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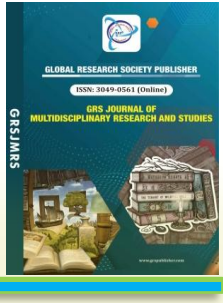

Human Health Impacts of Global Climate Change and Its Effects

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Abstract: Global climate change has emerged as one of the most pressing environmental challenges of the 21st century. While striking images—such as polar bears stranded on melting ice sheets in the Arctic or parched farmlands across Africa—have vividly illustrated ecological consequences, far less attention has been given to the profound implications for human health. To date, much of the literature has prioritized environmental and economic dimensions, leaving the direct, indirect, and psychological health impacts comparatively underexplored. This article seeks to address that gap by examining how climate change contributes to rising heat-related illnesses, the spread of vector-borne diseases, disruptions in food and water security, and the mental health burden associated with climate-induced displacement and disasters. In doing so, the study underscores the urgent need to integrate health considerations into climate change policy and adaptation strategies.

Keywords: *climate change, human health, heat waves, global warming, psychological impacts*

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Introduction

Over the past half century, human activities—particularly the burning of fossil fuels—have released large quantities of carbon dioxide and other greenhouse gases into the atmosphere. These gases trap excess heat in the lower atmosphere, contributing significantly to global climate change. Observational records indicate that average global temperatures have increased by approximately 0.74°C over the past century, with the majority of this warming occurring after 1975. Over the past 50 years, the rate of global warming has averaged about 0.13°C per decade. Medium-risk projections suggest that global temperatures could rise by 2–3°C by the year 2090, with even sharper increases of 4–5°C expected in northern Canada, Greenland, and Siberia.

Climate change is often assessed in terms of its impacts on the physical environment, such as melting ice sheets, rising sea levels, stronger storms, and more frequent heat waves. However, growing evidence indicates that the implications for **human health** may be even more profound and challenging. Rising greenhouse gas concentrations and the resulting environmental changes affect human well-being in multiple, complex ways.

Direct impacts include the health effects of extreme weather events such as heat waves, floods, and droughts, which increase mortality and morbidity rates. For example, populations exposed to flooding may not only face immediate risks of injury and waterborne Diseases but also suffer from long-term psychological disorders. Indirect effects of climate change include changes in biodiversity and ecosystem service, shifts in food and water availability, and the altered distribution of disease vectors such as those that transmit malaria and dengue fever. Climate change also interacts with air quality, often worsening respiratory conditions such as asthma and allergies.

Coastal populations are particularly vulnerable due to the risk of rising sea levels, especially in low-income countries where economic conditions limit the construction of protective coastal defenses. Moreover, environmental degradation and extreme weather events can lead to displacement, relocation, and homelessness, creating additional public health crises.

Overall, the health consequences of climate change can be categorized into multiple areas, including:

1. Asthma, allergies, respiratory, and airborne diseases
2. Cancer
3. Cardiovascular diseases and stroke
4. Food- and nutrition-related diseases
5. Heat-related mortality and illnesses
6. Human development impacts
7. Mental health and stress-related diseases
8. Neurological diseases and disorders
9. Infectious and vector-borne diseases

10. Water-borne diseases

Asthma, Allergies, and respiratory diseases

Allergies and respiratory illnesses are among the most common health conditions influenced by climate change. Rising global temperatures and shifts in precipitation patterns have altered exposure levels to several respiratory irritants. Extended growing seasons increase pollen levels; heavy or frequent rainfall promotes mold growth; warming oceans and coastal runoff contribute to toxic marine aerosols; and prolonged droughts create dust storms—all of which exacerbate respiratory health problems.

As a result, the global burden of asthma and related conditions has grown markedly. For instance, over the past decade, the prevalence of asthma has increased significantly, in some cases reported to be several times higher than before. This rise can be directly linked to environmental triggers intensified by climate change. Poor air quality, combined with climate-induced increases in allergens and particulates, poses a growing challenge to public health systems worldwide.

Cancer

The exact mechanisms of cancer development in humans and animals are not fully understood for all types of cancers. Nonetheless, it is well established that cancer arises from a combination of factors, including pathogens, environmental pollutants, age, and genetic predisposition. Recent research highlights that climate change contributes to cancer risk both directly and indirectly.

One of the most significant pathways is **increased ultraviolet (UV) radiation exposure**. Climate change can affect stratospheric ozone depletion, slowing the recovery of the ozone layer and thereby increasing UV radiation in certain latitudes. Rising temperatures also encourage people to spend more time outdoors with lighter clothing, increasing their vulnerability to sunburn and, consequently, skin cancer. For example, Australia records approximately 450,000 new cases of skin cancer annually, with over 95% directly attributed to solar UV exposure.

Another direct pathway involves the **volatilization of chemicals**. Higher ambient temperatures increase the evaporation of volatile and semi-volatile compounds, spreading pollutants over larger areas and threatening populations far beyond their original sources. Similarly, intense rainfall and flooding associated with climate change increase the leaching and leakage of toxic compounds and heavy metals into surface and groundwater, contaminating drinking water supplies and elevating long-term cancer risks.

Air pollution also plays a critical role. Although tobacco remains the primary cause of lung cancer, ambient air pollution—including fine particulate matter (PM2.5)—is increasingly recognized as a major contributor. Climate-related events, such as wildfires in the United States (notably in California and Colorado), worsen air quality and lead to widespread respiratory damage. According to the World Health Organization, air pollution is not only associated with lung cancer but also increases the risk of bladder cancer.

Cardiovascular disease and Stroke

Climate change has significant implications for cardiovascular health, primarily through increased heat stress, elevated exposure to airborne particulate matter, and shifts in the distribution of pathogens that can indirectly affect the cardiovascular system. Studies indicate that for every 1°C rise in temperature, the risk of cardiovascular disease increases by approximately **3.5%**, underscoring the vulnerability of human health to climate variability.

Both extreme heat and extreme cold are associated with higher rates of hospitalization for heart-related conditions, including chest pain, acute coronary syndromes, stroke, and cardiac arrhythmias. One illustrative example is **erythromelalgia**, a vascular disorder characterized by pain, burning, increased temperature, and swelling of the extremities, which is strongly exacerbated by fluctuations in ambient temperature.

Additionally, higher temperatures intensify the formation of ground-level ozone and other air pollutants, aggravating cardiovascular as well as respiratory diseases. These combined stressors disproportionately affect **vulnerable groups** such as the elderly, individuals with pre-existing cardiovascular conditions, and workers engaged in heavy physical labor. People with chronic heart failure are especially at risk, as their cardiovascular systems are less able to adapt to sudden environmental changes.

Foodborne and Nutritional Diseases

Rising global temperatures, shifting weather patterns, and the increasing frequency of extreme events have profound consequences for food systems, leading to contamination, spoilage, and disruption in distribution. Elevated carbon dioxide concentrations may increase crop yields but simultaneously reduce the nutritional value of staple agricultural products, resulting in deficiencies in essential nutrients. This poses a long-term threat to food security and public health.

Moreover, climate change heightens the risk of food contamination. Extreme rainfall, flooding, and warmer waters facilitate the proliferation of **chemical pollutants, biological toxins, and pathogenic microorganisms** in food supplies, particularly in seafood. These conditions raise the likelihood of foodborne illnesses and nutritional deficiencies. Climate variability also disrupts the transportation and distribution of food, making seasonal shortages more frequent and creating the potential for chronic supply issues under sustained climate change.

Indirectly, droughts and reduced agricultural productivity undermine livelihoods and trade, particularly in low-income countries, exacerbating malnutrition. Already, populations in **Africa, Asia, and Latin America** are experiencing higher rates of undernutrition as climate-driven crop failures rise. According to estimates, foodborne illnesses increase by approximately **2.5–6% for every 1°C rise in global temperature**, suggesting a compounding burden on public health as warming continues.

Heat-Related Deaths and Illnesses

Rising temperatures represent one of the most direct and visible health impacts of climate change. Prolonged heat exposure is associated with a spectrum of health effects, including muscle cramps, heat exhaustion, heatstroke, and premature death. Heat stress also exacerbates chronic conditions such as **respiratory, cardiovascular, and cerebrovascular diseases**, while increasing the prevalence of mental health disorders.

Certain groups are especially vulnerable to heat-related morbidity and mortality, notably **older adults over 65 years, infants under one year, and individuals with pre-existing health conditions**.

Urban populations are disproportionately at risk due to the **urban heat island effect**, where built environments trap and amplify heat, creating hotter microclimates compared to rural areas.

High ambient temperatures also contribute to elevated ground-level ozone and air pollutant concentrations, thereby compounding the risk of respiratory and cardiovascular illnesses. Additionally, extreme heat boosts pollen and allergen levels, increasing the incidence of asthma and allergic diseases.

Currently, climate-related factors account for over **100,000 deaths annually worldwide**, with projections indicating this number could rise to **300,000 deaths per year by 2030** if global warming continues unchecked.

Mental Health and Stress-Related Disorders

Mental health encompasses a broad spectrum of conditions, ranging from relatively mild disorders, such as social phobia and anxiety, to more severe illnesses, including depression and suicidal behavior. Climate change exacerbates this spectrum of disorders, with impacts ranging from temporary stress to long-term, chronic mental illness. While all populations are vulnerable, evidence shows that **low-income individuals are 1.6 times more likely** than high-income groups to experience adverse psychological outcomes. Moreover, **women are twice as likely as men** to suffer from climate-related mental health impacts.

The psychological consequences of climate change can be classified into **direct** and **indirect** impacts.

Direct impacts occur when communities are immediately exposed to extreme weather events or drastic environmental changes. Hurricanes, floods, wildfires, and heat waves not only cause physical destruction but also disrupt economic activities—particularly in agrarian societies that depend heavily on agriculture. The resulting **loss of livelihoods, displacement, and poverty** often give rise to depression, social isolation, grief, and homelessness. In extreme cases, suicide rates have been shown to rise following disasters. For example, after **Hurricane Andrew in 1992**, suicide rates in Miami doubled. Evidence also indicates that within 18 months after extreme weather events, **suicidal ideation rises from 2.8% to 6.4%**, while suicide attempts increase from **1% to 2.5%**.

Indirect impacts emerge more gradually, stemming from the broader consequences of climate change on health, infrastructure, and social systems. Food and water insecurity, loss of housing, and forced displacement due to droughts or floods contribute to prolonged stress and declining mental well-being. Importantly, the relationship between physical and mental health is interdependent; deterioration in physical health often precipitates psychological decline.

One of the most significant indirect drivers of psychological distress is **prolonged drought**, which intensifies food and water scarcity, forcing communities to migrate. The resulting increase in **climate migration** erodes social cohesion, cultural identity, and community ties, leading to heightened risks of **violence, conflict, and crime.**

Infectious and Vector-Borne Diseases

Climate conditions play a decisive role in the transmission of water-borne diseases and those spread by insects, snails, and other cold-blooded animals. Climate change is expected to **increase the seasonality, intensity, and geographic spread** of vector-borne diseases, thereby posing a growing challenge to global health.

Warming oceans and extreme weather patterns, such as floods and droughts, provide favorable conditions for the establishment, survival, and reproduction of vectors such as **mosquitoes, ticks, fleas, and snails**. For instance, the **El Niño phenomenon**, often associated with unusually high rainfall, increases flooding, which in turn fosters the growth of disease-carrying organisms. Similarly, ocean warming intensifies storms and winds that not only devastate human settlements but also facilitate the dispersal of disease vectors over vast distances.

Evidence shows that climate change is **lengthening the transmission seasons** of major vector-borne diseases and shifting their geographical ranges. For example, in China, warming temperatures have expanded the habitat of aquatic snails responsible for transmitting **schistosomiasis**, a parasitic disease strongly influenced by climatic conditions.

Mosquitoes, in particular, are highly sensitive to temperature, rainfall, and access to standing water. They are primary vectors of **malaria, filariasis, dengue fever, Japanese encephalitis, and yellow fever**. Research projects that by the 2080s, nearly **2 billion people worldwide** could be at risk of **dengue fever** due to climate-related habitat expansion.

Vector-Borne and Zoonotic Diseases (VBZD)—including **malaria, avian influenza, and Chagas disease**—are especially sensitive to ecological disruptions caused by climate change. Rising temperatures and altered precipitation patterns affect hosts and pathogens directly, while also reshaping ecosystems and predator-prey relationships that can increase vector populations.

Climate change has also been linked to the spread of **cholera**, caused by *Vibrio cholerae*. These bacteria can live on plankton, and warmer water temperatures promote plankton and algal blooms, which in turn support cholera proliferation. Consequently, countries with warm coastlines face heightened risks of cholera outbreaks.

Table 1. Examples of Vector-Borne Diseases Sensitive to Climate Change

Vector	Major Diseases
Mosquitoes	Malaria, filariasis, dengue fever, yellow fever, West Nile fever
Sandflies (mosquito)	Leishmaniasis
Kissing bug	Chagas disease
Blacklegged tick	Lyme disease, viral encephalitis
Tsetse fly	African sleeping sickness
Blackfly	River blindness
Snail (intermediate)	Schistosomiasis

Source: Haines A., Kovats R.S., Campbell-Lendrum D., Corvalán C. (2006)

Waterborne Diseases

Waterborne diseases arise when pathogens contaminate water sources, which are then consumed directly (as drinking water) or indirectly through contaminated food, or during recreational activities such as swimming. These diseases are caused by a variety of **microorganisms, biotoxins, and toxic pollutants**, and

can lead to life-threatening illnesses including **cholera, schistosomiasis, shigellosis**, and other severe gastrointestinal conditions.

Outbreaks of waterborne diseases frequently follow **heavy rainfall or flooding events**. As climate change increases the **intensity and frequency of extreme precipitation**, communities—particularly those in developing regions—are increasingly vulnerable to such outbreaks. Research shows a strong link between rainfall variability and the spread of waterborne diseases at the local, regional, and global scales.

Flooding and increased rainfall typically drive three main categories of diseases:

1. **Waterborne diseases** such as diarrheal illnesses.
2. **Mosquito-borne diseases**, since standing water provides ideal breeding grounds.
3. **Water-related infectious diseases** such as fungal skin infections, eye diseases, and respiratory conditions.

Temperature also plays a crucial role. Warmer conditions enhance the spread of pathogens such as **Giardia, Legionella (Legionnaires' disease), Shigella, and Cryptosporidium**. One study found that for every **1°C increase in temperature, diarrheal diseases rise by approximately 8%**. According to the **World Health Organization (WHO)**, diarrheal diseases already account for **4 billion cases and 2.2 million deaths annually**. A projected 1°C rise in global average temperature could therefore result in an additional **320 million cases and 176,000 deaths** from diarrheal diseases worldwide.

Conclusion

Climate change poses profound threats to physical, social, and psychological health, and is increasingly recognized as a major risk to **human well-being and survival**. Vulnerable populations—particularly in low-income countries—bear the greatest burden, as their adaptive capacities are limited. However, even marginalized groups in high-income nations face significant risks. Adaptation strategies—such as improving water infrastructure, strengthening disease surveillance, and expanding healthcare access—can reduce adverse impacts. Yet, in many developing nations, the **implementation of these strategies remains difficult** due to economic and institutional constraints. One key approach is the wider adoption of **renewable energy**, which simultaneously reduces air pollution and mitigates climate change.

Mental health must also be prioritized. Psychologists and health professionals have a moral responsibility to **address climate-related psychological distress**, reduce inequalities, and promote resilience. Coordinated programs, research initiatives, and specialized training in **climate-related psychological support** are urgently needed to strengthen global health systems and protect communities against the escalating challenges of climate change.

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