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The Interrelation among Obesity, Climate Change and the Food Industry

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ABSTRACT: Climate change poses a significant threat to natural ecosystems and human societies, while the global obesity pandemic constitutes a major public health challenge. These two phenomena are increasingly recognized as interconnected, with both influencing and being influenced by the food industry. The present study investigates the interrelationship among obesity, climate change, and the food industry, examining the interactions and mutual dependencies among these three domains. Their interlinkages are analyzed separately and their systemic interactions are highlighted. The results indicate that obesity, climate change, and the food industry are strongly interconnected and mutually influential. Consequently, changes in one of these domains can produce significant effects on the others. The findings suggest that the development of sustainable, low-carbon and climate-resilient agricultural systems capable of producing sufficient and nutritious food with minimal environmental impacts is urgently required. Furthermore, a strategic reorientation of the food industry toward the production of healthier food products with lower environmental footprints is necessary. Finally, the promotion through public policies of healthy dietary patterns with low greenhouse gas emissions could simultaneously reduce obesity prevalence and contribute to climate change mitigation. The findings of this study may be useful to policy makers, climate scientists, medical professionals, the food industry, farmers, and civil society organizations seeking to address these major challenges of the 21st century.

KEYWORDS: climate change, diet, food industry, GHG emissions, health, interdependence, obesity

1. INTRODUCTION

Climate change and obesity represent two major challenges facing modern societies, threatening both planetary and human health. The continuously increasing global demand for food requires greater land use and higher energy consumption, which often generate negative environmental impacts (1), (2). It has been estimated that food systems account for approximately 20–30% of global greenhouse gas (GHG) emissions, while the products of the food industry contribute significantly to the rising prevalence of obesity (3), (4), (5). Several studies indicate that climate change and obesity are interconnected phenomena that influence each other through multiple pathways (6). At the same time, climate change threatens food security by affecting agricultural productivity and the stability of food systems (7–11). Unhealthy dietary patterns are associated with both higher obesity prevalence and greater environmental impacts, as they often involve higher consumption of resource-intensive foods with elevated GHG emissions (12–14). Conversely, healthier dietary patterns, such as the Mediterranean diet, tend to generate lower GHG emissions, primarily due to reduced meat consumption, while simultaneously contributing to obesity prevention and improved health outcomes (15).

The aim of the present study is to examine the interrelation among obesity, climate change, and the food industry and to highlight their mutual interdependence. By exploring the interactions among these three domains, the study addresses a gap in the literature concerning their systemic relationship.

The findings may provide useful insights for policy makers aiming to mitigate climate change and reduce obesity prevalence, for the food industry whose activities influence both environmental and health outcomes, and for healthcare professionals seeking to address the global obesity epidemic.

2. LITERATURE SURVEY

The trilemma between food, energy, and the environment has been previously examined [1]. The authors indicated that the growing global demand for food requires increased land and energy resources, resulting in negative impacts on climate change. Considering the complex interactions among food, energy, and climate systems, they proposed the sustainable intensification of agriculture as a potential strategy to meet future food demand. The nexus between climate change and food systems has also been studied [2]. The authors estimated that food systems contribute between 19% and 29% of global GHG emissions, while agricultural production alone

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accounts for 80–86% of these emissions. They also emphasized that climate change is expected to have widespread and complex impacts on food systems, influenced by socioeconomic conditions. The influence of the food industry on obesity-related dietary behavior among children has been reviewed [3]. The study highlighted that increased consumption of energy-dense and nutrient-poor foods significantly contributes to childhood overweight and obesity. Three major obesogenic environments were identified, including schools, retail environments, media platforms, and household environments. The rapid growth of the fast-food industry in China and its potential influence on obesity has been explored [4]. The authors found that the expansion of fast-food consumption is positively associated with rising obesity rates in the country. The role of the food industry in obesity prevention has also been examined [5]. The study emphasized that the food supply chain significantly influences obesity development and that the food industry plays an essential role in addressing this public health challenge. The interrelation between obesity management and climate change in Greece has been investigated [6]. The author reported that climate change negatively affects obesity treatment in Greece, while effective obesity management can contribute to climate change mitigation. Climate change and sustainable food production have been analyzed in several studies [7]. Feeding a global population expected to reach nine to ten billion by 2050 while reducing environmental impacts represents one of the most significant challenges of the 21st century. Research has also examined food security within the context of climate change [8–11]. Climate change poses a major threat to global food security by affecting biodiversity, agricultural productivity, and food availability, particularly in regions dependent on rain-fed agriculture. Several studies have explored the environmental impacts of obesity and dietary patterns [12–14]. It has been estimated that obesity contributes to approximately 1.6% of global CO_2 emissions due to increased food production, higher metabolic energy requirements, and greater transportation needs. The relationship between dietary patterns, health outcomes, and environmental impacts has also been investigated [15, 20]. Healthier diets, particularly those based on plant-based foods, are generally associated with lower GHG emissions and improved health outcomes. The concept of a global "syndemic" linking obesity, undernutrition, and climate change has been proposed [24], highlighting the interconnected nature of these global challenges. Additional research has examined the impacts of weight loss on carbon emissions [25], the environmental benefits of the Mediterranean diet [26], and the carbon footprints of different dietary patterns [27]. Finally, research has highlighted the multifactorial nature of obesity, which involves genetic, environmental, and behavioral factors [28], as well as the effectiveness of multidisciplinary interventions in reducing obesity-related health risks among children [29]. The impact of obesity on climate change according to several researchers is presented in table 1.

Table 1. The climate impacts of obesity

Authors, year	Study	Results
Gryka et al, 2012	Loss of 10 kg of all the obese people in the planet	Decrease of the annual global CO_2 emissions (compared to 2007 level) by 0.2%
Underwood et al, 2015	Reversion of obesity rates in USA (from 2013 level to 1997 level) decreasing the food intake and transportation and estimating the impacts on CO_2 emissions	Decrease of the annual CO_2 emissions in USA by 2.7% (compared to 2013 level)
Magkos et al, 2019	Estimation of higher CO_2 emissions of obese people due to increased metabolism, increased food intake and more transportation	Obesity is related with around 20% higher GHG emissions per capita compared to normal state. Obesity results in approximately 1.6% higher global GHG emissions (compared to 2012 level) although the percentage varies among different countries.
Garcia et al, 2025	Relation of body composition and diet-related CO_2 emissions	Diet-related CO_2 emissions were linearly and positively associated with body weight and energy intake. High GHG emission diets are usually unhealthy.

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Rose et al, 2019	Carbon footprint and quality of several US diets	Diets with low GHG emissions had in general a better overall diet quality and were more nutritious in several dimensions.
Pradham et al, 2020	Interplay between diets, obesity and climate change	Two high-calorie diets embody more than 1.5 tCO_{2eq}/capita/yr, and two low-calorie diets embody around 1 tCO_{2eq}/capita/yr
Castaldi et al, 2022	Comparison of GHG emissions of Mediterranean and other diets	The GHG emissions of the ideal Mediterranean diet was estimated at 2.3 $kgCO_2$/capita/day while the GHG emissions of the current diets in several Mediterranean and non-Mediterranean countries was in the range of 4.03-4.46 $kgCO_2$/capita/day

Source: various authors

3. THE IMPACTS OF THE FOOD INDUSTRY ON OBESITY

Obesity has become a major global public health concern, with rapidly increasing prevalence in both developed and developing countries. Although obesity results from multiple factors, including genetics, lifestyle, and physical activity patterns, the food industry plays a crucial role in shaping modern dietary behaviors. One of the primary ways in which the food industry influences obesity is through the widespread availability of highly processed and energy-dense foods. Many products manufactured by large food corporations contain high levels of added sugars, unhealthy fats, and salt while providing limited nutritional value. Fast food, sugary beverages, packaged snacks, and ready-to-eat meals are typically designed to maximize convenience, taste, and shelf life rather than nutritional quality. Such foods are often highly caloric yet insufficiently satiating, encouraging consumers to consume larger quantities and thereby increasing total calorie intake. Over time, this contributes to weight gain and obesity. Marketing practices within the food industry further exacerbate the problem. Companies invest heavily in advertising unhealthy products, frequently targeting children and adolescents. Bright packaging, promotional incentives, celebrity endorsements, and social media campaigns encourage frequent consumption of fast food and sugary snacks. These strategies normalize unhealthy dietary habits and shape food preferences from an early age. Another important factor is the increasing portion sizes promoted by restaurants and fast-food chains. Consumers are often encouraged to purchase larger meals for only a marginal additional cost. Over time, these large portions alter perceptions of normal serving sizes and contribute to excessive calorie consumption. The food industry also influences obesity through pricing and accessibility. Highly processed foods are often cheaper and more readily available than healthier alternatives such as fresh fruits, vegetables, and whole grains. In many low-income communities, fast-food outlets are more common than grocery stores offering nutritious food options, making healthy choices more difficult. Although the food industry frequently emphasizes personal responsibility in dietary choices, these choices are strongly influenced by the surrounding food environment. Misleading food labels and health claims may further confuse consumers and hinder informed decision-making. While some companies have introduced healthier alternatives and improved nutrition labeling, these initiatives remain limited relative to the scale of unhealthy food production. Overall, the food industry has played a substantial role in the global rise of obesity through the promotion of processed foods, aggressive marketing strategies, large portion sizes, and unhealthy food environments. Meaningful progress in reducing obesity requires structural changes within the food industry, including stronger regulation, improved product quality, and responsible marketing practices.

4. THE IMPACTS OF OBESITY ON THE FOOD INDUSTRY

Obesity has become a major global health concern with increasing prevalence in many countries. Its effects extend beyond individual health and healthcare systems, significantly influencing the structure and functioning of the food industry. As obesity rates increase, public awareness, government policies, and consumer preferences have evolved, forcing the food industry to adapt. Obesity has

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reshaped food production, marketing strategies, regulatory frameworks, and consumption patterns. One of the most significant impacts of obesity on the food industry is increased public scrutiny. Food manufacturers and fast-food companies are frequently criticized for promoting products high in sugar, fat, and calories. As obesity-related diseases such as diabetes and cardiovascular disorders become more prevalent, consumers and public health organizations demand greater accountability from food companies. In response, many food companies have reformulated their products by reducing sugar, salt, and unhealthy fats. The introduction of low-calorie, low-fat, and sugar-free alternatives reflects the industry's attempt to align with changing consumer expectations and health concerns. Obesity has also influenced consumer behavior. Growing awareness of healthy lifestyles has increased demand for nutritious food options, including organic products, plant-based foods, and products designed for weight management. As a result, supermarkets and restaurants increasingly offer healthier menu choices, calorie-labeled meals, and smaller portion sizes. Government regulation represents another important impact of obesity on the food industry. Rising obesity rates have prompted policy measures such as sugar taxes, mandatory nutrition labeling, and restrictions on advertising unhealthy foods to children. These regulations influence product formulation, packaging, and marketing strategies. Although the food industry sometimes resists these measures due to increased costs, regulatory interventions have become an important driver of change. Marketing strategies have also evolved. Companies increasingly emphasize balanced diets, active lifestyles, and transparent nutrition information. Corporate social responsibility initiatives related to nutrition education and healthier product options have become more common as companies attempt to rebuild public trust. Overall, obesity has significantly influenced the food industry by increasing public scrutiny, altering consumer preferences, encouraging product reformulation, and prompting government regulation. While obesity presents challenges for the industry, it has also stimulated innovation and greater accountability. The interlinkage between food industry and obesity is presented in table 2.]

Table 2. Interlinkage between food industry and obesity

Impacts of food industry on obesity	Impacts of obesity on food industry
Promotion of highly processed and energy dense foods	Increasing public scrutiny and critics for promoting unhealthy food
Marketing unhealthy food products	Pressure to produce low-calorie, low-fat and sugar-free products
Promotion of large portion size	Pressure to develop a new market focused on food products related to health and wellness
Highly processed food is often cheaper that healthy food such as fruits, vegetables et cetera	Promotion of governmental regulations on food industry related to mandatory nutrition labelling and restrictions on advertising unhealthy food products to children
Misleading food labels can confuse consumers	

Source: own estimation

5. THE IMPACTS OF CLIMATE CHANGE ON THE FOOD INDUSTRY

Climate change represents one of the most significant global challenges of the 21st century, affecting ecosystems, economies, and human livelihoods. The food industry is particularly vulnerable because it relies heavily on stable climatic conditions, natural resources, and agricultural productivity. Rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events have already begun to disrupt food production and supply chains worldwide. One of the most direct impacts of climate change is reduced agricultural productivity. Higher temperatures, prolonged droughts, and irregular rainfall patterns negatively affect crop yields and livestock health. Many staple crops, including wheat, rice, and maize, are highly sensitive to temperature fluctuations and water availability. Extreme weather events such as floods, hurricanes, and wildfires also cause severe damage to farmland, infrastructure, and transportation networks. These disruptions may result in supply shortages, increased food prices, and financial losses for producers and food companies. Climate change further increases the spread of pests, weeds, and plant diseases. Warmer temperatures allow these organisms to expand into new regions, threatening both crop production and livestock farming. Consequently, farmers often face increased costs associated with pest management and disease control. Another concern relates to the nutritional quality of food. Elevated atmospheric carbon dioxide concentrations may reduce the protein and

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micronutrient content of some crops, potentially affecting food quality and nutritional value. Overall, climate change poses significant challenges to the food industry by reducing agricultural productivity, destabilizing supply chains, increasing production costs, and affecting food quality.

6. THE IMPACTS OF THE FOOD INDUSTRY ON CLIMATE CHANGE

The food industry contributes significantly to climate change through multiple pathways, including agricultural production, land use change, energy consumption, and food waste. Livestock production represents one of the largest sources of greenhouse gas emissions within the food system. Ruminant animals such as cattle produce methane during digestion, while the use of synthetic fertilizers releases nitrous oxide. Deforestation associated with agricultural expansion also contributes significantly to climate change. Large areas of forest are cleared to produce crops and livestock feed, reducing the capacity of ecosystems to absorb carbon dioxide. Food processing, packaging, refrigeration, and transportation require substantial energy inputs, much of which still relies on fossil fuels. Globalized food supply chains often involve long-distance transportation, increasing the carbon footprint of food products. Food waste further exacerbates climate change impacts. When organic waste decomposes in landfills, it produces methane emissions. Additionally, food waste represents a loss of the resources used during production, including water, energy, and land. Overall, the food industry contributes to climate change through greenhouse gas emissions, deforestation, energy use, transportation, and food waste generation. The interlinkage between food industry and climate change is presented in table 3.

Table 3. Interlinkage between food industry and climate change

Impacts of climate change on food industry	Impacts of food industry to climate change
Reduced agricultural productivity and higher food prices	Synthetic fertilizers used in agriculture result in significant GHG emissions
Extreme weather events can destroy crops and cattle breeding installations reducing the raw materials in food industry	Cattle breeding release large amounts of methane
Increased risks for pest and diseases in agriculture and cattle breeding	Deforestation for creating new farmland affects climate change
Undesired impacts on quality and nutritional value of food	Food processing and transportation require energy and fossil fuels resulting in GHG emissions
	Food waste is a major contributor to climate change
	Promotion of foodstuff with high meat content and processed food has undesired impacts to climate change
	The transportation of food materials over long distances before reaching consumers increases GHG emissions

Source: own estimations

7. THE IMPACTS OF OBESITY ON CLIMATE CHANGE

Although obesity is primarily a health issue, it also has environmental implications that contribute indirectly to climate change. One important pathway is increased food consumption, particularly of resource-intensive foods such as meat and processed products. Diets associated with obesity often involve higher calorie intake and greater consumption of foods with large environmental footprints. Rising obesity prevalence also increases overall food demand, requiring greater agricultural production, processing, transportation, and storage. Each stage of this expanded food system generates additional greenhouse gas emissions. Transportation patterns also contribute to the link between obesity and climate change. Obesity is frequently associated with sedentary lifestyles and increased reliance on motorized transport, which increases fossil fuel consumption and carbon emissions. Healthcare systems provide another connection. Obesity-related diseases require extensive medical treatment, hospital services, and pharmaceutical production. The healthcare sector is energy-intensive and generates significant emissions. Therefore, obesity contributes indirectly to climate change through increased food demand, resource-intensive diets, transportation patterns, and healthcare resource use.

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8. THE IMPACTS OF CLIMATE CHANGE ON OBESITY

Climate change may also influence obesity prevalence through several mechanisms affecting food systems, physical activity, and socioeconomic conditions. Extreme weather events can disrupt agricultural production and increase food prices, particularly for fresh fruits and vegetables. As healthy foods become less affordable, consumers may shift toward cheaper processed foods with higher caloric content. Climate change may also discourage physical activity. Rising temperatures, heat waves, and poor air quality reduce opportunities for outdoor exercise, contributing to sedentary lifestyles. Urban adaptation strategies such as increased reliance on air conditioning and motorized transport may further reduce physical activity levels while increasing energy consumption. Climate change can also exacerbate socioeconomic inequalities, which are closely associated with obesity. Vulnerable populations often face greater food insecurity, financial stress, and limited access to healthy foods and recreational facilities. Mental health impacts such as climate anxiety, stress, and uncertainty may also influence lifestyle behaviors, leading to emotional eating and reduced physical activity. The interlinkage between obesity and climate change is presented in table 4.

Table 4. Interlinkage between obesity and climate change

Impacts of obesity on climate change	Impacts of climate change on obesity
Increased food consumption of highly processed food has harmful impacts on climate change	Climate change affects the food production systems and leads to higher food prices especially for healthy foods
Due to rising temperatures obese people use often air-conditioning which is related with energy consumption and GHG emissions	Climate change discourages outdoor physical activity
Increased food consumption is related with increased food wastes having harmful impacts on climate change	Climate change increases the reliance of obese people on air-conditioning and motorized transport
Obese people are more relied on motorized transport and increase fuel consumption in transportation systems which mainly use fossil fuels	Climate change increases stress, displacement and financial instability which lead to unhealthy eating habits
Obese people use more often the healthcare systems which are energy-intensive and emit large amounts of GHGs	

Source: own estimations

9. DISCUSSION

The present study highlights the strong interconnection between obesity, climate change, and the food industry. One of the major global challenges of the 21st century is to feed a rapidly growing population—currently exceeding eight billion people—while protecting environmental sustainability and promoting public health. Producing sufficient nutritious food, maintaining healthy body weight, and mitigating climate change simultaneously represent a complex global challenge. Addressing this challenge requires the development of sustainable and low-carbon food systems capable of providing healthy diets while minimizing environmental impacts. Although obesity is a multifactorial disease influenced by genetic, behavioral, and environmental factors, environmental interventions and food system transformations can play an important role in reducing obesity prevalence. The findings of this study suggest several key directions for addressing this interconnected trilemma:

A) Providing nutritious and healthy diets for the global population while reducing overweight and obesity prevalence.
B) Ensuring that these dietary patterns generate minimal climate change impacts.
C) Developing sustainable, low-carbon, and climate-smart agricultural systems capable of producing sufficient food.
D) Reorienting the food industry toward healthier food products while minimizing waste and environmental impacts.

Addressing these challenges requires collaboration among multiple stakeholders, including policy makers, climate scientists, healthcare professionals, food industry representatives, farmers, and civil society. The present study is primarily qualitative and highlights conceptual relationships rather than quantifying them. Future research should focus on quantitative analyses of the interactions among obesity, climate change, and food systems across different countries in order to identify effective policy interventions.

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10. CONCLUSIONS

This study examined the interrelationship among obesity, climate change, and the food industry, emphasizing their mutual interdependence.

The key findings can be summarized as follows:

a) The food industry and the global obesity pandemic are mutually interdependent.

b) The food industry and climate change are strongly interconnected.

c) Obesity and climate change are also closely linked.

d) Changes in one of these domains can produce significant impacts on the others.

The main policy implications of this study include:

A) The urgent need to develop sustainable, low-carbon, and climate-resilient agricultural systems capable of producing sufficient food while reducing obesity prevalence.

B) The reorientation of the food industry toward the production of healthier food products with minimal environmental impacts.

C) The promotion through appropriate policies of healthy dietary patterns with low greenhouse gas emissions that can simultaneously reduce obesity rates and mitigate climate change.

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