



## The Effects of Climate Change on Public Health

Eqbal Yousif Abed<sup>1</sup>, Hanan Fadhil Kadhim<sup>2</sup>, Muthik A. Guda<sup>3</sup>

<sup>1</sup>Department of Medical Laboratory Techniques, Technical Institute/Kufa, Al-Furat Al-Awsat Technical University, Najaf, Iraq

<sup>2</sup>Department of Biology, College of Education for Women, University of Kufa, Najaf, Iraq

<sup>3</sup>Department of Ecology, Faculty of Sciences, Kufa University, Iraq

**Corresponding Author:** Muthik A. Guda

**ABSTRACT:** Climate change represents a profound global challenge with serious consequences for human health. Rising temperatures, changing precipitation patterns, and the increasing frequency of extreme weather events contribute directly to heat stress, cardiovascular complications, and injury from natural disasters. Indirect effects include expansion of vector-borne and waterborne diseases, food insecurity, and the aggravation of chronic respiratory and mental health disorders. Vulnerable populations such as children, the elderly, and individuals with chronic illnesses bear a disproportionate burden. Addressing these challenges requires the integration of health considerations into climate adaptation and mitigation policies, alongside investment in resilient healthcare infrastructure, early warning systems, and public awareness programs.

**KEYWORDS:** Climate change, public health, Infectious diseases, Adaptation policies, Mental health

### 1. INTRODUCTION

Climate change has emerged as one of the most pressing public health threats of the 21st century. Its impacts are multidimensional, spanning ecological disruption, food and water insecurity, economic instability, and health inequalities. Rising global average temperatures, shifting precipitation patterns, and the intensification of extreme weather events are altering the environmental and social systems upon which human health depends. According to the Intergovernmental Panel on Climate Change (IPCC, 2022), between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths annually due to malnutrition, malaria, diarrheal disease, and heat stress [1]. These estimates highlight the urgency of addressing climate-health interactions within policy frameworks at both national and international levels.

Climate change not only worsens existing health problems but also introduces new risks. Populations in low- and middle-income countries are particularly vulnerable due to weak healthcare systems and limited adaptive capacity. The Middle East, for example, faces increasing exposure to prolonged heat waves, desertification, and frequent dust storms, all of which exacerbate respiratory and cardiovascular illnesses. These threats are compounded by regional political instability and socioeconomic pressures. In contrast, wealthier nations often have greater resources to mitigate and adapt to such challenges, highlighting the inequitable burden of climate impacts on health across the globe.

This paper synthesizes current knowledge on the health consequences of climate change, distinguishing between direct and indirect impacts, while also addressing mental health, infectious disease dynamics, and the importance of coordinated policies and responses. The goal is to emphasize that climate change must be treated not only as an environmental issue but as a public health emergency requiring urgent action.

### 2. DIRECT HEALTH IMPACTS OF CLIMATE CHANGE

The direct health impacts of climate change primarily result from exposure to elevated temperatures and extreme weather events. Heatwaves have become more frequent and intense in recent decades, causing increases in heat-related illnesses such as heat exhaustion, heatstroke, dehydration, and cardiovascular complications. Vulnerable groups—including the elderly, children, and those with chronic conditions—face disproportionately high risks [2]. Studies indicate that every 1°C rise in temperature correlates with a 3–5% increase in heat-related mortality.

Extreme weather events such as hurricanes, floods, and wildfires also have immediate consequences. Floods often result in drowning, injuries, and displacement, while wildfires lead to burns and severe respiratory issues due to smoke inhalation. Damage to health infrastructure during such disasters can delay medical responses and intensify health burdens. For example, hospital closures or reduced access to clean water and electricity significantly increase morbidity and mortality following disasters.

Another direct effect is air pollution, which worsens as climate change intensifies. Dust storms, particularly in arid regions like the Middle East, elevate levels of airborne particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), triggering asthma, chronic bronchitis, and increased hospital admissions [3]. Thus, direct climate impacts act synergistically to produce complex and multifaceted health challenges.

### 3. INDIRECT HEALTH IMPACTS

Indirect health effects of climate change are broader, less visible, and often long-term. Food insecurity is a major pathway, as droughts, heat stress, and unpredictable rainfall patterns reduce crop yields and threaten livestock. This leads to malnutrition and micronutrient deficiencies, particularly in children and pregnant women [4]. Rising food prices further worsen inequalities, placing low-income populations at heightened risk of undernutrition.

Water scarcity is another indirect impact. Reduced freshwater availability affects hygiene and sanitation, leading to the spread of diarrheal diseases. Heavy rainfall and flooding, on the other hand, can contaminate drinking water supplies with pathogens such as cholera and typhoid. Furthermore, compromised food and water security increases susceptibility to infections by weakening immune responses.

Climate change also aggravates chronic illnesses. For instance, cardiovascular disease patients face heightened vulnerability due to prolonged heat exposure, while diabetics may encounter worsened conditions because of disrupted food availability. These indirect consequences emphasize the systemic nature of climate-health interactions.

### 4. CLIMATE CHANGE AND INFECTIOUS DISEASES

Climate change alters the epidemiology of infectious diseases by reshaping the habitats of vectors such as mosquitoes, ticks, and sandflies. Warming temperatures and higher humidity extend the geographic range and seasonality of malaria, dengue, Zika virus, and leishmaniasis [5]. Regions previously free of certain diseases are now experiencing outbreaks, challenging healthcare systems unprepared for new threats.

Flooding and extreme rainfall events create breeding grounds for mosquitoes while also increasing exposure to contaminated water sources. This drives outbreaks of cholera, gastroenteritis, and other diarrheal illnesses. In low-income settings, where access to clean water and sanitation is limited, the risks of epidemics are significantly amplified. Strengthening disease surveillance and prevention programs is therefore critical in mitigating these outcomes. Figure 1 summarized Climate Change and Infectious Diseases.

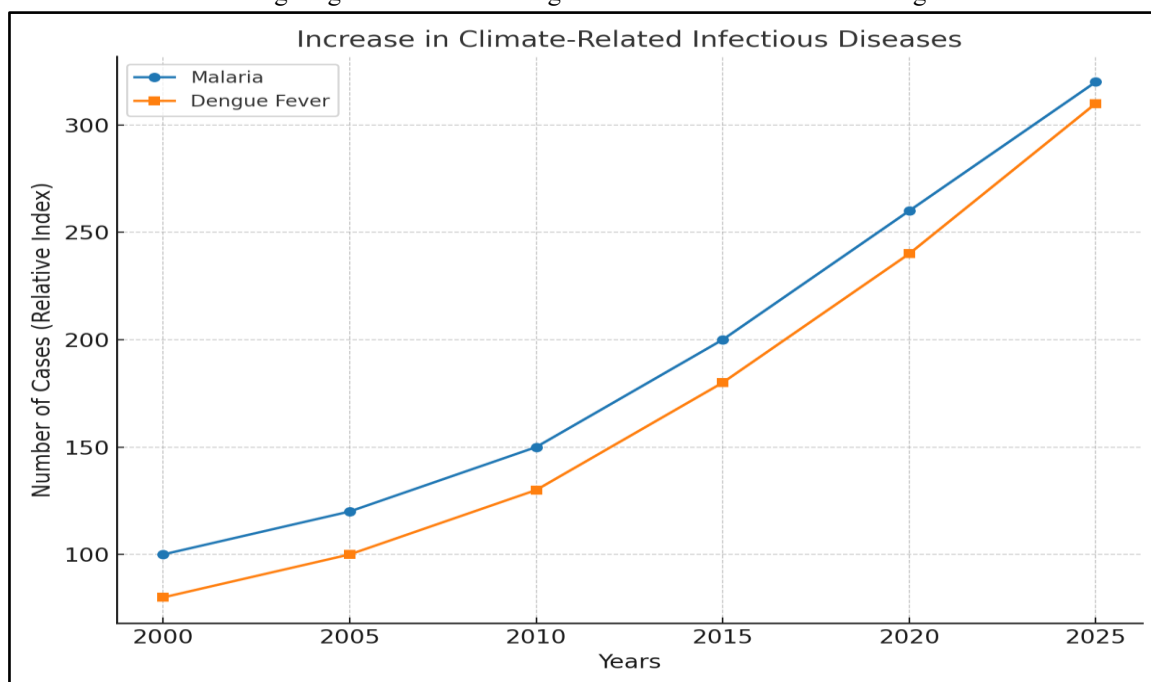


Fig. 1 Climate Change and Infectious Diseases

### 5. MENTAL HEALTH AND PSYCHOSOCIAL CONSEQUENCES

The psychological and social dimensions of climate change are increasingly recognized as critical health concerns. Populations exposed to climate-related disasters such as floods, hurricanes, or wildfires often develop post-traumatic stress disorder (PTSD), depression, and anxiety [6]. Children and the elderly are particularly vulnerable, with long-lasting effects on well-being and social functioning.

In addition to acute trauma, a phenomenon known as 'climate anxiety' or 'eco-anxiety' has emerged, particularly among younger generations. It is characterized by chronic worry about environmental decline and future uncertainties. Although not classified as a clinical disorder, climate anxiety affects daily functioning, productivity, and overall quality of life.

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Addressing these challenges requires integrating mental health services into disaster preparedness and adaptation plans. Community-level support, resilience-building initiatives, and culturally sensitive interventions can mitigate the psychological toll of climate change. Figure 2 summarized the Mental Health and Psychosocial Consequences.

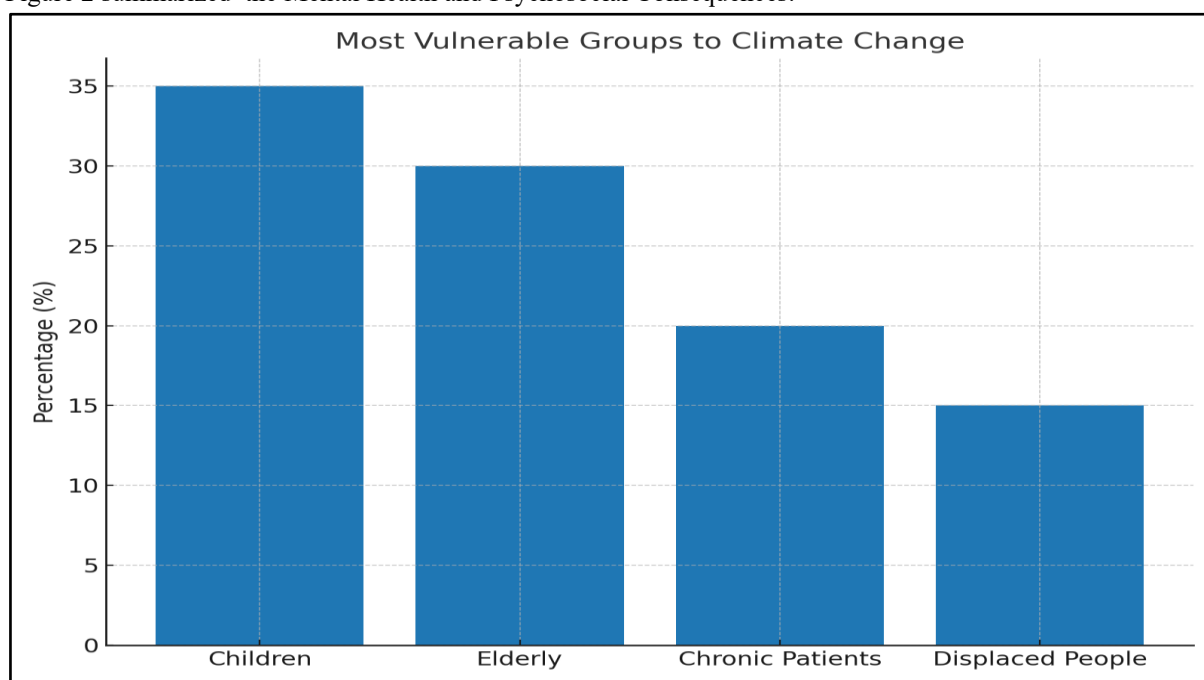


Figure 2 The Mental Health and Psychosocial Consequences.

## 6. GLOBAL POLICIES AND ADAPTATION STRATEGIES

Governments and international organizations are increasingly acknowledging the link between climate change and health. The Paris Agreement (2015) explicitly recognized health as an integral component of climate action, encouraging nations to incorporate health into mitigation and adaptation strategies [7]. Developing countries have introduced National Adaptation Plans (NAPs) focusing on strengthening health systems, ensuring water and food security, and improving early warning systems.

Technological advances in climate forecasting, monitoring, and communication have enabled more effective early warning for heatwaves, floods, and storms. In parallel, community-based awareness programs help populations adopt preventive measures. Nevertheless, disparities persist, as low-income countries often lack the resources to implement comprehensive adaptation strategies. Addressing these inequities requires international cooperation, capacity-building, and sustainable investment. Research on climate-health interactions must also expand, providing evidence to inform decision-making and guide public health policies. Figure 3 summarized the Global Policies and Adaptation Strategies.

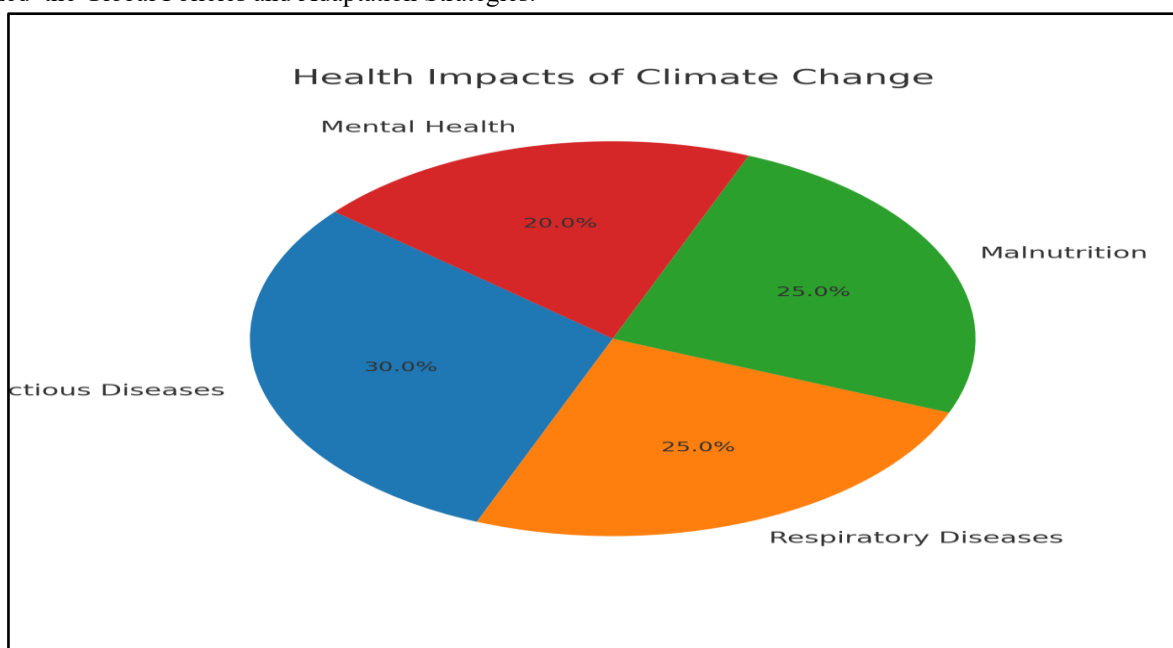


Figure 3 The Global Policies and Adaptation Strategies.

### 7. CONCLUSIONS AND RECOMMENDATIONS

Climate change constitutes a multifaceted global health emergency. Its direct impacts—heatwaves, air pollution, and natural disasters—combine with indirect effects such as food insecurity, water scarcity, and the spread of infectious diseases. The psychological toll of climate-related events further emphasizes the holistic nature of this crisis. Vulnerable populations, including children, the elderly, and individuals with chronic illnesses, are disproportionately affected.

To address these challenges, the following recommendations are proposed:

1. Strengthen global and national health surveillance systems to detect and respond to climate-related disease outbreaks.
2. Expand investment in climate-resilient healthcare infrastructure, particularly in vulnerable regions.
3. Promote sustainable agricultural and water management practices to enhance food and water security.
4. Integrate mental health support into climate adaptation and disaster response frameworks.
5. Foster international collaboration and knowledge-sharing to reduce health inequities and strengthen resilience.

Ultimately, integrating health into climate change strategies is essential not only to protect populations today but also to safeguard the well-being of future generations.

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