KEMAS 20 (3) (2025) 480-494

Jurnal Kesehatan Masyarakat

http://journal.unnes.ac.id/nju/index.php/kemas

Regulation and Warning Determination with Food Labelling in Controlling Consumption Patterns

Nur Siyam[1], Miranda Gita Wahyuningtyas[1], Herlina Tri Damailia[1], Sri Achadi Nugraheni[1]✉
[1]Faculty of Public Health, Universitas Diponegoro, Semarang, Indonesia

Article Info

Article History:
Submitted January 2024
Accepted May 2024
Published January 2025

Keywords:
Traffic light Label; health literacy; policy; non-communicable disease

DOI
https://doi.org/10.15294/kemas.v20i3.21229

Abstract

An unhealthy lifestyle can increase people's risk of developing non-communicable diseases. Obesity, Hypertension, and Diabetes Mellitus are metabolic disorders suffered by people who at the end of this decade attack younger age groups. So, it is important to immediately get handling from the government. For this reason, the government needs to realize policies in the form of stipulating regulations in controlling the consumption of unhealthy products through effective methods. The purpose of the study is to review the effectiveness of regulations and warnings with food labeling in controlling consumption patterns. The systematic review approach of literature review with PRISMA searches for articles in three databases: PubMed, Scopus, and ScienceDirect. Ten articles were selected through several stages of screening and underwent quality assessment. According to the findings of the study, the establishment of government/stakeholder regulations in related sectors and warnings with food labeling with increased food literacy can increase the effectiveness of controlling the consumption of unhealthy products sustainably. Food labeling needs to emphasize information related to healthy or unhealthy products to consume.

Introduction

Based on the results of a survey by the Central Statistics Agency (BPS) related to the number of deaths based on the cause from January 1, 2017, to 2020/2022, the overall number of deaths reached 8.07 million cases, of which the most common causes came non-contagious disease, with 7.03 million cases. Non-communicable diseases are the world's largest cause of death according to the WHO. Non-communicable diseases, such as coronary heart disease, diabetes mellitus, cancer, and substance dependence, cause far greater mortality than infectious diseases and are one of the biggest problems in the field of public health and welfare in this day and age (WHO, 2018). The main risk factors that can cause non-communicable diseases are unhealthy lifestyles, Excessive tobacco consumption, unhealthy diet, drinking excess alcohol, lack of physical activity, as well as air pollution, and eating foods high in sugar, salt, and artificial preservatives. In addition, these risk factors can cause metabolic disorders such as hypertension, overweight and obesity, uncontrolled blood sugar levels, and Hyperlipidemia. Non-modifiable risk factors are genetics, age, gender, race, and ethnicity (Wahidin *et al.,* 2023).

The morbidity and mortality of non-communicable diseases in the community can be prevented. This is because the risk factors for non-communicable diseases are generally related to lifestyles or behaviors that can be controlled or intervened. Although there are indeed several risk factors that cannot be controlled, such as genetic factors which are risk factors type 1 diabetes mellitus and some types of cancer. The four types of non-communicable diseases that cause the most deaths are cardiovascular disease, cancer, diabetes mellitus, and chronic respiratory diseases. Non-communicable diseases cause 74% of deaths in the world, where each year it causes the deaths of about 41,000,000 people.

✉ Correspondence Address:
Faculty of Public Health, Universitas Diponegoro, Semarang, Indonesia
Email: s.a.nugraheni.undip@gmail.com

pISSN 1858-1196
eISSN 2355-3596

Every 2 seconds, 1 person aged <70 years dies from a non-communicable disease, and 86% are in low- and middle-income countries. According to WHO data, 73% of deaths in Indonesia are caused by non-communicable diseases, namely +1,400,000 deaths/year. Details of non-communicable diseases that cause death include cardiovascular disease 25.6%, cancer 8.8%, chronic respiratory disease 4.4%, diabetes mellitus 4.4%, and other non-communicable diseases 29.8% (Ministry of Health, 2019).

To overcome non-communicable diseases in Indonesia, the Ministry of Health carries out P2PTM activities (guidelines for the management of non-communicable disease prevention and control programs), which consist of: 1) Increasing policy advocacy in favor of health programs and socialization of P2PTM, 2) Carrying out promotive, preventive, curative, rehabilitative, and palliative efforts comprehensively, especially through PROLANIS (chronic disease management program), 3) as a service program non-communicable disease health which includes counseling, screening, consultation, and efforts to prevent further complications, 4) Increasing the capacity of human resources, 5) Developing and strengthening surveillance systems, 6) Strengthening networks and partnerships through community empowerment (Ministry of Health, 2019). Food choices are influenced by the increasing availability of processed and packaged foods, increased eating out compared to eating at home, low nutritional literacy, and an inability to evaluate calorie and nutrient information that causes health problems. There have been many efforts that have been made by the government to reduce the number of morbidities and mortality due to non-communicable diseases but they have not been optimal. For this reason, the government/ stakeholders at the central, regional, school/ agency, and government in the smallest units of villages/sub-districts need to increase leverage and optimize existing programs by establishing them into binding regulations or policies for those related to the production and circulation ecosystem of food and beverage products that are traded freely in the community.

Method

This research was conducted using a systematic review method. This review follows the item reporting guidelines for a systematic review from PRISMA 2020 (Haddaway *et al.*, 2022). The authors searched for articles published in various English-language databases (PMC, PubMed, Scopus, and ScienceDirect) and published between 2015-2023. The article search is carried out by the author using keywords that have been compiled and discussed before. The keywords used in all databases are: "food labeling", "food labeling and law", "food labeling and jurisprudence", "food labeling and literacy", and "food labeling and food purchasing". Inclusion criteria are population/community-based research; prospective, cross-sectional, cohort, and experimental studies; involving community participation. The exclusion criteria are research results from the systematic literature review; not reporting relevant findings or results; hospital-based research; and the data used in the same population as the included study. All articles are listed and classified by author, year of publication, research location, research design, sampling technique, sample size, and results.

Results and Discussion

The search strategy resulted in 4173 articles: 1218 from PMC (Pubmed Central), 2176 from Scopus, and 779 from ScienceDirect. After eliminating duplicates, 114 articles were obtained. In addition, 114 abstracts were filtered using the following criteria: type of variable, type of research, and completeness of the article (full text), and 24 articles were obtained in English. A total of 6 articles were issued because they were not articles related to food labeling and law/policy, 6 articles with unclear results, and 2 articles in the clinical field. There were 10 articles obtained from the screening results that could be analyzed according to the inclusion criteria. Figure 1 shows the PRISMA flowchart along with its exclusion criteria and details.

The results of a review of 4173 journal

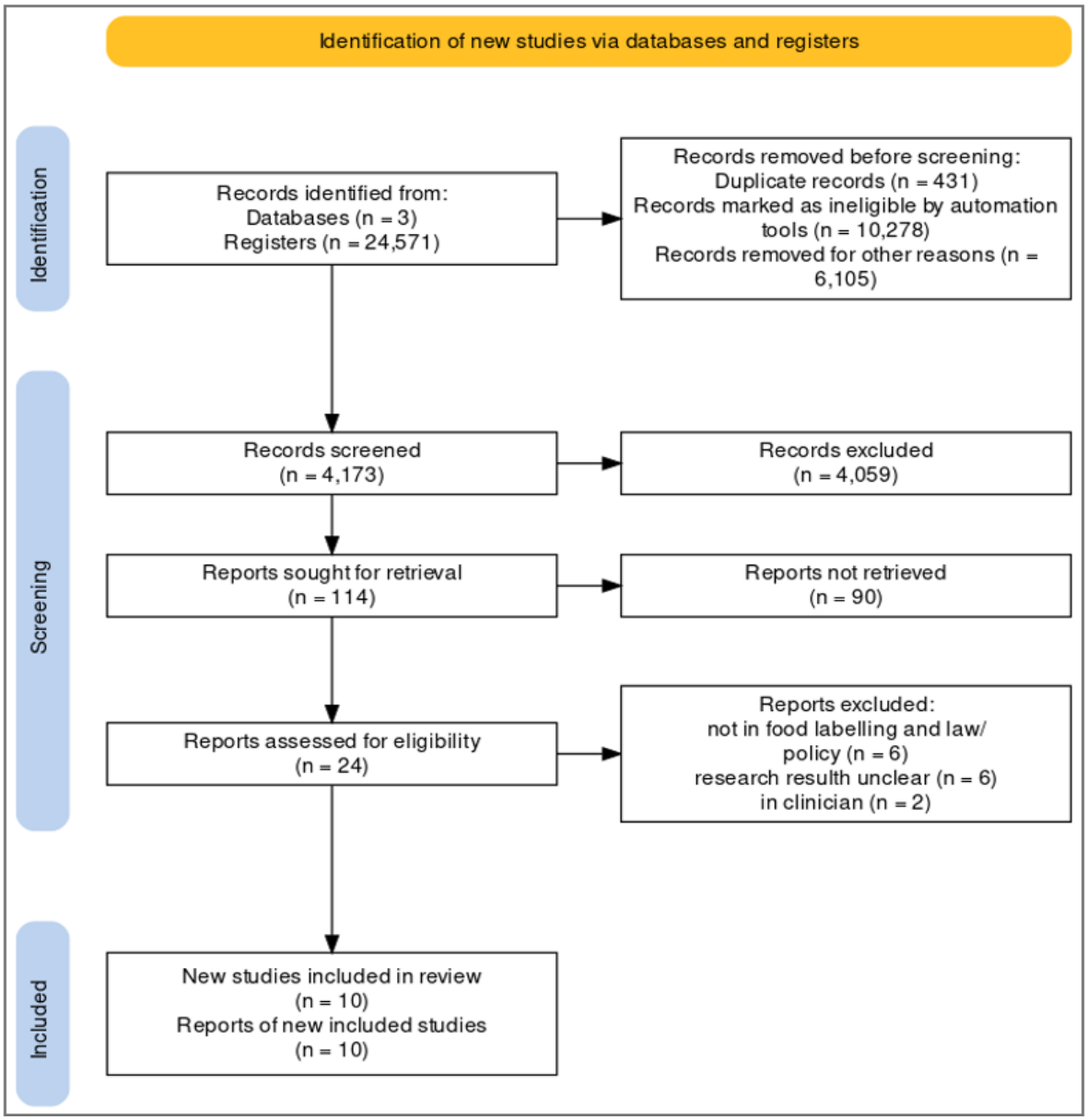

Figure 1. PRISMA Research Flowchart

Table 1. Characteristics of Eligible Articles

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
1	Taillie, *et al*., 2021 An Evaluation of Chile's Law of Food Labeling and Advertising on Sugar-sweetened Beverage purchases from 2015 to 2017: A before-and-after study (Taillie *et al.*, 2020)	Chile, Plos Medicine, Q1	Observational study, Monthly survey on households living in urban areas (n = 2,383) from January 1, 2015, to December 31, 2017.	37% of heads of households were poorly educated, 40% were secondary, and 23% were highly educated, and the sample became more educated during the study period. The volume of high-beverage purchases decreased by 22.8 mL/capita/day, post-regulation (95% [CI] -22.9 to -22.7; $p < 0.001$). High- and low-educated households showed a similar absolute decrease in high-alcohol purchases (about 27 mL/capita/day; $p < 0.001$). Calories from the purchase of high-end beverages decreased by 11.9 kcal/capita/day (95% CI -12.0 to -11.9; $p < 0.001$). Calories purchased from beverages classified as "not high" increased by 5.7 kcal/capita/day (95% CI 5.7-5.7; $p < 0.001$). Calories from total beverage purchases decreased by 7.4 kcal/capita/day (95% CI -7.4 to -7.3; $p < 0.001$).
2	Felipetto, *et al*., 2022 Brazilian Consumers' Perception Towards Food Labeling Models Accompanying Self-Service Foods (Felipetto *et al.*, 2022)	Brazil, Foods, Q1	This qualitative and quantitative assessment was performed with potential consumers at food services. Four food labeling formats, traditional, simplified, traffic-light, and warning, were proposed to evaluate three types of sandwiches: simple, chicken, and hamburger. Data were collected via an online survey from April to May 2020. The study included 413 subjects.	The respondents preferred the traffic light format, but there was a good understanding and acceptance of all four models. The nutrition labeling model of traffic lights and warnings, which indicate health warnings, led to a reduction in the choice of Simple Sandwich and Hamburger. Most respondents (96.1%, n = 397) agreed that it is necessary to supplement the information on food labels with the ingredients and the number of calories per serving. It is important to have laws that govern the nutritional content information of foods. Consumer choice increases with the increase in information placed on products.

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
3	Todd, *et al.*, 2022 Healthy or Not Healthy? A Mixed-Methods Approach to Evaluate Front-of-Pack Nutrition Labels as a Tool to Guide Consumers (Todd *et al.*, 2022)	South Africa, Nutrition, Q1	The sequential mix method design of the exploration uses qualitative interviews (n = 49) to gain insight into the labeling challenges and select FOP nutrition labels for consumer testing. Consumers (n = 1261) randomly rated two out of six possible FOP nutrition labels relative to 'labelless' controls in one of 12 online surveys, applied to fictitious cereal products. A mixed model variance analysis was used to compare differences in health ratings for different FOP nutrition labels.	The FOP that is easy for the public to understand is the one that helps consumers identify unhealthy products, the most prominent measure of effect for health warnings ($p < 0.01$), and low health star ratings ($p < 0.01$). The findings of this study not only clarify whether FOP nutrition labeling formats used in other regions such as Europe, South America, and Australia can be useful in the context of South Africa, but they can assist policymakers and decision-makers in selecting effective FOP labels.
4	Zhang, *et al.*, 2020 Red for "Stop": "Traffic-Light" Nutrition Labels Decrease Unhealthy Food Choices by Increasing Activity and Connectivity in the Frontal Lobe (Zhang *et al.*, 2020)	China, Nutrients, Q1	Using functional magnetic resonance imaging to assess the mechanisms by which traffic lights and daily count labels of guidelines influence food-related decision-making. Forty-four female dieters (age, mean = 20.0, standard deviation = 1.45 years) were recruited to participate in the food choice task; Healthy or unhealthy food options were presented with color-coded traffic light labels or pure numerical daily count-of-day guideline labels, and participants were asked to express their preferences.	Prominent red traffic light labels have the potential to reduce unhealthy food-related decision-making and activate superior medial frontal gyrus and additional motor areas, which are involved in the execution of motor response and inhibition, compared to daily number-of-day labels. Labels inspired by traffic lights may be a more effective means of public policy intervention than numerical labels that convey daily count guidelines

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
5	Seward, *et al.*, 2018 Student experiences with traffic-light labels at college cafeterias: a mixed methods study (Seward *et al.*, 2018)	USA, Obesity Science & Practice, Q2	Cross-sectional, mixed-methods study. Setting: One northeastern US college A total of 1,294 survey respondents; 57 focus group participants Interventions Seven-week traffic-light labeling (green = 'nutrient-rich', yellow = 'less nutrient-rich', red = 'more nutrient-rich choice in green or yellow') intervention at two college cafeterias.	60% found TLL useful, and 57% used it several times a week. When asked if TLL increased the risk of developing an eating disorder, 16% of participants said they did and 47% said TLL could worsen an existing eating disorder. In the focus group, some students thought 'the red color looks thunderous', but most agreed 'the more nutrition information available, the better'. Students generally support TLL.
6	Sato, *et al.*, 2021 Consumers' opinions on warning labels on food packages: A qualitative study in Brazil (de Morais Sato *et al.*, 2018)	Brazil, Plos One, Q1	The qualitative study, 12 focus groups among a diverse sample of adult consumers, to broadly assess: (1) the current use and perception of food labels, and (2) opinions on the application of pre-packaged warning labels to guide food purchases. The data were analyzed by triangulation. The code is divided into six main themes: (1) Reasons for using food labels; (2) Barriers to using food labels; (3) Requirements for new labels; (4) The perceived influence on consumption behavior; (5) The influence felt on children's behavior; and (6) Perception of food manufacturers who use warning labels.	Participants use food labels to check nutrition and ingredient information, but the format of these labels and the technical tents displayed often make the information inaccessible, especially for those with low socioeconomic status. Most of the participants supported the display of the warning label on the front of the packaging on the product and found it useful to inform the purchase. Women believe that they and their children will reduce food consumption with warning labels on the front of the packaging, while men report more polarity in their intentions. The potential of warning labels on the front of the packaging could support healthier behaviors in consumers and their children

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
7	Reyes, *et al.*, 2020 In June 2016, the first phase of the Chilean Food Labelling and Advertising Law that mandated front-of-package warning labels and marketing restrictions for unhealthy foods and beverages was implemented. We assess food and beverage reformulation after this initial implementation (Reyes *et al.*, 2020)	Chile, Plos Medicine, Q1	Cross Sectional Survey. The dataset with nutrition information from 2015 to 2017 was developed to collect information in 2 time periods: pre-implementation (T0: January-February 2015 or 2016; n = 4,055) and post-implementation (T1: January-February 2017; n = 3,025). The quartile of energy and nutrients of concern (total sugar, saturated fat, and sodium, per 100 g / 100 mL) and the proportion of products with energy and nutrients exceeding the legal limit (i.e., "high" products) compared to before and after the implementation of the law in cross-sectional samples of products with sales of >1% of their specific food or beverage group.	A significant decrease (T0 versus T1) in the proportion of products with "high" (from 51% [95% (CI) 49-52] to 44% [95% CI 42-45]), mostly in the food and beverage group where the regulatory limit is below the 75th percentile of nutrient or energy distribution. The most frequent reductions were in the proportion of "high" sugar products (in beverages, milk and milk-based beverages, breakfast cereals, sweet baked products, and sweet and savory spreads; from 80% [95% CI 73-86] to 60% [95% CI 51-69]) and in "high-sodium" products (in savory spreads, cheeses, ready-to-eat foods, soups, and sausages; from 74% [95% CI 69-78] to 27% [95% CI 20-35]). In contrast, the proportion of "high" products of saturated fat only decreased in savory spreads ($p < 0.01$), and the proportion of "high" energy products decreased significantly between breakfast cereals and savory spreads (both $p < 0.01$).

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
8	Doustmohammadian, et al., 2022 The association and mediation role of Food and Nutrition Literacy (FNLIT) with eating behaviors, academic achievement and overweight in 10–12 years old students: a structural equation modeling (Doust mohammadian et al., 2022b)	Tehran, Iran, Nutrition Journal, Q1	This study was conducted through two stages: 1) To propose a conceptual model of the relationship between FNLIT and determinants and its results, based on existing evidence and previous models, and 2) To test the proposed FNLIT model through a cross-sectional study on 803 elementary school students (419 males and 384 females, from 34 public elementary schools and 10 private elementary schools), aged 10–12 years using structural equation modeling. Demographic, socioeconomic, and household food security characteristics were collected by interviewing students and their mothers/caregivers using questionnaires. FNLIT is measured by self-managed, locally designed, and validated questionnaires.	The fit index showed sufficient data agreement with the hypothesis model ($\chi 2/df = 2.03$, $p < 0.001$, goodness of fit index (GFI) = 0.90, adjusted goodness of fit index (AGFI) = 0.88, comparative fit index (CFI) = 0.91, incremental fit index (IFI) = 0.91, root mean square error of approximation (RMSEA) = 0.04, standard root mean residual (SRMR) = 0.06). SES is directly and positively related to FNLIT and its subscale in students. FNLIT scores have a direct positive (non-mediating) relationship with healthy eating behavior and academic achievement. This pattern is very inverted in unhealthy eating behavior. There is a full mediating relationship between FNLIT and overweight/obesity through healthy eating behaviors. SES predicts academic performance in part through the mediating effect of Food Label Literacy (FLL). The findings also reveal the full mediating role of Food Choice Literacy (FCL) in the relationship between demographic factors and healthy eating behaviors.

It	Author, Year, and Title	Country, Journal, Quartile	Sample method and criteria	Result
9	Scarpelli, *et al*., 2020 Labeling and Advertising Law in Chile (Scarpelli *et al.*, 2020)	Chile, Nutrients, Q1	We analyzed the food nutrition labeling declarations of 70% of the most consumed packaged foods in Chile. Data collection was carried out in 2013 and 2019 in Santiago. Images of all sides of the package were taken from 476 products, classified into 16 food groups.	All food groups experienced changes in the ENC declaration during the study period. Total sugar content showed the highest decrease (-15.0%; $p = 0.001$). Milk, confitures, and similar sugary drinks had the greatest reduction in energy and total sugar levels ($p < 0.01$). Energy, total sugar, and sodium in the "high in" packaging of the simulation were significantly reduced in milk, sugary drinks, flour-based foods, confitures and the like, fish and seafood, fats and oils, spices, spices and sauces and sugars ($p < 0.05$). The company reformulated the product to adapt to the new regulations.
10	Mediano, *et al*., 2023 Framing a New Nutrition Policy: Changes on Key Stakeholder's Discourses Throughout the Implementation of the Chilean Food Labelling Law (Mediano *et al.*, 2023)	Latin America, International Journal of Environmental Research and Public Health, Q2	analysis of the content of media coverage of food regulations in five major periods from 2007, when the food bill was first introduced in Congress, to 2018, when the second phase of the law was implemented (N = 1295)	Most of the legal coverage is through the elite press. Half of the sources come from the food industry (26.7%) and the government (26.2%), while other stakeholders are less prevalent. The main food industry framework used during the discussion of the legislation was "economic threats" (41.9%), the prevalence of which decreased in the post-implementation period (13%, $p < 0.01$). No other relevant stakeholders changed their framing. Public health communication aspects can be improved to advance food environment policies.

articles showed that in 10 articles from 7 countries, the results identified that warnings with food labeling decreased consumers' energy intake, total fat, reduced sugar and salt consumption, and other unhealthy dietary choices, and increased consumption of foods with good nutrition. Evaluate the response of the industry in labeling the reduced content of packaged food produced. Significant increase in results in the use of Traffic Light Labels and accompanied by the Establishment of Laws and Regulations that govern them (Seward *et al.,* 2018; Kanter *et al.*, 2019; Scarpelli *et al.*, 2020; Taillie *et al.*, 2021; Mediano *et al.*, 2023). These results are also in line with a review of 60 intervention studies, food labeling reduces consumers' dietary intake of selected nutrients and influences industry practices to reduce the content of sodium products and artificial trans fats (Shangguan *et al.*, 2020).

The purchase of high-end beverages decreased significantly after the implementation of Chile's Food Labeling and Advertising Law; These reductions are greater than those observed from stand-alone policies, including the sugary drinks tax previously implemented in Latin America. Future research should evaluate the impact of Chilean policies on high food purchases, food intake, and long-term purchasing changes (Taillie *et al.*, 2021). Our results show that, after the initial implementation of the Chilean Law on Food Labeling and Advertising, there was a significant decrease in the amount of sugar and sodium in some groups of packaged foods and beverages. Further studies should clarify how food reformulation will impact the food quality of the population (Taillie *et al.*, 2020).

The increase in obesity over the decades in a country has led to the establishment of several policies aimed at improving diets, which are thought to play an important role in obesity (Gustafson & Prate, 2019). Many of these policies seek to influence individual behavior. Packaging front labels that provide consumers with important and easy-to-interpret information have shown promise in helping people identify and choose healthier foods. However, economic behavior can offer an opportunity to increase the effectiveness of labels. Label adjustments can be aimed at high-risk communities, including minority and rural populations, which have higher rates of diet-related illnesses than the overall population. Common labels are quite effective in encouraging healthier choices, but the level of understanding depends on the level of knowledge of the meaning of the label (Jo & Jung, 2019). Labels tailored to local communities will be more effective, resulting in a noticeable increase in healthy product purchases, but the implementation is more complex and requires a commitment to stakeholders such as the industry and its ecosystem (Mediano *et al.*, 2023). Adapting healthy food labeling systems using insights from economic behavior can improve program effectiveness (Gustafson & Prate, 2019).

Chile has implemented several strategies to reduce the burden of obesity and chronic diseases with the establishment of the Food Labeling and Advertising Law. The Food Labeling and Advertising Act (Law 20.606) requires a "high" warning label on the front of the package when energy and nutrients of concern (ENC) such as total sugar, saturated fat, and sodium exceed the set limit. The impact of the law is that the total sugar content shows the highest decrease (-15.0%; $p = 0.001$). Milk, confitures, and similar sugary drinks had the greatest reduction in energy and total sugar levels ($p < 0.01$). Energy, total sugar, and sodium of the simulated "high" packaging were significantly reduced in milk, sugary drinks, flour-based foods, confitures and the like, fish and seafood, fats and oils, spices, spices and sauces, and sugars ($p < 0.05$). The company reformulated the product to adapt to the new regulations (Scarpelli *et al.*, 2020). Nutrition labels *Front-of-pack* (FOP) as a rapid assessment tool is being improved to help consumers identify unhealthy products, add the most prominent effect measures for health alerts, and low health star ratings for unhealthy foods. The findings of this study not only clarify whether the FOP nutrition labeling format used is effective but can also assist policymakers and decision-makers in selecting effective FOP labels (Todd *et al.*, 2022; Pérez-Escamilla *et al.*, 2021).

Front-packed food labeling (FoPFL) is increasingly being advocated as an

effective intervention to facilitate behavioral change toward healthier food purchases and consumption, especially concerning products with added sugars. This study assesses the potential caries-related impacts of FoPFL. Interesting results are lesions can be caries prevented, dental care costs avoided, reduced productivity loss, and disability-adjusted life years (DALYs) avoided. Maintenance cost savings of €175.67 million, and productivity losses reduced considerably. Sensitivity analysis showed that the magnitude of the effect was highly dependent on the consumer response to FoPFL. Our findings suggest that FoPFL has the potential to substantially reduce caries, caries-related morbidity, and economic burden. In addition, our research allows for the inclusion of oral health estimates in overall health estimates for sugar-related food labeling. Before prioritizing strategies to address sugar consumption, decision-makers should carefully consider all relevant context-specific factors and implementation costs (Jevdjevic *et al.*, 2021). The usefulness of food labels should be used to check the nutritional content and ingredient information, but the format of these labels and the technicalities of the content displayed often make the information inaccessible (the text is small, the information is not specific, not easy to understand, and placed in less visible parts), especially for those with low socioeconomic status. Women believe that they and their children will reduce food consumption with warning labels on the front of the packaging. For men and their children, a warning label on the front of the package will result in a complete cessation of food intake or continued consumption without any change in quantity. The results highlight the potential of warning labels on the front of the package to support healthier behaviors in consumers and their children (De Morais Sato *et al.*, 2018).

Food labels can be used as a source of information that adds knowledge or literacy for all groups of people. Food and nutrition literacy and its dimensions and components among children consist of two main domains, including cognitive domains and skills. The cognitive domain consists of food and nutrition-related knowledge including four subcategories of "nutrition knowledge", "lifestyle knowledge", "food safety knowledge", and "knowledge about food and its preparation") as well as "food and nutrition understanding". The skill domain consists of three dimensions: "functional", "interactive", and "critical" food and nutrition literacy. The framework developed highlights the importance of the integrated implementation of all dimensions of food and nutrition literacy among these population groups. It can assist policymakers and curriculum developers in assessing educational curricula and developing effective strategies for teaching and learning to improve students' food and nutrition literacy (Doustmohammadian *et al.*, 2022a, 2022b).

Nutrition labels are an important tool to guide consumers about the quality and quantity of food nutrient constituents. Nutrition labels allow consumers to make purchasing decisions based on the information provided (Zafar *et al.*, 2022). Among the food label formats explored, Traffic Light is the most accepted and understood by the public. With Traffic Light Labels, Consumers are engaged in managing their health and seeking healthier food choices. The findings of this study are that the existence of food labels in food services is a consumer demand. The use of these traffic lights for food/industrial service owners and managers can be a great competitive opportunity. Standardization of food labeling requires greater formalization and control of the process so that the application of food labels can be a boon for both producers and consumers. On the other hand, efforts are needed to make consumers aware of the importance of reading labels which are greatly influenced by individual factors (Shahrabani, 2021; Singh *et al.*, 2021; Silva *et al.*, 2022). Educational actions can help make better choices based on an adequate understanding of the information attached to the product (Amuta-Jimenez *et al.*, 2019). If we add up all the aspects mentioned, the positive social and economic impact may be greater than the initial investment. The health of the population is improved by better food choices and the resulting health benefits. The government can reduce investment in hospitalization and other relief measures.

Based on the review of scientific articles, several alternative policies that can be applied

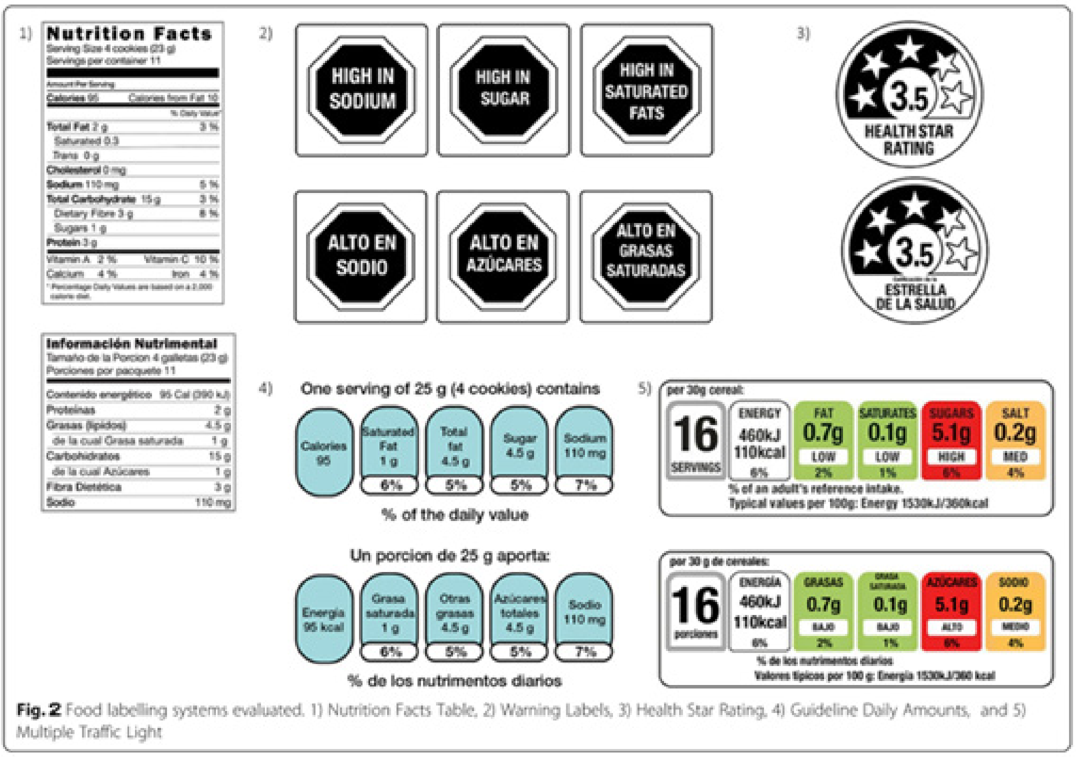

Figure 2. Food Label Nutrition for Literacy Nutrition (Nieto *et al.*, 2019)the most obese countries in the world. Methods: Adults from online consumer panels in the US (Whites n = 2959; Latinos n = 667

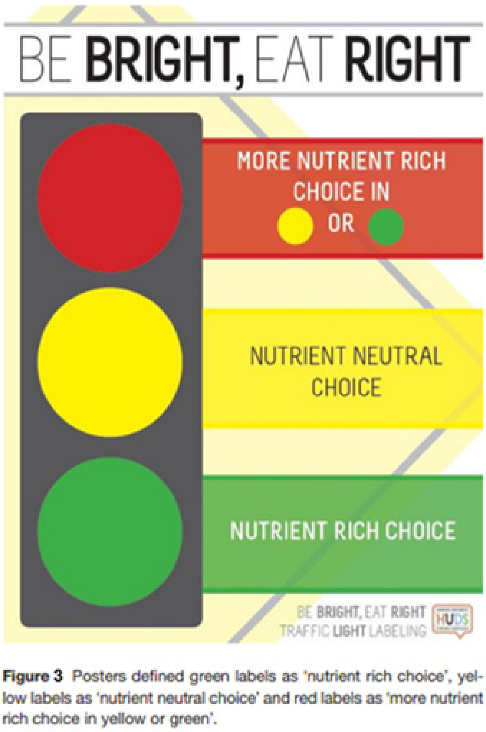

Figure 3. Example of Traffic Light Label (Seward *et al.,* 2018)

by the government or stakeholders in the Control of Unhealthy Consumption Patterns are formulated: 1) improving healthy living behaviors as the basis for comprehensive and integrated disease control, 2) improving public health protection against the circulation of substances harmful to public health; which can be done by monitoring businesses and industries of food/food and related substances, 3) Increasing literacy and information technology as an educational effort to the community; Holding regular and sustainable training both in cadres, communities, stakeholders, cross-sectors and health workers in-depth and comprehensively. Developing the right technology to monitor health, control lifestyle, and increase physical activity. Incorporating the Health curriculum into the world of Education/schools or integrating it with the school/UKS health business program, 4) strengthening cross-sector/cross-program cooperation; building partnerships with the non-health sector for the prevention and control of non-communicable diseases, such as involving food and beverage manufacturing companies, religious sectors, social sectors, women's empowerment and child protection, the education sector, and technology and information development sections to strengthen innovations and findings in reducing cases of non-communicable diseases, 5) Establishing policies related to threshold values for ingredients contained in food and Provide a warning label as a marker whether the food is good, healthy or unhealthy if consumed. Providing the best and clear information so that the food and beverage products traded are not harmful to consumers or the public and so that the public gets the optimal benefits from the products purchased (Nieto *et al.*, 2019). 6) Improve school programs by providing food label information to make healthier food choices, to improve students' knowledge, attitudes, and practices in healthy eating patterns for healthy living, healthy canteen programs, and the implementation of the Nutrition Health Education curriculum in schools (Hoteit *et al.*, 2022).

Conclusion

Prevention and control of non-communicable diseases must be carried out by implementing a healthy lifestyle from an early age, it needs to be carried out by all parties, both the central government to the smallest unit at the village or sub-district level and starting from habits in the family. To improve the implementation of non-communicable disease prevention and control activities related to nutrition and maintenance so that activities can be sustainable, the government needs to establish regulations or policies related to the restriction of substances that can be produced in food and beverage products traded on the market and provide the clearest warning labels so that the public can consider whether the product is healthy or unhealthy for consumed related to calorie, fat, sugar, and fiber labels. Within the scope of schools, it is necessary to implement the Nutrition Health Education curriculum in schools as a health investment for the nation's generation.

Acknowledgments

Thank you to BPPT and LPDP as education funders.

Reference

Amuta-Jimenez, A.O., Lo, C., Talwar, D., Khan, N., & Barry, A.E., 2019. Food Label Literacy and Use among US Adults Diagnosed with Cancer: Results from a National Representative Study. *Journal of Cancer Education*, 34(5), pp.1000–1009.

Doustmohammadian, A., Omidvar, N., Keshavarz-Mohammadi, N., Eini-Zinab, H., Amini, M., & Abdollahi, M., 2022a. Development of a Conceptual Framework of Food and Nutrition Literacy in Children. *BMC Nutrition*, 8(1), pp.1–11.

Doustmohammadian, A., Omidvar, N., Keshavarz-Mohammadi, N., Eini-Zinab, H., Amini, M., & Abdollahi, M., 2022b. The Association and Mediation Role of Food and Nutrition Literacy (FNLIT) with Eating Behaviors, Academic Achievement and Overweight in 10–12 Years Old Students: A Structural Equation Modeling. *Nutrition Journal*, 21(1), pp. 1–16.

Felipetto, N., Scheffer, P.A., Margutti, K.M.D.M., Silveira, J.T., Marques, C.T., Storck, C.R., Oliveira, V.R.D., Helbig, E., Ginani, V.C., & Saccol, A.L.D.F., 2022. Brazilian Consumers' Perception towards Food Labeling Models Accompanying Self-Service Foods. *Foods*,

11(6).

Gustafson, C.R. and Prate, M.R., 2019. Healthy Food Labels Tailored to A High-Risk, Minority Population More Effectively Promote Healthy Choices Than Generic Labels. *Nutrients*, 11(10).

Haddaway, N.R., Page, M.J., Pritchard, C.C., & McGuinness, L.A., 2022. PRISMA2020: An R Package and Shiny App for Producing PRISMA 2020-Compliant Flow Diagrams, with Interactivity for Optimised Digital Transparency and Open Synthesis. *Campbell Systematic Reviews*, 18(2), p. e1230.

Hoteit, M., Yazbeck, n., Ghader, M., & Mohsen, H., 2022. Assessment of the Knowledge, Attitudes and Practices of Lebanese Shoppers Towards Food Labeling: The First Steps in The Nutri-Score Roadmap. *F1000Research*, 11, pp.84.

Jevdjevic, M., Wijn, S.R.W., Trescher, A.L., Nair, R., Rovers, M., & Listl, S., 2021. Front-of-Package Food Labeling to Reduce Caries: Economic Evaluation. *Journal of Dental Research*, 100(5), pp. 472–478.

Jo, H.S., & Jung, S.M., 2019. Evaluation of Food Labeling Policy in Korea: Analyzing the Community Health Survey 2014-2017. *Journal of Korean Medical Science*, 34(32), pp. 1–14.

Kanter, R., Reyes, M., Swinburn, B., Vandevijvere, S., & Corvalan, C., 2019. The Food Supply Prior to The Implementation of The Chilean Law of Food Labeling And Advertising. *Nutrients*, 11(1), pp.1–10.

Kemenkes., 2019. *Buku Pedoman Manajemen Penyakit Tidak Menular*. Jakarta: Kemenkes RI.

Mediano, F., Fierro, C.,Corvalan, C., Reyes, M., & Correa, T., 2023. Framing a New Nutrition Policy: Changes on Key Stakeholder's Discourses throughout the Implementation of the Chilean Food Labelling Law. *International Journal of Environmental Research and Public Health*, 20(9).

De Morais Sato, P., Mais, L.A., Khandpur, N., Ulian, M.D., Martins, A.P.B., Garcia, M.T., Spinillo, C.G., Rojas, C.F.U., Jaime, P.C., & Scagliusi, F.B., 2018. Consumers' Opinions on Warning Labels on Food Packages: A Qualitative Study in Brazil. *PLoS ONE*, 14(6), pp.1–17.

Nieto, C., Jáuregui, A., Contreras-Manzano, A., Arillo-Santillan, E., Barquera, S., White, C.M., Hammond, D., & Thrasher, J.F., 2019. Understanding and Use of Food Labeling Systems Among Whites and Latinos in the United States and Among Mexicans: Results from the International Food Policy Study, 2017. *International Journal of Behavioral Nutrition and Physical Activity*, 16(1), pp.1–12.

Pérez-Escamilla, R., Vilar-Compte, M., Rhodes, E., Sarmiento, O.L., Corvalan, C., Sturke, R., & Vorkoper, S., 2021. Implementation of Childhood Obesity Prevention and Control Policies in the United States and Latin America: Lessons for Cross-Border Research and Practice. *Obesity Reviews*, 22(S3), pp.1–14.

Reyes, M., Taillie, L.S., Popkin, B., Kanter, R., Vandevijvere, S., & Corvalán, C., 2020. Changes in The Amount of Nutrient of Packaged Foods and Beverages After The Initial Implementation of The Chilean Law of Food Labelling and Advertising: A Nonexperimental Prospective Study, *PLoS Medicine*, 2020.

Scarpelli, D.Q., Fernandes, A.C.P., Osiac, L.R., & Quevedo, T.P., 2020. Labeling and Advertising Law in Chile. *Nutrients*, 12, pp.1–13.

Seward, M.W., Block, J.P., & Chatterjee, A., 2018. Student Experiences with Traffic-Light Labels at College Cafeterias: A Mixed Methods Study. *Obesity Science and Practice*, 4(2), pp.159–177.

Shahrabani, S., 2021. Determinants of Israeli Consumers' Decision to Use Food Label Information More Frequently: A National Survey Study. *Israel Journal of Health Policy Research*, 10(1), pp.1–10.

Shangguan, S., Afshin, A., Shulkin, M., Ma, W., Marsden, D., Smith, J., Saheb-Kashaf, M., Shi, P., Micha, R., Imamura, F., & Mozaffarian, D., 2020. A Meta-analysis of Food Labeling Effects on Consumer Diet Behaviors and Industry Practices. *Am J Prev Med.*, 56(2), pp.300–314.

Silva, B., Lima, J.P.M., Baltazar, A.L., Pinto, E., & Fialho, S., 2022. Perception of Portuguese Consumers Regarding Food Labeling. *Nutrients*, 14(14).

Singh, S., Naicker, A., & Memela, S.N., 2021. Categorizing Foods by Relative Healthfulness: A Scoping Review of Front of Pack Labelling. *International Journal of Environmental Research and Public Health*, 18(22).

Taillie, L.S., Reyes, M., Colchero, M.A., Popkin, B., & Corvalán, C., 2020. An Evaluation of Chile's Law of Food Labeling and Advertising on Sugar-Sweetened Beverage Purchases from 2015 to 2017: A Before-and-After Study. *PLoS Medicine*, 17(2), pp.1–22.

Taillie, L.S., Bercholz, M., Popkin, B., Reyes, M., Colchero, M.A., & Corvalán, C., 2021. Changes in Food Purchases After The Chilean Policies on Food Labelling, Marketing, and Sales in Schools: A Before and After Study. *The Lancet Planetary Health*, 5(8), pp.e526–e533.

Todd, M., Guetterman, T., Volschenk, J., Kidd, M., & Joubert, E., 2022. Healthy or Not Healthy? A Mixed-Methods Approach to Evaluate Front-of-Pack Nutrition Labels as a Tool to Guide Consumers. *Nutrients*, 14(14).

Wahidin, M., Agustiya, R.I., & Putro, G., 2023. Beban Penyakit dan Program Pencegahan dan Pengendalian Penyakit Tidak Menular di Indonesia. *Jurnal Epidemiologi Kesehatan Indonesia*, 6(2), pp.105–112.

WHO., 2018. *Noncommunicable diseases country profiles 2018*. Geneva.

Zafar, M.Z., Shi, X., Yang, H., Abbas, J., & Chen, J., 2022. The Impact of Interpretive Packaged Food Labels on Consumer Purchase Intention: The Comparative Analysis of Efficacy and Inefficiency of Food Labels. *International Journal of Environmental Research and Public Health*, 19(22).

Zhang, X., Liu, Y., Gu, Y., Wang, S., & Chen, H., 2020. Red for "Stop": "Traffic-Light" Nutrition Labels Decrease Unhealthy Food Choices by Increasing Activity and Connectivity in the Frontal Lobe. *Nutrients*, 12.