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Health Star Rating Labels: A systematic review and future research agenda

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ABSTRACT

Food labeling systems are paramount in consumer food choices, leading to different consumption patterns. Although earlier research focused on food labeling systems in general and Health Star Rating (HSR) in particular, research still lacks a comprehensive understanding of HSR literature with reference to consumer choices. Therefore, this study aims to understand the extant literature on HSR and how it helps consumers make healthy food choices. Following a systematic literature review methodology, we appraised 102 peer-reviewed articles, identifying five thematic areas around HSR and consumer healthy food choices, including 'regulations, implementations, and evaluations of HSR,' 'consumer food choices,' 'nutrient profiling focus', 'stakeholder perspective of HSR,' and 'marketing strategies for HSR'. Accordingly, this review proposes a future research agenda and offers practical guidelines to facilitate consumer healthy food choices.

1. Introduction

Front-of-pack (FOP) food labels display the nutritional profile of packaged food products (e.g., cereals, milk, yogurt, bread, and other retail items) to make them easily understood by consumers. FOP nutrition labels have recently attracted the interest of many scholars who have made them the subject of systematic reviews (e.g., Santos et al., 2020). For instance, a recent study on nutrition labels investigated how different label designs can enhance consumer's attention using eye tracking methodology (Ma & Zhuang, 2021). Beyond scholarly interest, political and regulatory agencies have also taken an interest in evaluating the effectiveness of FOP labels for a possible market implementation (European Commission, 2020; Kelly & Jewell, 2018; de-Magistris et al., 2017) and their potential to influence consumer behavior. Indeed, prior research has shown that FOP labels can improve nutritional literacy (Mansfield et al., 2020), guide consumers to make healthy food choices (Ang et al., 2023; Jones et al., 2018; Lima et al., 2018), turn consumer behavior towards more nutritious choices (El-Abbadi et al., 2020), incentivize the stakeholders to enhance its formulations (Vyth et al., 2010), and motivate them toward subsequent physical activity (Jin et al., 2020).

Additionally, FOP labels also provide many benefits, including (a) an increase of healthy food purchase and consumption, which could reduce, in the long-term, diet-related diseases (Donini et al., 2023; Schruff-Lim et al., 2023); (b) higher perceived food product quality (Hallez et al., 2023; Thomas & Capelli, 2023); (c) greater incentives for the food sector due to product design reformulation with FOP labels (Dubois et al., 2021; Mauri et al., 2021); and, (d) attract health-conscious consumers towards more healthy products (Andrews et al., 2021) due to the use of FOP as a part of visual ecology of a products' packaging (Orquin et al., 2020).

Primarily, the FOP labels comprise two main groups based on format, known as reductive and evaluative. The reductive FOP labels include the Daily Intake Guide (DIG), which is used in New Zealand and Australia, and the Reference Intakes (RI) system which is used in the UK. Evaluative FOP labels include the Multiple traffic lights (MTL) and the Health Star Rating (HSR), which generally use symbols (e.g., light and battery logos) and color coding (such as red, yellow, orange, or green) to emphasize food health (Cadario & Chandon, 2020). HSR is an evaluative nutritional label (Talati, Pettigrew, Kelly, et al., 2016) and is considered superior to reductive FOP labels (Hawley et al., 2013; Hersey et al., 2013; Talati, Norman, et al., 2017).

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In addition, it is important to note that there are inconsistencies in the understanding and usage of the front of pack labeling systems among different countries due to the differences in local perspectives and its effect and power on the public discussion on nutritional labeling. While baseline points of HSR are calculated for major nutrients, such as energy, saturated fat, sodium and total sugars, and modifying points are calculated for the proportion of fruit, nut, vegetable and legume (FVNL), fiber, and protein content, this labeling scheme is different in different countries and regions. For example, in the United States of America (USA), the Food and Drug Administration (FDA) regulates food labeling under the Federal Food, Drug and Cosmetics Act (FD&C Act.) (FDA, 2021), and they provide nutrition facts label, and ingredient list on the food package (Nieto et al., 2019). In Europe, food labeling regulation falls under the European Food Safety Authority (EFSA) (EFSA, 2011) and they require member countries to mention the following information in food packages: nutrition information label, country of origin label, and allergy information labels (Storcksdieck genannt Bonsmann et al., 2010).

In Australia and New Zealand, the Food Standards Australia New Zealand (FSANZ) polices front of pack labels and ensures that every packaged food contains: nutrition information, country of origin, and Health Star Rating label (FSANZ, 2018; Blakeney, 2016). In some countries, food labels are used to restrict the overconsumption of some ingredients such as salt (sodium), spices, oil, and sugar. Several countries have already reduced their salt intake, and have set a standard limit of sodium content, including Japan (1960–1970), Finland (1975 onwards), Australia (2012), Ireland (2005), Canada (2005), the USA (1980s), and the United Kingdom (2008) (He & MacGregor, 2009).

HSR labels serve different purposes across different countries where it has been implemented. Prior studies have highlighted that both New Zealand and Australia have used different approaches and policies to raise consumer awareness of HSR (Talati, Pettigrew, Kelly, et al., 2016; Brownbill et al., 2019). They further argued that public health campaigns at different levels, such as at educational institutes, have proved a very effective strategy by the New Zealand government, demonstrating the potential of the HSR system to impact public health positively. Although the HSR labeling system has been designed to compare processed and packaged foods, primarily within the same product category (Niven et al., 2019), products with HSR labels have been compared both within and between categories in previous literature. For instance, consumers selected healthy products with the help of HSR labels within food categories, such as snacks and breakfast cereals (Bucher et al., 2017; Dunford et al., 2017; Kumar et al., 2018). However, one of the prior studies compared products both across and within categories and found that evaluating star rating labels within the category is forthright, but across categories often creates confusion and diverse interpretations (Maubach et al., 2014; Cornish & Moraes, 2015).

The existing literature has examined the diverse aspects of the HSR, such as measuring consumer perception towards healthy food products (Ahmed et al., 2020; Marozzo et al., 2020), using HSR as a significant intervention that (a) can influence the customer decision-making process towards healthy food choices (Anderson & O'Connor, 2019; Thomas et al., 2021), (b) help to quantify the nutritional quality of food products (Egnell et al., 2019), and (c) reduce consumers' psychological load in comparison to other types of FOPs (Egnell et al., 2019).

Furthermore, results of prior literature on HSR have not always demonstrated consistent findings. For example, Santos et al. (2020) suggest that HSR is less effective than Multiple Traffic Light (MTL) labeling systems. However, other scholars have recommended HSR label over other labels, such as the multiple traffic light (MTL) and the Reference intakes (RI) labels for endorsing healthy food products (FoodSwitch: State of the (Food Supply, 2019; Talati, Norman, et al., 2017; Talati, Pettigrew, Ball, et al., 2017). Similarly, Talati, Norman, et al. (2017) reported that HSR efficiently labels distinct healthy and unhealthy foods. However, Egnell et al. (2019) found no significant difference across different FOPLs regarding label perceptions and their impact on food choices. Taken together, inconsistencies in the prior literature further strengthen the need for a systematic literature review (SLR) to examine different aspects of HSR and situate particularly consumer food healthy choices based on HSR food label. Accordingly, in this SLR, we focus on understanding deeply the extant HSR literature with emphasis on consumer food healthy choices to answer the following research question*: what are the various key topics and boundaries of HSR literature?*

This SLR has three contributions. First, broadly, this SLR contributes to the existing knowledge on HSR with a particular focus on consumer food healthy choices. Second, this SLR attempts to provide a broader understanding of the influential role of the HSR on consumer food healthy choices. Finally, this SLR provides incremental insights for different stakeholders to formulate relevant strategies to increase the awareness and importance of the HSR label. The remainder of this paper follows by scoping the boundaries of this SLR followed by the methodology of this SLR, selection and analysis processes of peer-reviewed articles. We offer an in-depth view of thematic areas, highlighting theoretical and practical implications, limitations, and suggestions for future research.

2. Scope of the review

To capture the full scope of HSR, we only focused on peer-reviewed evidence to portray a future picture of food products having an HSR label. Therefore, much of the research interest in HSR focused on its importance, implementation (Dickie et al., 2020), acceptance by the manufacturers over some time (Shahid et al., 2020; Talati, Egnell, Hercberg, Julia, & Pettigrew, 2019), and its role in framing the consumers' choice box and decision making (Thomas et al., 2021). We limited our study's gamut to HSR and did not target the other FOP labels and their allied concepts in detail.

The scope of this review is coming from macro to micro-level focus on food labels. At the macro-level, government rules and regulations, industry standards, and cultural norms governing the execution and efficacy of food related information for consumer guidance. The *meso*-level focuses on the key regulations including, ingredient lists, nutrition facts labels, expiration dates, allergen label, quality assurance labels, and country of origin labels, among others. Finally, at the micro level, we narrow down our focus on nutrition facts labels, where front-of-pack labels is one of the food label categories. We further studied the extant literature on Health Star Rating label to provide a thorough understanding of the key topics and boundaries of HSR, to propose future research directions and policy implications (see Fig. 1).

3. Methodology

Given the objectives of this study, we adopted the systematic literature review (SLR) as a method of inquiry to systematically identify, synthesize, evaluate, interpret, provide incremental insights, and offer future research directions (Kunisch et al., 2023; Paul & Criado, 2020; Snyder, 2019). This study followed the footpaths of previous scholars (e.g., Zheng, 2021; Kumar & Srivastava, 2022; Skwara, 2023) to address our research questions and employ the SLR method. We followed the PRISMA flow chart to plan this review in order to extract and include relevant articles (Moher et al., 2015) from the health star rating literature: Step 1) Identification of the studies; Step 2) Screening of studies; Step 3) Applying eligibility criteria; and Step 4) Selection of relevant studies. Fig. 2 presents the whole process of extracting and selecting relevant studies to analyze health star rating literature further.

3.1. Identification of the studies

We utilized two well-known databases, Scopus and Web of Science, given their comprehensive search engine nature that allows one to cover a vast spectrum of literature (Mongeon & Paul-Hus, 2016) to identify

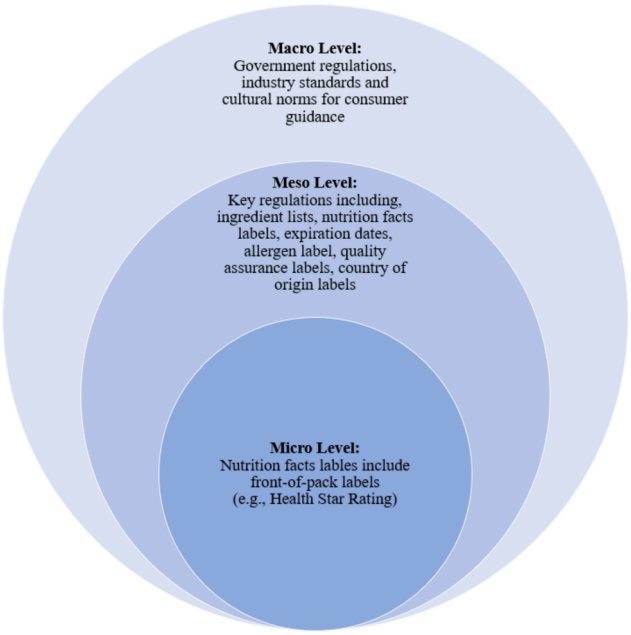

Fig. 1. Scope of the Systematic Literature Review.

relevant articles. We searched in the title, abstract, and keywords of documents in these databases using the following search string: ("health star rating*" OR "Health Star Rating (HSR)*," which resulted in 368 total documents. This search result was executed on 15 December 2023.

3.2. Screening of studies

The compiled 368 documents were screened for language ('English') and document type ('Journal Article'). Next, we combined results from Scopus and Web of Science. After removing duplicates, a total of 225 journal articles published in the English language remained.

3.3. Applying eligibility criteria

After the screening stage, we employed a specific qualitative criterion to check the studies' eligibility for this literature review. For the relevance of health star rating literature in the business and management contexts, we used two international journal rankings, including the Academic Journal Guide (AJG) and the Australian Business Deans Council (ABDC), which yielded 190 articles. After that, two of the authors of this SLR acted as independent coders, evaluating and coding all 190 articles, either to include or exclude articles based on the criteria defined in Table 1. This criterion was applied to the title and abstract of the articles. Additionally, authors accessed the full text to evaluate the relevance of articles with the objectives and scope of this literature review, i.e., health star rating and healthy food choices. Coders discussed and ensured double coding reliability. As a result, 102 articles were selected for the final analysis.

3.4. Selection of relevant studies and analysis

After careful selection of the chosen 102 articles, a thematic analysis was manually employed to understand the underlying mechanisms of the impact of health star rating labels on consumer behavior, consumer decision-making, and consumer participation. We followed a detailed thematic analysis process as suggested by Braun and Clarke (2012), including familiarizing with the data, generating initial codes, searching for themes, reviewing potential themes, defining themes, and reporting and interpreting the final themes.

4. Analysis and results

4.1. Descriptive analysis

The publication trend over the last 10 years (from 2014 to 2023) years indicates that studies on HSR labels were first published in 2014 (Volkova et al., 2014). Over time, the number of publications has notably increased since 2018, with 25 articles in each of the past six years (2018 to 2023). Furthermore, studies on HSR labels have been spread across various journals. "Nutrients" has emerged as the leading journal, with 50 research articles, followed by "Appetite," "Public Health Nutrition" (13 articles each), and "Food Quality and Preference" (09 articles). "Simone Pettigrew" emerges as the most prolific author in the field, boasting 34 publications, followed by "Bruce Neal" with 32 publications, "Cliona Ni Mhurchu" authored 24 publications, and "Zenobia Talati" contributed 23 articles to the body of HSR labels literature. Notably, 92.5 % of the studies on HSR labels have followed Sustainable Development Goal 03, "Good Health and Well Being." Most studies were reported by authors (Corresponding authors) from Australia (146 publications), New Zealand (42), the USA, and England (35 each).

4.2. Thematic analysis

The selected studies in the review examine the HSR label from different angles and its various facets. To amalgamate all these multiple studies methodically, we made efforts to categorize the common themes inside the selected literature by following Gioia methodology (Gioia et al., 2013), where we adopted a three-step process (first-order concepts, second-order categories, and aggregate dimensions) to confirm that the derived themes would provide an impartial view of the past studies. First, open coding was performed, and after that, the deductive and inductive method of axial coding was utilized to classify the relationship among open codes. Initially, 102 first-order concepts were extracted from the reviewed literature. These concepts were further categorized into nine second-order categories. At the third and last level, five aggregate dimensions were outlined. This whole process has been validated with two authors to ensure unanimity and inter-rater consistency. The sequencing, categorization, and aggregate dimensions were discussed and agreed upon which are presented in Fig. 3.

4.2.1. Marketing strategies for HSR

The reviewed studies have also discussed the HSR label connection with other behavioral and marketing factors (e.g., pricing, product, and package size). A strong correlation and influence between HSR and the proportion of products' prices were found in past studies (Riesenberg et al., 2019). A study reported that the ratio of price-sponsored products within each HSR score category declined as the HSR score increased (Riesenberg et al., 2019). For instance, products with an HSR of 0.5 were normally more price promoted than products with an HSR of 5.0. Similarly, a significant inverse correlation was found between HSR and the magnitude and frequency of price promotions (Riesenberg et al., 2019). Hence, it is concluded that products with high HSR scores earned small price discounts while products with low HSR scores earned high price discounts to encourage consumers to purchase a less healthy product with discount packages.

de Abreu et al. (2019) suggested a slight positive correlation between HSR and food cost for cereal-based bars and juices only. However, a past study's results reported that product package size was a prospective confounder of the association between food costs and HSR (de Abreu et al., 2019). Another study shared that smaller portion sizes products with HSR and easy-to-understand star-based summary of nutrition information are more active and quicker in guiding consumers to inform them about healthy or unhealthy food intake (Riley et al., 2016; Talati, Pettigrew, et al., 2018). Contrariwise, another study claimed that the HSR label does not consider the portion size except those with 3.5 stars

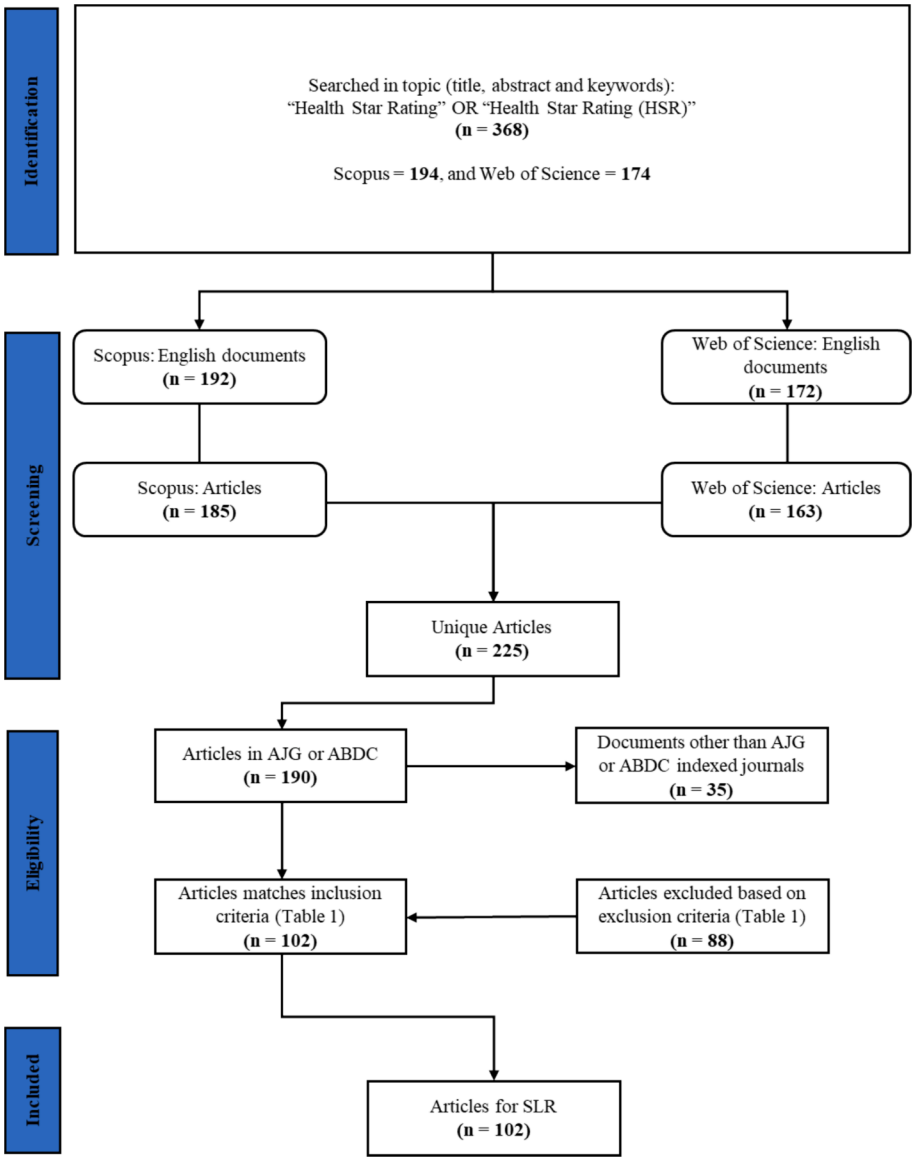

Fig. 2. Data collection based on PRISMA flowchart.

Table 1
Selection of articles based on inclusion and exclusion criteria.

Inclusion	Exclusion
Articles focusing on HSR as a central idea of discussion.	Articles mentioned HSR in the title, abstract, and keywords; however, the articles did not focus on HSR as a main discussion point.
Articles focusing on consumption-related factors such as consumer behavior, consumer decision making	Articles related to other areas in the food labeling system domain, such as health labels, food packaging, nutritional value, front package labels, and labeling systems.
Articles with empirical data.	Articles based on systematic literature review.

or more (Shi et al., 2018). While reviewing studies that also discussed FOP labels, HSR can positively affect the judgments of unhealthy foods in terms of portion size (Talati, Pettigrew, et al., 2018; Pettigrew et al., 2017).

4.2.2. *Consumer food choices*

Previous literature results indicated that the primary reason behind the launch of a HSR label was to influence and assist consumers in making healthier food choices. However, the extent to which one can predict HSR label's influence on consumers is still small, particularly when compared to other consumer decision inputs placed on the product package (Hamlin & McNeill, 2018), and in predicting consumers' purchase intention and health perception (Ares et al., 2018). A study by Franco-Arellano et al. (2020) reported that HSR played a helping hand in consumers' ability to rank food products according to their nutritional quality correctly. Franco-Arellano et al. (2020) found that among the five different FOP labels, HSR outperformed only in the cake category and exhibited a better score after the Nutri-Score within two (breakfast cereals and pizza) of the three food categories.

Additionally, Santos et al. (2020) reported that familiarity with the label system favors the consumer side. For instance, the Australian government developed the HSR label as an optimum nutritional label solution (Neal et al., 2019). Australian people are aware of this system, so they use it for effective purchase decisions. Researchers have found that brand familiarity and trust protect a product from being known as unhealthy, even when nutritional labels are present (Tonkin et al., 2018;

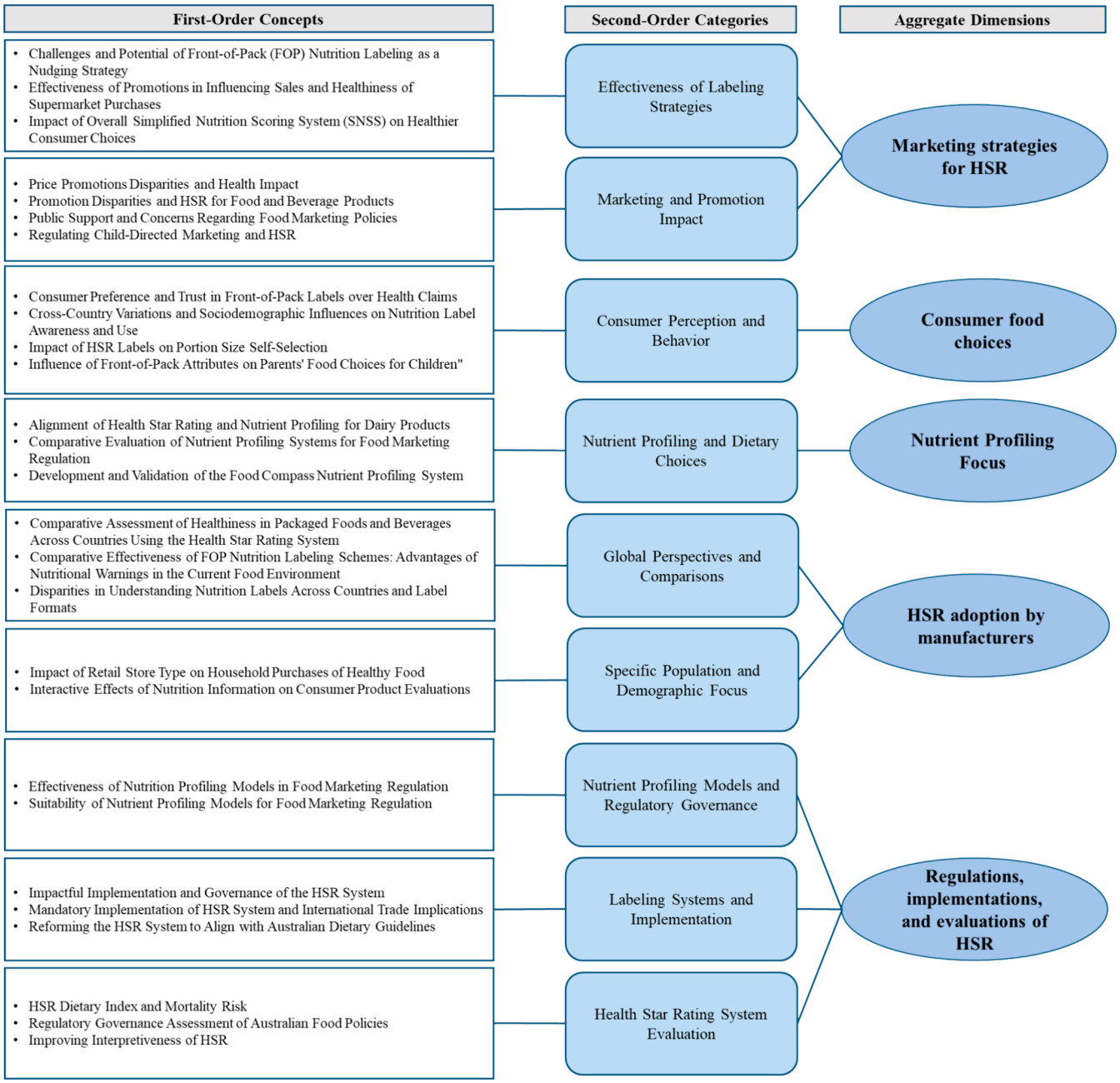

Fig. 3. Thematic analysis of research on HSR labels.

Velasco Vizcaíno & Velasco, 2019). Hwang and Kim (2021) explain that multitier private brands impact consumer choice and brand equity differently than domestic brands.

Prior literature has also offered insights into factors motivating and demotivating consumers toward HSR. In their study, Talati, Pettigrew, Hughes, et al. (2016b) described trust and ease of use as the main motivating factors influencing the participants' willingness to include HSR in the product evaluation process because HSR simplified their evaluation of each food product by the easily understandable way. According to participants, HSR is more objective than actual health claims, because such health claims on food labels and product packages are not based on verifiable and unbiased evidence. So, participants were skeptical about the authenticity of such claims and also the use of such claims for marketing purposes. As previous literature revealed that high health claims produced by manufacturers create distrust among consumers from demotivating factors. Such health claims are based on unbalanced and fake nutrition and health values (Talati, Norman, Kelly, et al., 2018). The second demotivating factor is the meaning and score of the terms; high stars and low stars. Lastly, people get confused with three different brand products within the same food category, other nutritional elements, and the same HSR score.

All these demotivating factors contribute to customers' ignorance about the HSR, resulting in reduced usage by consumers (Russell et al., 2017; Talati, Pettigrew, Neal, et al., 2017). In accordance with the Elaboration Likelihood Model (Petty & Cacioppo, 1986), the ease of use of the HSR system is paramount in facilitating users' information processing, ensuring they can engage with the system effectively. Past studies have highlighted the importance of consumer education and health literacy in promoting HSR usage. For instance, the Australian government has implemented a consumer education campaign incorporating HSR into packaged foods (Franco-Arellano et al., 2020; Grafenauer & Curtain, 2018). This campaign aimed to guide consumers in

making healthy food choices. According to Dunford et al. (2017), consumer education is a key motivating factor in developing and implementing schemes to assist customers in selecting healthy foods.

4.2.3. Nutrient profiling focus

Nutrient profiling is a rigorous process aimed at classifying foods based on their nutritional composition, ensuring that the systems we use are reliable and trustworthy. Nutrient profiling can be defined as "the discipline of characterizing foods for specific purposes based on assessing their nutrient composition according to scientific and pragmatic principles" (Garsetti et al., 2007, p. 16). Similarly, Drewnowski and Fulgoni (2008) described Nutrient profiling as "science of ranking foods based on their nutrient content" (p. 23). These authors provided an overview of Nutrient profiling, showing that focus of HSR uptake varied by different food categories. The purpose of discussing nutrient profiling focuses on HSR is to provide evidence of different food categories and their relevant HSR score that they received and how consumers reacted to their scores.

Indeed, prior literature has found that HSR differentiates among different food categories such as, dairy beverages, food, cheese, dairy foods, oils, fats, and beverages, and assigned them value based on their nutrient composition. Prior studies have found that dairy products often had higher HSRs than soft drinks, products with energy-dense ingredients and offered little nutritional value (Neal et al., 2019; Shahid et al., 2020). It encourages consumers to choose drinks with high HSR value (Billich et al., 2018). Because of the high HSR score of dairy products, a recent study has defined HSR calibration categories into these classifications: 1) non-dairy drinks, for instance, sugar-sweetened drinks and fruit juices; 2) core cereals, such as, pasta and rice; core dairy products, for example, cheeses, yogurt, protein foods, fats and oils, vegetables, fruit, and 3) non-core foods (Contreras-Manzano et al., 2018; Dunford et al., 2017).

In the case of Yoghurt, HSR showed a lower willingness to purchase a product than without any food label (Hamlin & McNeill, 2016). The average HSR score for different foods categories, such as vegetables, fruit, eggs, and nuts and legumes, considered with the highest mean HSR was 3.76 and 3.63, respectively, while the confectionery food category showed the lowest mean HSR that was 1.23 out of 5.0 (Baldridge et al., 2019). This literature also revealed that the HSR label discriminates fast food from packaged foods based on nutritional features. So, the HSR label was also applied to fast foods to extend the scope of the HSR label (Dunford et al., 2017). However, Yang et al. (2016) described one limitation of the HSR label regarding dietary fiber and fruit content, which is not considered in the scoring criteria of the HSR label. Plain water receives the maximum HSR rating of five stars (Carrad et al., 2016). The other food categories that have adopted the HSR label system include packaged fruit and vegetables, convenience foods, sauces and spreads, and breakfast drinks.

Based on the literature, we observed varying HSR across different product categories. Most products had an HSR score above 3.0, with a median score of 4.0 (Dunford et al., 2017, 2018; Jones et al., 2018; Morrison et al., 2019; Peters et al., 2017). These summarized stats of the HSR value provides a clear picture of the overall healthiness of different products across different categories. We can infer, based on these values, that the majority of the available food is in the healthy quadrant. It can convince consumers to rely on HSR scores, and also give confidence to the manufacturer to continue improving their product and quality.

Past studies reported that the HSR label had been used to assess the products' healthfulness offered by foreign companies (e.g., Neal et al., 2019). This assessment has facilitated the evaluation of international firms' products between countries (Vergeer et al., 2020). Authors found that the HSR label can reformulate the product to increase the health benefits and reduce the mean population body weight (Herrera et al., 2018). The high energy-dense products are transformed into less energy-dense products after following the HSR label. On the other hand, products without implementing HSR exhibited an increase in energy density, which causes health issues among consumers.

The reviewed studies have found the usage and effects of the HSR label in other countries. Countries such as middle income with less healthy foods and drinks are advised to implement nutrient profiling systems like HSR to reformulate available products in the marketplace to decrease the risk of non-communicable diseases, e.g., obesity and heart-related diseases (Billich et al., 2018). Generally, packaged foods and beverages in the UK, USA, Australia, and Canada ranked healthiest, with the mean HSR ranging from 2.74 to 2.83 out of 5.00 (Billich et al., 2018). On the other hand, Indian, Hong Kong, Chinese, and Chilean foods ranked least healthy; the mean HSR ranged from 2.27 to 2.44 out of 5.00 (Billich et al., 2018). Mexican participants reported that healthier products display more stars than unhealthy ones (Vargas-Meza et al., 2019). Similarly, studies reported that in a Canadian marketplace, the effect of the HSR label was noted in one-third of participants who used HSR more often than the average (Mhurchu et al., 2017). A past study by Lappi et al. (2020) found that, in Sweden, the bread products are considered healthy as per HSR label criteria, and the HSR label also pointed out unhealthy products sold in Swedish supermarkets.

4.2.4. HSR adoption by manufacturers

The manufacturer's point of view related to the HSR label, its purpose of implementation, expected outcomes, and social benefits are important aspects of this systematic review. The reviewed studies have revealed that food businesses adopt unique approaches to modify the nutritional structure of their manufactured goods dependent on the nutrient and food category (Spiteri & Soler, 2018). The manufacturers were reluctant to use the HSR label, and limits of commercial goodwill were observed in applying HSR voluntarily (Shahid et al., 2020). The low HSR of a product is a big hurdle. Manufacturers are very worried that if their products get a low HSR, the consumer will not buy them, and if every effect has a high HSR, then doubts will be created in the consumer's mind (Shahid et al., 2020).

For instance, if three different brand products of the same category have high HSR, consumers may get confused about which option is the healthiest option. This confusion and misunderstanding increase the cognitive burden in consumer decision-making. In turn, the HSR label may impel a negative message to the consumer community, losing its purpose. Researchers have found that only those products with a good profile would carry the stars (Shi et al., 2018). The manufacturers stated that implementation of the HSR label contains many difficulties and challenges, such as complications in HSR calculation and usage of extra resources bearing additional costs and human resources (Shahid et al., 2020).

The reviewed studies have found external stakeholders (e.g., government, food producers, and sellers) in the acceptance and implementation of the HSR label. A study by Pulker et al. (2019) found that people in Australia believed that the implementation and use of HSR labels would only be accurate and trustworthy with government leadership because of food manufacturers' selective approach to food labeling information use. This is one of the reasons why 97 percent of participants in a study stated that the government should fix the healthy food standards and nutritional labels on the products instead of food companies (Pollard et al., 2013). From manufacturers' role in HSR usage, reviewed studies revealed that participants anticipated food companies would be reluctant to highlight unhealthy food products voluntarily (Pulker et al., 2019). For instance, manufacturers would only recommend HSR to those considered healthy and secure an excellent HSR score.

After a successful launch in Australia, HSR got the attention of most consumers and manufacturers. Manufacturers started to use the HSR label as a marketing tool to promote healthy products (Lawrence et al., 2018). Chandon (2013) discussed manufacturers' behavior of displaying every food as healthy because of the health halo effect. Another study examined the possibility of using causal rational to lessen the adverse health halo (Sundar et al., 2021). Manufacturers did not provide any

evidence behind the healthy food claim, which is why people do not trust them.

4.2.5. Regulations, implementations, and evaluations of HSR

This theme consists of important HSR regulatory aspects, its implementation and evaluation over time. There are no globally recognised rules for FOP labeling, and their application and regulations are very localized (Jones et al., 2019), and World Health Organization (WHO) has recommended FOP labeling as a strategy to cope with obesity and non-communicable diseases depending on the individual countries specific formats and regulatory procedures (van der Bend & Lissner, 2019). Food labels literature has stated that governments are in the leading role in designing, developing and implementing the food labels rules and regulation in different countries which classify food products based on specific nutritional criteria set by each regulatory body. In addition, international efforts have been made to compare and standardize FOP labels across the countries to align and connect them to a single health goal globally (Talati et al., 2019). Furthermore, the Codex Committee on food labeling has been proposed to develop a new global standard for FOP labels, aiming to protect existing laws and empower countries to issue nutrition regulations with higher public health impact. In some countries, governmental organizations independently work on developing food labeling systems, such as, Food and Drug Administration (FDA) in USA (Philipson, 2005), and Canadian Food Inspection Agency (CFIA) in Canada (Charlebois et al., 2021).

While some countries follow guidelines set by central organizations, such as, European Food Safety Authority (EFSA) under Regulation (EU) No 1169/2011 across the Europe (Meijer et al., 2021), and Food Standards Australia New Zealand (FSANZ) in Australia and New Zealand (Breen et al., 2020), past literature indicated that the HSR system was reformed from the Nutrient Profiling Scoring Criterion (NPSC), which was developed by Australia and New Zealand legislative bodies (Dunford et al., 2018). According to this criterion, products with stars greater than or equal to 3.5 out of 5.0 are considered "healthy" (Wellard et al., 2016). The analysis of HSRs of 20,225 products (Carrad et al., 2016) and 34,000 packaged foods found that the HSR label is consistent with the Australian Dietary Guidelines (ADGs) and classified products on ADG recommendations (Carrad et al., 2016). HSR reduces participants' cognitive processing burden during purchase decisions (Talati, Pettigrew, Kelly, et al., 2016).

Previous studies found that HSR intervention is cost-effective for the health sector and society (Herrera et al., 2018). It also illustrates the economic evaluation, which leads to health outcomes in a cost-efficient manner. Prior studies have reported HSR's implementation by measuring its performance and found that HSR in new products was more significant than before by 235 % (Dickie et al., 2020). Interestingly, however, the distribution and frequency of the HSR label remain the same from the first day of implementation, with an HSR median of 3.5 and a clustered frequency of 3.5 and 4 stars (Lawrence et al., 2018). Past studies revealed that low HSR scores attract customers more than high HSR scores. Previous research has indicated that consumers are more influenced by negative than positive labeling (Cooper et al., 2017).

Prior scholars have attempted to convince the legislative authorities and organizations about HSR's mandatory continuation and compulsion (Talati et al., 2019). They argued that some nutritional labeling systems only work if they are enforced and instructed by the food manufacturers to apply a label across respective products. When HSR is applied voluntarily instead of mandatory, it tends to be placed mostly on healthier products with high HSR (Jones et al., 2018; Morrison et al., 2019). On the other hand, products with low HSR scores are less likely to display the HSR to protect their product sales from falling because consumers tend to under-appreciate products with lower HSR (Lawrence et al., 2018). Thus, manufacturers present a higher median HSR (i.e., four stars) on discretionary branded foods.

Studies have found that a high HSR score attracts consumers more than a low one, and it helps in increasing healthy food choices (Lawrence et al., 2019; Thomas et al., 2021). However some of the studies have shown that participants viewed HSR as a confusing factor with displaying an absolute value of healthiness in the form of a star, stating their doubts about the limited role of HSR in discouraging consumers from purchasing low-score products (Pelly et al., 2020).

One problem with HSR labels that was reported by prior studies is its association with technical aspects of HSR label design. Nutritionists have argued that the HSR label does not follow the standard nutrition exposure and health outcomes (Niven et al., 2019). They say that HSR measures a particular food's health potential by simply summing its ingredients' score. Another drawback is the fact that it always gives a positive score, i.e., 0.5–5.0, and does not assign a negative score to any product. Such situations cause doubts in consumers' and manufacturers' minds and lead to distrust and a lack of confidence (Dickie et al., 2020). For the manufacturer, literature revealed food manufacturers and food categories included Five Food Group (FFG) foods (such as fruit; vegetables; grain foods; meat/eggs/tofu/nuts/seeds/legumes; milk/yogurt/cheese/alternatives); and Discretionary Foods (such as Snacks and Bakery), in Australia (Lawrence et al., 2019).

Prior literature illustrated that many participants noticed a lack of transparency in deciding the HSR. Participants felt no strong congruence between health perceptions of a food product and the star rating assigned to that product. HSR development, implementation, and evaluation involve a partnership excluding public health nutritionists, leading to a lack of relevant and independent expertise. This partnership encompasses government, NGOs, and the food industry, posing challenges to effective administration. For instance, critics note that vegetables and fruits do not receive five stars in the HSR system, prompting scrutiny of added sugar inclusion in the algorithm. Additionally, the HSR label's initial focus on packaged foods excludes consideration of non-packaged products, necessitating alternative solutions. The reviewed studies have found an unresolved dispute on the appropriate cut-off point to determine what 'healthy food' means on the HSR scale.

5. Future research agenda

After reviewing the prior studies, we found that different themes created gaps in the literature on HSR and FOP labels. We extracted theme-based literature gaps and proposed prospective research questions for future researchers to fill these gaps. This process, supplemented by suggested research directions, covers the development of a theoretical framework. Identifying these research gaps and questions is important because it helps motivate scholars and practitioners to do thorough research on how people use alternative staple foods. These themes and potential research questions are presented in Table 2.

6. Conclusion

This study adopted the SLR methodology to integrate extant studies on HSR labels. This study has set a boundary by counting 102 selected peer-reviewed published studies on HSR by carefully organizing it according to the year-wise, journal-wise, and country-wise publications, country of origin, publication time frame, and main contributors. This study provided a holistic picture of prior work on the HSR label, future research directions, and thoughtful implications for theoretical and practical purposes. The study carefully adopted the SLR method to recognize, integrate, and analytically assess the selected studies on the HSR label to answer our main research questions related to HSR. This study provides significant contributions to the food labeling literature. It is the first review to examine published studies on the HSR label. Secondly, while most studies on HSR originate from Australia and New Zealand, this study offers a comprehensive examination, unlike previous reviews focused on HSR's impact, uptake, and performance. Third, more profound insights into the HSR label can help the customers in decision-making and guide the producers and the government's public policy institute to the possible strategies that can be executed to increase the

Table 2
Theme-centered gaps and future research questions.

Theme	Thematic gaps	Proposed research questions
Marketing strategies for HSR	● Scholars have overlooked the shared effect of HSR labels on consumer behavior during their decision-making processes. ● Future research needs to examine the relationship between product size and food healthiness and the mediating effect of HSRs to better predict the consumer response toward large-size products. ● Promotion of the HSR labels as a mandatory and healthy tool should be justified by the cost analysis of different food products to assist the consumer in decision-making.	● How do HSR labels and food costs affect consumer behavior? ● How do HSR labels bridge the gap between product size and food healthiness? ● What promotional initiatives and activities can increase consumers' uptake and acceptance of HSR? ● Should companies make individual strategies for food labels and nutritional information?
Consumer food choices	● The impact of HSR labels on consumer decision-making needs scholarly attention. ● There is a need to evaluate the nutritional information and symbols displayed on HSRs, currently present in numerous formats in Australia, which overload the information and lead the consumer towards reduced readability, interpretability, and intricate decision-making process. ● Future studies should also investigate the relationship between consumers' nutrition knowledge and willingness to pay. ● Prior studies indicate that nutritional knowledge may help consumers in their decision-making.	● To what extent do the different ranked products influence the consumer purchase decision? ● What kind of information does the consumer want to see on HSR? ● Do the different formats of HSR with excessive information increase the consumers' cognitive load? ● Does nutritional knowledge ease the decision-making journey of consumers and convince them to pay for products? ● Does the food labeling system use the appropriate symbols (e.g., traffic light, battery, etc.)? ● To what extent does the valence of HSR (positive vs. negative) influence consumers' food purchase decisions?
Nutrient profiling focus	● Future studies should observe the development of the FOP labeling systems to assess their performance in the beverage market in different countries. ● As labeling systems develop, new studies should evaluate consumer perceptions and understanding of these developments, particularly HSR's role in calculating the nutritional profile of different food categories.	● Do new developments in FOP labeling systems affect the global beverage market? ● How do new labeling systems, particularly HSR, contribute to improving the nutritional profiling of food products? ● Does HSR restrict energy consumption and sugar-dense beverages among young consumers in the real-world setting (i.e., Z-generation)?
	● The presence of an HSR label on energy-dense and sugar-sweetened beverages may reduce consumption among young consumers. ● Research should be conducted in a real-world setting to confirm the HSR impact on reducing such beverage consumption. ● Incorporating various cultural nuances in the nutritional label design and composition can enhance the globalization of the label. ● Addressing disparities in health knowledge and resources can help maximize the label's effectiveness in promoting healthy eating. ● Collaboration among key stakeholders can enhance the profiling focus of the label.	● How can restrictions through different labeling systems prevent the high use of health-affecting ingredients (such as sugar, fats, sodium, etc.) in various food categories? ● Can nutritional information weaken product loyalty between a brand and consumers after disclosure of less healthy ingredients? ● How do local and diverse cultural components make food labels globally effective? ● What is the impact of incorporating cultural and contextual elements into labels?
HSR adoption by manufacturers	● Intervention studies should focus on a company's essential factors (such as market share, ownership status, size of customer pool, and offered product categories). ● Manufacturers along with government institutes must recognize the hurdles and important factors they encounter when formulating and reformulating new products with HSR labels. ● Prior studies have neglected the producer's point of view on HSR implementation and its impact on the food sector and the overall consumer market. ● Governments, manufacturers, and retailers need mutual working for nutritional information disclosure on food labels.	● Does HSR intervention affect the company's overall profit? ● What are the potential challenges when formulating new products with HSR labels? ● Can a new labeling system affect the company's expenses, sales, and customers if the label changes periodically? ● What do manufacturers think about HSR, its potential, and its possible impact on their businesses? ● How can companies and government institutes convey the exact nutritional information and healthy food-related messages to literate and illiterate consumers?
Regulations, implementation, and evaluations of HSR	● Food labeling is predominantly controlled and regulated by the national government of each country, and also some central organizations such as the Food and Agriculture Organization (FAO). Future studies should	● How do governments develop and implement food labels in different countries? ● How do food labeling regulations differ across various countries, and what are the underlying factors behind these differences?

(*continued on next page*)

Table 2 (*continued*)

Theme	Thematic gaps	Proposed research questions
	focus on finding the role and impact of governments in development and implementation of food labels across the countries. ● Research requires estimating the Australian Daily Guidelines' (ADGs) orientation of all food products showing HSR labels. ● After reviewing the prior studies, future studies should extend the scope of the HSR label by measuring its usability and transferability to new food items (i.e., new production), eatery food, food services, and food products offered in countries other than Australia and New Zealand. ● The limitations of the HSR label should be overcome by updating the product evaluation criteria. For example, consumers feel uncertain when junk food products get a high HSR rating. So, the requirements should be well defined, and products should filter through it genuinely. ● The government should ensure the minimum HSR score while manufacturing the product instead of evaluating it after production. This will save manufacturers' costs, and they can also develop their strategies according to HSR evaluation criteria.	● What is the impact of government-mandated food labels on consumers and their purchase decisions? ● How effective are these food labeling systems in creating and improving health related awareness? ● To what extent do HSR labels displaying products align with ADGs? ● Can the use of HSR labels transfer to different products and services and other countries? ● Are governments required to convert the HSR status from voluntary to mandatory? And its outcomes? ● How could the mandatory HSR status affect the consumers and manufacturers? ● How could different categories of food items earn the same as HSR? ● What are the appropriate criteria for evaluating the products considering different HSR label scores? ● What role can the government institutes, consumers' associations, and manufacturers' associations play in promoting the HSR? ● How can companies deal with their low HSR product to prevent low sales and maintain customer trust?

awareness and usage of food labels.

6.1. Theoretical implications

In response to the need of understanding the literature on HSR labeling systems in a systematic way, this paper has examined the existing literature on HSR to find out main global research themes and propose a future research agenda. However, it is necessary to accept that food labeling regulations are not standardized globally. Each country's national government enforces varied regulations per recommendations and suggestions from the relevant institutions and authorities. These differences in the regulatory environment influence consumers and control the effective implementation of food labels across the country. Hence, considering these variations to ensure they are applicable in diverse regulatory contexts, we present important theoretical implications. This SLR has four critical academic contributions.

First, though several studies have been conducted on HSR label review, most are tilted toward the uptake, performance, and future scope of HSR (Shahid et al., 2020). Our review is the first to examine the peer-reviewed published articles on the HSR label. Second, food labeling literature still needs significant actions on emerging labeling systems such as the HSR label. Hence, the five themes indicated in this SLR offer a bird's eye view of the prospective areas to interested researchers for in-depth and comprehensive analysis of the HSR label. Third, future researchers need to examine the five themes-centered gaps and their allied research questions to develop the research area. Fourth, consumers and manufacturers can discriminate between HSR-labeled and HSR-unlabeled food products before deciding to choose. In this way, future consumer researchers can work on the perceptual changes and their impact on final diction-making among group participants.

Fifth, the research profiling of the selected studies revealed that theory-based analyses are scarce in the extant research archives on the HSR label. Therefore, a theoretical model approach is necessary for future researchers to develop different theoretical frameworks in the HSR labeling area to understand the adoption of the HSR label and its importance in consumer food choices. It is strongly evidenced that theory-supported outcomes are more convincing in motivating researchers, consumers, manufacturers, government institutes, and other stakeholders to adopt and promote a particular FOP labeling system for a healthy food environment. Lastly, by developing the unified framework model, this study lays out a systematic overview of the HSR label and constructs an actionable plan to strengthen the implementation across other geographical areas.

6.2. Practical implications

Our findings have important practical implications that underline the significance of understanding to the changing nature of food labeling regulations across different countries. Prior studies have revealed that food labeling regulations are not stagnant; they progress and evolve over time to respond to the varying government policies regarding public health goals, the changing landscape of the food industry, their newly adopted practices, and political changes at national level (Mozaffarian & Angell, 2010). For instance, to meet the evolving political, environmental, and health aims, the EU has updated its food labeling regulations regularly, with the introduction of Regulation (EU) No 1169/2011, to improve the food labeling systems mechanism according to the needs of the time, to educate the consumer gradually, and to ensure the transparency and accuracy of the labeling system (van der Bend & Lissner, 2019). These changes invite and motivate the relevant stakeholders, such as manufacturers, retailers, and policymakers, to keep them updated and comply with the system. Due to this factor, updates in food labeling regulations in Europe require that manufacturers adjust their labels according to new visual and label design updates and standards (Hawkes, 2010).

By acknowledging the regulatory variability and indicating flexible strategies, this SLR has several implications to follow in the case of the HSR labeling system. First, this literature review can create awareness of HSR usage and its significance among stakeholders. Adding HSR labels to packaged foods provides an excellent opportunity for manufacturers to educate customers about healthy food options. Manufacturers can boost consumer trust and demonstrate their dedication to health awareness by clearly putting HSR labels on their products, empowering customers to make informed dietary decisions (Huang et al., 2018). The HSR label can communicate the advantages of displaying HSR on products, provide the HSR score for each product to assist consumers during purchase, educate consumers about health standards, and classify products as healthy or unhealthy. Second, intermediaries and manufacturers must understand that consumers' decision-making black boxes guide them to consume and use healthy food products and services. Additionally, the implementation of HSR labeling by product manufacturers can frame the consumer decision-making heuristics.

Third, the overemphasis on stars, grades, lights, and other health indicators can increase health consciousness among consumers.

However, on the other hand, the demand for high-star products increases, and low-star and unhealthy food decreases this demand. Fourth, recent studies (e.g., Santos et al., 2020; Andreeva et al., 2020) have recommended that consumers differentiate between authentic and interpretive FOP-labeled food rather than any simple labeled food. Researchers urge such outcomes for policymakers to standardize packaged food with an HSR labeling system. Fifth, the total cost and pricing will also increase due to HSR or other FOP label interventions. Therefore, each stakeholder (such as consumers and producers) can adapt it to discourage unhealthy food and get protection from diseases.

6.3. Limitations and scope for further research

This SLR comes with a few limitations. First, the selection of articles in this review was limited to Scopus, and Web of Science databases. Consequently, future research could expand it to other databases to cover the multidisciplinary view of HSR. Second, we did not include editorial letters, commentaries, conceptual discussion papers, duplicate studies, or any non-peer-reviewed literature to confirm the irreproachable and effectiveness of the review. Future research could also bring different types of publications to comprehensively study HSR literature with reference to other phenomena under study, for example, HSR and its importance for food policy designs. Given the multidisciplinary nature of HSR literature, future research could expand to other elements of HSR related policy designs and policy implementations. Finally, we synthesized the extant literature on HSR, which further necessitated the need of examining the impact of HSR food label on 'consumer food choices'. Accordingly, future researchers could run a meta-analysis to proceed in this direction. Despite these limitations, this SLR pioneers a micro-level understanding of HSR with reference to consumer food healthy choices.

7. Authors' contributions

The first author undertook electronic literature searches. The first and second authors screened the articles for inclusion. The first and second authors collected and analyzed data from articles. All authors cross-checked the data and analysis. The first author wrote the first draft of the manuscript, and all authors contributed to and approved the final manuscript.

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CRediT authorship contribution statement

Muhammad Junaid Shahid Hasni: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Project administration, Methodology, Formal analysis, Conceptualization. **Mohsin Abdur Rehman:** Writing – review & editing, Visualization, Validation, Project administration, Methodology, Conceptualization. **Nicolas Pontes:** Writing – review & editing, Validation, Supervision, Conceptualization. **Muhammad Zafar Yaqub:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.foodqual.2024.105310.

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