



Bibliometric Analysis of Nutritional Epidemiology and Malnutrition Research: The Impact of the SDGs Over Two Decades (2005–2024)

Natasha Aqmarina^{1*}, Tutut Okta Hardiyanti²

1. Department of Community, Family, and Occupational Medicine, Khon Kaen University, Thailand
2. Health Research Center, Institute for Research and Community Service, Diponegoro University, Indonesia

Korespondensi : natasha.a@kkumail.com

ABSTRAK

Pendahuluan: Penerapan Sustainable Development Goals (SDGs) pada tahun 2015 telah mengubah fokus penelitian epidemiologi nutrisi dan malnutrisi secara global, namun dampaknya terhadap tren penelitian belum banyak dianalisis secara komprehensif. Penelitian ini memberikan wawasan baru melalui analisis bibliometrik untuk memahami evolusi penelitian ini sebelum dan sesudah SDGs. Penelitian bertujuan untuk mengevaluasi pengaruh SDGs terhadap hasil penelitian, tema, dan kolaborasi dalam epidemiologi nutrisi dan malnutrisi dari 2005 hingga 2024.

Metode: Penelitian ini menggunakan desain analisis bibliometrik dengan data dari basis data Scopus, diakses pada 25 Mei 2025. Sampel meliputi 672 artikel periode pra-SDGs (2005–2014) dan 3.311 artikel periode pasca-SDGs (2015–2024), dipilih berdasarkan kriteria inklusi artikel asli berbahasa Inggris dan akses terbuka. Data dianalisis menggunakan perangkat lunak VOSviewer untuk memetakan tren publikasi, distribusi geografis, afiliasi institusi, area subjek, dan kluster tematik berdasarkan kata kunci penulis.

Hasil: Hasil menunjukkan peningkatan signifikan dalam jumlah publikasi dari 672 menjadi 3.311 artikel pasca-SDGs, dengan diversifikasi tema dari malnutrisi anak dan kekurangan gizi menjadi isu seperti keamanan pangan, diet berkelanjutan, dan penyakit tidak menular. Negara berpenghasilan tinggi mendominasi publikasi, meskipun kontribusi dari negara berpenghasilan rendah-menengah meningkat.

Kesimpulan: SDGs telah mendorong pertumbuhan dan pendekatan interdisipliner dalam penelitian nutrisi, namun ketimpangan geografis tetap menjadi tantangan. Penelitian di masa depan perlu memanfaatkan basis data yang lebih beragam dan analisis konten untuk mendukung kebijakan gizi berbasis bukti.

Kata Kunci: Epidemiologi nutrisi; malnutrisi; SDGs; analisis bibliometrik; tren penelitian

ABSTRACT

Introduction: The adoption of the Sustainable Development Goals (SDGs) in 2015 reshaped global nutritional epidemiology and malnutrition research, yet its impact on research trends remains underexplored. This study provides a novel bibliometric analysis to understand the evolution of research output, themes, and collaborations in this field from 2005 to 2024. The study aims to assess the influence of SDGs on nutritional epidemiology and malnutrition research over two decades.

Methods: This bibliometric analysis utilized data from the Scopus database, accessed on May 25, 2025. The sample comprised 672 articles from the pre-SDG period (2005–2014) and 3,311 articles from the post-SDG period (2015–2024), selected based on inclusion criteria of original, open-access, English-language articles. Data were analyzed using VOSviewer software to map publication trends, geographic distribution, institutional affiliations, subject areas, and thematic clusters based on author keywords.

Results: Findings reveal a significant increase in publication volume from 672 to 3,311 articles post-SDGs, with thematic diversification from child malnutrition and undernutrition to topics like food security, sustainable diets, and non-communicable diseases. High-income countries dominated publications, though contributions from low- and middle-income countries rose.

Conclusion: *The study concludes that the SDGs have catalyzed growth and interdisciplinary approaches in nutrition research, but geographic disparities persist. Future research should leverage diverse databases and content analysis to enhance evidence-based nutrition policies, aligning with the SDGs' vision for 2030.*

Keywords: *nutritional epidemiology; malnutrition; SDGs; bibliometric analysis; research trends*

INTRODUCTION

The adoption of the Sustainable Development Goals (SDGs) by the United Nations in 2015 marked a pivotal moment in the global commitment to address interrelated challenges concerning poverty, inequality, health, education, and environmental sustainability. Among these, SDG 2 explicitly aims to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture” (United Nations Development Programme, 2024). Nutrition is also a cross-cutting theme that supports other targets, including good health and well-being (SDG 3) and responsible consumption and production (SDG 12) (Grosso et al., 2020).

Malnutrition remains one of the most pressing global health challenges, encompassing a spectrum of conditions such as undernutrition, micronutrient deficiencies, overweight, obesity, and diet-related non-communicable diseases (World Health Organization, 2024). In 2022 alone, an estimated 2.5 billion adults were overweight, with 890 million classified as obese, and approximately 390 million were underweight. Among children under five, 149 million were stunted, 45 million wasted, and 37 million overweight or obese. Notably, nearly half of child deaths under the age of five are attributable to undernutrition, particularly in low- and middle-income countries (LMICs) (Agabiirwe et al., 2022; World Health Organization, 2024).

Nutritional epidemiology, a specialized branch of epidemiology, investigates the complex interactions between diet, nutritional status, and health outcomes at the population level. It provides vital insights for public health policy, the identification of disease risk factors, and the design of effective nutrition interventions (Persson & Persson, 2024). As the links between dietary patterns and health outcomes have become more evident, the relevance of nutritional epidemiology has grown (Hadi, 2021). One of the critical contemporary challenges is the double burden of malnutrition (DBM), the coexistence of undernutrition and overweight/obesity, posing unique difficulties for public health strategies, especially in transitional economies (Hernández-Ruiz et al., 2022; Sahiledengle et al., 2023; Winichagoon & Margetts, 2017).

Prior to the SDG era (2005–2014), research in nutritional epidemiology focused largely on undernutrition and micronutrient deficiencies. Landmark studies, such as those by Black et al. (2008) and Bhutta et al. (2013), documented the global burden of maternal and child undernutrition and proposed evidence-based interventions. Other research, including a systematic review of childhood malnutrition in Vietnam, further emphasized the prevalence of stunting, wasting, and underweight as key concerns in global health (Takhelchangbam et al., 2024). This period also saw growing attention to dietary diversity and food security, with the Millennium Development Goals (MDGs) indirectly influencing research priorities related to maternal and child nutrition (Bhutta, 2017).

Following the launch of the SDGs in 2015, the global research agenda in nutritional epidemiology has undergone a paradigm shift. The scope of research has expanded to include more integrated and systems-oriented approaches, focusing not only on undernutrition but also on overnutrition and related non-communicable diseases. Researchers have increasingly explored the nutrition transition, characterized by shifts toward energy-dense, nutrient-poor diets and reduced physical activity, particularly in LMICs (Popkin, 2017). The role of food systems, sustainable diets, and food environments has also gained prominence in shaping nutritional outcomes (Downs et al., 2020; Fanzo & Davis, 2021; Goh et al., 2024).

Moreover, the SDG framework has catalyzed broader international collaboration and the generation of large-scale data, as seen in initiatives such as the Global Nutrition Report and Global Burden of Disease Study, which support evidence-based policymaking and cross-country comparisons (Cesare et al., 2021).

Despite this growing body of literature, there remains a notable gap in understanding how the SDGs have influenced the structure, focus, and collaboration patterns within the field of nutritional epidemiology and malnutrition research. While many studies address specific nutrition challenges, few provide a comprehensive, longitudinal view of how global nutrition research has evolved in response to the SDGs. Therefore, this study aims to conduct a bibliometric analysis of scientific publications on nutritional epidemiology and malnutrition across two time periods: 2005–2014 (pre-SDGs) and 2015–2024 (post-SDGs). By examining research output, thematic developments, and collaboration networks, this study seeks to assess the influence of the SDGs on the field and provide insights to guide future research and policy directions.

METHOD

Data Collection

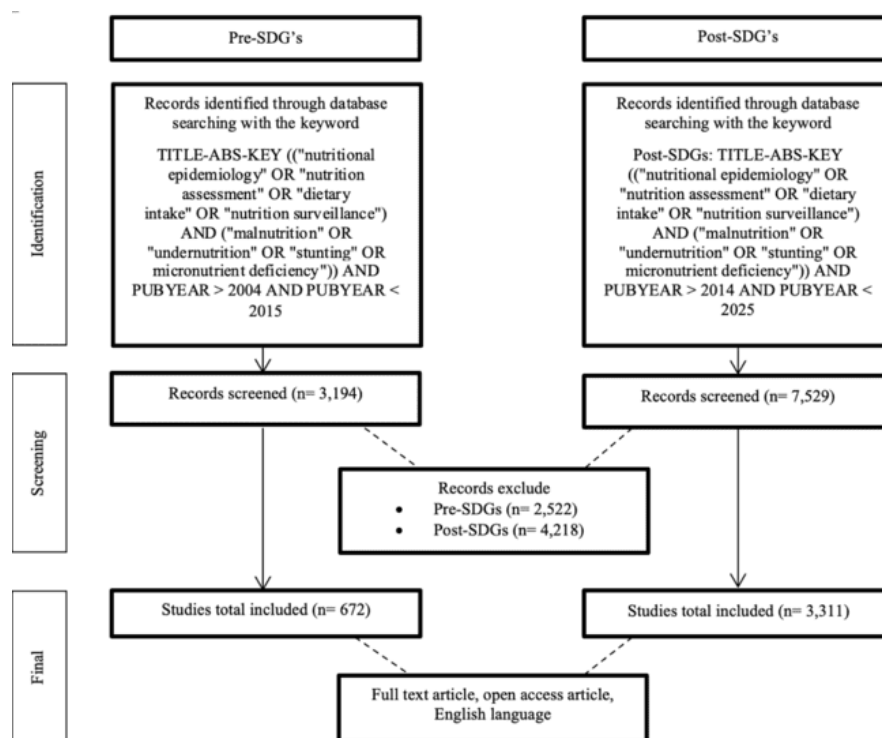


Figure 1. Article Selection Process

This bibliometric analysis utilized data extracted from the Scopus database, one of the most comprehensive citation and abstract databases of peer-reviewed literature. The data collection was conducted on May 25, 2025, using the keywords TITLE-ABS-KEY ((\"nutritional epidemiology\" OR \"nutrition assessment\" OR \"dietary intake\" OR \"nutrition surveillance\") AND (\"malnutrition\" OR \"undernutrition\" OR \"stunting\" OR \"micronutrient deficiency\")).

The inclusion criteria were: (1) original research articles; (2) open access; (3) written in English; and (4) related to nutritional epidemiology and malnutrition. Excluded were editorials, notes, letters, reviews, conference papers, data papers, errata, and articles in press. The timeframe was divided into two periods: 2005–2014 (pre-SDGs) and 2015–2024 (post-SDGs), representing a decade before and after the SDG adoption.

The selection process followed a structured filtering approach as illustrated in Figure 1, which outlines each stage of screening from initial retrieval to final inclusion. A total of 672 articles were identified for the pre-SDGs period (2005–2014) and 3,311 articles for the post-SDGs period (2015–2024).

Analytical Tool

VOSviewer, a software program for constructing and visualizing bibliometric networks, was used for analysis. The software facilitates the creation of network visualizations based on keyword co-occurrence, co-authorship, and citation relationships. The criteria for keyword selection and co-occurrence analysis involved identifying core keywords and themes frequently appearing in the dataset (van Eck & Waltman, 2014). Studies by van Eck and Waltman (2010) demonstrate VOSviewer's utility in mapping scientific knowledge and identifying key research areas (van Eck & Waltman, 2010).

Sample articles were downloaded from the Scopus database in *.csv format and imported into VOSviewer for further analysis. The software generated visualizations and analyzed trends in the form of bibliometric maps, providing a comprehensive overview of the research landscape.

Comparison Approach

Building on the extracted metadata and visual mapping, the study employed a comparative approach to assess shifts in research trends across the two time periods. The comparison was conducted using five key indicators: publication trends per year, leading countries of origin, institutional affiliations, subject area distributions, and author keyword co-occurrence. All bibliographic data were retrieved from the Scopus database, including metadata fields such as author affiliations, subject classifications, and keywords. VOSviewer software was used to analyze author-supplied keywords, applying a minimum occurrence threshold of five to ensure relevance. This enabled the identification of thematic clusters, which are groups of frequently co-occurring keywords that represent dominant research topics within each period. Descriptive statistics were used to analyze publication counts, top contributing institutions, and subject area frequencies, while visual maps provided insight into the evolving structure and focus of research in nutritional epidemiology and malnutrition. By integrating these dimensions, the comparative analysis offers a comprehensive understanding of how the global research landscape has responded to the SDG agenda over the past two decades.

RESULT

Article Publication Trends per Year

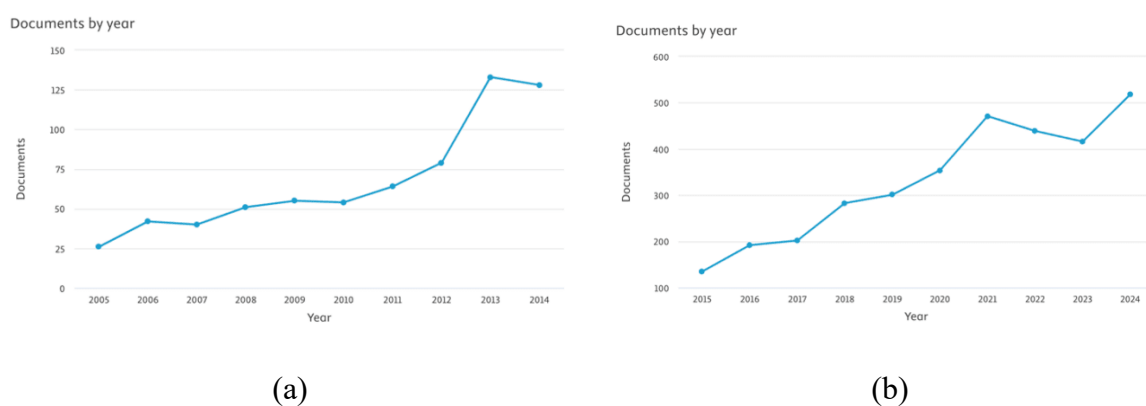


Figure 2. Total publication counts (a) Pre-SDGs (2005-2014) (b) Post-SDGs (2015-2024)

Source: Scopus, 2025

A comprehensive search of the Scopus database was conducted to determine the total number of publications related to nutritional epidemiology and malnutrition before and after implementing the SDGs as shown in Figure 2. The search was limited to articles to ensure the inclusion of peer-reviewed and scholarly contributions.

The search yielded 672 publications for the pre-SDG period (2005-2014). These publications reflect the state of research and scholarly interest in nutritional epidemiology and malnutrition before adopting the SDGs. In contrast, the post-SDGs period (2015-2024) showed a significant increase in publications, with 3,311 articles. The substantial rise indicates a heightened focus and expanded research activities in the field following the introduction of the SDGs.

In the pre-SDGs period (Figure 2a), publication output gradually increased from approximately 25 documents in 2005 to over 125 documents in 2014, with notable acceleration beginning in 2012. In contrast, the post-SDGs period (Figure 2b) shows a much steeper growth trajectory, starting with approximately 130 publications in 2015 and reaching more than 520 documents by 2024. This pattern demonstrates a substantial increase in research productivity following the adoption of the SDGs.

Author's Country of Origin

Table 1 shows the analysis of the geographic distribution of publications on nutritional epidemiology and malnutrition research, revealing significant changes in research focus and contributions from different regions between the pre-SDGs (2005-2014) and post-SDGs (2015-2024) periods.

Table 1. Top 10 Countries for Publication

Pre-SDGs (2005-2014)		Post-SDGs (2015-2024)	
Country	Number of publications	Country	Number of publications
United States	171	United States	566
United Kingdom	65	United Kingdom	309
Brazil	59	China	286
Australia	51	Japan	209
Netherlands	42	Netherlands	203
Italy	38	Australia	199
India	35	Brazil	182
Japan	35	Spain	180
Canada	33	Italy	165
France	33	Germany	143

Table 1 illustrates the top 10 countries contributing to publications on nutritional epidemiology and malnutrition across two time periods: pre-SDGs (2005–2014) and post-SDGs (2015–2024). In both periods, the United States consistently led in publication output, with a substantial increase from 171 documents in the pre-SDGs period to 566 in the post-SDGs period. The United Kingdom maintained its position as the second-highest contributor, increasing from 65 to 309 publications. Notably, several countries showed a marked rise in their research output during the post-SDGs period, including China (286 publications), Japan (209), and the Netherlands (203). While Brazil, Australia, and Italy remained within the top 10 across both periods, new entries in the post-SDGs list included Spain (180 publications) and Germany (143), replacing Canada and France, which were among the top contributors during the pre-SDGs era.

To further illustrate the distribution of publications by country income level, Figure 1 aggregates the data from Table 1 into High-Income Countries (United States, United Kingdom, Australia, Netherlands, Italy, Japan, Canada, France) and Low- and Middle-Income Countries (Brazil, India).

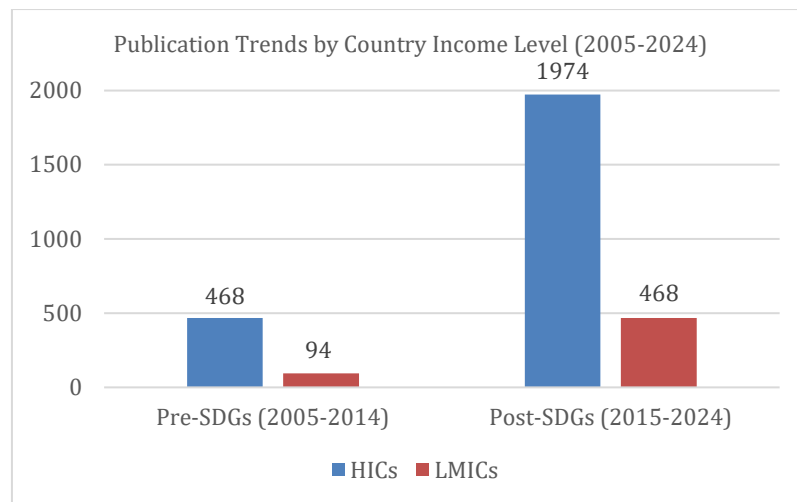


Figure 3. Publication Trends by Country Income Level (2005-2024)

In the pre-SDG period, HICs contributed 468 publications, while LMICs contributed 94 publications. In the post-SDG period, HIC contributions rose to 1,974 publications (United States, United Kingdom, Japan, Netherlands, Australia, Spain, Italy, Germany), and LMIC contributions (China, Brazil) increased to 468 publications. This chart highlights the significant growth in publication volume across both income groups, with HICs maintaining a dominant share.

Documents Based on Affiliation

Figure 3 shows the analysis of institutional affiliations, which revealed a noticeable transformation in the leading contributors to nutritional epidemiology and malnutrition research before and after the implementation of the SDGs.

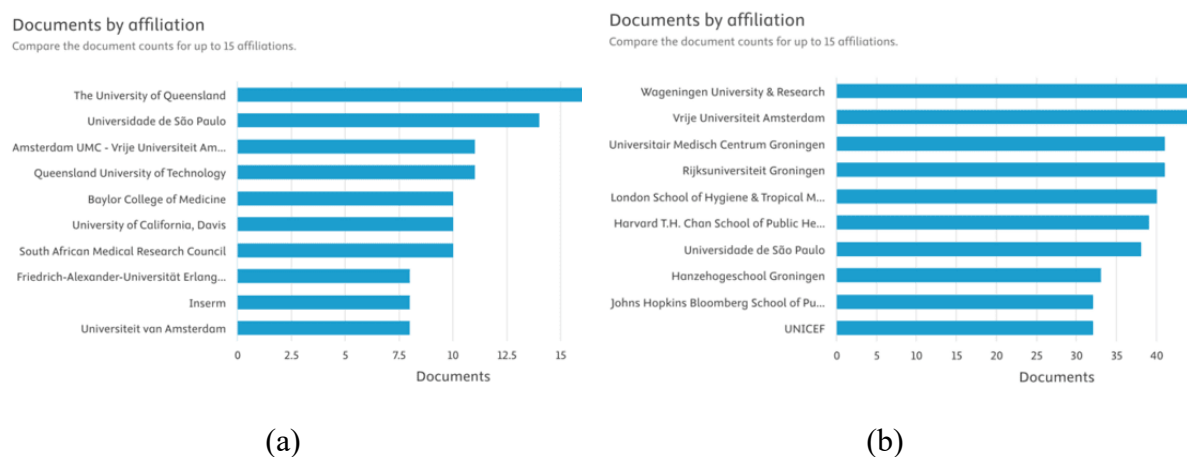


Figure 4. Documents Based on Affiliation (a) Pre-SDGs (2005-2014) (b) Post-SDGs (2015-2024)

Source: Scopus, 2025

Figure 4a presents the top 10 contributing affiliations based on the number of documents during pre-SDGs period (2005-2014). The University of Queensland ranked highest, contributing approximately 16 documents, followed by Universidade de São Paulo with approximately 14 documents. Other prominent contributors included Amsterdam UMC – Vrije Universiteit Amsterdam, Queensland University of Technology, Baylor College of Medicine, University of California Davis, South African Medical Research Council, Friedrich-Alexander-Universität Erlangen-Nürnberg, Inserm, and Universiteit van Amsterdam, each contributing approximately 8–11 documents.

In contrast, figure 4b illustrates another distribution of the top 10 affiliations for the post-SDGs period (2015-2024), with Wageningen University & Research and Vrije Universiteit Amsterdam each contributing approximately 40 documents, followed by Universitair Medisch Centrum Groningen, Rijksuniversiteit Groningen, London School of Hygiene & Tropical Medicine, and Harvard T.H. Chan School of Public Health, each contributing approximately 38–39 documents. Additional notable contributors included Universidade de São Paulo, Hanzehogeschool Groningen, Johns Hopkins Bloomberg School of Public Health, and UNICEF, with approximately 32–35 documents each.

Documents by Subject Area

A comparison of subject classifications across both time periods indicates a shift in the thematic scope of research shown in Figure 5.

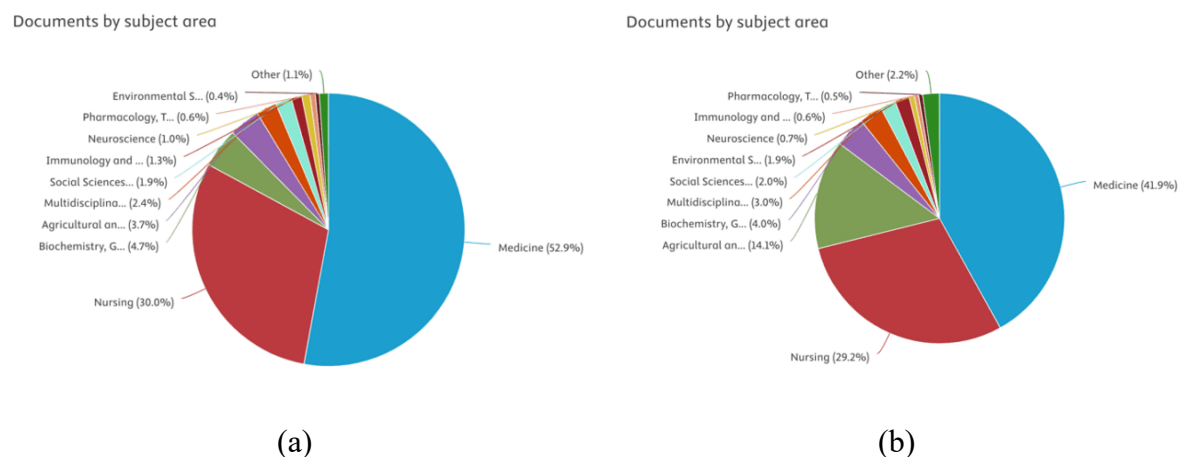
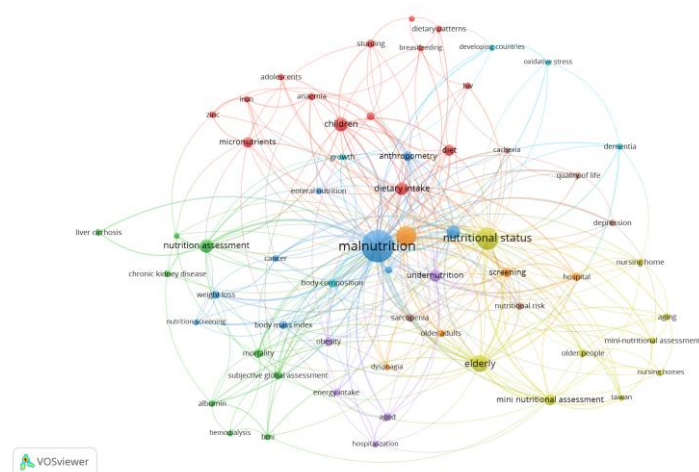


Figure 5. Documents Based on Subject (a) Pre-SDGs (2005-2014) (b) Post-SDGs (2015-2024)
Source: Scopus, 2025

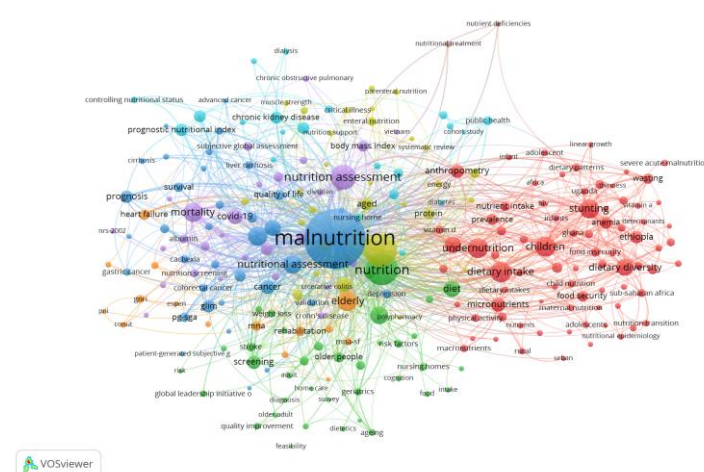
During the pre-SDGs period (Figure 5a), research was primarily concentrated in Medicine (52.9%) and Nursing (30.0%), with smaller contributions from Biochemistry, Genetics and Molecular Biology (4.7%), Agricultural and Biological Sciences (3.7%), and other disciplines each accounting for less than 3%. In the post-SDGs period (Figure 5b), while Medicine (41.9%) and Nursing (29.2%) remained the two largest categories, Agricultural and Biological Sciences expanded considerably to 14.1% of publications. Other subject areas, including Multidisciplinary (3.0%), Biochemistry, Genetics and Molecular Biology (4.0%), Social Sciences (2.0%), and Environmental Science (1.9%), also experienced slight increases, indicating a diversification of research topics in the post-SDGs era.

Thematic Clustering based on Author Keywords

A network visualization analysis of author keywords was conducted using VOSviewer to identify the thematic structure and research trends in malnutrition studies before and after the adoption of the Sustainable Development Goals (SDGs). The analysis identified 61 highly connected author keywords during the Pre-SDGs period (2005–2014) and 250 during the Post-SDGs period (2015–2024), indicating a substantial growth in thematic diversity over time. The co-occurrence networks revealed strong interconnections among keywords, reflecting the interdisciplinary and expanding nature of malnutrition-related research (Pojanapunya, 2016).



(a)



(b)

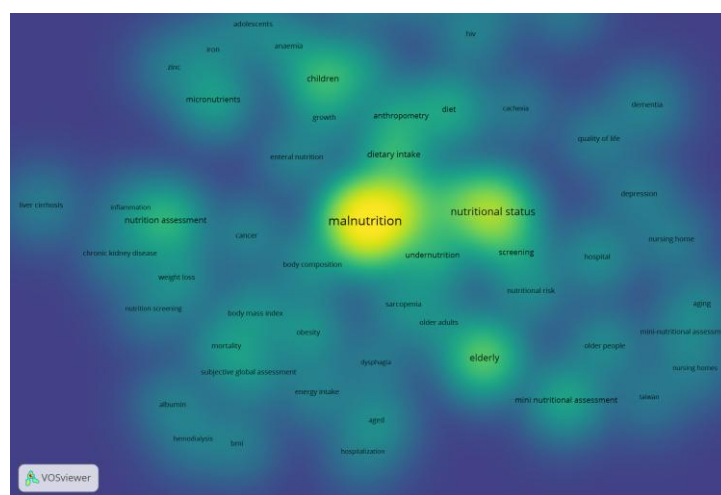
Figure 6. The network map of the author's keywords (a) Pre-SDGs (2005-2014) (b) Post-SDGs (2015-2024)

In the pre-SDGs period (Figure 6a), eight keyword clusters emerged. Cluster 1 included 14 items related to child nutrition and dietary factors, such as dietary intake, children, micronutrients, diet, and stunting. Cluster 2 contained 9 items, focusing on clinical nutrition assessment with keywords like nutrition assessment, mortality, subjective global assessment, albumin, and body mass index (BMI). Cluster 3 featured 9 items, including malnutrition, nutritional assessment, anthropometry, body mass index, and cancer. Cluster 4 centered on geriatric nutrition with 9 keywords, such as nutritional status, elderly, mini nutritional assessment, nursing home, and aging. Cluster 5 comprised keywords like undernutrition, obesity, energy intake, and aged, while Cluster 6 focused on broader health determinants, including body composition, growth, dementia, oxidative stress, and developing countries. Cluster 7 emphasized hospital-based nutrition care, including nutrition, screening, older adults, hospital, and dysphagia. Lastly, Cluster 8 addressed quality of life and disease complications, including sarcopenia, depression, quality of life, cachexia, and nutritional risk.

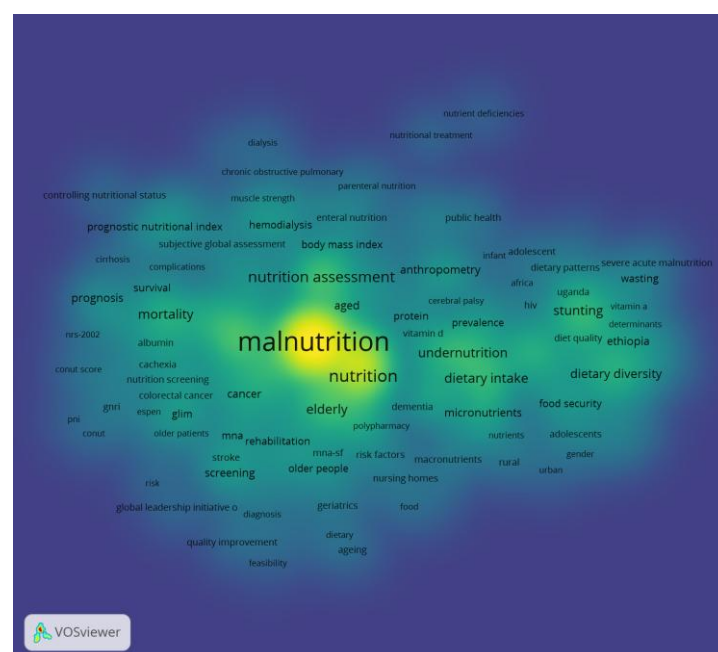
In contrast, the Post-SDGs period (Figure 6b) showed a broader distribution of themes, also separated into eight clusters. Cluster 1 was the largest, comprising 79 items and focusing on pediatric and dietary issues, with keywords such as dietary intake, children, stunting, dietary diversity,

and undernutrition. Cluster 2 included 37 items focused on adult and elderly nutrition, such as nutrition, older adults, diet, screening, and stroke. Cluster 3 also had 37 items, centering on clinical nutrition with keywords like malnutrition, sarcopenia, prognosis, nutritional assessment, and cancer. Cluster 4 consisted of 30 items addressing aging and frailty, including nutritional status, frailty, aged, nutritional screening, and nutritional intervention. Cluster 5, with 29 items, reflected emerging topics such as nutrition assessment, mortality, COVID-19, and inflammation. Cluster 6 highlighted chronic disease and prognosis, including chronic kidney disease, geriatric nutritional risk index, prognostic nutritional index, hemodialysis, and all-cause mortality. Cluster 7 consisted of 15 items focused on rehabilitation and elderly care, with keywords like elderly, heart failure, rehabilitation, BMI, and mini nutritional assessment (MNA). Finally, Cluster 8 included two specific terms: nutrient deficiencies and nutritional treatment.

Density Display Mode



(a)



(b)

Figure 7. The density display mode (a) Pre-SDGs (2005-2014) (b) Post-SDGs (2015-2024)

Figure 7 presents the density visualization of author keyword co-occurrence in research on nutritional epidemiology and malnutrition across two periods: (a) Pre-SDGs (2005–2014) and (b) Post-SDGs (2015–2024). It illustrates term frequency and importance based on color intensity. Brighter yellow areas indicate higher co-occurrence densities.

In the pre-SDGs period (Figure 7a), research density is relatively concentrated around a limited number of core terms such as malnutrition, nutritional status, nutrition assessment, and dietary intake. The visualization shows fewer keywords overall, indicating that research during this period was focused more narrowly on foundational themes related to undernutrition, children, and basic anthropometric assessments. The lower keyword diversity reflects a more traditional approach to nutritional epidemiology, with emphasis on descriptive and clinical aspects of malnutrition. In contrast, the post-SDGs period (Figure 7b) exhibits a significantly denser and more dispersed keyword landscape. In addition to core terms such as malnutrition and nutrition, emerging themes such as food security, dietary diversity, micronutrients, non-communicable diseases, and sustainable diets have gained prominence. There is a notable increase in research addressing broader determinants of malnutrition, such as public health, aging, gender, and environmental factors.

DISCUSSION

This bibliometric analysis demonstrates a significant evolution in the field of nutritional epidemiology and malnutrition research following the adoption of the SDGs. This study provides empirical evidence supporting the claim that global development frameworks have influenced scientific priorities and research production by comparing data from the pre- and post-SDGs period.

The dramatic increase in publication volume in the post-SDGs decade (from 672 to 3,311 articles) reflects a global shift in focus, echoing the agenda-setting role of the SDGs. Specifically, SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being) have helped reframe nutrition not only as a health concern but as a cross-cutting development issue (Cesare et al., 2021; Grosso et al., 2020). This surge aligns with scientometric findings that show a rapid and significant growth in SDG-related research output following their adoption. For instance, Sianes et al. (2022) reported that over 60% of SDG-focused publications between 2015 and 2020 were concentrated in just the last two years of that period, with an R^2 of over 96% indicating a strong upward trend. Similarly, Gurav et al. (2025) found a 21.2% annual growth rate in SDG-related publications from 2015 to 2024, with documents increasing from just 137 in 2015 to 4,039 in 2024.

The notable increase in publication volume from pre-SDGs (2005-2014) to the post-SDGs (2015-2024) period highlights the impact of global initiatives and policy frameworks on research priorities. The SDGs, emphasizing health and well-being, have catalyzed greater academic and scientific engagement in addressing nutritional challenges and epidemiological studies related to malnutrition. This trend underscores the role of international agendas in shaping research landscapes and driving scholarly attention toward critical health issues.

This bibliometric evidence suggests that the SDGs have played a critical role in shaping academic agendas globally. Specifically, SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being) have helped reposition nutrition not merely as a health issue but as a cross-cutting development priority, influencing a wide range of sectors. As Hefferon et al. (2021) emphasized, improved nutrition contributes to goals beyond health, including productivity, education, and equity, highlighting its foundational role in sustainable development.

The results in Table 1 and Figure 3 highlight persistent geographic disparities in the authorship of nutritional epidemiology and malnutrition research. Although the overall publication volume increased in the post-SDGs era, the majority of contributions still came from HICs, notably the United

States and the United Kingdom. Even with the rise of countries like China and Japan, the global research landscape remains imbalanced. It is well documented that scientific contributions in high-impact journals are disproportionately from authors affiliated with institutions in HICs (Plancikova et al., 2021), reflecting unequal access to funding, infrastructure, and academic publishing networks.

The underrepresentation of LMICs, despite bearing the highest malnutrition burdens, may stem from multiple systemic barriers. As noted by Plancikova et al. (2021), potential reasons include a shortage of trained researchers and supervisors, weak academic and peer networks, poor salaries, lack of clear career structures, and limited access to journals whose readership is often targeted toward high-income audiences. While Brazil remains a consistent LMIC contributor, countries like India show little growth in output, because of one of the world's largest populations and a high double burden of malnutrition (both undernutrition and rising rates of obesity and non-communicable diseases) (Takhelchangbam et al., 2024).

These shifts illustrate both the expansion and democratization of nutritional research in the post-SDGs era. The rise of countries like China, Japan, and Spain indicates a more geographically diverse research landscape, while continued leadership from the United States and the United Kingdom underscores the ongoing role of established academic powers. Overall, the data reflect a growing global momentum toward achieving SDG-related nutrition targets, supported by a more interconnected and inclusive research community.

In terms of institutional affiliations in nutritional epidemiology and malnutrition research from 2005 to 2024, highlights a significant shift in the global research landscape following the adoption of the SDGs in 2015. In the pre-SDG period, research was dominated by institutions in HICs, such as the University of Queensland and Universidade de São Paulo, reflecting the global North's historical leadership in health research due to superior funding and infrastructure (Adam et al., 2023). However, this concentration may have limited the inclusion of perspectives from LMICs, where malnutrition challenges are often most acute.

In contrast, the post-SDG era suggests that the SDGs, particularly SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being), have catalyzed broader global engagement in malnutrition research. The increased prominence of institutions from the Netherlands and the inclusion of international agencies indicate a move toward interdisciplinary and cross-sectoral approaches. For instance, Wageningen University's focus on sustainable food systems and UNICEF's emphasis on policy-oriented interventions reflect a growing alignment of research with the SDGs' holistic framework (United Nations, 2015). The rise of institutions like the London School of Hygiene & Tropical Medicine and Johns Hopkins Bloomberg School of Public Health further highlights the interdisciplinary nature of post-SDG research. These institutions are known for integrating epidemiology, public health policy, and global health perspectives, which are critical for addressing the multifaceted determinants of malnutrition. This trend is consistent with the SDGs' emphasis on partnerships (SDG 17) and the need for collaborative, multi-stakeholder approaches to tackle complex global challenges (Sachs et al., 2019). Compared to earlier studies, such as Bhutta et al. (2020), which noted limited LMIC representation in global health research, this analysis suggests progress toward inclusivity, though HICs still dominate, underscoring the need for equitable partnerships to address malnutrition effectively.

The transition in subject areas, from a predominance of Medicine and Nursing in the pre-SDGs period to greater inclusion of Environmental Science, Social Sciences, and Multidisciplinary fields in the post-SDGs period, reflects a shift toward systems-level thinking in nutrition. In the pre-SDG period, research was heavily concentrated in Medicine (52.9%) and Nursing (30.0%), reflecting a predominantly clinical focus on malnutrition, consistent with earlier findings that prioritized medical interventions for nutritional deficiencies (Black et al., 2008). The minimal contributions from Agricultural and Biological Sciences (3.7%) and other fields indicate a limited exploration of

malnutrition's broader determinants, such as food systems or environmental factors. In contrast, the post-SDG period demonstrates a marked diversification, with Agricultural and Biological Sciences expanding to 14.1%, alongside modest increases in Multidisciplinary (3.0%), Social Sciences (2.0%), and Environmental Science (1.9%) publications. This shift aligns with the SDGs' integrated approach, particularly SDG 2 (Zero Hunger), which emphasizes sustainable agriculture, and SDG 17 (Partnerships), which promotes cross-disciplinary collaboration (United Nations, 2015). This transition corresponds to the social determinants of health framework, where malnutrition is viewed as a consequence of interconnected social, environmental, and political factors (Sandler & Sun, 2024).

Compared to prior studies, such as Bhutta et al. (2020), which underscored the need for holistic strategies to combat malnutrition, these findings suggest that the SDGs have fostered greater interdisciplinary engagement. However, the continued dominance of clinical disciplines indicates that further efforts are needed to strengthen non-medical perspectives, particularly from LMICs, to ensure research comprehensively addresses the multifaceted drivers of malnutrition in the context of sustainable development.

The thematic clustering of author keywords further substantiates this broadening scope. In the pre-SDGs period, research was largely concentrated on foundational themes such as undernutrition, anthropometry, and child health. By contrast, the post-SDGs clusters revealed greater diversity, including emerging topics such as sarcopenia, frailty, food security, NCDs, and sustainable diets. These findings are in line with Winichagoon & Margetts (2017) and Hernández-Ruiz et al. (2022), who emphasized the complexity of the double burden of malnutrition and its relevance in transitioning societies. The inclusion of terms such as "COVID-19", "prognosis", and "dietary diversity" also highlights how nutrition research has responded to recent global health emergencies and contemporary nutritional challenges.

The increased keyword density and thematic complexity observed in the post-SDGs period (Figure 7b) reflect not only a growth in volume but also a qualitative expansion in the field's intellectual structure. Nutrition is now being studied not merely in terms of biological outcomes, but also as a system embedded in environmental, economic, and political contexts (Fanzo & Davis, 2021; Goh et al., 2024). However, the persistence of some clinically focused keywords underscores the need for continued efforts to integrate non-clinical perspectives to fully capture the systemic drivers of malnutrition, ensuring research aligns with the SDGs' holistic vision for sustainable development by 2030.

Potential Opportunities on the Topic of Nutritional Epidemiology and Malnutrition

The findings of this study highlight several emerging opportunities in the field of nutritional epidemiology and malnutrition that can guide future academic, institutional, and policy efforts. First, the increased integration of social, environmental, and health-related disciplines suggests fertile ground for interdisciplinary research, particularly at the intersection of nutrition, sustainability, and climate resilience. Topics such as food system transformation, equity in dietary access, and nutrition-sensitive policies offer promising directions for expanding the relevance of nutrition research in global development.

Second, the thematic expansion seen in the post-SDGs period indicates a growing interest in life-course nutrition, elderly care, and chronic disease management. These areas are especially important in the context of aging populations and the increasing burden of non-communicable diseases worldwide. Researchers and practitioners can explore nutrition's role in preventive care, rehabilitation, and health system integration.

Third, the emergence of themes like COVID-19, sarcopenia, and sustainable diets reveals the need to address nutrition within dynamic and rapidly evolving public health contexts. There is an opportunity to build robust surveillance and response systems that integrate nutritional risk into pandemic preparedness, aging policies, and environmental health frameworks.

Finally, the growing involvement of non-academic institutions such as UNICEF and broader global networks points to opportunities for evidence-informed policymaking. Researchers can collaborate with policy bodies to translate findings into impactful interventions and monitor SDG progress through real-time data and applied nutrition science.

Limitation

While this study offers a comprehensive bibliometric overview, several limitations must be acknowledged. First, the analysis is limited to English-language articles indexed in the Scopus database, potentially excluding regionally significant or non-English literature. Second, the interpretation of keyword clusters, although informed by co-occurrence data, involves some subjectivity. Third, the focus on author keywords may overlook relevant themes embedded in full-text content or other metadata fields not captured in the analysis.

Recommendation for Future Research

Future research should incorporate additional databases such as Web of Science, PubMed, and regional repositories to capture a more inclusive body of literature. Moreover, integrating content analysis of full-text articles could provide richer insight into the conceptual evolution of the field. Further research might also explore the translation of scientific knowledge into policy and practice by analyzing grey literature, including reports from NGOs, government agencies, and UN bodies.

CONCLUSION

This bibliometric analysis highlights a profound shift in nutritional epidemiology and malnutrition research following the 2015 adoption of the Sustainable Development Goals (SDGs). The study reveals a nearly five-fold increase in publication volume from the pre-SDG (2005–2014) to the post-SDG (2015–2024) period, underscoring the SDGs' role in galvanizing global research efforts, particularly aligned with SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being). Research themes have evolved from a primary focus on undernutrition and child health to encompass broader, systems-oriented topics, including food security, sustainable diets, non-communicable diseases, and aging. The diversification of subject areas, with increased contributions from Agricultural and Biological Sciences, Social Sciences, and Environmental Science, reflects a growing interdisciplinary approach. However, persistent geographic disparities, with high-income countries (HICs) contributing the majority of publications compared to low- and middle-income countries (LMICs), highlight systemic barriers such as limited funding and publication access that hinder equitable research representation. These findings suggest that while the SDGs have fostered a more inclusive and holistic research landscape, addressing these disparities is critical to fully realizing the global nutrition agenda. Future research should leverage diverse databases, incorporate full-text content analysis, and explore grey literature to deepen insights and enhance the translation of scientific findings into effective, evidence-based nutrition policies and interventions, ensuring progress toward the SDGs by 2030.

REFERENCES

- Adam, T., Ralaidovy, A. H., Ross, A. L., Reeder, J. C., & Swaminathan, S. (2023). Tracking global resources and capacity for health research: time to reassess strategies and investment decisions. *Health Research Policy and Systems*, 21(1), 93. <https://doi.org/10.1186/S12961-023-00979-7>
- Agabiirwe, C. N., Dambach, P., Methula, T. C., & Phalkey, R. K. (2022). Impact of floods on undernutrition among children under five years of age in low- and middle-income countries: a systematic review. *Environmental Health: A Global Access Science Source*, 21(1), 1–21. <https://doi.org/10.1186/S12940-022-00910-7/FIGURES/1>

- Bhutta, Z. A. (2017). Community-based primary health care: a core strategy for achieving sustainable development goals for health. *Journal of Global Health*, 7(1), 1. <https://doi.org/10.7189/JOGH.07.010101>
- Bhutta, Z. A., Akseer, N., Keats, E. C., Vaivada, T., Baker, S., Horton, S. E., Katz, J., Menon, P., Piwoz, E., Shekar, M., Victora, C., & Black, R. (2020). How countries can reduce child stunting at scale: Lessons from exemplar countries. *American Journal of Clinical Nutrition*, 112(Suppl 2), 894S-904S. <https://doi.org/10.1093/ajcn/nqaa153>
- Bhutta, Z. A., Das, J. K., Rizvi, A., Gaffey, M. F., Walker, N., Horton, S., Webb, P., Lartey, A., & Black, R. E. (2013). Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *The Lancet*, 382(9890), 452–477. [https://doi.org/10.1016/S0140-6736\(13\)60996-4](https://doi.org/10.1016/S0140-6736(13)60996-4)
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., Mathers, C., & Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet*, 371(9608), 243–260. [https://doi.org/10.1016/S0140-6736\(07\)61690-0](https://doi.org/10.1016/S0140-6736(07)61690-0)
- Cesare, M. Di, Ghosh, S., Osendarp, S., & Mozaffarian, D. (2021). *Assessing progress towards the global nutrition targets - Global Nutrition Report*. <https://globalnutritionreport.org/reports/2021-global-nutrition-report/assessing-progress-towards-the-global-nutrition-targets/>
- Downs, S. M., Ahmed, S., Fanzo, J., & Herforth, A. (2020). Food Environment Typology: Advancing an Expanded Definition, Framework, and Methodological Approach for Improved Characterization of Wild, Cultivated, and Built Food Environments toward Sustainable Diets. *Foods* 2020, Vol. 9, Page 532, 9(4), 532. <https://doi.org/10.3390/FOODS9040532>
- Fanzo, J., & Davis, C. (2021). *Sustainable Diets: Aligning Food Systems and the Environment*. 155–168. https://doi.org/10.1007/978-3-030-72763-5_10
- Goh, E. Von, Sobratee-Fajurally, N., Allegretti, A., Sardeshpande, M., Mustafa, M., Azam-Ali, S. H., Omari, R., Schott, J., Chimonyo, V. G. P., Weible, D., Mutalemwa, G., Mabhaudhi, T., & Massawe, F. (2024). Transforming food environments: a global lens on challenges and opportunities for achieving healthy and sustainable diets for all. *Frontiers in Sustainable Food Systems*, 8, 1366878. <https://doi.org/10.3389/FSUFS.2024.1366878/BIBTEX>
- Grosso, G., Mateo, A., Rangelov, N., Buzeti, T., & Birt, C. (2020). Nutrition in the context of the Sustainable Development Goals. *The European Journal of Public Health*, 30(Suppl 1), i19. <https://doi.org/10.1093/EURPUB/CKAA034>
- Gurav, V. P., Bankar, R., & Bansode, N. (2025). *Mapping Global Sustainable Development Goals (SDGs) Research: A Scientometric Perspective*. <https://doi.org/10.2139/SSRN.5246450>
- Hadi, P. A. A. (2021). Involvement of Nutritional Epidemiology in Public Health. *Journal of Pharmaceutical Research International*, 3749–3757. <https://doi.org/10.9734/JPRI/2021/V33I60B35072>
- Hefferon, K. L., Downs, S., Oliu, G. O., & De Steur, H. (2021). Editorial: Sustainable Development Goals (SDGs): Impact on Nutrition. *Frontiers in Nutrition*, 8, 676080. <https://doi.org/10.3389/FNUT.2021.676080/BIBTEX>

- Hernández-Ruiz, Á., Madrigal, C., Soto-Méndez, M. J., & Gil, Á. (2022). Challenges and perspectives of the double burden of malnutrition in Latin America. *Clinica e Investigacion En Arteriosclerosis : Publicacion Oficial de La Sociedad Espanola de Arteriosclerosis*, 34 Suppl 1, S3–S16. <https://doi.org/10.1016/J.ARTERI.2021.11.005>
- Persson, P. B., & Persson, A. B. (2024). Nutritional health. *Acta Physiologica*, 240(5), e14136. <https://doi.org/10.1111/APHA.14136>
- Plancikova, D., Duric, P., & O'May, F. (2021). High-income countries remain overrepresented in highly ranked public health journals: a descriptive analysis of research settings and authorship affiliations. *Critical Public Health*, 31(4), 487–493. <https://doi.org/10.1080/09581596.2020.1722313>
- Pojanapunya, P. (2016). Clustering Keywords to Identify Concepts in Texts: An Analysis of Research Articles in Applied Linguistics. *REFlections*, 55–70.
- Popkin, B. M. (2017). Relationship between shifts in food system dynamics and acceleration of the global nutrition transition. *Nutrition Reviews*, 75(2), 73–82. <https://doi.org/10.1093/NUTRIT/NUW064>
- Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six Transformations to achieve the Sustainable Development Goals. *Nature Sustainability*, 2(9), 805–814. <https://doi.org/10.1038/S41893-019-0352-9>;SUBJMETA=172,4081,496,648,704,706;KWRD=ENVIRONMENTAL+IMPACT,RESEARCH+MANAGEMENT
- Sahiledengle, B., Mwanri, L., Kumie, A., Beressa, G., Atlaw, D., Tekalegn, Y., Zenbaba, D., Desta, F., Kene, C., Seyoum, K., Gomora, D., Woldeyohannes, D., & Agho, K. E. (2023). The coexistence of stunting and overweight or obesity in Ethiopian children: prevalence, trends and associated factors. *BMC Pediatrics*, 23(1). <https://doi.org/10.1186/S12887-023-04037-7>
- Sandler, A., & Sun, L. (2024). The Socio-Environmental Determinants of Childhood Malnutrition: A Spatial and Hierarchical Analysis. *Nutrients* 2024, Vol. 16, Page 2014, 16(13), 2014. <https://doi.org/10.3390/NU16132014>
- Sianes, A., Vega-Muñoz, A., Tirado-Valencia, P., & Ariza-Montes, A. (2022). Impact of the Sustainable Development Goals on the academic research agenda. A scientometric analysis. *PLOS ONE*, 17(3), e0265409. <https://doi.org/10.1371/JOURNAL.PONE.0265409>
- Takhelchangbam, N. D., Saxena, D., Singh, N. P., & Singh, A. (2024). Epidemiology of Double Burden of Malnutrition: Causes and Consequences. *Preventive Medicine: Research & Reviews*. https://doi.org/10.4103/PMRR.PMRR_55_24
- United Nations. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. <https://sdgs.un.org/2030agenda>
- United Nations Development Programme. (2024). *Sustainable Development Goals | United Nations Development Programme*. <https://www.undp.org/sustainable-development-goals>

- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/S11192-009-0146-3>
- Winichagoon, P., & Margetts, B. M. (2017). The double burden of malnutrition in low- and middle-income countries. *Energy Balance and Obesity*. <https://www.ncbi.nlm.nih.gov/books/NBK565820/>
- World Health Organization. (2024, March 1). *Fact sheets - Malnutrition*. <https://www.who.int/news-room/fact-sheets/detail/malnutrition/>