the future update of the Nutri-Score algorithm, the objectives of the present study were to evaluate in an exploratory way consumers' perceptions, understanding and uses of the label using qualitative interviews combined with shopping observations in a real purchasing setting. The study also aimed to collect consumers' expectations and potential criticisms of the Nutri-Score as well as their opinions on its update. These data will help the public health authorities to better design messages to inform consumers about the Nutri-Score update.

Methods

Presentation of the Nutri-Score FOPNL

The Nutri-Score (Fig. 1) was developed in line with the WHO objectives to guide consumers in their choices towards healthier products using an easy-to-read FOPNL
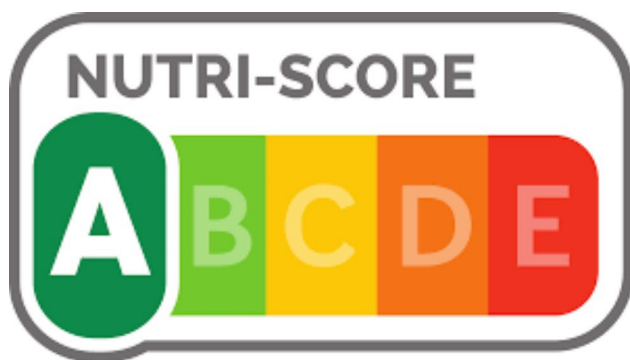

Fig. 1 Current logo of the Nutri-Score

and to encourage food manufacturers to improve the nutritional content of their products [3, 46]. The nutrient profiling system underlying the Nutri-Score was initially developed by the British Food Standards Agency and adapted for labelling [47, 48]. The calculation of the Nutri-Score is based on the allocation of negative or positive points for nutrient content (saturated fat, sugar, salt, dietary fibre and protein), energy and food composition (fruit, vegetable, legume and nut content) per 100 g (or 100 mL) [49, 50].

The updated version of the algorithm and its impact on the classification of food products have been described elsewhere [41].

Study design

This qualitative study was conducted between January and February 2023 in collaboration with Kantar Public and in accordance with the Declaration of Helsinki, which describes the ethical principles for research involving human subjects [51]. Two complementary types of data collection were carried out:

- Six focus group discussions to identify a whole range of different opinions on the topic, to observe participants' reactions and interactions and to describe the various criticisms about the Nutri-Score currently circulating on the Internet as well as the debates and discussions generated by this topic among participants [52];
- Twenty individual shopping observations followed by in-depth interviews to first observe consumers' purchasing behaviours in real-life conditions (in their usual supermarket, with everyday shopping constraints such as noise, other customers, missing products, discounts, prices, etc.) and then to discuss their purchasing habits and compare their responses with their observed behaviours [53]. The in-store observation allows us to limit the biases associated with the semi-directive interview (e.g., intellectualisation, social desirability bias, omission).

Since the Nutri-Score is intended to help consumers choose healthier food products at the point of purchase, the impact of the label was evaluated during this step (through the shopping observations) and not in relation to other dietary habits such as food preparation and consumption on which the Nutri-Score has less impact.

The number of focus groups, interviews and overall participants were determined by taking into account the diversity of profiles to reach saturation (meaning that further observations and analysis reveal no new themes). According to a systematic review of empirical tests, saturation is usually reached with 9 to 17 interviews or 4 to 8

focus group discussions [54]. In this study, it was decided to carry out 6 focus group discussions and 20 interviews.

The Consolidated Criteria for Reporting Research (COREQ) checklist was used for the description of the methods and results (see Supplementary file 1).

Recruitment and participants
Participants were contacted through a recruitment panel specialised in qualitative studies and sent an online questionnaire elaborated by Santé publique France and Kantar Public to assess their eligibility. To avoid recruitment bias, the study was presented as an evaluation of food-purchasing habits. Overall criteria for inclusion in the focus groups or shopping observations were similar, although participants could only be enrolled in one part of the study. Eligibility criteria were being over 18 years and being in charge of food shopping at least twice a month. Exclusion criteria were a background in health, marketing or journalism and the absence of internet access at home (for the focus groups only). Eligible participants were contacted by email and then by phone. They were informed about the overall objectives of the study, the application of the General Data Protection Regulations, the rules of anonymity and the recording procedures for which they gave their written consent. The ethics rules were reiterated at the beginning of the focus groups and shopping observations. Moreover, consumers were informed about their rights to withdraw their consent at any time and have access to their data. Participants received financial compensation between 30€ and 55€ for participating in the study. They were not informed about the study outcomes. Personal data treatment of participants was carried out in accordance with the conventions of the National Data Protection Authority (Commission Nationale Informatique et Liberté (CNIL)) and the European Regulation no. 2016/679, known as the General Data Protection Regulation. According to French law no. 78−17 of the 6th of January 1978, this study did not have to obtain the approval of a national ethics committee, as it is not legally considered as research involving human beings.

To ensure a diversity of profiles and observe potential differences in individual characteristics, a purposive sampling method was used. To compare their perceptions of the label and possible reasons for not using it, both Nutri-Score users and non-users were recruited in almost equal proportions for the focus groups. For the shopping observations, a higher proportion of consumers using the Nutri-Score and smartphone applications dedicated to food product evaluation was targeted to better understand how they used such rating systems. Participants' use of the Nutri-Score was assessed in a question related to the tools used during food shopping, which included 20 items such as a shopping list, trolley, smartphone applications dedicated to food product evaluation and the Nutri-Score. Three possible answers were given: yes, usually / yes, sometimes / no, never. Participants were classified as Nutri-Score users if they reported usually or sometimes using the label, although usual users were preferentially included in the study (20 out of 22 users in focus groups and 8 out of 12 in the shopping observations). The distribution of participants into focus groups and shopping observations depended on their Nutri-Score use (yes/no), age (18−34/35−54/>55), sex (female/male), place of residence (urban in Paris/suburban in Dijon/rural) and socio-professional category (low SPC/intermediate or high SPC) and income level (2 people at or below the minimum wage in focus groups of low SPC). Trades people, shopkeepers, company directors, licensed professionals, senior executives, intermediate professionals and middle managers were categorised as intermediate/high SPC, whereas service workers and manual labourers were categorised as low SPC. In addition, participants were recruited in ensure a similar proportion of individuals with and without children, those who did and did not use smartphone applications with food product scores such as Yuka, people with different consumption frequencies of ready-prepared meals and with varying self-perceptions of the healthiness of their diet. The number of participants recruited according to these different characteristics was set a priori to ensure a variety of different profiles given the potential influence of these variables on food choices and Nutri-Score use. For people using smartphone applications, the number was fixed a priori in order to observe how the application was used in combination with or without the Nutri-Score. In the focus groups, the number was limited to two application users per group to avoid discussions drifting too frequently onto this subject. More details regarding the sampling method are provided in Supplementary file 1 − item 16 (description of the sample).

Data collection
Using a funnel method, a semi-structured guide was developed for the focus groups to guide the discussion according to the study objectives, with specific parts for users and non-users of the Nutri-Score. For the individual interviews, the most relevant questions from the focus group facilitation guide were selected and adapted to the in-depth interviews in order to obtain more detailed and well-argued reflections and put into perspective the participants' answers with their behaviour. A specific part on shopping habits was also added. The guides used for the interviews and focus groups are provided in Supplementary files 2 and 3, respectively.

Three experienced professionals from Kantar Public carried out the focus group discussions and shopping observations (see Supplementary file 1).

Topics of interest were defined by referring to the conceptual framework presented in the Introduction with the aim to assess the effectiveness of FOPNL. Therefore, questions were included to evaluate consumers' perceptions, understanding and use of the label and to identify any criticisms related to it, since the latter can alter their perceptions of the Nutri-Score. Additional questions aimed to provide descriptive data about food habits and to generate evidence for policy action, particularly with respect to the Nutri-Score update.

The **focus groups** lasted 2.5 h on average and were divided into six sections: (i) introduction of the study aims, interviewer and participants; (ii) food perceptions and use of smartphone applications dedicated to food product evaluation; (iii) perception and understanding of the Nutri-Score; (iv) use of the label (specific questions for users and non-users); (v) knowledge, perception and criticism of the label (three criticisms shared on the internet were studied to evaluate their significance and observe consumers' responses) and opinion about the updated algorithm; and (vi) expectations relating to the label's information campaign. In the final section, consumers' perceptions of video about the Nutri-Score were assessed, although they are not discussed in the present article.

The **shopping observations** lasted for about 1 h and were divided into two phases.

Phase I: shopping session. The participant and the interviewer met at the participant's regular supermarket for their weekly food shopping. The participant was instructed to buy food items as usual. The interviewer accompanied the participant throughout the supermarket to observe his/her purchasing behaviour. The consumer was told to think out loud and was questioned by the interviewer where necessary in order to collect information about his/her motivations and decision-making process, including purchasing criteria and habits. The use of think-aloud methodology limited the intellectualising bias, while the systematic identification of unusual purchases detected compulsive buying. If the Nutri-Score was not mentioned during the shopping observation, at the end of the session, the participant was asked to choose (but not buy) a ready-made meal to observe whether the label was used as a criterion when selecting a new product. To conclude the session, a photograph of the purchases was taken.

Phase II: interview. An in-depth interview was conducted in a quiet place after the shopping session. It was divided into three parts with specific questions for users and non-users of the Nutri-Score: (i) discussion of the participant's purchasing behaviours; (ii) perception and use of the Nutri-Score (a photo of the logo was shown as in Fig. 1); and (iii) expectations about the label.

The shopping observations took place in large, medium and small urban areas in Paris, Dijon and Vendôme, respectively. Four focus group discussions took place in Paris and Dijon and two online (via Zoom) to reach people living in rural areas around the country (see Supplementary file 1). Shopping observations were audio recorded, while the focus group discussions were audio and visual recorded; the recordings were later transcribed verbatim.

Data analysis

The authors (MC and PD) both listened to the recording and checked the verbatim transcripts provided by a professional transcriber. An initial analysis was performed by the three interviewers using a thematic approach. Data were then simultaneously and independently analysed by the two authors (MC and PD) using a similar approach. Themes and subthemes used for the analysis were identified based on the main topics from the interview guides: (i) food perceptions and purchasing criteria, (ii) knowledge and understanding of the Nutri-Score, (iii) perceptions of the Nutri-Score, (iv) uses of the Nutri-Score, (v) criticisms about the Nutri-Score, (vi) perceptions and expectations related to the Nutri-Score update (focus groups only) (for more details see Supplemental files 2–3). The analysis of the content was compared and discussed by the authors. The most relevant verbatim transcripts from the interviews and focus groups were selected and translated into English to illustrate the findings. Thematic saturation was reached in this sample.

Results

A total of 71 participants were recruited for this study: 51 for the focus groups and 20 for the shopping observations (see Table 1 and Supplementary file 4, respectively,

Table 1 Characteristics of the focus groups participants

Focus group (FG)	N	Age (years)	Nutri-Score use	SPC*	Sex	Place of residence
FG 1	6	18–34	Users	Low SPC	3 women, 3 men	Rural (online)
FG 2	10	18–34	Non-users	Intermediate/high SPC	All women	Dijon
FG 3	9	35–54	Non-users	Low SPC	All men	Dijon
FG 4	9	35–54	Users	Intermediate/high SPC	5 women, 4 men	Paris
FG 5	10	≥55	Non-users	Low SPC	5 women, 5 men	Paris
FG 6	7	≥55	Users	Intermediate/high SPC	4 women, 3 men	Rural (online)

*SPC: socio-professional category

for participant characteristics). Overall, the profile of participants in the shopping observation was well balanced according to age, sex, SPC and living area (Table 2).

The results are discussed below according to six themes. The first (i) relates to food perceptions and purchasing criteria to situate the participants in the context of the study. The next five themes deal with (ii) participants' knowledge and understanding of the Nutri-Score, (iii) their perceptions of it, (iv) their uses of the label, (v) their criticisms and expectations of the Nutri-Score, and finally, (vi) their opinions and expectations regarding the algorithm update and the related information campaign (in the focus groups only). Overall, both methods led to similar findings, although the shopping observations highlighted elements not raised in the focus groups. Thus, the findings relate to the analysis of both the focus group discussions and shopping observations except if otherwise specified. Main results are summarised in Table 3 by themes and subthemes of analysis, and according to the use of the Nutri-Score when it was relevant.

In the following sections, verbatim transcripts from the focus groups (FG) or shopping observations (S) are given to illustrate the results (see Table 1 and Supplementary file 4, respectively, for participant characteristics). Interestingly, very few differences were observed according to individual characteristics (e.g., sex, age, SPC), so the results are presented globally, except when differences or specificities in some subgroups were observed. Even though no precise quantitative analysis has been performed, the following terms are used in the present section to describe the prevalence of the results among participants (from the least to the most prevalent): « a few » (very small proportion), « some » (higher proportion but not more than one third of the participants), "several" (higher than "some" but less than half of the participants), and "the majority of" (more than half of the participants).

i) Food perceptions and purchasing criteria

Participants had a complex perception of food. They spontaneously associated food with the notion of pleasure and then with time or financial constraints or necessity. They were concerned about the rise of ultra-processed food, the series of health crises in recent years and the origin of food items.

> *"I think that we've all lost confidence in the food industry. There are always scandals, things you discover." (FG2).*

Of the seven participants who had to choose a ready-made meal during the shopping observations (because they had not spontaneously mentioned the Nutri-Score), three excluded products with meat because they did not know its origin. Four of them also paid attention to the products' composition, although only one participant took the Nutri-Score into account.

> *"Either I don't know where [the meat] comes from or I think that it has lots of fat. I know that it's full of sauces and artificial colouring... So, I usually choose some plant-based soy balls or chili con carne, which scares me less..." (S3).*

Participants from low SPC also pointed to rising prices as a cause of concern, particularly in the current context of high inflation.

> *"... We're more careful with our wallets than our stomachs ... well, our health, unfortunately." (S12).*

Overall, price and preference for a product were the main purchasing criteria. In the shopping sessions, almost all participants (19/20) usually checked and compared prices, with half of them looking for promotions even if it meant shopping in several supermarkets.

> *"Yeah, brand X. It's good value for money and quite tasty. And compared with the other one over there that's got a smoky flavour, it's got a funny taste that's not so good." (S10).*
> *"But I always look at the price per litre and per kilo, it's something I always do. So there I can see the difference, it's double the price, so I think that I'm going to take a non-organic juice or that one." (S2).*

Table 2 Distribution of the participants of the shopping observations

Age		N
	18–34 years	5
	35–54 years	8
	≥ 55 years	7
Sex		-
	Women	11
	Men	9
SPC*		-
	Low SPC	9
	Intermediate/high SPC	11
Place of residence		-
	Paris	8
	Dijon	6
	Rural	6
Nutri-Score use		-
	Users	12
	Non-users	8

*SPC: socio-professional category

Table 3 Main results by themes and subthemes of analysis and according to the use of the Nutri-Score

Themes and Subthemes	Common to Nutri-Score users and non-users	Specific to Nutri-Score users	Specific to Nutri-Score non-users
Food perceptions and purchasing criteria			
Food perceptions and purchasing criteria	Food associated with pleasure as well as with constraints (time/money). Purchasing criteria: price, preference, habits, and labels in a lesser extent (origin, composition, organic nature).		
Knowledge and understanding of the Nutri-Score			
Definition	Nutri-Score defined as an indicator of the nutritional quality of the product (although somewhat confusing).		
Aim	To guide consumers towards a healthier diet and better health.		
Calculation	Poor knowledge on how the Nutri-Score is calculated and the criteria taken into account. Most cited nutrition criteria: sugar, salt, fat and calorie. Other criteria: additives and degree of processing. Reference quantity: 100 g.		
Origin	Unknown. The majority guessed that it was a public initiative but some mentioned a private initiative from the food and beverage industry.		
Voluntary nature	Unknown. Deduced as some food items did not display the logo. Majority in favour to make it mandatory.		
Perceptions of the Nutri-Score			
Perception of the logo	Clear, visible and understandable.		
Perception of the rating system	Binary perception according to colours: a "good score" with the green letters (A and B) and a "bad score" with the orange ones (D and E). The letter C was usually considered borderline. However, perception depended on the product or food category. Gradient of healthiness/dangerousness. Lower score associated with lower frequency of consumption.		
Perceived reliability	Reliable because of its public funding. However, its reliability was questioned after delving deeper into the subject because of lack of information, scoring perceived as incomplete…		
			Logo viewed as a commercial tool (minority).
Uses of the Nutri-Score			
Why do consumers use the Nutri-Score?		To have a healthier diet, to change their habits by choosing healthier products or simply to be informed and evaluate their diet quality. The majority use the Nutri-Score since its implementation.	No attention is paid to the Nutri-Score: no interest or no need. A few were suspicious and preferred to follow their own intuition.
How do consumers use the Nutri-Score?	When buying a new product or when choosing between two similar products. Use depends on the food category (ex: more used with processed food).		
Influence of the Nutri-Score in the purchase		Used in a secondary way because of the greater importance of habits, price and taste.	
Barriers and levers			Greater transparency and a more precise calculation method would encourage them to use it.

Table 3 (continued)

Themes and Subthemes	Common to Nutri-Score users and non-users	Specific to Nutri-Score users	Specific to Nutri-Score non-users
Influence of children		Two contrasting behaviours regarding lower scores. Children are aware of the Nutri-Score.	
Use of smartphone applications dedicated to product evaluation		Most well-known in France: Yuka. Complementary use between Yuka and the Nutri-Score.	
Usefulness	Found useful, especially for younger people or those with a special diet: raises awareness and informs consumers about product quality, encourages manufacturers to make their recipes healthier. Relevance questioned for certain products (ex: chocolate spreads or cans of vegetables).		
Criticisms about the Nutri-Score			
Impact of criticisms shared on the internet *(focus groups only)*	No criticisms relayed on the internet was heard.		
Criticisms of participants	Additives or degree of processing not taken into account. Need for more transparency (calculation method and origin). The logo should be mandatory.		
Perceptions and expectations related to the Nutri-Score update *(focus groups only)*			
Perceptions regarding the Nutri-Score algorithm update	Evolution perceived as normal and showing progress. Gives credibility to the label. For a minority, changing the algorithm cast doubt on its initial reliability.		
Expectations regarding the information campaign about the Nutri-Score and its update	Campaign should first revisit the fundamentals of the Nutri-Score (how to read and use the Nutri-Score, calculation method, public initiative, voluntary nature) and then the update of the algorithm.		

"I go to supermarket A and then here and depending on the promotions, I might go to supermarket B, C or D, it depends on what they offer, what's interesting." (S8).

Participants' choices were mainly driven by their habits, as they selected food items simply because they were their usual products. Sometimes they were unable to explain to the interviewer why they chose the product in the first place.

"I couldn't tell you, perhaps it's out of habit. I think it's more a matter of habit, because I've never bought another brand." (S16).

Because they are reassuring, labels that indicate the origin or organic status of food, for example, may influence consumer's purchases but to a lesser extent. During the shopping sessions, several participants paid attention to the origin (9/20), composition (9/20) or organic nature (8/20) of the products.

"Now I'm going take some fromage frais... So I'll chose one that's a bit more expensive, but it's made with French milk, whereas the other one is from the EU, which is a bit vague." (S8).

ii) Knowledge and understanding of the Nutri-Score.

All participants were familiar with the Nutri-Score or recognised the logo thanks to previous information campaigns and its clear packaging display. In the majority of sessions, participants spontaneously mentioned the Nutri-Score as a reassuring element or as a tool used when food shopping. Even though their overall perception of the label as an assessment of product quality was correct, their knowledge about the components of the Nutri-Score was relatively limited.

Participants had a somewhat confused definition of the Nutri-Score. They defined it as an indicator of the quality of a product in reference to its health or nutritional quality but without precisely understanding what these terms meant.

"If it's A, it's good for your health, and E, it's really bad for your health. So that's it, but what's good for your health? What is?" (S15).

For the participants, the Nutri-Score aimed to guide consumers towards a healthier diet and better health. They also pointed to its objective of informing and raising awareness about the healthiness of products in the population, especially among young people.

"I think it helps you choose a product, so if someone wants to buy or have really health food, they'll only choose Nutri-Score A or B." (FG6).

The vast majority of participants did not know how the Nutri-Score was calculated. Several participants believed that it was based on the content of different nutrients in the product. They more rarely discussed the notion of balance between healthy and unhealthy elements.

"But in relation to what? It's good, average, acceptable but in relation to what? Nutri means nutrition but..." (FG5).
"I think it's based on the weight of the whole product: grams of sugar, proportion of salt, fat, proteins, carbohydrates." (S13).
"I would say that it indicates the nutritional quality. What's good and what isn't good, so I really think it's about finding a balance between the two. What's good in the product, I don't know, in terms of fibre or something else, well, the amount of sugar or fat might not be good, so I think the letter is decided based on that." (FG6).

Participants did not know which criteria were taken into account in the calculation, because they had never considered the issue. All participants thought that it included the nutritional composition – most often sugar, salt (or sodium) and fat – and the number of calories. More than half of participants (mainly non-users but not only) believed that the presence of additives and the degree of food processing were also taken into account in the calculation.

"No, because there are three nutritional components, that's the key: too much fat, too much sugar, too much salt. They make you put on weight or aren't good for your health." (S13).
"And they don't waste any time making products for preservatives, with all that stuff in there, and there may be lot of them, which can influence the Nutri-Score in my opinion." (S20).

This ignorance was a source of both confusion and mistrust. This feeling was especially expressed in the shopping sessions during which a few participants were confused when they tried to explain the rating using the nutritional information table.

"Ah, knowing what explains the difference between the two. So, I look at the ingredients, is there more sugar? So, no. Are there more processed products? No. That one has more protein and is still B. It has a bit more salt but just a little. This one, which is also B, has fewer calories, so I don't understand the Nutri-Score. I should probably pay more attention." (S8).

The majority of participants rightly thought that the FOPNL is calculated for the standard reference quantity (100 g or 100 mL). They found this method to be appropriate, because it allows the comparison of food items and provides an overview of the product.

"The fact that it's based on 100 g means that you can compare two different products, for example. Based on the portion, I don't see the point." (FG1).

The majority did not know which body is behind the Nutri-Score but guessed that it was a public initiative run by the French government, even the Ministry of Health as part of its strategy to tackle obesity. After discovering that the Nutri-Score is managed by the Ministry of Health, they found this body to be legitimate, reassuring and trustworthy. Nonetheless, some participants mentioned the lobbying of the food and beverage industry and questioned its role in the design of the Nutri-Score.

"Wasn't it the Ministry of Health to tackle obesity 5 years ago? And given the use of pesticides, the rise in cancer..." (S3).
"I thought that it was the manufacturers. Aren't they behind it? There must be lobbying." (FG4).

Overall, the participants were uncertain whether the Nutri-Score was mandatory and the majority deduced it was not compulsory, since some food items did not display the logo on their packaging. Nonetheless, some participants were confused by the fact that it was not shown on all products. Overall, the participants were in favour of making it mandatory.

"I think the Nutri-Score is still optional, but it would be good if it became compulsory. In my view, not enough products use it." (S19).

iii) Perception of the Nutri-Score.

Overall, participants liked the logo. They found it clear, visible and understandable with its colours (and less so its letters), which reminded them of traffic lights or the energy rating used for household appliances.

> *"For me, I like the colours and letters. I find it clear. I don't think that it could be more informative. Because it's easy to read." (S1).*

Participants noted a few disadvantages about the Nutri-Score. A few non-users reported that the logo was not clearly visible on packaging due to the visual overload of the product labels, which was occasionally off-putting. A minority of users found it infantilising to be guided in their food choices.

> *"Oh no, I didn't even notice what was written. Yeah, I didn't see it, you can't see it in the middle of all that packaging with photos and bright colours and all that, you can't see it." (S15).*
> *"They treat us like children. A, B, C." (FG4).*

Participants interpreted the logo mainly through its colours.

> *"I find it quite good, because in people's minds, green means go for it. Red calls for caution. So, I think it's a good scale, the colours aren't bad." (S1).*

They defined a "good score" as the green letters (A and B) and a "bad score" as the orange letters (D and E). The letter C was usually considered borderline. Participants found it hard to explain the differences between two adjacent scores (A/B and D/E).

> *"– We buy up to C.*
> *– Yellow, it's the limit.*
> *– A and B are good, because they're both green." (FG2).*

> *"It's quite vague, the result, I couldn't tell the difference between A and B. You don't know the criteria or the balance. It's not very clear." (FG4).*

Consumers correctly stated that their perception of the score also depended on the product or food category: the same score could be interpreted differently depending on the product.

> *"[D] is not good, but I can justify it, for example, if it's a cake. But sometimes I take some cordon bleu, if I see it's a D, I don't take it, because I know I can buy B or C." (S3).*

Consumers thought that the interpretation of the letters followed a gradient of healthiness, dangerousness or even processing (and to a lesser extent, tastiness). They considered a product ranked A to be healthy but, for a minority of participants, tasteless, whereas a product scored E was viewed as unhealthy, dangerous when consumed in excess and, for some, ultra-processed.

> *"'A' means that it's very good, it's healthy, that normally there aren't too many additives or added sugar, so yeah... The further you go in the alphabet, the worse it gets." (S16).*

Participants associated the letters with a frequency of consumption, mainly for the lower scores, suggesting that products ranked D or E should be eaten in smaller quantities and less often. Nonetheless, a few participants indicated that A or B did not necessarily mean that they could consume the product as much as they wanted.

> *"C would perhaps be once a week. D once every fortnight and then maybe E once a month." (S13).*

In the majority of focus groups, participants spontaneously said that the Nutri-Score was a positive and reassuring label. The majority of participants declared that it was reliable, mainly because of its public funding, thus ensuring its official and independent status.

> *"I think it's well managed by effective people who do their job well." (S18).*

However, after delving deeper into the subject, many participants questioned the reliability of the Nutri-Score: the lack of information about the score, its seemingly incomplete calculation method and the potential involvement of the food industry. For a minority of non-users, the logo was viewed as a commercial tool used by manufacturers or distributors to sell more products.

> *"Reliable, why not if it's based on criteria and if the manufacturers respect the criteria, why not." (FG6).*
> *"I think that it's a business, it's the supermarket chains that do it, supermarket A, supermarket B, supermarket C and then the people... it's a business, I don't even pay attention to it, I look at whether it's good or not, I know straight away." (FG5).*

iv) Uses of the Nutri-Score.

The majority of Nutri-Score users have been using the logo since its implementation. Their main motivations are to have a healthier diet, to change their habits by choosing healthier products or simply to be informed and evaluate their diet quality. Sometimes they used it to validate their choices when selecting healthy products. Overall, the shopping sessions highlighted the strong influence of habits, which limited the use of the Nutri-Score, even among self-declared users.

> *"I think the Nutri-Score is good at a certain level: it makes people aware that some products aren't necessarily good for them like cheese." (FG6).*
> *"When the Nutri-Score is marked D, E or even C, I look for another product." (S17).*

The focus group discussions and in-depth interviews revealed that consumers mainly used the Nutri-Score when buying a new product or when choosing between two similar products. These behaviours only occurred in five shopping observations, because participants mostly bought their usual product brand.

> *"Pure butter puff pastry, 1€25, or this one, the standard one. There you go. I'll take the one marked D, it's not great. This one is D, you see. That one is also D." (S20).*
> *"When choosing between different brands, if you want the same thing like shepherd's pie. I can choose just like that. For the same product." (FG2).*

However, the use of the label depended on the food category. For example, participants considered it with processed food, because they did not feel capable of evaluating the quality on their own. For instance, one participant took the Nutri-Score into account when choosing a ready-made meal in the shopping observation. Consumers also reported not using it for products perceived as healthy, because they knew that they would have a "good" score. They likewise did not use it on some seemingly unhealthy products, either because they needed it (e.g., butter) or because they gave priority to taste over nutritional quality (e.g., sweets). These behaviours were observed in some of the shopping sessions.

> *"It's like I said before: I tend to look at the Nutri-Score with processed food and, to be honest, it's quite bad quality." (FG6).*
> *"I look yes, but just because it's D doesn't mean that I won't take it: for example, a packet of butter, it's going to be C or D, but I need it, so I'll take it." (S8).*
> *"Yes, if you go to the cheese and cream section, there'll be more C, D and E ratings, but that doesn't mean that I won't buy it." (FG2).*

Users found the Nutri-Score to be easy and quick to use.

> *"I don't use it systematically but when I don't know the product, things that I don't buy very often or when I don't have time, it's the first indicator I use..."* (FG4).

For the majority of users, the Nutri-Score gave additional information about the product, although it was not a disqualifying criterion. The secondary use of the score in the purchasing process was due to the greater importance accorded to other criteria such as price, habits or taste. Users declared that they frequently used the Nutri-Score when purchasing a product for the first time and then less often, because they usually bought the same products for which they already knew the score. In the shopping observations, a few participants explained that they did not pay much attention to the label, because they had already used it when first purchasing the item.

> *"It's not a criterion for me. It's not going to make me buy it... Sure, it's a tool that's sometimes interesting, that's true, but it's not the only thing." (S5).*
> *"I also rely on the Nutri-Score, but as I usually buy the same products, it's the same. Now I look less because I know how it's scored or something." (FG6).*

Non-users did not pay attention to the Nutri-Score, mainly because they were not interested or did not need it.

> *"It's of no interest to me. Food is first and foremost about pleasure." (S7).*

A few participants were suspicious about it and preferred following their own intuition, because they did not know who and what was behind the Nutri-Score. Non-users were rather reluctant about using it but said that greater transparency and a more precise calculation method would encourage them to use it.

> *"They advertised it on TV, but I don't know what it's based on. So, if someone explains to me why and how they calculate A, B or C, D and E, perhaps, then perhaps I'll pay it more attention to it. But it's still too abstract, no yeah." (S7).*

Parents were concerned about their children having a healthy diet. However, two contrasting behaviours were reported and observed regarding unhealthy products like cookies: not buying them to ensure a healthy diet or buying them so as not to deprive children of tasty food. Overall, their children seemed aware of the Nutri-Score, which could contribute to their nutritional education.

"... After I explain to them that there are some products that I don't buy because they contain lots of things that aren't good for them. Now they understand, so we'll try to find another product, but sometimes I also want to make them happy if they want something. I know that it's only going to be an occasional thing. It all depends on the price (laughing)." (S5).

The most well-known French application that provides information on food products is Yuka. Like the Nutri-Score, Yuka was mainly used when it was initially downloaded by users to scan their regular products and identify healthier alternatives. Thereafter, it was used less frequently except when purchasing new products.

"Personally, it's with new products that I don't know. Then, after using it, I know which product to buy." (FG1).

Compared with Yuka, consumers reported that the Nutri-Score had several advantages: it was quicker to use, displayed on the packaging and more reliable.

"I think it's really good, because sometimes you're in a rush or, yeah. It's a good visual indicator. Yuka, you have to use the application, so if you don't have your telephone or I don't know..." (S20).
"I think that the Nutri-Score is more reliable, because it comes from the government, whereas Yuka was created by a company." (FG2).

However, consumers liked the fact that Yuka suggests alternative products to replace items with a bad rating, provides detailed scores with explanations and is more transparent about the criteria used in the calculation.

"I like Yuka, because it suggests an alternative, for example, the blinis weren't good but those of brand X are good, so it gives you advice." (S19).
"For a start, it's clearer than the Nutri-Score because you see what's good inside or not, which helps you limit the amount of protein or salt. Which you don't necessarily look at. And it's also more precise than a Nutri-Score A or B, which doesn't mean anything. For example, if I see green, I think it's good but in fact, it's borderline." (S3).

Nonetheless, the two product evaluation systems were not seen as competitors, because users of Yuka and the Nutri-Score declared using them in a complementary way. This complementary usage was also observed in the shopping sessions.

"If there's no Nutri-Score. But here there's the Nutri-Score. So there, B it's good, so there's no need for Yuka." (S20).
"Yeah and sometimes also with the substitute products that have a Nutri-Score of E, for example. I scan it [with Yuka] to try and see if there's something similar." (FG1).

Overall, participants found the Nutri-Score to be useful, especially for younger people or those with a special diet.

"I think that for someone who has cholesterol or who has to eat food without salt or something else, it can help them choose..." (FG6).

According to participants, this label helps raise awareness and informs consumers about product quality. It can help people to make healthier choices and protect them from the misleading practices of the food industry. The participants also stressed how the Nutri-Score can encourage manufacturers to make their recipes healthier.

"It helps me rule out certain products with too much fat." (FG6).
"... The brand that makes products scored as E is going to say, 'I'm going change my recipe to have a better Nutri-Score' and that's positive." (FG4).

However, participants questioned its relevance for certain products like chocolate spreads or cans of vegetables, as they believed that they were capable of evaluating their nutritional quality on their own.

"Putting a Nutri-Score of E on butter is stupid. It's not at all useful. We all know it." (FG2).

v) Criticisms and expectations of the Nutri-Score.

Participants from the focus groups had never heard about the criticisms of the Nutri-Score relayed on the internet, mainly on Twitter, by lobbying groups.

"I sort of had the impression that there was a consensus that it's pretty reliable, well, I'd never heard of any big scandal about it." (S2).

The first criticism shared with participants stated that "some products often judged as fatty or unhealthy can be B like French fries or breakfast cereals". This surprised the majority of participants who found it illogical, whereas others understood the reasoning.

"So, that motivates me even less. I thought it was already opaque and not very clear, but for me, chips

are E, but if they're B and then cereals are also B..."
(FG5).
"If you take oven chips, it's essentially potatoes and potatoes aren't fattening. It's how you cook them." (FG4).

The second criticism stating that "some ultra-processed food like Coca-Cola can have a better rating than natural products like olive oil" bothered. Participants found it logical according to the calculation mode of the Nutri-Score but questioned the relevance of the rating, because it shows the limitations of the label and how it favours food from the food industry.

"– I have difficulty believing it, for me, it's incoherent, there's no logic.
– It's not surprising. The product is ultra-processed, but it can be very light." (FG5).
"Given the calculation method, I understand it better... There, soda zero for brand X, it's zero sugar, so of course it's going to have a really good score. But I know it's not good. Yes, because there are things that replace [the sugar] and they aren't taken into account in the additives. That's why it's B or C." (FG2).

The last criticism stating that "some traditional or Protected Designation of Origin (PDO) products can be D or E like cheese or cold meats" did not surprise participants. These ratings did not bother them, because they eat these products because of their taste, not their nutritional quality. Some people even questioned the usefulness of putting a logo on such products.

"I understand it, because as I said, they don't take everything into account with the manufacturing process, so yes, it's normal that it's rated as E, as they only look at the nutritional value." (FG1).
"The Nutri-Score doesn't interest me with this type of product: I know it's fatty. But it's not going to stop me from eating it." (FG1).

Although the impact of these criticisms relayed on the internet is limited, a few participants from the focus groups and shopping observations had heard such criticisms about the Nutri-Score's reliability in the press or from their relatives. Moreover, participants raised other issues during the discussion. The majority of participants in five of the focus groups as well as seven consumers participating in the shopping observations believed that well-rated products were more expensive and that cheaper products were of poorer quality. They regretted this disparity and felt a sense of distrust towards manufacturers.

"It's not a trend, it's not something that I made up: the closer it is to A, the more expensive it is... You saw before with the crispbread and Swedish buns, there's a difference of 10 cents between A and B." (S16).

Moreover, the participants suggested that food manufacturers would change their recipe in order to improve the rating of their products. However, a few participants highlighted that this could make them use ingredients of poorer quality such as adding sweeteners instead of sugar in yogurts.

"Fruit yoghurts now have a score of C, so aren't the manufacturers going to be encouraged to add artificial sweeteners instead of sugar?" (FG6).

After the discussion, the participants shared their disappointment that the Nutri-Score calculation did not take into account additives or the degree of processing (and for some, pesticides). The majority wanted these criteria to be included, because they considered them to be just as important as nutritional content. Several participants believed that the Nutri-Score was incomplete without these criteria, thus questioning its relevance in helping them have a healthier diet.

"Yes, it's not very reliable. It's quite limited in terms of what it really takes into account." (FG1).
"I would prefer having information about additives, the chemical and processed aspects..." (S9).

Some participants did not understand why the Nutri-Score is not present on every product. They wanted the logo to be mandatory, either for all products or for specific items like ultra-processed food. By making the Nutri-Score mandatory, the comparison of products would be more pertinent, while the competition between brands would be fairer. However, a few participants disagreed, claiming that manufacturers should be free to choose whether to include it.

"– Yes, it should be mandatory.
– I also think in relation to competition: there should be greater transparency." (FG1).
"If it was mandatory, perhaps I'd have more confidence. The manufacturers would try to have a score close to A." (FG2).

Many participants blamed the Nutri-Score for the lack of transparency, especially regarding its calculation method and origin, which lessened its reliability.

"It's clear, but some information is still missing. Where do they get the information to have a score of A or B? As consumers, we don't know why they say things." (S4).

vi) **Perceptions and expectations related to the Nutri-Score algorithm update (focus groups only)**.

All participants in the focus groups approved the process of updating the Nutri-Score algorithm. They thought that this evolution was normal and showed progress. For some participants, their opinion about the Nutri-Score update would depend on the new calculation method and the criteria taken into account. They appreciated the use of consumers' feedbacks to improve the Nutri-Score, which gave it credibility. For a minority of participants, changing the Nutri-Score algorithm cast doubt on its initial reliability.

"For me, it's logical to make things evolve over time. There's no need to say so." (FG2).
"It shows that the old one didn't count for much." (FG3).

None of the participants wanted the graphic design of the logo to change, because they thought that it would be confusing for consumers who were now used to this relatively recent label.

"– People are used to the logo and have their standards, so I think you need to keep the logo.
– They're going to think that it's another organisation or that the old one wasn't validated: it'll discredit the movement, [the logo] has to stay the same." (FG4).

All the participants agreed that consumers had to be informed about the update via an information campaign. However, they wanted the campaign to first revisit the fundamentals of the Nutri-Score with explanations about its calculation method: the standard reference quantity, the criteria taken into account and the reasons why additives and degree of processing are not included.

"What isn't clear are the criteria used for the Nutri-Score and if they evolve, it's the right moment to organise an information campaign." (FG3).

Participants also wanted explanations about how to read and use the Nutri-Score.

"I hadn't thought about it, but now that we're talking about it, I want to know what it means, because
there's no legend and if all oils are E, what's the point of putting a Nutri-Score on a bottle of oil." (FG5).

The future information campaign should underline which organisation manages the Nutri-Score and also remind consumers about its voluntary nature.

"That's the question: who gives the Nutri-Score? Who decides?" (S8).
"Why isn't the Nutri-Score everywhere? Why is it only on some products and not on others? Why is the Nutri-Score on this fish but not on that one?" (S8).

The information campaign should give greater visibility to the logo and help consumers understand it better. Participants thought that people would consequently trust the Nutri-Score and use it more often.

Discussion

In view of the future update of the Nutri-Score algorithm, this is the first study to evaluate consumers' perceptions, understanding and uses of the label in a qualitative way and in real purchase conditions by applying an innovative method. Consumers reported that they were familiar with the Nutri-Score and liked it, although the shopping observations revealed that they mostly used the label in a secondary way, since other criteria such as purchasing habits or price were more important. Participants considered the updating process of the Nutri-Score to be both normal and relevant. However, a few points remained unclear such as the organisation responsible for the label and the criteria taken into account for the calculation, thus highlighting the need to provide information about these issues when advising consumers about the changes made to the calculation method.

Real-life use of the Nutri-Score

Overall, participants were worried about the quality of the products that they buy. This is consistent with previous studies conducted in 2004 and 2008, which revealed that consumers were mainly concerned about the nutritional balance of their diet, food safety and especially issues such as pesticides, antibiotics and additives [55, 56]. Our study suggests that these issues are still relevant given the relative importance attributed to food labels like organic food. However, recent health crises such as the E. Coli contamination in Buitoni pizzas in France [57, 58] have increased consumers' concerns. In this context, food labels are perceived as reassuring, because they enable consumers to regain control of their diet and improve their confidence in the food supply.

The use of food labels in general and the importance of the Nutri-Score appeared to be related to consumers' purchasing criteria, with the main criteria being product

taste, price, labels (of quality or origin) and nutritional content. Indeed, consumers who were concerned about the nutritional quality of their food were more likely to use the Nutri-Score. Overall, the Nutri-Score was used in a secondary way because of the predominant influence of other factors during shopping. In particular, the shopping observations revealed that the strength of habits was a major factor in the purchasing act. Indeed, participants admitted using the label when buying a product for the first time to improve their dietary choices but then stopped using it, either because their purchases were influenced by habits or because they already knew the product rating. This is consistent with a study conducted in Uruguay in which participants reported not using warning labels, because their choices were mainly driven by habits as well as needs, taste and affordability [59]. In line with our results, previous studies concluded that product brand, taste or price were the most important purchasing criteria [36, 60, 61]. Consequently, studies have demonstrated that the type of product and brand are major criteria that could reduce the effectiveness of FOPNL [62, 63]. Additionally, the coexistence of many other types of nutritional information (e.g., nutritional values, health claims) or food marketing on the packaging may also limit the use of FOPNL. Indeed, consumer attention to nutrition labels has been shown to decrease with increasing information density on the front of packing [64, 65]. Another hypothesis not explored in this study relates to time constraints. A Dutch study showed that without any time constraints, participants studied the FOPNL more carefully [66]. Nonetheless, despite these parameters that may limit the use of the label, studies based on actual purchases have shown the positive impact of FOPNL [34], including the Nutri-Score [16], to improve consumers' food choices.

Despite the limited use of the Nutri-Score by participants, both the focus groups and shopping observations confirmed that consumers were aware of the label and knew how to use it. They reported using it to improve their diet quality by choosing products with a better rating and limiting their consumption of products with a low rating. However, different behaviours were reported and observed for poorly rated products depending on the category, as shown by one participant who explained that he could buy a cake with a Nutri-Score D but not processed meat with the same rating. Other studies also identified different patterns of purchasing behaviours with different types of low-rated products: for example, reducing or stopping consumption, finding a substitute or even ignoring the label and continuing to buy it depending on the food category [34, 36]. Our study revealed that behavioural changes mainly occurred when consumers found an inconsistency between their perception of the product's healthiness and the Nutri-Score. For instance,

participants continued to buy cakes and butter despite their low ratings because they were aware of their high fat or sugar content, with the Nutri-Score providing no additional information in this case. These behaviours are consistent with those reported in previous studies, which revealed that the presence of warning labels on products perceived as healthy but with a high content of sugar, fat and/or salt led to a reduction in purchasing intentions [67] and actual purchases [68], whereas no impact was observed when products were already perceived as unhealthy [68].

The present study revealed that participants distinguished between healthy and unhealthy products mainly using the colours of the Nutri-Score logo, with the letters being used as additional information. The colour-based analysis of ratings by the participants of our study was consistent with a previous study on the Nutri-Score, which showed that consumers behaved as if there were only three values and nuanced the messages into good (green), neutral (yellow) and bad (dark orange) signals [69].

Beliefs and expectations regarding the Nutri-Score and its update

In line with the common belief that healthy products are more expensive than unhealthy products, participants thought that products with good ratings (A or B) were more expensive than those with bad ones (D or E). A previous experimental study showed that the provision of health information is likely to influence the price perception of a product, although this relationship differed according to the country [70]. Nevertheless, the objective link between product rating and price is still an insufficiently explored issue that prevents us from drawing firm conclusions. One study on the Health Star Rating label, which evaluated the price of three categories of products, did not find any association between rating and price [71]. Nonetheless, according to one study on warning labels in Chile, the implementation of the FOPNL not only led to the reformulation of food products to improve their nutritional quality but also to higher prices [68]. It thus appears necessary to collect more data on this topic given the major influence of prices on food choices.

Even though consumers were familiar with the Nutri-Score, they did not know about its calculation method. Among non-users, this might be due to a lack of interest in the label or in nutritional information in general. Among users, before they were questioned about it, this lack of knowledge did not seem to affect their use of the label or its perceived reliability. Participants usually identified three main nutrients – sugar, salt and fat – as the criteria taken into account. This result is consistent with previous studies, which showed that these nutrients are the three most important nutrients to which

consumers pay attention [34, 72]. A non-negligible part of participants also thought that non-nutritional components such as additives, degree of processing and pesticides (in a minor way) were also included in the calculation. These aspects appeared to be of major importance to consumers, since they felt less confident about assessing these dimensions themselves compared with the nutritional quality. After learning that these factors were not included in the calculation of the Nutri-Score, many consumers subsequently said that they felt disappointed because they considered the label to be too restrictive. This concern regarding additives has been reported in previous studies, with 75% of American consumers regarding additives as a moderate or serious food safety problem and 76% of Korean consumers not trusting authorised additives [56, 73]. In our study, participants were less concerned about the nutritional quality of individual products than the overall quality of their diet, which included various dimensions such as sanitary quality, local products and low-processed or unprocessed food. Overall, the standard reference quantity of 100 g used to calculate the Nutri-Score was appreciated by participants and considered to be appropriate, because it enables between-product comparisons. A few participants even drew a parallel with the price per kg that they frequently use during food shopping. According to participants, a reference quantity per serving would encourage the consumption of unhealthy products with a serving size of less than 100 g, because the rating per serving would be better than the rating per 100 g. One participant cited the example of chocolate, which would have a better rating if the Nutri-Score was based on a few squares of chocolate than on 100 g. This link between perceived healthiness and consumption was evaluated in a previous study, which showed that the consumption of unhealthy products increased when the calorie-per-serving rate was lower than expected [74].

In addition to the issue of the calculation method, the majority of participants were unfamiliar with the criticisms often relayed on social media, thus suggesting that these issues are raised by experts in the field or by political stakeholders. Regarding the criticism that the Nutri-Score severely assesses traditional products, participants declared that they were less likely to pay attention to the Nutri-Score for these products. Even though they knew that some of these products are high in fat, salt or sugar, pleasure is the main driver of their purchase choices. Moreover, a French study performed on 310 regional products showed that they did not have a particularly low rating, since 62% had a Nutri-Score of A, B or C [75]. Before the study, participants did not have questions or criticisms about the Nutri-Score, although some emerged during the discussions. In line with studies conducted in Uruguay, the major issue limiting the use of the label among the non-user population is a lack of interest [15, 59]. Its use was limited by the perceived poor reliability of the label, most likely due to the lack of information about its calculation, which could lead to a gap between the perceived healthiness of the product and its actual rating. In addition, participants had doubts about the source of the label and the influence of manufacturers. Not all participants knew that the label was a government-endorsed scheme, although they regarded this as a guarantee of reliability. A New Zealand qualitative study confirmed that consumers considered government-implemented food labels to be trustworthy and legitimate to guide them towards healthier food choices [31].

Besides the Nutri-Score update, making the label mandatory could also promote its use. Indeed, consumers who were aware of the voluntary nature of the Nutri-Score appreciated when brands used the logo and viewed it as a guarantee of transparency. This is in accordance with a French study, which reported that 70% of consumers have a better image of the brand if the product uses the Nutri-Score [76], and with a Brazilian study, which confirmed that the use of a warning label gives a positive perception and more credibility to the company [34]. Nevertheless, since the label is not mandatory, some consumers may believe that it is a manufacturer-led initiative, because it is only found on certain brands, thus making the Nutri-Score less credible. Although not all participants were aware of the voluntary nature of the Nutri-Score, which is in line with previous quantitative studies, the majority were in favour of making it mandatory [30, 31, 77, 78]. In their opinion, a mandatory FOPNL would be more equitable and encourage food manufacturers to improve their recipes, as shown in previous studies evaluating the impact of the implementation of a FOPNL on the nutritional composition of food in Belgium and Chile [79, 80].

Policy implications

This study highlighted core elements concerning consumer's expectations about the Nutri-Score and its algorithm update, which may be useful for future public health information campaigns. Indeed, the calculation method used for the Nutri-Score and its management by a public body were the main issues on which consumers needed to receive more information. Participants even suggested that the information campaign should focus on these topics before publicising the algorithm update. Indeed, viewing this evolution process as normal and consistent, consumers did not necessarily want to have all the details. Thus, by improving its coherence and credibility, the update of the Nutri-Score label could enhance its perceived reliability and thus its use by consumers.

Participants in the present study felt disappointed, because they considered the label criteria to be too

restrictive, because it did not take into account additives or the degree of processing, for example. Nonetheless, the current state of knowledge does not allow the inclusion of these dimensions in a comprehensive indicator. For this reason, the updated version of the Nutri-Score algorithm only includes nutritional criteria of which health-related evidence is well documented. However, a recent paper concluded that compared with the original Nutri-Score, the updated version appeared to be more aligned with the NOVA classification used to discriminate food according to its degree of processing, with significantly less ultra-processed foods being rated favourably [81]. Thus, the algorithm update better aligns the Nutri-Score with consumers' expectations in terms of its reliability.

In accordance with consumers' expectations to make the label mandatory, the Science Advice for Policy by European Academies recommended that a mandatory FOPNL would be an effective tool like the energy efficiency labels, as it would guide consumers towards healthier habits and encourage manufacturers to improve their products [82]. The current EU regulation does not enable the mandatory use of the Nutri-Score, although within the framework of the Farm to Fork strategy, the European Commission is committed to proposing a harmonised and mandatory FOPNL of which the Nutri-Score is a candidate [10]. In this case, the obligation for manufacturers to use the logo on their products would be a welcome move based on participants' feedback.

In addition, it seems crucial to study the relationship between the Nutri-Score and food prices in order to address the common belief that healthy products are more expensive than unhealthy ones, which would potentially reassure consumers about the label.

Strengths and limitations

This study will add to the limited number of qualitative studies on FOPNL and in particular the Nutri-Score. To date, this is the first study evaluating the real-life use of the recently implemented Nutri-Score. The strengths of this study lie in its use of two complementary approaches. Firstly, the focus groups facilitated the discussion of many different issues while delving deeper into some topics depending on the reactions and interactions of participants. Thus, despite the very promising results of previous quantitative studies, the present study brought to light some misunderstandings regarding the label. This study also highlighted the need for greater pedagogy to explain the source and calculation method of the Nutri-Score to consumers, which provided ideas for the future information campaigns. One general limitation of focus groups is that the results can be distorted if a few participants dominate the discussion. To prevent this, the interviewers regularly asked each participant to express their opinion. Consumers may also misrepresent themselves due to the social desirability bias and a fear of being judged. To avoid this, interviewers explained at the beginning of the sessions that there were no right or wrong answers. Nonetheless, this could not prevent discrepancies between the words and actions of participants.

Secondly, the shopping observations enabled us to study consumers' actual behaviours in real purchase conditions (e.g., regular grocery shopping in their usual supermarket). To the best of our knowledge, this is the first study to use this methodology for evaluating consumers' behaviours in relation to FOPNL. The limitations of this approach were the social desirability bias and the potential influence of the interviewer. However, the fact that participants used a shopping list or chose and purchased their regular products limited these biases. Moreover, collecting data during consumer's usual food shopping in their regular supermarket enabled the inclusion of daily life constraints and limited the social desirability bias.

Some limitations of the study should be acknowledged. Firstly, considering the limited number of studies evaluating the impact of FOPNL on real-life purchasing behaviour and the widespread use of the Nutri-Score in France, the present study is mainly empirical with the aim to support public health actions. Nonetheless, the variables of interest were partly defined based on the conceptual framework developed by Grunert and Wills to evaluate the effectiveness of FOPNL [11]. Regarding the practical implementation of the study, some participants in the shopping observations and focus groups, who were recruited as Nutri-Score users (and reporting it "usually" for the most part), turned out to never or only rarely use the label. Different hypotheses may explain this discrepancy. The self-reported frequency of using the Nutri-Score might be overestimated, as already reported in a previous study in which 50% of participants overestimated their self-reported frequency of using nutritional information [83]. In addition, some consumers might only use the label for specific products or in certain contexts that did not occur during the sessions. This may also be related to the major importance of habits during grocery shopping, which causes consumers to buy products in an automatic manner. Finally, participants might have claimed to use the Nutri-Score simply to gain the compensation money. Nonetheless, considering the complexity of food choices, it is probable that the observed behaviour is the most prevalent among consumers using the Nutri-Score. Indeed, consumers giving more importance to the label in comparison with other determinants might be a minority and have more specific profile (e.g. higher interest in nutrition) and therefore not be representative of the population of users.

Conclusion

Since its implementation in France in 2017 and progressively throughout Europe, this is the first study to provide qualitative and observational evidence about how the Nutri-Score is used by consumers during real-life food purchases. Even though consumers were familiar with the label, they mainly used it in a secondary way to guide them towards a healthier diet, because other criteria like habits, taste or price were of greater importance. Consumers' lack of knowledge about the calculation method of the Nutri-Score and its management by a public body could create a sense of mistrust and limit the use of the label, which should encourage the public health authorities to provide more information about the label to increase consumer confidence in it. Nonetheless, consumers tended not to be aware of criticisms relayed on the internet regarding the Nutri-Score, with this information instead being limited to specific stakeholders. Consumers considered the updating of the Nutri-Score to be a legitimate, normal and consistent process, which will better align it with food-based dietary guidelines. These findings are of major importance, as they will help formulate the messages addressed to consumers to inform them about the Nutri-Score update. It is thus crucial to ensure consumers' trust in the label and encourage them to use it.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-024-20092-w.

Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Declarations

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