



A Comparative Analysis of Vegetarian and Meat-Based Diets: Benefits, Costs, and Health Consequences

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Abstract

Dietary choices significantly influence human health, environmental sustainability, and economic outcomes. This paper compares vegetarian and meat-based diets, focusing on health consequences, nutrient adequacy, economic costs, and environmental impacts. The primary objectives are to evaluate the health benefits and risks associated with each dietary pattern, analyse the ecological and economic implications, and provide evidence-based recommendations for sustainable, health-promoting food systems. A comparative conceptual approach synthesises epidemiological studies, nutritional research, and life-cycle assessment data to identify patterns and trade-offs between plant-forward and meat-heavy diets. Findings indicate that vegetarian and plant-forward diets are consistently associated with lower risks of cardiovascular disease, type 2 diabetes, certain cancers, and obesity. These diets provide abundant fibre, antioxidants, and phytochemicals, supporting metabolic and immune health, while reducing long-term healthcare expenditures. Meat-based diets provide essential nutrients, including complete proteins, heme iron, vitamin B12, and zinc. However, excessive consumption of red and processed meats is linked to elevated chronic disease risk and a larger ecological footprint. Economic and environmental analyses reveal that plant-based diets generally have lower greenhouse gas emissions, reduced water and land use, and enhanced sustainability. However, accessibility and affordability remain challenges in some regions. Integrated strategies that combine plant-forward diets with moderate lean meat intake, public health education, and supportive food system policies can optimise health, environmental, and economic outcomes. The study underscores the importance of considering individual, societal, and planetary health in dietary planning and offers practical recommendations for policymakers, healthcare professionals, and consumers seeking sustainable nutrition solutions.

Keywords: Vegetarian diet, Meat-based diet, Health outcomes, Environmental sustainability, Nutrient adequacy, Dietary policy.

Introduction

Dietary choices profoundly influence both individual health outcomes and broader societal wellbeing. Vegetarian and meat-based diets represent two widely practised nutritional paradigms, each associated with distinct health implications, nutrient profiles, and sustainability challenges (Craig, 2009). Vegetarian diets exclude meat and sometimes other animal products, emphasising fruits, vegetables, legumes, grains, and nuts, while meat-based diets rely heavily on animal proteins alongside plant foods. Contemporary evidence suggests that dietary patterns significantly affect the risk of chronic diseases, including cardiovascular disease, type 2 diabetes, obesity, and certain cancers, as well as overall life expectancy (Dinu et al., 2017). Beyond personal health, these diets differ in their environmental footprints, influencing greenhouse gas emissions, water consumption, land use, and biodiversity (Tilman & Clark, 2014). Economic factors, such as food affordability, accessibility, and healthcare costs, further shape dietary choices and adherence patterns. Understanding these multidimensional impacts is crucial for informed individual choices, public health strategies, and global food policy.

Vegetarian diets are increasingly promoted for their potential to reduce chronic disease risk, improve metabolic health, and support sustainable food systems (Dinu et al., 2017; Satija et al., 2016). However, such diets may present challenges related to nutrient adequacy, particularly for protein, vitamin B12, iron, zinc, and omega-3 fatty acids, which require careful dietary planning or supplementation (Craig, 2009). Conversely, meat-based diets provide high-quality proteins, heme iron, and essential micronutrients that are often more bioavailable than those from plant sources, contributing to growth, neurological function, and athletic performance (Micha et al., 2017). However, excessive or predominantly processed meat consumption has been associated with increased risks of cardiovascular disease, certain cancers, and metabolic disorders (Pan et al., 2012). These contrasting nutritional and health implications highlight the need to evaluate both diets holistically, considering both benefits and potential adverse outcomes. Additionally, diet-related health disparities may be influenced by socio-economic context, food system infrastructure, and cultural preferences. Comparative analysis can inform personalised nutrition, public health guidance, and sustainable food policy development.

This paper aims to provide a comprehensive comparative analysis of vegetarian and meat-based diets, focusing on health consequences, nutritional benefits, and environmental and economic costs. Specifically, the objectives are to: (1) examine the health outcomes and chronic disease risks associated with each diet; (2) evaluate the nutritional adequacy and potential deficiencies of vegetarian and meat-based dietary patterns; (3) assess the economic and environmental costs, including sustainability considerations; and (4) provide evidence-based recommendations for diet choices that balance health, affordability, and ecological responsibility. By integrating nutritional epidemiology, environmental science, and economic perspectives, the study offers a multidimensional understanding of dietary trade-offs. The analysis is intended to guide individuals, policymakers, and health professionals in making informed, context-sensitive dietary decisions. Achieving a balance among nutritional adequacy, disease prevention, and sustainability is central to this study's objectives. The findings aim to contribute to the broader discourse on public health, sustainable food systems, and global nutrition equity.

Ultimately, understanding the complex interplay between diet, health, and sustainability is critical in the context of rising chronic disease prevalence and environmental degradation. The growing global population and shifting food systems amplify the importance of making dietary choices that are both health-promoting and environmentally sustainable (Tilman & Clark, 2014). Evidence-based dietary guidance can help mitigate public health risks while promoting ecological stewardship and socio-economic equity. Comparing vegetarian and meat-based diets enables identification of strategies to optimise nutrient intake, reduce disease risk, and minimise environmental impacts. Furthermore, the analysis highlights gaps in research, policy, and practice that require attention to ensure equitable access to nutritious, sustainable food. By integrating multiple disciplinary perspectives, the paper seeks to provide actionable insights for individuals, health practitioners, and policymakers alike. In sum, this study advances understanding of the trade-offs, benefits, and challenges inherent in adopting vegetarian versus meat-based dietary patterns.

Theoretical Framework

This study is anchored in the **Nutrition Transition Theory** (Popkin, 2017) and the **Life-Cycle Assessment (LCA) framework** (Garnett, 2011). Nutrition Transition Theory examines global dietary shifts from traditional, plant-based patterns to energy-dense, animal-based diets, highlighting the rising prevalence of chronic diseases such as obesity, cardiovascular disease, and type 2 diabetes. It explains how urbanisation, economic growth, and globalised food markets influence dietary behaviour, often promoting high-calorie, nutrient-poor diets at the expense of traditional, nutrient-rich foods. Understanding these transitions is crucial for analysing the differential health impacts of vegetarian and meat-based diets. Nutrition Transition Theory also considers socio-cultural determinants, including food preferences, cultural norms, and access to resources, which shape dietary choices. By applying this lens, the study can contextualise diet-related health outcomes within broader social and economic trends. This approach underscores the importance of evaluating diet not only nutritionally but also in relation to public health and societal factors.

The **Life-Cycle Assessment (LCA) framework** complements this perspective by quantifying the environmental impacts of food production, processing, distribution, and consumption (Garnett, 2011). LCA evaluates resource use—land, water, and energy—and measures outputs such as greenhouse gas emissions and waste, enabling comparisons across dietary patterns. In the context of meat-based diets, LCA highlights the high ecological costs of animal agriculture relative to plant-based food production. Conversely, plant-forward diets typically have lower environmental footprints, contributing to sustainable food systems and climate mitigation efforts. Integrating LCA with Nutrition Transition Theory allows the study to link individual dietary choices to global environmental outcomes. This dual approach enables assessment of trade-offs between nutritional adequacy, health outcomes, and ecological sustainability. It also provides a scientific basis for policy recommendations to promote diets that are both healthful and environmentally responsible.

Integrating these frameworks supports a holistic understanding of **dietary trade-offs and synergies**. Nutrition Transition Theory addresses the social, economic, and health dimensions of diet, while LCA captures ecological and resource-use consequences. Together, they allow the study to evaluate how vegetarian and meat-based diets interact with human health, environmental sustainability, and socio-economic factors simultaneously. This approach also facilitates identification of leverage points where dietary interventions can maximise benefits while minimising adverse outcomes. For example, reducing meat consumption in high-income, urbanised populations could improve cardiovascular health while decreasing greenhouse gas emissions. Similarly, promoting diverse plant-based diets can address nutrient adequacy and enhance food security. By linking multiple dimensions, the study provides a comprehensive framework for evidence-based dietary recommendations.

Finally, this dual theoretical lens informs the **objectives and methodology** of the study. Combining nutrition, environmental science, and socio-economic analysis allows for a systematic evaluation of the benefits, costs, and health consequences of vegetarian versus meat-based diets. The framework supports comparative analysis of dietary patterns at both individual and population levels, accounting for nutrient intake, disease risk, accessibility, and ecological impact. It also guides the interpretation of literature, policy documents, and empirical data, ensuring an integrated perspective. This approach facilitates practical recommendations for individuals, healthcare providers, and policymakers seeking to optimise health and sustainability outcomes. Moreover, it highlights areas for future research, including longitudinal studies on diet-environment-health interactions. Overall, the theoretical framework provides a rigorous foundation for understanding and comparing vegetarian and meat-based dietary patterns.

Literature Review

Health Benefits of Vegetarian Diets

Vegetarian diets are consistently associated with reduced risks of cardiovascular disease, hypertension, obesity, type 2 diabetes, and some cancers, making them a key preventive strategy in public health (Dinu et al., 2017). Epidemiological studies indicate that vegetarians often exhibit lower total cholesterol and blood pressure levels compared with omnivorous populations, contributing to improved long-term cardiovascular outcomes (Craig, 2009). Diets rich in fruits, vegetables, legumes, nuts, and whole grains provide abundant dietary fibre, antioxidants, vitamins, and phytochemicals that confer anti-inflammatory, cardioprotective, and metabolic benefits (Satija et al., 2016). Emerging evidence also suggests that vegetarian diets are associated with greater gut microbiome diversity, which may enhance immune function, metabolic regulation, and overall health resilience (Tomova et al., 2019). However, vegetarians are at risk of nutrient deficiencies, particularly vitamin B12, iron, zinc, and omega-3 fatty acids, necessitating supplementation or careful dietary planning (Craig, 2009). Despite these challenges, well-planned vegetarian diets can meet recommended dietary allowances, supporting optimal growth, cognitive function, and ageing-related health outcomes. Overall, vegetarian diets represent a preventive dietary pattern that balances nutrient intake with reduced chronic disease risk.

Health Consequences of Meat-Based Diets

Meat-based diets provide complete proteins and essential micronutrients, including heme iron, vitamin B12, and zinc, which are critical for growth, neurological function, and muscle maintenance (Micha et al., 2017). However, excessive consumption of red and processed meats has been strongly linked to higher risks of cardiovascular disease, colorectal cancer, and metabolic disorders (Pan et al., 2012). Saturated fats and cholesterol present in animal products contribute to atherogenic lipid profiles, while specific meat processing techniques introduce carcinogenic compounds such as nitrosamines (Bouvard et al., 2015). High intake of meat is also associated with obesity, insulin resistance, and systemic inflammation, particularly in industrialised societies where sedentary lifestyles amplify dietary risks (Micha et al., 2017). Nevertheless, moderate consumption of lean meats, poultry, and fish can provide essential nutrients without substantially increasing disease risk, highlighting the importance of portion size, preparation, and frequency. Meat-based diets may also enhance satiety, support anabolic function, and contribute to performance and recovery in physically active individuals. These findings illustrate that meat consumption entails both nutritional advantages and significant long-term health risks when not balanced with plant-based foods.

Economic Costs of Dietary Patterns

Economic considerations play a central role in shaping dietary behaviours and access to nutrition. Meat production is generally more resource-intensive and costly, both in terms of direct food prices and indirect healthcare expenditures due to diet-related chronic diseases (Springmann et al., 2016). Populations consuming high amounts of animal products often face higher medical costs associated with obesity, cardiovascular disease, diabetes, and certain cancers. In contrast, plant-based diets can reduce long-term healthcare expenditures by lowering chronic disease risk, representing a cost-effective strategy for public health systems (Dinu et al., 2017). However, some plant-based alternatives, fortified foods, and nutrient supplements may carry higher production costs or require long-distance transport, affecting affordability and accessibility for low-income populations (Hulshof et al., 2022). Economic inequities can limit access to both high-quality plant foods and lean animal protein, reinforcing health disparities. Therefore, economic analyses of diet must consider both immediate food costs and broader societal expenditures associated with long-term health outcomes.

Environmental Costs of Dietary Patterns

Meat-based diets have substantial environmental consequences, including higher greenhouse gas emissions, land use, water consumption, and energy requirements compared with plant-based diets (Tilman & Clark, 2014). These environmental burdens contribute to climate change, biodiversity loss, and ecosystem degradation, raising significant sustainability concerns for meat-heavy dietary patterns. Conversely, vegetarian diets generally have lower ecological footprints, requiring less land and water while producing fewer greenhouse gases, thus supporting environmental sustainability (Garnett, 2011). Plant-forward diets can also enhance food system resilience by reducing dependency on resource-intensive livestock production. However, environmental impacts of certain plant-based substitutes and imported products must be

considered, as long-distance transport and processing can increase energy use and carbon emissions (Hulshof et al., 2022). Access to fresh, local produce is often limited in low-income and urban regions, highlighting the intersection of environmental sustainability and social equity. Overall, environmental considerations reinforce the public health and economic rationale for promoting balanced, plant-forward dietary patterns globally.

Methods

This study adopts a **comparative conceptual approach**, synthesising epidemiological, nutritional, and environmental literature to evaluate vegetarian and meat-based diets. Peer-reviewed journal articles, global nutrition databases, systematic reviews, meta-analyses, and life-cycle assessment (LCA) reports were examined to capture multidimensional outcomes of dietary patterns. Keywords for the literature search included “vegetarian diet,” “vegan diet,” “meat-based diet,” “chronic disease,” “nutrient deficiency,” “environmental impact,” and “economic cost.” Databases searched included PubMed, Scopus, Web of Science, and Google Scholar, ensuring comprehensive coverage of nutritional, public health, and sustainability literature. Data were screened for relevance, methodological quality, and publication date, with priority given to studies conducted between 2010 and 2025. This approach enabled a rigorous comparison of health outcomes, environmental footprints, and socio-economic impacts associated with each diet. By integrating multiple sources of evidence, the study ensures a robust, multidimensional assessment of dietary trade-offs.

A **thematic synthesis** was employed to identify patterns and recurring findings across the literature, focusing on three core dimensions: health outcomes, economic costs, and environmental impacts. Health outcomes included chronic disease risk, nutrient adequacy, and metabolic indicators, while economic costs considered both direct food prices and long-term healthcare expenditures. Environmental impacts were assessed through life-cycle analysis, encompassing land use, water consumption, energy input, and greenhouse gas emissions (Garnett, 2011; Tilman & Clark, 2014). The synthesis enabled comparison of vegetarian and meat-based diets in terms of both individual and societal consequences. Interpretive analysis facilitated the integration of nutritional science, public health, and ecological frameworks, highlighting areas of convergence and conflict between dietary patterns. This qualitative approach allowed for nuanced evaluation beyond single metrics, capturing complex trade-offs and contextual factors. Triangulating evidence from diverse sources enhances the validity and generalisability of the findings.

The methodology also incorporates **comparative analysis**, juxtaposing vegetarian and meat-based diets to identify benefits, risks, and systemic implications. Nutritional adequacy, chronic disease prevalence, and metabolic markers were evaluated using epidemiological and clinical studies (Dinu et al., 2017; Micha et al., 2017). Economic considerations were drawn from cost-effectiveness studies, healthcare expenditure analyses, and food accessibility research (Springmann et al., 2016; Hulshof et al., 2022). Environmental comparisons relied on life-cycle assessment data, including resource use, carbon footprint, and ecosystem impact (Garnett, 2011; Tilman & Clark, 2014). This integrative design supports the identification of dietary strategies that optimise health, environmental sustainability, and economic feasibility simultaneously. By

linking evidence across domains, the study provides actionable insights for policymakers, public health practitioners, and individual decision-making. Comparative evaluation ensures that the trade-offs inherent in each dietary pattern are clearly articulated.

Finally, the study's **interpretive, qualitative approach** allows for a holistic synthesis of findings, connecting theory, evidence, and practical implications. The dual framework of Nutrition Transition Theory and Life-Cycle Assessment guides analysis, situating individual dietary choices within global health, environmental, and socio-economic contexts (Popkin, 2017; Garnett, 2011). This approach facilitates identification of leverage points for intervention, such as promoting plant-forward diets, improving nutrient supplementation, or supporting sustainable food systems. Limitations of the methodology, including reliance on secondary data and variability in study designs, are acknowledged, but triangulation across multiple sources mitigates bias. Ethical considerations include accurate reporting and contextualisation of dietary recommendations to avoid oversimplification. Overall, this methodology enables a comprehensive evaluation of vegetarian and meat-based diets, providing a robust evidence base for policy and practice recommendations. The approach balances rigour, breadth, and relevance, ensuring applicability to diverse populations and settings.

Findings and Analysis

Health Benefits and Risks

Vegetarian diets consistently demonstrate lower risks of chronic diseases, including cardiovascular disease, type 2 diabetes, and certain cancers (Dinu et al., 2017). Nutrient-rich plant-based foods provide abundant fibre, antioxidants, and phytochemicals that support metabolic, cardiovascular, and immune health, while meat-based diets supply essential amino acids, heme iron, zinc, and vitamin B12, which are critical for growth and neurological function (Craig, 2009; Micha et al., 2017). Excessive consumption of red and processed meats is associated with increased risk of chronic diseases, underscoring the importance of portion, frequency, and preparation. Balanced meat intake, when combined with vegetables, whole grains, and moderate saturated fat intake, can help mitigate potential health risks. Vegetarian diets require careful planning to prevent deficiencies in vitamin B12, iron, omega-3 fatty acids, and zinc. Both diets can support health if nutrient adequacy and balance are maintained, while risks primarily arise from overconsumption, nutrient inadequacy, or poor diet quality. Table 1 summarises comparative health outcomes of vegetarian versus meat-based diets.

Table 1: Comparative Health Outcomes of Vegetarian and Meat-Based Diets

Health Indicator	Vegetarian Diet	Meat-Based Diet	Evidence Source
Cardiovascular disease risk	Lower	Moderate to high (if excessive)	Dinu et al., 2017
Type 2 diabetes	Lower	Moderate to high	Dinu et al., 2017
Cancer risk (colorectal, others)	Lower	Higher with red/processed meat	Pan et al., 2012; Bouvard et al., 2015
Nutrient adequacy	Adequate with supplementation	High (protein, B12, iron)	Craig, 2009; Micha et al., 2017

Gut microbiome diversity	Higher	Lower	Tomova et al., 2019
Longevity	Higher	Moderate	Satija et al., 2016

Economic and Environmental Analysis

Meat-based diets are resource-intensive, requiring greater water, land, and energy inputs, and producing higher greenhouse gas emissions compared with vegetarian diets (Tilman& Clark, 2014). Public health expenditures are also elevated due to diet-associated chronic diseases, increasing societal economic burdens. Vegetarian diets generally exhibit lower environmental footprints and can reduce healthcare costs by preventing chronic disease (Springmann et al., 2016). However, specific plant-based alternatives, fortified foods, or imported products can be more expensive, and access may be limited in regions with low agricultural diversity (Hulshof et al., 2022). Economic feasibility depends on local food systems, subsidies, and individual purchasing power, affecting diet adoption. Policy interventions supporting local, affordable plant-based foods can enhance accessibility, equity, and public health outcomes. Table 2 summarises the comparative economic and environmental costs of vegetarian and meat-based diets.

Table 2: Economic and Environmental Costs of Vegetarian and Meat-Based Diets

Dimension	Vegetarian Diet	Meat-Based Diet	Evidence Source
Greenhouse gas emissions	Low	High	Tilman& Clark, 2014
Land use	Low	High	Garnett, 2011
Water consumption	Low	High	Tilman& Clark, 2014
Food costs	Moderate (variable by region)	High	Hulshof et al., 2022
Healthcare expenditure	Lower	Higher	Springmann et al., 2016
Resource efficiency	High	Low	Garnett, 2011
Sustainability potential	High	Moderate to low	Tilman& Clark, 2014

Integration of Dimensions

Health, environmental, and economic dimensions of dietary patterns are interconnected and mutually reinforcing. Diets that reduce chronic disease risk simultaneously lower long-term healthcare expenditures and support environmental sustainability. Conversely, diets high in red and processed meats elevate healthcare costs while exacerbating environmental impact. Integrated dietary strategies emphasising plant-forward eating, moderate lean meat consumption, and nutrient balance can optimise health, affordability, and ecological responsibility. Public policy, nutrition education, and food system infrastructure are critical enablers of such integration. A multidimensional assessment highlights the importance of considering individual, societal, and planetary health when evaluating dietary choices. Table 3 illustrates how integrated dietary strategies can balance health, economic, and environmental outcomes.

Table 3: Integrated Outcomes of Dietary Strategies

Dietary Strategy	Health Outcome	Economic Outcome	Environmental Outcome
Plant-forward vegetarian	Lower chronic disease risk	Reduced healthcare costs	Low GHG, water, and land use
Moderate lean meat + plant-based	Balanced nutrient intake	Moderate healthcare costs	Moderate environmental impact
High red/processed meat	Increased disease risk	Higher healthcare costs	High environmental footprint
Fortified/processed plant-based	Nutrient adequate	Variable food costs	Moderate environmental impact
Whole food plant-based	Optimised health & longevity	Low to moderate costs	High sustainability potential

Summary of Findings

The findings indicate that vegetarian and plant-forward diets consistently offer superior health outcomes and reduced environmental impact compared with meat-heavy diets. Meat-based diets provide essential nutrients but entail higher risks of chronic disease and greater ecological costs when consumed excessively. Economic and access considerations are critical, as plant-based alternatives may be cost-prohibitive in certain regions, while meat remains affordable and culturally ingrained in many diets. Integrating health, environmental, and economic perspectives suggests that moderate, balanced consumption of lean meats combined with plant-forward foods can optimise overall outcomes. Public policy, education, and food system reform are necessary to support sustainable, affordable, and health-promoting diets. Tables summarising comparative outcomes provide clear guidance for individuals, healthcare providers, and policymakers. Overall, evidence supports dietary strategies that prioritise nutrient adequacy, disease prevention, environmental sustainability, and economic feasibility.

Discussion

The comparative analysis of vegetarian and meat-based diets demonstrates that no single dietary approach is universally optimal; instead, context, balance, and nutrient adequacy are critical determinants of health outcomes. Vegetarian diets consistently show protective effects against cardiovascular disease, type 2 diabetes, and certain cancers, while meat-based diets provide essential nutrients but may elevate chronic disease risk if overconsumed (Dinu et al., 2017; Micha et al., 2017). Environmental sustainability is closely linked to diet composition, with plant-forward diets demonstrating substantially lower greenhouse gas emissions, water use, and land requirements compared with meat-heavy diets (Tilman & Clark, 2014; Garnett, 2011). Economic considerations highlight that access, affordability, and food system infrastructure influence adoption, and policy interventions are needed to reduce disparities in diet quality and sustainability (Hulshof et al., 2022). Integrating the health, environmental, and economic dimensions suggests that moderate, lean meat consumption, combined with plant-based foods, provides a balanced approach to nutrient adequacy, disease prevention, and reduced ecological

impact. Implementation challenges include cultural preferences for meat, limited local availability of diverse plant foods, and potentially higher costs of some plant-based alternatives. Nevertheless, global trends in nutrition transition, combined with life-cycle assessment evidence, indicate that targeted interventions and public education can facilitate healthier, more sustainable dietary patterns (Popkin, 2017; Garnett, 2011).

Policy implications of these findings are substantial. Governments and public health agencies can incentivise the production and distribution of affordable, nutrient-dense plant-based foods while supporting moderate consumption of lean animal proteins. Nutrition education programs can promote dietary literacy, emphasising nutrient adequacy, portion control, and the environmental impacts of food choices (Springmann et al., 2016). Subsidies and fiscal strategies, such as taxing high-emission foods or reducing costs for locally grown plant-based foods, can enhance equitable access and encourage dietary shifts. Healthcare systems may also benefit economically by reducing chronic disease prevalence through population-level dietary improvements. Collaborative initiatives between public, private, and civil sectors can support sustainable food production and distribution infrastructure. Multidisciplinary approaches integrating nutrition, environmental science, and economics are essential for designing effective interventions. Ultimately, policy strategies must align with cultural norms, local food availability, and socio-economic realities to achieve meaningful impact.

Education and community engagement are critical to fostering sustainable dietary behaviour change. Public awareness campaigns can communicate the dual benefits of plant-forward diets for health and environmental sustainability. Schools, workplaces, and healthcare settings can serve as platforms for promoting dietary literacy and modelling balanced meal planning. Culinary education and culturally sensitive meal design may increase acceptance of plant-forward diets, particularly in populations with strong cultural preferences for meat. Engagement with local farmers and food producers can enhance supply chain resilience and ensure access to fresh, affordable plant-based options. Collaborative efforts can also encourage innovation in plant-based protein alternatives and sustainable livestock practices. Such interventions, when combined with regulatory and fiscal policies, can create systemic shifts toward healthier, more sustainable dietary patterns.

Finally, the multidimensional analysis underscores the interconnectedness of human, economic, and environmental health. Diets that optimise nutrient intake, reduce chronic disease risk, and minimise ecological footprints offer co-benefits for individuals, healthcare systems, and the planet. A comparative evaluation shows that vegetarian and plant-forward dietary patterns consistently outperform meat-heavy diets across health and environmental indicators. At the same time, moderate meat consumption offers a feasible compromise when integrated thoughtfully. Economic feasibility remains a critical consideration, especially in low-income regions where access to a diverse range of plant-based foods is limited. Integrated strategies that combine education, policy, and food system reform are essential to achieve sustainable dietary transitions. Future research should monitor long-term health outcomes, nutrient adequacy, and environmental impacts across diverse populations. In conclusion, dietary choices can serve as powerful levers to improve public health, advance sustainability, and promote socio-economic equity.

Conclusion

Equitable and sustainable dietary strategies require integrating health, environmental, and economic considerations. Vegetarian and plant-forward diets consistently provide protective health benefits, reduce greenhouse gas emissions, and lower long-term public health costs. Meat-based diets offer essential nutrients, but excessive consumption increases chronic disease risk and ecological burden. Key recommendations include: (1) promoting plant-forward diets rich in fruits, vegetables, legumes, and whole grains; (2) encouraging moderate consumption of lean meats, poultry, and fish to ensure nutrient adequacy; (3) supporting local, affordable plant-based food production to enhance access and equity; and (4) implementing public health education programs to raise awareness of nutrient balance, portion control, and environmental impacts. Policymakers should consider fiscal incentives, subsidies, and regulatory measures to facilitate dietary shifts that balance health, affordability, and sustainability. Collectively, these measures can transform dietary patterns, optimise human health, reduce environmental degradation, and support resilient, equitable food systems.

Recommendations

Vegetarian and meat-based diets each offer distinct nutritional and cultural advantages; however, plant-forward diets provide broader benefits for public health, environmental sustainability, and long-term economic feasibility (Dinu et al., 2017; Tilman & Clark, 2014). Structurally, promoting dietary diversity through abundant fruits, vegetables, legumes, nuts, and whole grains is essential to ensure nutrient adequacy. Fortification or supplementation of critical micronutrients, such as vitamin B12, iron, zinc, and omega-3 fatty acids, is necessary for individuals adopting entirely plant-based diets (Craig, 2009). For omnivores, encouraging moderate consumption of lean meats, poultry, and fish can help balance nutrient intake while minimising chronic disease risk (Micha et al., 2017). Policymakers and food system stakeholders should prioritise access to locally sourced, affordable plant-based foods to enhance adoption and equity. Evidence-based guidance must integrate both nutritional science and sustainability metrics to ensure that diet recommendations achieve multiple public health objectives. A structured approach to diet planning can mitigate nutrient deficiencies while promoting long-term health and environmental stewardship.

Health policy interventions are critical for supporting sustainable dietary transitions at the population level. Integrating dietary education into public health campaigns can raise awareness about nutrient adequacy, portion control, and environmental impacts of food choices (Springmann et al., 2016). Incentivising sustainable food production, such as supporting local farmers and plant-based food initiatives, can reduce dependence on resource-intensive meat production. Subsidising nutrient-rich plant foods improves affordability and accessibility, particularly for low-income populations. Healthcare systems can incorporate diet-based preventive strategies to reduce the burden of chronic diseases and associated costs. Multi-sectoral collaboration between public health, agriculture, and environmental agencies is necessary to implement coherent policies. Monitoring and evaluation frameworks should be established to assess the effectiveness of dietary interventions over time.

Cultural and behavioural strategies are equally important for the successful adoption of plant-forward diets. Encouraging culturally acceptable plant-forward meals ensures that dietary transitions respect local traditions, preferences, and culinary practices (Satija et al., 2016). Reducing consumption of processed and high-fat meats can be promoted through nutrition literacy programs and community engagement. Culinary education and cooking demonstrations can empower individuals to prepare balanced, plant-forward meals that are palatable and nutritionally adequate. Media campaigns, school curricula, and workplace initiatives can reinforce dietary literacy and positive food choices. Collaboration with community leaders and influencers may facilitate behavioural change and social acceptance. Culturally adapted plant-forward diets enhance adherence, long-term sustainability, and health outcomes.

Finally, integrating environmental, health, and economic perspectives strengthens the impact of dietary recommendations. Policy coordination, food system planning, and international partnerships are essential to enhance the adoption, equity, and sustainability of plant-forward diets (Garnett, 2011; Tilman & Clark, 2014). Life-cycle assessments should inform policies to reduce greenhouse gas emissions, water use, and land degradation associated with dietary production. Future research must track dietary transitions, nutrient adequacy, and long-term health outcomes across diverse populations. Economic analyses should consider both direct food costs and indirect healthcare savings to guide resource allocation. Balanced, plant-forward diets can serve as a cornerstone of sustainable, health-promoting, and economically feasible food systems. Overall, informed dietary choices offer a pathway to improve personal, public, and planetary health simultaneously, advancing global nutrition and sustainability goals.

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