

Climate change and malnutrition are a public health challenge

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KEYWORDS Malnutrition, climate change, public health

Climate change contributes to environmental change and augments disaster risk [1] and can amplify extreme weather events [2]. These events are meteorological, hydrological, climatological, or related incidents that cause widespread damage to human lives, property, or both. Examples of extreme weather events include storms, cyclones, droughts, floods, and heat waves that can generate cardiovascular, respiratory, and mental health diseases [3].

According to Watts et al. (2017), anthropogenic (human-caused) climate change has "undermined the last 50 years of public health advances", affecting a wide range of health outcomes [4]. The first commission on climate change in The Lancet stated that this is "the greatest global threat of the 21st Century". In 2015, the second commission stated that it remained a relevant global threat and that addressing it could be the "greatest global health opportunity of the 21st Century" [4,5].

The World Health Organization (WHO) has declared climate change as the most significant global health threat of the 21st Century through direct (heat, drought, storms, and sea level rise) and indirect (respiratory and vector-borne diseases, food and water insecurity, mental health) impacts.

Regarding food insecurity, the way food is collected, produced, traded, and consumed is becoming unsustainable. Social contrasts, effects on nature, and adverse health outcomes highlight the profound interrelationship of food systems with health, life, and development. The interactions of the global socioeconomic model with food systems, sustained by large-scale productivity, the technification of natural resources for agricultural production, as well as the biochemical

intervention of food in the production and transformation phase, are degrading the biosphere, increasing burden of diseases, and pre-existing socioeconomic inequalities [6].

In the world, more than 800 million people are suffering from hunger, two billion people are overweight and obese, and three billion people lack a healthy diet, all of which are intimately linked to structural social determinants such as poverty, lack of education, and unhealthy food environments with low availability and access to healthy, nutritious and safe food [7]. Forty years ago, the number of underweight people in the world was much higher than the number of obese people. This situation has reversed, and today, the number of obese people is twice the number of underweight. If the trend continues, more than 40% of the world's population will be overweight, and more than one-fifth will be obese by 2030 [8].

Obesity is a pandemic that currently contributes to a global syndemic [9], together with malnutrition and climate change. These three pandemics share structural determinants, such as multidimensional poverty. Therefore, blaming people for suffering from this condition ignores all the available evidence on the tremendous social inequalities that condition human behavior. These three epidemics co-occur, interact with each other synergistically, and constitute a triad that impedes development. Promoting a social discourse of freedom of choice is unacceptable when there is no availability or access to healthy food and when advertising encourages the consumption of unhealthy food. Nutritious, healthy, safe, biologically and culturally relevant food is essential for people's health, well-being and development. Moreover, it is also a fundamental human right [10].

It is therefore necessary to consider overcoming the common factors underlying these pandemics, including transportation, urban design, land use, the economic model, and extractivist production. For example, food systems drive malnutrition and generate 25-30% of greenhouse gas emissions.

Food systems have the potential to promote human health and support environmental sustainability. However, they currently threaten both. Food systems are a major contributor

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Citation Rodríguez-Osiac L, Silva-Santa Cruz I. Climate change and malnutrition are a public health challenge. Medwave 2024;24(01):e2806 DOI 10.5867/medwave.2024.01.2806

Submitted Dec 5, 2023, **Accepted** Dec 19, 2023,

Published Jan 22, 2024

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to climate change and sustainable diets are one strategy to mitigate its progression. Although global calorie production has kept pace with population growth, more than 820 million people lack sufficient food, and many more consume low-quality diets that cause micronutrient deficiencies and contribute to a substantial increase in the incidence of diet-related obesity and non-communicable diseases.

Healthy and sustainable diets are a way to mitigate not only malnutrition but also climate change. Due to the lack of national surveys on food consumption, there is not much evidence in the region on the impact of diets on the environment. In Chile, a recent study [11] estimated the carbon and water footprint of the diet of the Chilean population based on the National Food Consumption Survey conducted in 2010. The study found a carbon footprint equivalent of 4.67 kilograms of carbon dioxide and a water footprint equivalent of 4177 liters per person per day. Foods of animal origin, such as dairy and red meat, were responsible for 60.5% of the total carbon footprint and 52.6% of the water footprint. When comparing these data with other countries, Chile is below the values of the United States and Argentina but above Peru, Brazil, France, and Denmark.

It is necessary to transform diets and food systems into healthier and more sustainable ones, which will require substantial changes. The consumption of fruits, vegetables, nuts, seeds, and legumes should be doubled, and foods such as red meat and sugar should be reduced by more than 50% [12].

The solution is not simple. It requires a paradigm shift, changing a discursive social reality about the conception and significance of eating and food. These perceptions must be observed from multiple perspectives: our history, culture, public policies, urban spaces, city infrastructure, and social constructs, among many others, are part of the problem and, therefore, also part of the solution. Addressing the complex issue of global syndemia requires rethinking food systems, the social, political, and economic model, and how we produce, process, transport, consume, and use food.

To achieve successful interventions, we must implement an approach and public policies that incorporate strategies throughout the life cycle, even before gestations. It is also crucial to consider the social determinants of health approach, incorporating structural measures that allow access to and availability of quality food, which promotes and favors healthy choices. Production, processing, storage, and distribution of food consumption should be considered to minimize the adverse effects on the health and nutrition of the population [13].

Based on how policymakers shape food systems, a recent study by Burgaz et al. [14] aimed to identify and prioritize policies with double or triple-bottom-line potential to achieve healthy diets from sustainable food systems. Through a compilation of international policy recommendations, a scoping review, online surveys, and four regional workshops with experts, policies were identified and prioritized based on their potential for double or triple effects, synergies, and trade-offs.

Using participatory and transdisciplinary approaches, Burgaz et al. determined a set of double- and triple-bottom-line policies for simultaneously addressing malnutrition, obesity, non-communicable diseases, and environmental sustainability. The study proposes a list of 44 healthy and sustainable food policies, divided into two main policy areas: "food supply chains" and "food environments".

The highest-rated "food supply chain" policies were:

1. Incentives for crop diversification.
2. Support for new businesses and small and medium-sized enterprises.

The highest-rated "food environments" policies were:

1. Affordability of healthier and more sustainable diets.
2. Subsidies for healthier and more sustainable food
3. Restrictions on children's exposure to marketing through all media.

A strong political commitment and solid and global strategic alliances between the academic, political, and social worlds are required to combat the forces opposing change and thus achieve the sustainable development proposed by the United Nations [15].

Contributor roles Both authors contributed substantially to the conception and writing of the paper, as well as to the final approval of the submitted version.

Competing interests There is no conflict of interest for any of the authors.

Funding There is no funding for this manuscript.

Language of submission Spanish.

Peer review and provenance This commentary was solicited by the editor-in-chief. No peer review was made

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El cambio climático y la malnutrición son un desafío para la salud pública



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