

Climate Change Impact on Human Health and How Individuals Can Reduce with Help of AI - Review

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Abstract

Climate change poses a significant threat to human health by increasing the incidence of heat-related illnesses, respiratory disorders, infectious diseases, malnutrition, and mental health challenges. Rising temperatures, air pollution, extreme weather events, and changing disease patterns directly affect vulnerable populations across the globe. Individual actions also play a crucial role in reducing climate-related health risks. This study explores how individuals can mitigate the health impacts of climate change with the assistance of Artificial Intelligence (AI). AI-based tools such as health monitoring applications, air-quality prediction systems, climate-aware fitness and lifestyle recommendations, and early warning systems for extreme weather can empower individuals to make informed decisions. By enabling personalized risk assessment, promoting sustainable behaviors, and supporting preventive healthcare, AI acts as a bridge between climate awareness and actionable health protection. The integration of AI at the individual level can contribute to improved public health outcomes while supporting global efforts to combat climate change.

Keywords: Climate Change, Human Health Impact, Sustainable Lifecycle, AI-driven Health Monitoring

Introduction

The global climate crisis is no longer a distant theoretical threat; it is a defining public health emergency of the 21st century. While large-scale policy shifts are essential, the immediate impact of rising global temperatures, volatile weather patterns, and degraded air quality is felt most acutely at the individual level. Climate change acts as a "threat multiplier," exacerbating respiratory illnesses, heat-related morbidity, and the spread of vector-borne diseases.

Despite the scale of this challenge, a significant gap exists between scientific awareness and individual actionable intelligence. In recent years, Artificial Intelligence (AI) has emerged as a powerful tool in addressing climate-related health challenges. AI technologies such as machine learning, predictive analytics, and data modeling can help forecast extreme weather events, monitor disease outbreaks, optimize energy consumption, and promote sustainable lifestyle choices. AI-driven health monitoring systems can provide early warnings, enabling individuals and communities to take preventive measures.

At the individual level, AI-enabled applications can assist in reducing carbon footprints through smart energy management, personalized health recommendations, sustainable transportation planning, and environmental monitoring. By integrating AI solutions into daily life, individuals can contribute to climate mitigation while simultaneously protecting their health.

Literature Review

Climate Change and Human Health Trends(2019–2025)

Recent global health research has documented the worsening impact of climate change on human health. According to the World Health Organization, climate change is already affecting every aspect of health — from heat stress and air pollution to malnutrition and vector-borne diseases — and is expected to cause approximately **250,000 additional deaths per year between 2030 and 2050** due to climate-sensitive outcomes like undernutrition, malaria, diarrhoea and heat stress. Globally, about **3.6 billion people live in areas highly susceptible to climate change**, with low-income regions facing disproportionate risks. Death rates from extreme weather events have increased **15 times in the most vulnerable regions compared to less exposed areas**, and climate impacts like droughts and floods continue to elevate disease risk and food insecurity.

External analyses further quantify these health trends. A major 2025 global report estimated that **heat-related deaths have surged by 23% since the 1990s**, contributing to more than **546,000 annual fatalities**, with wildfire smoke linked to **154,000 deaths in 2024 alone**. Air pollution from burning fossil fuels also contributes to roughly **2.5 million deaths each year** worldwide. Another study estimated that the **2025 European heatwave directly caused about 1,500 deaths** that would not have occurred without human-driven warming, marking one of the first direct attributions of specific deaths to fossil fuel emissions. These findings illustrate the growing and quantifiable toll of climate change on human health across different regions.

Systematic and narrative reviews further support these trends. One recent review highlighted the direct and indirect ways climate change affects health — including heatwaves, spread of vector-borne and water-borne diseases, food insecurity, and psychological stress — confirming the multi-dimensional nature of climate health risks. Another analysis focusing on low- and middle-income countries found that **70% of health impact studies were published just in the last five years**, showing a significant growth in research interest, although with geographic gaps and under-representation of vulnerable regions such as Africa.

Artificial Intelligence in Climate & Health Research (2019–2025)

A growing body of research in the last five years has explored the role of artificial intelligence in understanding climate change and associated health impacts. A 2025 publication reviewed the use of AI for predicting climate-driven infectious disease outbreaks, showing that machine learning models (e.g., random forests, neural networks, transformer models) outperform traditional statistical methods in forecasting vector-borne and water-borne disease risks under climate variability. These advanced AI techniques capture non-linear climate–disease relationships and enable real-time analytics, which can be vital for early warning systems and proactive public health interventions.

Another recent systematic review analysed big data and machine learning approaches to predicting the impacts of climate change on health outcomes, indicating that climate-health modelling using AI has expanded significantly in recent years. This trend aligns with broader systematic work on AI’s environmental and human health impacts, which reviewed over 1,200 studies from the last decade. It found that while most AI environmental studies focus on energy and CO₂ emissions, research linking AI to **health outcomes and social dimensions is still emerging**, highlighting the need for more interdisciplinary work in this area.

Significant interdisciplinary reviews on AI in healthcare and climate contexts also emphasize both opportunities and challenges. A 2024 review on AI and climate change in healthcare highlighted the potential for AI to improve

diagnostic efficiency and patient outcomes while warning that health systems themselves are significant sources of emissions, and sustainable AI practices must be prioritized. Additionally, research exploring AI’s energy demands — such as the environmental and public health burden of data centres — has revealed substantial pollution-related health costs in recent years, further underscoring the importance of sustainable AI deployment

Artificial Intelligence in Healthcare and Individual-Level Interventions

Parallel to environmental applications, AI has revolutionized healthcare delivery and disease management. AI-powered diagnostic tools, predictive analytics, and wearable health monitoring devices have improved early detection and personalized treatment strategies. Machine learning algorithms can analyze patient data to predict disease outbreaks, assess risk factors, and recommend preventive interventions.

In the context of climate change, AI-driven healthcare systems can forecast climate-sensitive disease outbreaks by integrating meteorological data with epidemiological patterns. For example, predictive models can identify high-risk zones for dengue outbreaks based on temperature and rainfall trends. Additionally, AI-enabled mobile applications provide real-time air quality alerts, heatwave warnings, and personalized health recommendations, empowering individuals to modify their behavior to reduce exposure to environmental risks.

Smart home technologies integrated with AI further allow individuals to reduce energy consumption through automated temperature regulation, efficient lighting systems, and energy usage monitoring. These systems not only lower carbon emissions but also create healthier indoor environments. Wearable devices that monitor heart rate, hydration levels, and physical activity can alert users during extreme heat conditions, helping prevent heat-related illnesses.

| Author / Organization | Year | Focus Area | Key Findings | Important Statistics | Contribution / Gap |
|--|---------|-----------------------------|---|---|---|
| World Health Organization | 2024-24 | Climate change and Health | Climate change increases heat stress, malnutrition, vector-borne diseases, and mortality. | Estimated 250,000 additional deaths per year (2030–2050) due to climate-related causes; 3.6 billion people vulnerable globally. | Highlights urgent health burden but does not focus on AI-based individual mitigation. |
| Intergovernmental Panel on climate change | 2022 | Global Climate Assessment | Confirms increased frequency of extreme weather events affecting human health. | Vulnerable regions show 15× higher mortality risk from climate disasters. | Provides climate-health linkage but limited discussion on AI intervention. |
| The Lancet Countdown Report | 2024-25 | Climate & Health Monitoring | Tracks global health impacts of climate change annually. | Heat-related deaths increased by 23% since 1990s; approx. 546,000 annual heat-related deaths globally. | Strong statistical evidence; lacks focus on AI-enabled individual-level solutions. |
| Springer Nature Study (AI & Infectious Disease Prediction) | 2025 | AI in Disease Forecasting | Machine learning models outperform traditional models in predicting climate-sensitive diseases. | AI models show higher predictive accuracy (10–25% improvement) over statistical methods. | Shows AI potential but focuses on institutional use rather than individual action |
| Frontiers in Climate (Systematic Review) | 2025 | Climate-Health Impacts | Multi-dimensional impact including mental health and food insecurity. | Significant rise in studies post-2020; majority focused on heatwaves and respiratory illness. | Identifies research growth but limited integration with AI tools. |
| Nature Digital Medicine (Digital Tech Review) | 2025 | Digital Health & Climate | Digital tools used for education and | Increase in digital health interventions after | Indicates gap in AI-based personalized |

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|---|-----------|-----------------------------------|--|--|--|
| | | | climate-health communication. | COVID-19; limited direct monitoring tools. | health protection. |
| ArXiv Review (AI Environmental Impact Study) | 2024–2025 | AI & Environmental Sustainability | AI helps optimize energy and predict disasters but consumes high energy. | Large AI data centers contribute significantly to carbon emissions. | Raises ethical concern: sustainable AI deployment needed. |
| ScienceDirect Review (AI in Healthcare & Climate) | 2024 | AI in Healthcare System | AI improves diagnostics and outbreak prediction under climate variability. | AI-assisted diagnostics reduce error rates by up to 15–20% in some case studies. | Suggests integration potential but lacks individual behavior-change focus. |

Impact of Climate Change on Human Health

Heat-Related Illnesses

Rising global temperatures due to climate change have significantly increased the frequency, intensity, and duration of heatwaves. According to the Intergovernmental Panel on Climate Change, extreme heat events that previously occurred once in 50 years are now becoming more frequent in many regions. Prolonged exposure to high temperatures can lead to heat exhaustion, heatstroke, dehydration, and worsening of pre-existing cardiovascular and respiratory conditions. Vulnerable populations, including elderly individuals, outdoor workers, children, and people with chronic illnesses, are at greater risk of heat-related morbidity and mortality. Urban areas experience an additional “urban heat island effect,” where concrete infrastructure traps heat, increasing health risks for city residents. Studies have shown a significant rise in heat-related deaths over the past decade, highlighting the urgent need for early warning systems and adaptive health strategies.

Air Pollution & Respiratory Disorders

Climate change directly influences air quality through increased temperatures, wildfires, and changes in atmospheric circulation patterns. Higher temperatures accelerate the formation of ground-level ozone and increase concentrations of particulate matter (PM_{2.5}), which are harmful to lung and heart health. The World Health Organization identifies air pollution as one of the leading environmental risk factors for global mortality. Exposure to polluted air contributes to asthma, chronic obstructive pulmonary disease (COPD), lung cancer, and cardiovascular diseases. Climate-driven wildfires further worsen air quality by releasing large amounts of smoke and toxic pollutants. Long-term exposure to air pollution weakens immune responses and increases vulnerability to infections. Thus, climate change amplifies respiratory health risks by deteriorating ambient air conditions worldwide.

Vector-Borne Diseases

Climate variability plays a crucial role in the transmission patterns of vector-borne diseases. Rising temperatures, altered rainfall patterns, and increased humidity create favorable breeding environments for disease-carrying vectors such as mosquitoes and ticks. Diseases like malaria, dengue, chikungunya, and Zika virus are highly sensitive to climatic conditions. Warmer temperatures shorten the incubation period of pathogens within vectors, accelerating transmission cycles. As a result, regions that were previously unaffected are now experiencing outbreaks. Expanding geographic distribution of vectors poses new public health challenges, particularly in tropical and subtropical countries. Climate-driven shifts in ecosystems also disrupt natural predator-prey balances, further influencing disease spread. Therefore, climate change is not only increasing disease intensity but also expanding its geographical reach.

Mental Health Stress

The psychological effects of climate change are increasingly recognized in recent literature. Climate-related disasters such as floods, cyclones, and wildfires lead to displacement, loss of livelihood, and trauma. Individuals exposed to such events may experience anxiety, depression, post-traumatic stress disorder (PTSD), and chronic stress. Even

indirect exposure to climate information, often referred to as “eco-anxiety,” affects mental well-being, particularly among younger populations. Uncertainty about future environmental conditions and economic stability further contributes to psychological distress. Mental health systems, especially in developing countries, are often underprepared to address climate-induced stress disorders. Hence, climate change not only impacts physical health but also significantly influences emotional and psychological well-being.

Water & Food Insecurity

Climate change significantly affects freshwater availability and agricultural productivity. Irregular rainfall, prolonged droughts, floods, and soil degradation reduce crop yields and threaten food security. Agricultural disruptions can lead to malnutrition, particularly among children and low-income communities. In addition, contamination of water sources during floods increases the risk of water-borne diseases such as cholera, diarrhea, and typhoid. Reduced access to clean drinking water further exacerbates health risks. Food insecurity also contributes to weakened immune systems, making populations more susceptible to infections. Climate change thus affects the entire food-water-health nexus, creating complex public health challenges that require integrated policy responses.

Role of Artificial Intelligence in Climate–Health Risk Reduction

Predictive AI

Artificial Intelligence plays a critical role in predicting climate-related health risks before they occur. Predictive AI systems use machine learning algorithms to analyze large volumes of environmental, meteorological, and health data to identify patterns and forecast potential hazards. With increasing climate variability, early prediction becomes essential for reducing mortality and morbidity.

Extreme Heat Forecasting

AI-based climate models are increasingly used to forecast extreme heat events with higher precision than traditional statistical methods. By integrating satellite data, atmospheric temperature records, humidity levels, and historical climate patterns, machine learning models can generate early warnings for heatwaves. According to the Intergovernmental Panel on Climate Change, extreme heat events are becoming more frequent and intense, increasing the risk of heatstroke and cardiovascular complications. AI-driven early warning systems allow governments and individuals to prepare in advance by adjusting work schedules, ensuring hydration, and activating cooling systems. Personalized heat-risk alerts delivered through mobile applications can help vulnerable populations reduce exposure and prevent heat-related illnesses.

Disease Outbreak Prediction

Climate change significantly influences the spread of vector-borne and water-borne diseases. AI models can integrate climatic variables such as rainfall, temperature, humidity, and vegetation patterns with epidemiological data to predict outbreaks of diseases like malaria, dengue, and cholera. Machine learning techniques such as neural networks and random forest models have shown improved predictive accuracy compared to traditional surveillance systems. These predictive systems allow public health authorities to initiate preventive measures such as vector control and vaccination drives. At the individual level, AI-based health applications can notify users about high-risk zones and recommend protective actions, thereby reducing disease transmission and improving community resilience.

Monitoring AI

While predictive AI focuses on forecasting future risks, monitoring AI emphasizes real-time data collection and health tracking. Continuous monitoring enables timely intervention and personalized decision-making.

Wearables

AI-integrated wearable devices such as smartwatches and fitness trackers continuously monitor physiological parameters including heart rate, body temperature, hydration levels, and oxygen saturation. During extreme heat events or high pollution days, these devices can detect abnormal physiological changes and alert users to take preventive actions. For instance, elevated heart rate combined with high ambient temperature can indicate heat stress risk. Wearables use embedded AI algorithms to analyze patterns and provide personalized recommendations, thereby reducing vulnerability to climate-related health conditions.

Air Quality Applications

Air pollution is closely linked to climate change and respiratory diseases. AI-powered air quality applications analyze data from environmental sensors and satellites to provide real-time Air Quality Index (AQI) updates. These apps can predict pollution peaks and send alerts to individuals, particularly those with asthma or respiratory conditions. The World Health Organization has identified air pollution as a major contributor to global mortality. By using AI-driven AQI monitoring tools, individuals can avoid outdoor exposure during hazardous conditions, use protective masks, or operate indoor air purification systems.

Smart Environmental Sensors

Smart sensors embedded in homes and urban infrastructure continuously monitor temperature, humidity, carbon dioxide levels, and indoor air quality. AI algorithms process this data to maintain healthy environmental conditions. For example, automated ventilation systems adjust airflow when indoor pollutant levels rise. These AI-enabled monitoring systems help maintain healthier living environments while also optimizing energy use.

Mitigation AI

Beyond prediction and monitoring, AI contributes to long-term climate mitigation strategies that indirectly protect human health by reducing greenhouse gas emissions and environmental degradation.

Smart Home Energy Optimization

AI-powered smart home systems regulate electricity usage by learning household energy consumption patterns. These systems optimize heating, ventilation, air conditioning (HVAC), and lighting to minimize energy waste. Reduced energy consumption leads to lower carbon emissions, contributing to climate change mitigation. Efficient indoor climate control also ensures comfortable and safe living conditions during extreme weather events.

Carbon Footprint Tracking Applications

AI-driven carbon footprint tracking applications analyze user behavior related to transportation, electricity usage, food consumption, and lifestyle patterns. These applications provide personalized recommendations to reduce emissions, such as adopting plant-based diets, reducing electricity consumption, or choosing sustainable products. By quantifying environmental impact, AI encourages behavioral change at the individual level, indirectly contributing to climate-health risk reduction.

AI-Based Transport Recommendations

Transportation is a major contributor to greenhouse gas emissions. AI systems integrated into navigation apps recommend fuel-efficient routes, carpooling options, and public transport alternatives. By reducing vehicle emissions, these systems improve air quality and decrease respiratory health risks. Smart traffic management systems powered by AI further reduce congestion and urban pollution levels.

Conclusion

Climate change has emerged as a significant and escalating threat to global public health. The increasing frequency of extreme heatwaves, rising air pollution levels, shifting patterns of infectious diseases, water scarcity, and food insecurity clearly demonstrate that climate change is no longer a distant environmental concern but an immediate health crisis. Scientific assessments by the Intergovernmental Panel on Climate Change confirm that climate-related hazards are intensifying across regions, disproportionately affecting vulnerable populations such as the elderly, children, low-income communities, and individuals with pre-existing health conditions. Additionally, the World Health Organization has identified climate change as one of the greatest health challenges of the 21st century, emphasizing its direct and indirect impacts on mortality, disease burden, and mental well-being. These findings reinforce the urgent need for innovative and adaptive strategies to safeguard human health.

Importantly, this study highlights that climate-health risk reduction is not solely dependent on governmental policies or global agreements. Individuals, when equipped with AI-enabled tools, can actively reduce their vulnerability to climate-related health threats. Personalized alerts, data-driven health insights, and sustainable lifestyle recommendations enable proactive behavioral changes that enhance resilience. Thus, AI bridges the gap between large-scale climate data and individual-level action, transforming abstract environmental risks into manageable, personalized health strategies.

However, the successful integration of AI into climate-health frameworks requires coordinated policy support, sustainable technological infrastructure, and ethical governance. AI systems must be designed with energy efficiency in mind to minimize their environmental footprint. Policymakers should promote equitable access to digital tools, particularly in low-resource settings, to prevent widening health disparities. Collaboration among public health institutions, climate scientists, technologists, and governments is essential to ensure that AI-driven solutions are reliable, inclusive, and environmentally sustainable. In conclusion, climate change poses severe and multidimensional risks to human health, but Artificial Intelligence offers powerful predictive, monitoring, and mitigation capabilities that can significantly reduce these risks. By empowering individuals with intelligent tools and integrating supportive policy measures, societies can move toward a more climate-resilient and health-protective future.

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