



SOCIOECONOMIC DETERMINANTS OF THE ADHERENCE TO HEALTHY AND SUSTAINABLE EATING PATTERNS IN VERY HIGH HUMAN DEVELOPMENT INDEX COUNTRIES

DETERMINANTES SOCIOECONÓMICOS DA ADESÃO A PADRÕES ALIMENTARES SAUDÁVEIS E SUSTENTÁVEIS EM PAÍSES COM ÍNDICE DE DESENVOLVIMENTO HUMANO MUITO ELEVADO

A.R.
ARTIGO DE REVISÃO

Maria Silva¹  ; Bárbara Belezá¹ 

¹ Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto, Rua do Campo Alegre, n.º 823, 4150-180 Porto, Portugal

*Endereço para correspondência:

Maria Silva
Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto, Rua do Campo Alegre, n.º 823, 4150-180 Porto, Portugal
mimariab16@gmail.com

Histórico do artigo:

Recebido a 12 de junho de 2024
Aceite a 30 de junho de 2025

ABSTRACT

INTRODUCTION: Non-communicable diseases are the leading cause of death globally, disproportionately affecting individuals in lower socioeconomic positions. Promoting a healthy and sustainable diet may be a crucial strategy for preventing these diseases and protecting the environment. Therefore, understanding the connections between socioeconomic position and sustainable healthy eating patterns is vital for effective public health interventions.

OBJECTIVES: This review aims to examine the association between sustainable healthy eating patterns and socioeconomic determinants.

METHODOLOGY: For this review, several databases were consulted employing MeSH terms and combinations of keywords, without any time restriction, focusing on European countries with a very high Human Development Index.

RESULTS: Studies have demonstrated that individuals with higher incomes and a higher educational level tend to exhibit higher adherence to the Mediterranean Diet, while mixed results were found regarding residential area and occupational status. Limited evidence exists for the Nordic and the Dietary Approach to Stop Hypertension, with higher education being associated with adherence. Vegetarian diets are more prevalent among those with higher educational levels and lower income. For the Planetary Health Diet, higher adherence is more likely to be observed in metropolitan and rural areas and among both higher and lower incomes. Further research is needed to explore socioeconomic determinants of adherence to Mediterranean-DASH Intervention to Stop Hypertension.

CONCLUSIONS: Dietary habits are influenced by political and economic factors, and it is important for governments, along with other stakeholders, to promote healthy environments and address the remaining challenges.

KEYWORDS

Dietary pattern, Food cost, Politics and economics, Socioeconomic factors, Sustainable healthy diet

RESUMO

INTRODUÇÃO: As doenças crónicas não transmissíveis são a principal causa de morte a nível global e afetam desproporcionalmente indivíduos de posição socioeconómica mais baixa. Promover uma dieta saudável e sustentável pode ser uma estratégia crucial para prevenir estas doenças e proteger o ambiente. Assim, compreender as interações entre a posição socioeconómica e padrões alimentares saudáveis e sustentáveis é essencial para intervenções de saúde pública eficazes.

OBJETIVOS: Esta revisão tem como objetivo analisar a associação entre padrões alimentares saudáveis e sustentáveis e a posição socioeconómica.

METODOLOGIA: Para esta revisão, foram consultadas várias bases de dados utilizando termos MeSH e combinações de palavras-chave, sem restrição temporal, com enfoque em países europeus com um Índice de Desenvolvimento Humano muito elevado.

RESULTADOS: Os estudos demonstraram que indivíduos com rendimentos e um nível educacional mais altos tendem a apresentar uma maior adesão à Dieta Mediterrânica e, relativamente à área de residência e ocupação, foram encontrados resultados discrepantes. A evidência é limitada para a Dieta Nórdica e a *Dietary Approach to Stop Hypertension*, sendo que um maior nível educacional está associado a uma maior adesão. As dietas vegetarianas são mais prevalentes entre os níveis educacionais mais elevados e menores rendimentos. Na Dieta da Saúde Planetária, observa-se uma maior adesão em áreas metropolitanas e rurais e entre rendimentos altos e baixos. São necessárias mais pesquisas para explorar os determinantes socioeconómicos da adesão à *Mediterranean-DASH Intervention to Stop Hypertension*.

CONCLUSÕES: Os hábitos alimentares são influenciados por fatores políticos e económicos, sendo importante que os governos, juntamente com outras partes interessadas, promovam ambientes saudáveis e enfrentem os restantes desafios.

PALAVRAS-CHAVE

Padrões alimentares, Custo da alimentação, Economia e política, Fatores socioeconómicos, Dietas saudáveis e sustentáveis

INTRODUCTION

Non-communicable diseases (NCDs) are the underlying cause of 74% of all deaths worldwide each year (1). In Portugal, NCDs represent 9 of the 10 main causes of death and disability combined (2), leading to long-term complications and early mortality (3). These negative outcomes are more pronounced among lower socioeconomic position (SEP) individuals, which results in a social gradient in health (1, 4). Moreover, individuals with lower SEP are less likely to purchase and consume healthy foods, which are essential for preventing these diseases and maintaining good health throughout life (1, 5-7). The increased production of processed foods, urbanization, modernization and changing lifestyles have led to changes in dietary patterns that negatively impact health and also have adverse environmental consequences, as food systems are already exceeding some planetary boundaries (6-10). It is projected that, in 2050, the world population will surpass the 9 billion people mark (10) and, as a consequence of medical advancements, and economic and social development, the age structure will shift dramatically, directing to an aging population, that may arise the prevalence of NCDs and aggravate the environmental scenario (11, 12). Given these challenges, addressing socioeconomic disparities is paramount to fostering a dietary transition towards healthy and sustainable eating patterns (10). SEP, evaluated through income, education, occupation, and place of residence, is a strong predictor of dietary habits (5, 7, 13, 14). Income affects dietary cost, shaping food purchase and consumption, given the fact that healthy foods tend to be more expensive per calorie compared to unhealthy options, that are often nutrient-poor and energy-dense (15-20). This cost burden disproportionately affects lower SEP groups (7, 17, 21, 22) and is related to Engel's Law, where richer individuals spend a larger absolute amount on food but corresponds to a smaller percentage of their income (20, 23). Understanding the connection between socioeconomic determinants and adherence to healthy and sustainable dietary patterns is crucial for designing effective interventions. This review aims to identify the available evidence regarding the association between socioeconomic determinants and the adherence to several healthy and sustainable dietary patterns.

METHODOLOGY

To conduct this review, relevant literature was identified through various databases, including PubMed, Scopus, and Web of Science. The following search expressions were used: ("MIND diet" OR "Mediterranean-Dash Intervention for Neurodegenerative Delay" OR ("Mediterranean diet" AND "Neurodegenerative Delay")) AND ((education OR income OR employment OR job OR socioeconomic OR "Social Inequalities" OR "standard of living" OR "living standard" OR "land tenure" OR "economic status" OR "social class" OR poverty) AND (determinant OR factor OR predictor)); ("Vegetarians"[Mesh]) AND "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]; (("Diet, Vegetarian"[Mesh]) AND "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]; (((("Population Characteristics"[Mesh]) OR "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]) AND ("Diet, Vegetarian"[Mesh] OR "Vegetarians"[Mesh])); ("Diet, Vegan"[Mesh]) OR "Vegans"[Mesh]) AND "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]; ("planetary health* diet"[Title] OR (planet*[Title] AND diet[Title])); planetary healthy diet OR "planetary health diet" OR "planetary diet" AND education OR income OR employment OR job OR socioeconomic OR "Social Inequalities" OR "standard of living" OR "living standard" OR "land tenure" OR "economic status" OR "social class" OR poverty AND determinant OR factor OR predictor; "planetary healthy diet" OR "planetary health diet" OR "planetary diet"; ("nordic diet" AND

(education OR income OR employment OR job OR socioeconomic OR "Social Inequalities" OR "standard of living" OR "living standard" OR "land tenure" OR "economic status" OR "social class" OR poverty) AND (determinant OR factor OR predictor)); ("Diet, Healthy"[Mesh] AND "Europe"[Mesh] AND "Socioeconomic Factors"[Mesh]) NOT (COVID OR SARS*); ("Diet, Mediterranean"[Mesh]) AND "Socioeconomic Factors"[Mesh]; (("Diet, Mediterranean"[Mesh]) AND "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]; and (("Dietary Approaches To Stop Hypertension"[Mesh]) AND "Socioeconomic Factors"[Mesh]) AND "Europe"[Mesh]. From the selected articles, similar studies were also checked. The search was conducted from March 2023 until June 2023, and updated in June 2024, and articles in English, Portuguese and Spanish published up to that date were included without any time restriction. References were managed using the bibliographic reference software EndNote 20. The literature was further refined by focusing on European countries with a very high Human Development Index (HDI > 0.8) (24), allowing a comparison among geographically close countries with similar development levels. Only articles that studied the adult population (>18 years old) were selected in this review. In addition to academic databases, electronic websites, online databases, and relevant documents of the World Health Organization, United Nations, Food and Agriculture Organization of the United Nations, the European Environment Agency, the International Food Policy Research Institute, and the European Commission were consulted to gather comprehensive information. In total, 70 references were used, encompassing a diverse range of sources such as articles, reports, books, databases, blogs, and web pages.

Socioeconomic Position

SEP is defined as a construct that represents the social and economic background of an individual or group, reflecting their relative position within a specific social structure (25). It is influenced by individual factors namely income, education, and occupation, as well as contextual factors, including regional economic development, income inequality, employment opportunities, education and healthcare quality, and social support networks (7, 26).

The dynamic interplay between socioeconomic determinants and dietary eating patterns is well stated. Investigations show that individuals with lower educational levels and lower income are associated with scarce nutritional knowledge, resulting in compromised food quality and variety (21, 22, 26). The global phenomenon of urbanization is expected to grow in size and significance, with projections indicating that nearly 70% of the global population will live in urban areas (14, 27). Despite greater social and economic development, more labour opportunities, and better essential services, these areas also concentrate poverty, preventing some individuals from ensuring adequate well-being (14). Furthermore, investigations also suggest that supermarket access plays an important role in diet quality, and depending on where individuals live (place of residence), it may cause the lack of access to healthy foods (14, 28).

Therefore, it becomes imperative to understand the association between socioeconomic determinants and the adoption of healthy sustainable dietary patterns. There is no ideal diet that corresponds to specifications. Instead, there is a wide diversity of dietary patterns, explored below.

Mediterranean Diet

Regarding the Mediterranean Diet (MD), higher-income individuals were more likely to demonstrate greater adherence, a consistent fact among five studies (18, 21, 29-31). Results concerning occupational status are

incongruous across different studies due to the different categorizations of this socioeconomic determinant. Two studies found no significant association with occupational status (29, 32), while another indicated that individuals with lower occupational status were more likely to have higher adherence to the MD, compared to unemployed individuals and those with medium or higher occupational levels (33). Investigations suggest that individuals in managerial or professional occupations, compared to routine, technical, and other occupations, tend to exhibit higher adherence to the MD (18), as well as those with more qualified employment too when considering these categories: student, worker, farmer, professional, merchants, unemployed, employed and pensioner (31). Conversely, one study suggested that unemployed individuals were more likely to exhibit higher adherence to the MD, potentially influenced by the cultural heritage maintenance on Mediterranean Islands (34). Regarding education, eight out of fifteen studies proved that participants with a higher educational level were more likely to have a higher adherence score to the MD (7, 18, 21, 29, 35-38). Three studies showed no significant association (31, 39, 40), two showed higher adherence among those with a medium educational level (32, 33), and one investigation demonstrated that higher education was associated with lower adherence to the MD, that may be attributed to the intake of animal products or processed food during a period of nutrition transition with urbanization and increased income levels in Portugal (30). Lastly, research conducted on Maltese adults identified that both higher and lower educational attainment, compared to a medium level, were associated with higher adherence (34). Furthermore, two studies demonstrated that individuals living in semi-urban and urban areas were more likely to exhibit lower adherence (13, 30), one study showed no significant association (29), while another study found similar adherence between rural and urban areas (32). Supermarket availability is crucial, as a study found higher MD adherence in wealthier areas (41) and a research on Mediterranean Islands shows that higher MD scores are associated with higher SEP, based on income, occupation, and education (13). One limitation of this review is the varied assessment of MD adherence using different scoring systems.

Nordic Diet

Only one study was found, which evaluated adherence to the Nordic Diet (ND) using the Healthy Nordic Food Index. This investigation conducted with Swedish women showed higher educational attainment among high versus low adherence (42).

Dietary Approach to Stop Hypertension

One study suggests that individuals with higher income were more likely to exhibit a higher Dietary Approach to Stop Hypertension (DASH) score, while those with lower educational level were more likely to have a lower score. Lower scores were more frequent among individuals with routine occupations compared to those with higher managerial and professional occupations, lower managerial and professional occupations, intermediate occupations, small employers and own account workers, lower supervisory and technical occupations, and semi-routine occupations (16).

Vegetarian Diet

In this review, the vegetarian diet is considered to encompass various plant-based dietary patterns that may involve the exclusion of certain or all animal products from consumption (43). A French study found that, compared to meat-eaters, vegetarians and vegans were more likely to be self-employed or never employed than managerial staff and lower income was associated with a higher likelihood of adopting a vegetarian

or vegan diet compared to meat-eaters (44). Three studies supported the idea that individuals with higher educational levels were more likely to be vegetarians (non-meat consumers) (45-47). Additionally, research demonstrates that individuals with lower educational level were more likely to be vegans (44). However, in a recent study, comparing the adoption of the MD to a vegetarian diet, no significant differences were found across various levels of education, income, or place of residence (48).

Planetary Health Diet

According to a study conducted among nutrition students in Turkey, using the Planetary Health Diet Index, higher scores were associated with living in metropolitan and rural areas compared to urban areas (49). Regarding income, individuals with both high and low income had higher scores than those with adequate income (categorization defined by the balance between expenses and income) (49). Also, significant regional differences were also found, with mean scores in coastal regions (Marmara, Aegean, Mediterranean, Black Sea, Eastern Anatolia, Southeast Anatolia) being significantly higher than those in central Anatolia (49).

Mediterranean-DASH Intervention for Neurodegenerative Delay

There is no evidence establishing a connection between socioeconomic determinants and adherence to this diet.

Limitations

Despite some findings, further research is necessary to fully understand these dynamics. Limitations include the cross-sectional nature of the studies, which hinders causal inferences, and unmeasured confounders, such as early-life socioeconomic conditions.

Politics, Economics, and Health

Governments must support healthy and sustainable diets by shaping food environments through policies that regulate composition, labelling, marketing, and fiscal measures in order to guide consumer choices (10, 50, 51). Research indicates that taxes or subsidies on particular food items or ingredients can have an impact on individuals' food choices by making healthier options more affordable and discouraging the consumption of unhealthy products (10, 50, 52). Due to the significant influence of dietary cost on food choices and consumption patterns, it is imperative to explore the feasibility and affordability of sustainable healthy diets. Studies show that higher adherence to the MD and DASH diet is linked to higher dietary costs compared to lower adherence and to the Western Diet (7, 18, 28, 53-56). The vegetarian diet is generally more affordable than the MD, except for the vegan diet (53). As far as the other diets are concerned, there is no available evidence regarding their costs. Moreover, the higher costs associated with healthier diets have been identified as a significant factor contributing to a decline in adherence to the MD and the DASH, particularly among those with lower SEP, a trend further accelerated by the 2007 economic crisis (33, 39, 55, 57-59). However, recent studies indicate that their adherence have been increasing more prominently among individuals in a comfortable economic situation (16, 60).

As previously stated, the connection between dietary cost and economic crises is clear and may be understood through various mechanisms. Economic crises may lead to inflation, causing prices of essential commodities, including food, to rise (61). The instability in the economy can also result in price volatility in agricultural markets, making food prices unpredictable and prone to sudden spikes (62).

Economic crises often result in higher unemployment and lower household incomes, significantly reducing the money available for food (7, 61, 63). Besides the lingering effects of the 2007 economic crisis, the COVID-19 pandemic has further aggravated the situation, causing higher unemployment rates, decreased earnings and incomes, and the war in Ukraine has contributed to increased prices and historical rates of inflation (50, 63-66). Recently, constant disruptions of global trade, particularly in the Red Sea and Panama Canal, due to geopolitical and environmental shocks, have forced exporters to find more costly alternatives for their shipping routes (67). It is crucial to consider the impact of climate change on the ongoing global food crisis (68). The general population is exposed, but it is the disadvantaged groups that are more noticeably affected, worsening food access disparities. (7, 69). The combined forces of urbanization, population growth, and the globalization of the food market have been also indicated as the causes of a substantial change in dietary and lifestyle patterns. These concerns can only be addressed through collaborative efforts at scale, involving partnerships with governments and food systems experts (65, 68). A holistic, multi-stakeholder approach is essential for changing dietary habits, tackling cultural, political, and economic challenges to promote healthy, sustainable, and equitable food systems (10, 50). Furthermore, it is imperative for governments to prioritize investments in education. The International Monetary Fund (IMF) emphasizes education's key role in promoting equality, social mobility, and reducing income disparities and breaking intergenerational cycles of poverty (70). Given the aforementioned factors, it is crucial to stabilize dietary costs and address the political and economic contexts that influence population's life in order to promote healthy dietary patterns.

CONCLUSIONS

The present review reported that SEP influences the adherence to healthy and sustainable eating patterns. It revealed that higher educational attainment, incomes, and occupational levels are associated with healthier dietary patterns. Adopting a plant-forward way of eating has health benefits and also contributes to environmental sustainability. However, socioeconomic inequalities, particularly exacerbated during periods of economic and political instability, are associated with disparities in food access. Identifying individuals with lower SEP is essential for the implementation of public policies that promote the well-being of the population. Governments must strive to improve the quality of life by focusing on areas such as economic growth, employment opportunities, housing, price stability, and education. Health and food literacy hold immense importance. For the population, understanding health and food choices empowers individuals to make informed decisions, prevent NCDs, and adopt healthier lifestyles. For policymakers, it allows for the creation of interventions that approach key health challenges, promote healthy eating behaviours, and reduce health inequalities. Efforts to address the social determinants of health and reduce socioeconomic disparities are crucial for promoting health equity and improving overall population health. Nutritionists play a vital role in facilitating dietary transitions towards better health. The growing challenge lies in preventing periods of economic and financial instability from escalating into health and social crises.

CONFLICTS OF INTEREST

None of the authors reported a conflict of interest.

AUTHORS' CONTRIBUTIONS

MS: Conception, bibliographic research, and writing of the first versions of the manuscript; BB: Conception and coordination of the work, final review.

REFERENCES

1. World Health Organization. Noncommunicable diseases 2023 [Available from: <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>].
2. Institute for Health Metrics and Evaluation. Global Burden of Disease [Available from: <https://www.healthdata.org/portugal>].
3. Pan American Health Organization (PAHO). Noncommunicable Diseases [Available from: <https://www.paho.org/en/topics/noncommunicable-diseases>].
4. World Health Organization. Social determinants of health [Available from: <https://www.who.int/health-topics/social-determinants-of-health>].
5. Affret A, Severi G, Dow C, Rey G, Delpierre C, Boutron-Ruault MC, et al. Socio-economic factors associated with a healthy diet: results from the E3N study. *Public Health Nutr.* 2017;20(9):1574-1583.
6. World Health Organization. Healthy diet 2020 [Available from: <https://www.who.int/news-room/fact-sheets/detail/healthy-diet>].
7. Pribisalić A, Popović R, Salvatore FP, Vatauvuk M, Mašanović M, Hayward C, et al. The Role of Socioeconomic Status in Adherence to the Mediterranean Diet and Body Mass Index Change: A Follow-Up Study in the General Population of Southern Croatia. *Nutrients.* 2021;13(11).
8. United Nations. Population, food security, nutrition and sustainable development. 2021.
9. Food and Agriculture Organization. Global agriculture towards 2050/2009.
10. World Health Organization, Food and Agriculture Organization of the United Nations. Sustainable healthy diets: guiding principles. Geneva 2019.
11. United Nations. World population ageing. New York 2013.
12. United Nations Department of Economic and Social Affairs. World Population Ageing 2019.
13. Katsarou A, Tyrovolas S, Psaltopoulou T, Zeimbekis A, Tsakountakis N, Bountziouka V, et al. Socio-economic status, place of residence and dietary habits among the elderly: the Mediterranean islands study. *Public Health Nutr.* 2010;13(10):1614-1621.
14. Vilar-Compte M, Burrola-Méndez S, Lozano-Marrufo A, Ferré-Eguiluz I, Flores D, Gaitán-Rossi P, et al. Urban poverty and nutrition challenges associated with accessibility to a healthy diet: a global systematic literature review. *Int J Equity Health.* 2021;20(1):40.
15. Pinho MGM, Mackenbach JD, Charreire H, Oppert JM, Bárdos H, Glonti K, et al. Exploring the relationship between perceived barriers to healthy eating and dietary behaviours in European adults. *Eur J Nutr.* 2018;57(5):1761-1770.
16. Patel L, Alicandro G, La Vecchia C. Dietary Approaches to Stop Hypertension (DASH) diet and associated socio-economic inequalities in the UK. *Br J Nutr.* 2020;124(10):1076-1085.
17. Rubini A, Vilaplana-Prieto C, Flor-Aleman M, Yeguas-Rosa L, Hernández-González M, Félix-García FJ, et al. Assessment of the Cost of the Mediterranean Diet in a Low-Income Region: Adherence and Relationship with Available Incomes. *BMC Public Health.* 2022;22(1):58.
18. Tong TYN, Imamura F, Monsivais P, Brage S, Griffin SJ, Wareham NJ, et al. Dietary cost associated with adherence to the Mediterranean diet, and its variation by socio-economic factors in the UK Fenland Study. *Br J Nutr.* 2018;119(6):685-694.
19. de Mestral C, Khalatbari-Soltani S, Stringhini S, Marques-Vidal P. Fifteen-year trends in the prevalence of barriers to healthy eating in a high-income country. *Am J Clin Nutr.* 2017;105(3):660-668.
20. Darmon N, Drewnowski A. Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: a systematic review and analysis. *Nutr Rev.* 2015;73(10):643-660.
21. Cavaliere A, De Marchi E, Banterle A. Exploring the Adherence to the Mediterranean Diet and Its Relationship with Individual Lifestyle: The Role of Healthy Behaviors, Pro-Environmental Behaviors, Income, and Education. *Nutrients.* 2018;10(2).
22. Mackenbach JD, Dijkstra SC, Beulens JWW, Seidell JC, Snijder MB, Stronks K, et al. Socioeconomic and ethnic differences in the relation between dietary costs and dietary quality: the HELIUS study. *Nutr J.* 2019;18(1):21.
23. Patel L, Alicandro G, Bertuccio P, La Vecchia C. Educational inequality in the Dietary Approach to Stop Hypertension diet in the UK: evaluating the mediating role of income. *Br J Nutr.* 2021;126(12):1897-1903.

24. United Nations Development Programme. Human Development Report 2021-22. Available from: <http://report.hdr.undp.org>.
25. Michalos AC. Encyclopedia of quality of life and well-being research: Springer Netherlands Dordrecht; 2014.
26. Shavers VL. Measurement of socioeconomic status in health disparities research. *J Natl Med Assoc.* 2007;99(9):1013-1023.
27. United Nations. World Urbanization Prospects 2018.
28. Mackenbach JD, Burgoine T, Lakerveld J, Forouhi NG, Griffin SJ, Wareham NJ, et al. Accessibility and Affordability of Supermarkets: Associations With the DASH Diet. *Am J Prev Med.* 2017;53(1):55-62.
29. Biasini B, Rosi A, Menozzi D, Scazzina F. Adherence to the Mediterranean Diet in Association with Self-Perception of Diet Sustainability, Anthropometric and Sociodemographic Factors: A Cross-Sectional Study in Italian Adults. *Nutrients.* 2021;13(9).
30. Rodrigues SS, Caraher M, Trichopoulou A, de Almeida MD. Portuguese households' diet quality (adherence to Mediterranean food pattern and compliance with WHO population dietary goals): trends, regional disparities and socioeconomic determinants. *Eur J Clin Nutr.* 2008;62(11):1263-1272.
31. Vitale M, Racca E, Izzo A, Giacco A, Parente E, Riccardi G, et al. Adherence to the traditional Mediterranean diet in a population of South of Italy: factors involved and proposal of an educational field-based survey tool. *Int J Food Sci Nutr.* 2019;70(2):195-201.
32. Grosso G, Marventano S, Giorgianni G, Raciti T, Galvano F, Mistretta A. Mediterranean diet adherence rates in Sicily, southern Italy. *Public Health Nutr.* 2014;17(9):2001-2009.
33. Marventano S, Godos J, Platania A, Galvano F, Mistretta A, Grosso G. Mediterranean diet adherence in the Mediterranean healthy eating, aging and lifestyle (MEAL) study cohort. *Int J Food Sci Nutr.* 2018;69(1):100-107.
34. Cuschieri S, Libra M. Adherence to the Mediterranean Diet in Maltese Adults. *Int J Environ Res Public Health.* 2020;18(1).
35. Marques-Vidal P, Waeber G, Vollenweider P, Bochud M, Stringhini S, Guessous I. Sociodemographic and Behavioural Determinants of a Healthy Diet in Switzerland. *Ann Nutr Metab.* 2015;67(2):87-95.
36. Dinu M, Pagliai G, Giangrandi I, Colombini B, Toniolo L, Gensini G, et al. Adherence to the Mediterranean diet among Italian adults: results from the web-based Medi-Lite questionnaire. *Int J Food Sci Nutr.* 2021;72(2):271-279.
37. Leone A, Battezzati A, De Amicis R, De Carlo G, Bertoli S. Trends of Adherence to the Mediterranean Dietary Pattern in Northern Italy from 2010 to 2016. *Nutrients.* 2017;9(7).
38. León-Muñoz LM, Guallar-Castillón P, Graciani A, López-García E, Mesas AE, Aguilera MT, et al. Adherence to the Mediterranean diet pattern has declined in Spanish adults. *J Nutr.* 2012;142(10):1843-1850.
39. Romaguera D, Bania C, Pons A, Tur JA, Trichopoulou A. Food patterns and Mediterranean diet in western and eastern Mediterranean islands. *Public Health Nutr.* 2009;12(8):1174-1181.
40. Tur JA, Romaguera D, Pons A. Adherence to the Mediterranean dietary pattern among the population of the Balearic Islands. *Br J Nutr.* 2004;92(3):341-346.
41. Tsiampalis T, Faka A, Kouvari M, Psaltopoulou T, Pitsavos C, Chalkias C, et al. The impact of socioeconomic and environmental determinants on Mediterranean diet adherence: a municipal-level spatial analysis in Athens metropolitan area, Greece. *Int J Food Sci Nutr.* 2021;72(2):259-270.
42. Roswall N, Eriksson U, Sandin S, Löf M, Olsen A, Skeie G, et al. Adherence to the healthy Nordic food index, dietary composition, and lifestyle among Swedish women. *Food and Nutrition Research.* 2015;59.
43. World Health Organization. Plant-based diets and their impact on health, sustainability and the environment: a review of the evidence. 2021.
44. Allès B, Baudry J, Méjean C, Touvier M, Péneau S, Hercberg S, et al. Comparison of Sociodemographic and Nutritional Characteristics between Self-Reported Vegetarians, Vegans, and Meat-Eaters from the NutriNet-Santé Study. *Nutrients.* 2017;9(9).
45. Ponzio E, Mazzarini G, Gasperi G, Bottoni MC, Vallorani S. The Vegetarian Habit in Italy: Prevalence and Characteristics of Consumers. *Ecol Food Nutr.* 2015;54(4):370-379.
46. Koch F, Heuer T, Krems C, Claupein E. Meat consumers and non-meat consumers in Germany: a characterisation based on results of the German National Nutrition Survey II. *J Nutr Sci.* 2019;8:e21.
47. Hoek AC, Luning PA, Stafleu A, de Graaf C. Food-related lifestyle and health attitudes of Dutch vegetarians, non-vegetarian consumers of meat substitutes, and meat consumers. *Appetite.* 2004;42(3):265-272.
48. Sandri E, Sguanci M, Cantín Larumbe E, Cerdá Olmedo G, Werner LU, Piredda M, et al. Plant-Based Diets versus the Mediterranean Dietary Pattern and Their Socio-Demographic Determinants in the Spanish Population: Influence on Health and Lifestyle Habits. *Nutrients.* 2024;16(9).
49. Navruz-Varlı S, Mortaş H, Çelik MN. Sociodemographic Trends in Planetary Health Diets among Nutrition Students in Türkiye: Bridging Classroom to Kitchen. *Nutrients.* 2024;16(9).
50. World Health Organization. Transforming food systems to reduce global inequality and improve food safety and health. 2023.
51. World Health Organization. Action framework for developing and implementing public food procurement and service policies for a healthy diet. Geneva 2021.
52. Djojoseparto SK KC, Vandevijvere S, Harrington JM and Poelman MP. The Healthy Food Environment Policy Index (Food-EPI): European Union. An assessment of EU-level policies influencing food environments and priority actions to create healthy food environments in the EU. 2021.
53. Kabisch S, Wenschuh S, Buccellato P, Spranger J, Pfeiffer AFH. Affordability of Different Isocaloric Healthy Diets in Germany-An Assessment of Food Prices for Seven Distinct Food Patterns. *Nutrients.* 2021;13(9).
54. Lopez CN, Martinez-Gonzalez MA, Sanchez-Villegas A, Alonso A, Pimenta AM, Bes-Rastrollo M. Costs of Mediterranean and western dietary patterns in a Spanish cohort and their relationship with prospective weight change. *J Epidemiol Community Health.* 2009;63(11):920-927.
55. Alves RM, Lopes CMM, Rodrigues SSP, Perelman J. Adhering to a Mediterranean diet in a Mediterranean country: an excess cost for families? *Br J Nutr.* 2022;128(7):1393-1400.
56. Monsivais P, Scarborough P, Lloyd T, Mizdrak A, Luben R, Mulligan AA, et al. Greater accordance with the Dietary Approaches to Stop Hypertension dietary pattern is associated with lower diet-related greenhouse gas production but higher dietary costs in the United Kingdom. *Am J Clin Nutr.* 2015;102(1):138-145.
57. Mendonça N, Gregório MJ, Salvador C, Henriques AR, Canhão H, Rodrigues AM. Low Adherence to the Mediterranean Diet Is Associated with Poor Socioeconomic Status and Younger Age: A Cross-Sectional Analysis of the EpiDoC Cohort. *Nutrients.* 2022;14(6).
58. Ruggiero E, Di Castelnuovo A, Costanzo S, Persichillo M, Bracone F, Cerletti C, et al. Socioeconomic and psychosocial determinants of adherence to the Mediterranean diet in a general adult Italian population. *Eur J Public Health.* 2019;29(2):328-335.
59. Bonaccio M, Di Castelnuovo A, Bonanni A, Costanzo S, De Lucia F, Persichillo M, et al. Decline of the Mediterranean diet at a time of economic crisis. Results from the Moli-sani study. *Nutr Metab Cardiovasc Dis.* 2014;24(8):853-860.
60. Alves R, Perelman J. European mature adults and elderly are moving closer to the Mediterranean diet-a longitudinal study, 2013-19. *Eur J Public Health.* 2022;32(4):600-605.
61. Braun vJ. Food and financial crises. 2008.
62. European Commission. Agricultural markets and international trade.
63. European Union. A decade on from the crisis: Main responses and remaining challenges. 2019.
64. Glauber J, Laborde D. Repurposing food and agricultural policies to deliver affordable healthy diets, sustainably and inclusively: what is at stake? 2023.
65. European Parliament. Russia's war on Ukraine: Impact on food security and EU response 2022.
66. Sun Z, Scherer L, Zhang Q, Behrens P. Adoption of plant-based diets across Europe can improve food resilience against the Russia-Ukraine conflict. *Nature Food.* 2022;3(11):905-910.
67. Glauber J, Mamun A. Impacts of Red Sea shipping disruptions on global food security 2024 [Available from: <https://www.ifpri.org/blog/impacts-red-sea-shipping-disruptions-global-food-security>].

68. World Food Programme. War in Ukrain drives Global Food Crisis. 2022.
69. Bonaccio M, Bes-Rastrollo M, de Gaetano G, Iacoviello L. Challenges to the Mediterranean diet at a time of economic crisis. *Nutr Metab Cardiovasc Dis.* 2016;26(12):1057-1063.
70. International Monetary Fund. Why Education Policies Matter for Equality 2014 [Available from: <https://www.imf.org/en/Blogs/Articles/2014/09/08/why-education-policies-matter-for-equality>].