

Mapping Global Research on Packaged Food Labeling Policy: A Bibliometric Study

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Abstract. Food labeling policies are an important strategy in combating non-communicable diseases. Front-of-pack labeling (FOPL) policies have been adopted by various countries with different approaches, both mandatory and voluntary, which aim to effectively convey the health risks associated with excessive consumption of sugar, salt, and fat. However, the effectiveness of these policies is highly dependent on the social and cultural context, nutrition literacy levels, and regulatory capacity in each country. This study aims to map and analyze global trends in scientific literature on packaged food labeling policies over the past decade (2015–2024). Bibliometric methods were applied to 1,843 documents from Scopus, analyzed using VOSviewer. The results show a significant increase in publication volume, with the United States, Australia, and the United Kingdom dominating. Thematic analysis revealed five main clusters: consumer behavior, health policy, sustainability, research methodology, and global health. This research is multidisciplinary but still concentrated in developed countries. Inclusive global collaboration and a contextual approach are needed to improve the implementation of labeling policies in low and middle income countries.

Keywords: food labeling, FOPL, nutrition policy, bibliometric.

1 Introduction

Food labeling policies have become one of the most widely adopted public health policy instruments globally to address the burden of non-communicable diseases (NCDs) associated with unhealthy dietary patterns, such as obesity, type 2 diabetes, and cardiovascular disease [1]. Non-communicable diseases account for more than 70% of deaths worldwide [2]. The WHO recommends that governments implement nutrition labeling on packaging as the best approach to prevent NCDs [3]. Food labeling has become an important concern in global efforts to improve public health by providing consumers with clear, easy-to-understand nutritional information [4,5]. As the prevalence of diet-related non-communicable diseases increases, labeling policies play a key role in influencing consumer choices and encouraging product reformulation by the food industry. Front-of-pack labeling (FOPL) policies have been adopted by various countries with different approaches, both mandatory and voluntary, which aim to effectively convey the health risks associated with excessive consumption of sugar, salt, and fat and influence purchasing decisions [6]. Studies show mandatory FOPL has a more significant impact than voluntary systems in improving public health [7]. FOPL aims to ensure that consumers have access to accurate, clear, and useful information about the food they buy, thereby helping them make healthier and more informed consumption choices [8].

Over the past decade, the implementation of front-of-pack labeling (FOPL) such as Nutri-Score, Health Star Rating, and warning labels has grown rapidly in various developed and developing countries. Empirical evidence shows that easy-to-understand nutrition labels can reduce sugar, salt, and fat intake and increase public nutrition awareness [9,10]. Labeling not only aims to provide information but also influences risk perception, facilitates healthy choices, and encourages product reformulation by the food industry. However, the effectiveness of this policy is highly dependent on the social and cultural context, level of nutrition literacy, and regulatory capacity in each country. Although the number of studies on packaged food labeling policies continues to increase, a comprehensive understanding of the following three aspects remains limited: (1) the intellectual evolution of this field over time, (2) the network of collaboration between researchers and institutions globally, and (3) the development and thematic direction of research. These limitations

leave gaps, particularly in understanding the representation and contribution of developing countries in global knowledge production in this field. Therefore, this study was designed to fill these gaps through a bibliometric approach. This study aims to map and analyze global trends in scientific literature on packaged food labeling policies over the last decade (2015–2024). Using comprehensive data from the Scopus database, this study seeks to provide an objective mapping of the knowledge landscape, identify key actors (such as the most influential authors, institutions, and countries), and reveal the thematic focus and gaps in this research, with a particular focus on the dynamics between developed and developing countries.

2 Methods

2.1 Study design and search strategy

This study uses a quantitative bibliometric approach with data from the Scopus database. The search strategy included a combination of keywords: "food labeling" OR "food packaging" OR "product labeling" OR "labeling, nutrition" OR "nutrition labeling" AND "policy." Inclusion criteria included English-language articles and reviews published between 2015 and 2024. All key information from each publication was identified and collected, including the title, author, year of publication, source, keywords, abstract, and citations. From 2,168 initial results, the screening process produced 1,843 final documents that met the criteria.

2.2 Data analysis and visualization

Keyword network visualization analysis was performed using VOSviewer software developed by the Center for Science and Technology Studies at Leiden University, Netherlands. This technique allows researchers to map conceptual relationships in a field of research through keyword co-occurrence analysis. The resulting visualization represents each keyword as a node (point). In contrast, the relationships between keywords are indicated by edges (connecting lines) that indicate the strength of association between these concepts. Through this analysis, three important aspects of the research structure can be identified. First, the formation of thematic clusters that represent interrelated research focus areas. Second, the density of keywords in each cluster shows the concentration and intensity of discussion on a particular topic. Third, the network of relationships between keywords reveals how various concepts are interconnected in academic discourse, where the proximity between nodes reflects the strength of the semantic relationship between these concepts. This approach allows for tracing the evolution of research themes and identifying areas that require further development.

3 Results And Discussion

The initial search yielded 2,168 documents, which underwent a gradual screening process. First, documents were selected based on type, leaving 1,893 original articles and reviews. Next, non-English documents were excluded, leaving 1,851 documents. The final stage was to select based on source, where only documents from journals were retained, resulting in 1,843 documents that were eligible for analysis.

3.1 Publication Output

The development of publication trends related to packaged food labeling policies shows a significant increase from 148 documents in 2015 to more than 200 documents per year starting in 2021, with the largest surge occurring between 2017 and 2018. This trend reflects the increasing academic and policy attention to this issue, as shown in **Figure 1**.

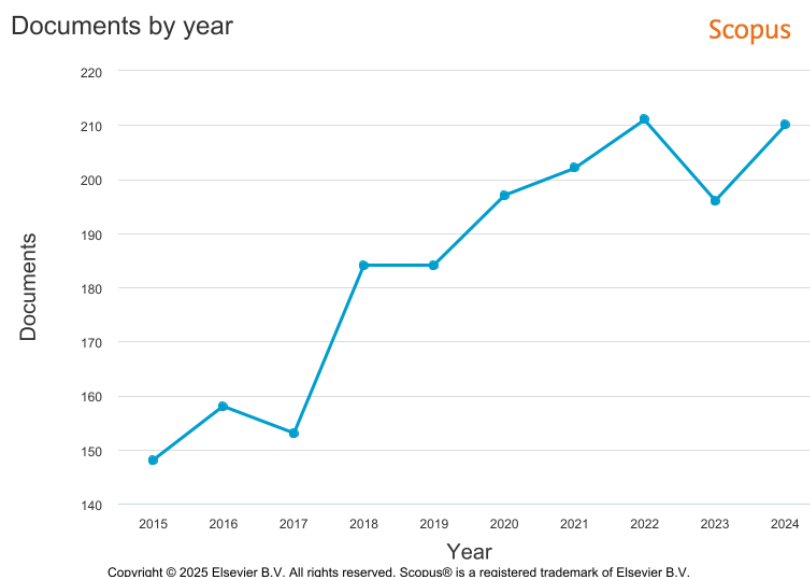


Fig. 1. Growth in the Number of Documents on Packaged Food Labeling Policy.

3.2 Contributions by authors, institutions, and countries

Several leading authors Hammond, dominate research on packaged food labeling policies. O is the most prolific author with 61 documents, demonstrating a dominant role in scientific contributions in this field. Other authors who are also quite active are Taillie, L.S. (42 documents), Thrasher, J.F. (34 documents), and Vanderlee, L. (34 documents) (**Table 1**). The institutions that dominate this research are major universities in North America and Australia, with the University of North Carolina at Chapel Hill ranking first with 109 documents, followed by the George Institute for Global Health (90 documents) and the UNC Gillitn gs School of Global Public Health (85 documents) (**Table 2**). When viewed from the perspective of the country of research, developed countries dominated, with the United States ranking highest with 628 documents, followed by Australia (297 documents) and the United Kingdom (274 documents) (**Table 3**).

Table1. Top 10 Authors Publishing Articles on Packaged Food Labeling Policy Throughout 2015-2024

Rank	Authors	Articles, n
1	Hammond, D.,	61
2	Taillie, L.S.,	42
3	Thrasher, J.F.,	34
4	Vanderlee, L.,	34
5	Pettigrew, S.,	31
6	Ares, G.,	30
7	Vandevijvere, S.,	29
8	Hall, M.G.,	26
9	Neal, B.,	26
10	Julia, C.,	24

Table 2. Top 10 Institutions Publishing Articles on Packaged Food Labeling Policy Throughout 2015-2024

Rank	Affiliations	Country	Articles, n
1	The University of North Carolina at Chapel Hill	USA	109
2	George Institute for Global Health	Australia	90
3	UNC Gillings School of Global Public Health	USA	85
4	University of Waterloo	Canada	84
5	University of Toronto	Canada	68
6	The University of Sydney	Sydney	66
7	UNSW Sydney	Sydney	63
8	Department of Nutrition	USA	63
9	Carolina Population Center	USA	61
10	Deakin University	Australia	60

Table 3. Top 10 Countries Publishing Articles on Packaged Food Labeling Policy Throughout 2015-2024

Rank	Country	Articles, n
1	United States	628
2	Australia	297
3	United Kingdom	274
4	Canada	224
5	Italy	89
6	France	85
7	Brazil	77
8	Germany	76
9	New Zealand	72
10	China	67

3.3 Research Topic Structure and Network Based on Keyword Mapping and Country Analysis

Based on keyword mapping analysis using VOSviewer, research on packaged food labeling policies strongly focuses on consumer behavior and contextual aspects. Keyword groups such as menu labeling, restaurants, fast food, and serving size indicate a concentration of research on the food service environment and fast food consumption patterns. Meanwhile, keywords such as adolescent, female, and food preference confirm a special focus on consumer segmentation based on demographics and psychographic characteristics. Interestingly, the emergence of keywords such as eye tracking behavior and product labeling indicates an increasingly sophisticated methodological approach to researching the effectiveness of label design, in which consumers' visual and cognitive responses are measured objectively. On the other hand, the analysis also reveals an expansion of the research discourse to comparative health issues and policy interventions. The presence of keywords such as water pipe smoking, smoking cessation, and comparative effectiveness reflects an analogy with other health policies, particularly tobacco, in evaluating the effectiveness of labeling interventions. The keyword groups health policy, universities, and risk indicate diverse policy

[illegible]

Based on the analysis of research collaboration mapping using VOSviewer (shown in **Figure 3**), a geographical distribution was identified that reflects the involvement of various countries in studies on packaged food labeling policies. The dominance of research clearly comes from high-income countries, with the United States occupying a central position in the global collaboration network, followed by European countries such as the United Kingdom, Italy, the Netherlands, Germany, and France. Australia and Canada also contribute significantly, forming solid research clusters in their regions. Meanwhile, several Latin American countries, such as Brazil, Argentina, and Uruguay, are emerging as active contributors, indicating growing research interest in the Global South. Furthermore, this collaboration map reveals interesting patterns of relationships between developed and developing countries. There is a strong collaboration network between European countries and several countries in the Middle East, such as Saudi Arabia, the United Arab Emirates, and Lebanon, as well as research relationships between North America and Asian countries such as Japan, South Korea, and Singapore. However, the participation of African countries (except Egypt, Ghana, and Nigeria) and Southeast Asian countries (such as Indonesia, Vietnam, and the Philippines) is still relatively limited in terms of publication volume and integration into global collaboration networks. These findings indicate that although the issue of food labeling policy has become a global concern, research capacity and international collaboration are still highly concentrated in countries with adequate research resources. In contrast, the participation of developing countries tends to be segmented and not yet evenly integrated into the global academic discourse.

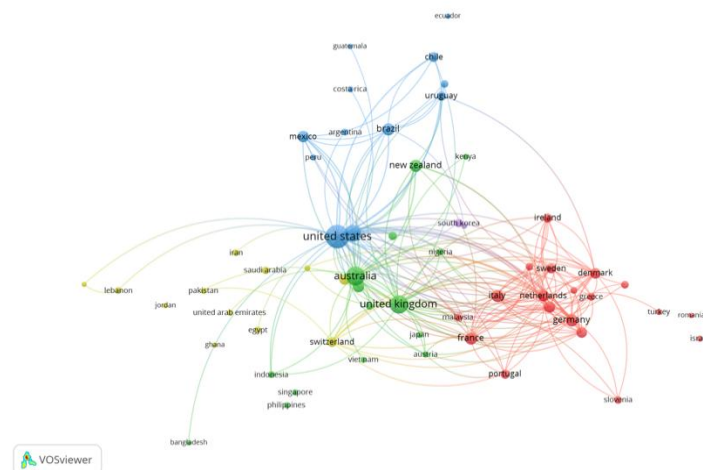


Fig. 3. Network Visualization Based on Country.

3.4 Discussion

The results of this bibliometric study reveal the dynamics of research development on packaged food labeling policies from 2015 to 2024. Research on packaged food labeling policies has shown significant growth in the last decade, indicating increasing global attention to the role of labeling in reducing the burden of non-communicable diseases (NCDs) associated with unhealthy food consumption. The consistent increase in publications since 2015 shows that this issue has become a priority agenda in global health policy, as Roberto et al. (2015) observed in their analysis of food policy developments worldwide [10]. This trend is in line with the global urgency to address the increase in non-communicable diseases (NCDs) through evidence-based interventions, including front-of-pack labeling (FOPL) [1]. The dominance of developed countries such as the United States, Australia, and the United Kingdom in the production of this literature reflects the research capacity that is still centered on countries with strong research resources. In contrast, the involvement of developing countries is still relatively limited despite showing signs of improvement, especially in Latin America and several Asian countries. Adopting FOPL policies in developing countries often faces unique challenges, such as strong industry lobbying and limited monitoring infrastructure [12].

This indicates the need for increased research collaboration and capacity support in the Global South so that labeling policies can be designed and implemented contextually according to local needs [13]. These findings are consistent with the literature highlighting the role of epistemic communities in influencing the global food policy agenda [14]. A recent study by Ruopeng An, et. al. (2021) provides scientific evidence that warning labels are significantly more effective in reducing the intention to purchase unhealthy products among adolescents than other labels¹⁵. Previous research confirms that simple and clear labeling systems, such as warning labels, are more effective than quantitative systems such as Guideline Daily Amount (GDA) in improving consumer understanding and influencing purchase intentions [7]. Similar findings were also obtained in Latin America, where the implementation of warning labels contributed significantly to reducing the consumption of added sugar, sodium, and saturated fat [16]. The results of keyword analysis in this study, which featured terms such as menu labeling and fast food, support these findings, where FOPL plays an important role in the context of fast food, which is often associated with obesity and metabolic diseases.

In addition, the issue of inequality in understanding labels remains a concern. Consumers from low socio-economic groups tend to have limited nutritional literacy, making them less able to utilize the information available on labels [17]. This condition reveals the limitations of policy approaches that rely solely on providing information without strengthening consumer capacity. Nutrition literacy has been shown to play an important role in reinforcing the effectiveness of Front-of-Pack

Labeling [18], while also serving as a bridge to reduce the gap in understanding between social groups. These findings emphasize the urgency of integrating comprehensive and sustainable public education strategies as integral to labeling policy implementation. The analysis of collaboration networks in this study also confirms the dominance of developed countries, while the contribution of developing countries remains minimal. This aligns with reports that research capacity in developing countries is still hampered by limited resources, even though the burden of non-communicable diseases in these regions is quite high [19]. Meanwhile, the emergence of clusters linking labeling with tobacco (smoking cessation) and sustainability (packaging waste) policies indicates an expansion of the research discourse towards a health-in-all-policies and circular economy approach. This aligns with the argument that effective food policies must be integrated with other health issues and environmental sustainability [20]. Interestingly, the research focus has also broadened to include aspects of sustainability, as seen in the emergence of keywords such as packaging waste and plastic pollution. These findings are consistent with recent studies stating that food labeling policies should be viewed not only as a health instrument but also as a sustainability strategy that encompasses the environmental impact of food packaging [21]. Thus, this study's results confirm that food labeling is now moving towards a multidisciplinary approach, involving aspects of health, consumer behavior, political economy, and environmental sustainability.

4 Conclusion

Research on food labeling policies has become a growing focus of global research over the past decade. Research dominance is still concentrated in developed countries like the United States, Australia, and the United Kingdom. Analysis of collaboration networks and keywords reveals that this field of research is multidisciplinary, focusing not only on nutrition and public health aspects but also on consumer behavior, environmental sustainability, and integrated policy approaches. These findings highlight the importance of front-of-package labeling (FOPL) as an effective health policy instrument, particularly in non-communicable disease prevention. Implementation challenges such as industry lobbying, nutrition literacy gaps, and low research capacity in low and middle-income countries require contextual policy approaches, supported by public education and more inclusive global collaboration. Future research must strengthen perspectives from developing countries and integrate sustainability and equity dimensions into food labeling policy frameworks.

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