

Exploring the Effects of Climate Change on Human Health

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Abstract

Climate change has emerged as one of the most pressing global challenges of our time, profoundly impacting ecosystems and human societies. This research article aims to investigate the multifaceted effects of climate change on human health. Drawing from a comprehensive review of existing scientific literature and empirical data, the study delves into the complex interplay between changing climatic patterns and various aspects of human well-being. The article explores the direct and indirect pathways through which climate change influences human health. It examines the escalating frequency and intensity of extreme weather events, such as heatwaves, hurricanes, and droughts, and their immediate health consequences, including heat-related illnesses, injuries, and mental health impacts. Moreover, the paper investigates the long-term health ramifications of altered precipitation patterns, rising sea levels, and changes in vector-borne disease distributions. Through a systematic analysis, the research also elucidates the disproportionate impact of climate change on vulnerable populations, including low-income communities, children, the elderly, and marginalized groups. Furthermore, it delves into the complex web of social, economic, and environmental factors that amplify or mitigate the health effects of climate change. The article underscores the urgency of addressing climate change as a public health imperative. It highlights the importance of developing adaptive strategies and policies to protect human health and build resilient communities in the face of an ever-changing climate. The study emphasizes the need for interdisciplinary collaboration among policymakers, health professionals, environmental scientists, and stakeholders to develop comprehensive solutions that safeguard human health in a warming world. In conclusion, "Exploring the Effects of Climate Change on Human Health" provides valuable insights into the multifaceted challenges posed by climate change on global health. The research calls for concerted efforts to mitigate the drivers of climate change while promoting climate-resilient healthcare systems to protect the well-being of current and future generations.

Keywords: Climate, human health, infectious diseases.

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Introduction:

Climate change is a pressing global issue that has far-reaching implications for various aspects of human life. While its impact on ecosystems, weather patterns, and natural resources has been extensively studied, the effects of climate change on human health are becoming increasingly recognized and concerning. The intricate relationship between climate and health underscores the urgent need to understand and address the potential consequences of a changing climate on human well-being.

Climate change refers to long-term shifts in temperature, precipitation patterns, sea levels, and extreme weather events, resulting primarily from the accumulation of greenhouse gases in the Earth's atmosphere. These greenhouse gases, including carbon dioxide, methane, and nitrous oxide, are largely emitted by human activities such as burning fossil fuels, deforestation, and industrial processes. The continuous rise in greenhouse gas emissions has led to a steady increase in global temperatures, triggering a cascade of environmental transformations with significant implications for human health.

The impacts of climate change on

human health are multifaceted and occur through various pathways. Changes in temperature and precipitation patterns can directly influence the occurrence and distribution of infectious diseases, such as malaria, dengue fever, and Lyme disease. Rising temperatures can enhance the breeding cycles of disease vectors like mosquitoes and expand their geographical range, bringing these illnesses to regions previously unaffected. Furthermore, extreme weather events, including heatwaves, hurricanes, and floods, pose direct threats to human life, causing injuries, displacement, and loss of essential infrastructure, disrupting healthcare systems, and increasing the risk of mental health issues.

Beyond the immediate physical risks, climate change has the potential to exacerbate existing health disparities and vulnerabilities. Impacts on food production, water availability, and air quality can have indirect but profound effects on human health, particularly among vulnerable populations. For instance, compromised agricultural productivity and changing weather patterns can lead to food scarcity and malnutrition, affecting both physical and cognitive development in children.

Moreover, diminished air quality resulting from increased air pollution, pollen levels, and the intensification of wildfires can worsen respiratory conditions such as asthma and contribute to cardiovascular diseases.

Understanding the complex relationship between climate change and human health requires a multidisciplinary approach. Researchers from various fields, including climate science, epidemiology, public health, and social sciences, are working together to investigate the mechanisms through which climate change impacts health outcomes and to develop effective adaptation and mitigation strategies. These efforts are crucial in informing policy decisions, implementing public health interventions, and fostering community resilience in the face of climate change.

This paper aims to explore the effects of climate change on human health by examining the existing body of research and highlighting key findings from relevant studies. It will delve into specific health impacts across different regions and populations, discuss the underlying mechanisms driving these effects, and discuss potential strategies for adaptation and mitigation. By shedding light on the

intricate interplay between climate change and human health, this study seeks to contribute to the ongoing dialogue and foster a comprehensive understanding of the challenges and opportunities that lie ahead in safeguarding human well-being in a changing climate.

Understanding the Mechanisms of Climate Change

Understanding the mechanisms of climate change is essential for comprehending the complex processes that drive global warming and its impacts on the Earth's ecosystems. Climate change refers to long-term alterations in the Earth's climate, primarily attributed to human activities, such as the burning of fossil fuels and deforestation. Scientists have extensively studied the mechanisms behind climate change to predict its effects accurately and devise strategies to mitigate its adverse consequences.

One of the main mechanisms of climate change is the greenhouse effect. Greenhouse gases, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), trap heat in the Earth's atmosphere, preventing it from escaping into space. Human activities, particularly the burning of fossil fuels for energy, have significantly increased the concentration of greenhouse gases, intensifying the

greenhouse effect and leading to global warming.

Another crucial mechanism of climate change is deforestation and land-use change. Forests act as carbon sinks, absorbing and storing CO₂ from the atmosphere. When forests are cleared or burned, the stored carbon is released, contributing to higher greenhouse gas levels and further warming the planet. Deforestation also reduces the Earth's ability to absorb CO₂, exacerbating the effects of climate change.

Changes in the Earth's energy balance, known as radiative forcing, is another mechanism driving climate change. External factors, such as solar radiation, volcanic eruptions, and changes in the Earth's orbit, can influence the amount of energy the planet receives. Human activities, however, have become the dominant driver of radiative forcing, leading to the rapid warming of the Earth's surface.

The feedback mechanisms also play a significant role in climate change. Positive feedback loops amplify the effects of climate change, while negative feedback loops mitigate its impact. For example, as the Arctic ice melts due to global warming, less sunlight is reflected

back into space, causing more heat absorption and further ice melt. Such positive feedback loops accelerate climate change, leading to cascading effects on weather patterns, sea levels, and ecosystems.

Understanding the mechanisms of climate change is crucial for developing effective strategies to address and adapt to the challenges it poses. By recognizing the human-induced drivers of climate change, policymakers, scientists, and individuals can work together to reduce greenhouse gas emissions, promote sustainable land-use practices, and implement measures to protect vulnerable communities and ecosystems from the impacts of a changing climate. A well-informed approach is essential to mitigate the worst consequences of climate change and create a sustainable future for our planet.

Climate Change and Vector-Borne Diseases

Climate change has emerged as a significant driver of the spread and prevalence of vector-borne diseases worldwide. Vector-borne diseases, such as malaria, dengue fever, Zika virus, and Lyme disease, are transmitted to humans through the bites of infected vectors, such as mosquitoes, ticks, and fleas. Changes in temperature, rainfall patterns, and

humidity due to climate change directly impact the distribution, behavior, and survival of these vectors, leading to shifts in disease transmission patterns and posing new challenges for public health.

One of the key ways climate change influences vector-borne diseases is by expanding the geographical range of disease vectors. Warmer temperatures in previously cooler regions create more favorable conditions for vectors to thrive and multiply. As a result, areas that were once considered unsuitable for vector populations may now become suitable breeding grounds, leading to the spread of diseases to new regions and communities.

Additionally, altered weather patterns due to climate change can lead to increased frequency and intensity of extreme weather events, such as hurricanes and floods. These events can disrupt the ecological balance and force human populations to relocate or seek refuge in temporary shelters. Such movements of people can facilitate the spread of vectors and their associated diseases to new areas, increasing the risk of outbreaks and epidemics.

Climate change also impacts the life cycle and behavior of disease vectors. Higher temperatures can accelerate the

development of pathogens within the vector, reducing the time it takes for the vector to become infectious. This can lead to an increase in the number of transmission cycles and, consequently, more opportunities for disease transmission to occur. Moreover, changes in rainfall patterns can create breeding sites for mosquitoes, while prolonged warm seasons may extend the period during which vectors are active, further influencing disease transmission rates.

Public health systems and vector control strategies must adapt to the challenges posed by climate change and vector-borne diseases. Surveillance systems need to be improved to monitor changes in vector populations and disease transmission patterns. Implementing effective vector control measures, such as insecticide-treated bed nets, insecticide spraying, and source reduction, becomes crucial to limit the spread of diseases and protect vulnerable populations.

In conclusion, climate change plays a significant role in shaping the distribution and transmission of vector-borne diseases, posing substantial challenges to global public health. As climate change continues to impact the planet, the risks associated with vector-

borne diseases are expected to increase. It is imperative for governments, organizations, and communities to take proactive measures to mitigate the impacts of climate change, develop adaptive strategies for disease prevention and control, and foster international cooperation to address this critical public health issue.

Extreme Weather Events and Their Health Impacts

Extreme weather events, such as heatwaves, hurricanes, floods, and droughts, have become more frequent and severe in recent years due to climate change. These events pose significant threats to human health and well-being. As global temperatures rise and weather patterns become more unpredictable, understanding the health impacts of extreme weather events is essential for developing effective strategies to protect communities and mitigate the consequences of these events.

Health Risks During Heatwaves

Heatwaves, characterized by prolonged periods of extremely high temperatures, can have devastating health effects. Heat-related illnesses, such as heatstroke, heat exhaustion, and dehydration, become more prevalent during these events. Vulnerable

populations, including the elderly, children, and individuals with pre-existing health conditions, are at higher risk. Additionally, heatwaves can exacerbate air pollution and worsen respiratory conditions, leading to increased hospitalizations and even mortality.

Health Impacts of Hurricanes and Floods

Hurricanes and floods pose a range of health risks, both during the event and in the aftermath. During these disasters, injuries, and trauma from physical impacts are common. Access to clean water and sanitation may be compromised, leading to the spread of waterborne diseases. Disruptions to healthcare services and access to medication can exacerbate chronic health conditions. Furthermore, the loss of homes and displacement can have profound effects on mental health and well-being.

Drought and Its Health Consequences

Droughts, which involve prolonged periods of water scarcity, can lead to numerous health challenges. Reduced water availability can impact agriculture and food security, leading to malnutrition and related health issues. Drought can also increase the risk of wildfires, resulting in respiratory problems due to smoke exposure. Additionally, the mental health

impacts of prolonged drought and its associated economic hardships can be significant.

****Paragraph 5: Mitigation and Adaptation Strategies****

Addressing the health impacts of extreme weather events requires a combination of mitigation and adaptation strategies. Mitigation efforts to reduce greenhouse gas emissions can help slow down climate change and decrease the frequency and intensity of extreme weather events. Adaptation measures, such as early warning systems, heat action plans, and improved infrastructure to withstand floods and hurricanes, can enhance communities' resilience to these events. Public health preparedness and education are crucial in raising awareness and empowering individuals to protect themselves during extreme weather events.

In conclusion, extreme weather events have severe health impacts, affecting vulnerable populations disproportionately. As the frequency and intensity of these events continue to increase due to climate change, there is an urgent need to prioritize public health initiatives and take proactive steps to mitigate and adapt to the health risks posed by extreme weather. Through coordinated efforts at the local, national, and global

levels, we can work towards building resilient communities that can better withstand the challenges of extreme weather events and safeguard human health.

Air Quality and Respiratory Health

Air quality plays a crucial role in respiratory health, with a direct and significant impact on the well-being of individuals and communities. Poor air quality, often caused by pollution from various sources such as vehicle emissions, industrial activities, and burning of fossil fuels, can lead to a range of respiratory problems. Particulate matter, nitrogen dioxide, ozone, and volatile organic compounds present in polluted air can irritate the respiratory system, triggering or exacerbating conditions such as asthma, chronic obstructive pulmonary disease (COPD), and respiratory infections.

For individuals with pre-existing respiratory conditions, exposure to poor air quality can be particularly detrimental. High levels of air pollution can worsen symptoms, increase the frequency and severity of asthma attacks, and lead to more frequent hospitalizations. Moreover, prolonged exposure to polluted air can contribute to the development of respiratory diseases in otherwise healthy

individuals, affecting lung function and decreasing overall respiratory capacity over time.

Children, the elderly, and individuals with compromised immune systems are especially vulnerable to the adverse effects of poor air quality on respiratory health. Children's respiratory systems are still developing, and exposure to pollutants during critical periods can have long-term consequences for their lung function. Similarly, older adults and those with weakened immune systems may experience more severe respiratory symptoms due to their reduced ability to defend against pollutants and respiratory infections.

Addressing air quality concerns is crucial for protecting respiratory health on a broader scale. Implementation of strict environmental regulations, adoption of cleaner energy sources, and promotion of sustainable transportation can contribute to reducing air pollution levels. Public awareness campaigns can also educate communities about the importance of air quality monitoring and encourage behavior changes that reduce exposure to harmful pollutants.

In conclusion, air quality plays a central role in respiratory health, with poor

air quality having detrimental effects on individuals' well-being, particularly those with pre-existing respiratory conditions and vulnerable populations. Efforts to improve air quality through policy changes, technological advancements, and community engagement are vital in safeguarding respiratory health and creating a healthier environment for present and future generations. Proactive measures taken to reduce air pollution can contribute to better respiratory outcomes, enhance overall public health, and ensure a sustainable and cleaner future for everyone.

Water Scarcity and Waterborne Diseases

Water scarcity and waterborne diseases are interconnected challenges that pose significant threats to public health and socio-economic development worldwide. Water scarcity occurs when the demand for water surpasses its availability, leading to limited access to safe and clean water for drinking, sanitation, and agriculture. As a consequence of water scarcity, communities may resort to using contaminated water sources, increasing the risk of waterborne diseases. Understanding the relationship between water scarcity and waterborne diseases is crucial for

implementing effective strategies to ensure adequate water supply and safeguard public health.

Water scarcity exacerbates the spread of waterborne diseases by forcing communities to use unclean water sources. Insufficient water supply often compels individuals to rely on polluted rivers, stagnant ponds, or contaminated wells, which are breeding grounds for waterborne pathogens. Diseases like cholera, typhoid, and dysentery thrive in such conditions, leading to widespread outbreaks that can severely impact vulnerable populations, particularly children and the elderly.

Moreover, water scarcity can hinder proper sanitation practices, further contributing to the transmission of waterborne diseases. In areas where water is scarce, people may be unable to practice proper hygiene, such as handwashing, which is essential for preventing the spread of infectious agents. This lack of access to clean water and sanitation facilities compromises the ability to control and contain waterborne disease outbreaks.

Climate change exacerbates water scarcity, making it a pressing global issue. Changes in weather patterns, including prolonged droughts and extreme rainfall

events, disrupt the natural water cycle, reducing water availability in many regions. The resulting water stress intensifies the challenge of ensuring access to safe water, making communities more susceptible to waterborne diseases.

Addressing water scarcity and waterborne diseases requires a multi-faceted approach that encompasses water resource management, infrastructure development, and public health interventions. Implementing water conservation and management practices, such as rainwater harvesting, can help alleviate water scarcity and provide a sustainable source of water. Improved sanitation facilities and increased access to clean water are essential to reducing the incidence of waterborne diseases and improving overall public health.

Furthermore, community education and awareness programs play a crucial role in combating water scarcity and waterborne diseases. Educating individuals about water conservation, proper sanitation practices, and the importance of safe water sources can empower communities to take proactive measures in safeguarding their health and ensuring the sustainable use of water resources.

In conclusion, water scarcity and

waterborne diseases are complex challenges that intertwine in a vicious cycle, posing grave threats to public health and sustainable development. By adopting integrated approaches that combine water resource management, infrastructure development, and public health initiatives, we can work towards mitigating water scarcity, preventing waterborne diseases, and securing a healthier and more resilient future for all.

Impacts on Food Security and Nutrition

Food security and nutrition are fundamental aspects of human well-being, directly influencing health, economic stability, and overall quality of life. However, various factors can impact food security and nutrition, leading to both short-term crises and long-term challenges. Understanding these impacts is essential for developing effective strategies to address food insecurity and malnutrition, especially in vulnerable populations.

One significant impact on food security and nutrition is climate change. Extreme weather events, such as droughts, floods, and heatwaves, can disrupt agricultural production, reduce crop yields, and deplete water resources. These climate-related challenges can lead to food shortages, price fluctuations, and increased

vulnerability among communities that rely heavily on agriculture for sustenance and livelihoods. Climate change also affects the nutritional content of crops, potentially reducing essential vitamins and minerals, exacerbating malnutrition.

Another critical factor is conflict and political instability. Armed conflicts and political upheavals often result in disrupted food supply chains, reduced access to food, and displacement of populations. Food-producing regions can become inaccessible, leading to localized famines and food crises. Additionally, conflicts can hinder humanitarian aid and relief efforts, further exacerbating food insecurity and malnutrition, particularly in conflict-affected regions.

Economic factors also play a significant role in food security and nutrition. Rising food prices, inflation, and income inequality can limit access to nutritious foods for vulnerable populations, pushing them towards cheaper, less nutritious options. Economic downturns and recessions can lead to job losses and reduced purchasing power, negatively affecting the ability of households to afford a balanced diet. Moreover, food systems' globalization and reliance on international trade can make

countries susceptible to market shocks, impacting food availability and affordability.

Social factors, such as gender inequalities, also influence food security and nutrition. Women and girls, in many societies, bear the primary responsibility for household food preparation and care of family members. Gender disparities in access to education and resources can limit women's ability to make informed decisions regarding nutrition and food choices, impacting the overall health and well-being of their families.

Finally, food wastage is a significant challenge that affects food security and nutrition. In many parts of the world, a substantial amount of food is lost or wasted during production, distribution, and consumption. Addressing food wastage can not only reduce the strain on food resources but also increase the availability of nutritious food for those in need.

In conclusion, various factors impact food security and nutrition, and addressing these challenges requires a multi-faceted approach. Climate change, conflicts, economic fluctuations, social disparities, and food wastage all contribute to the complexity of the issue.

Implementing sustainable agricultural practices, promoting equitable economic policies, and empowering vulnerable communities are vital steps towards ensuring food security and improving nutrition for all. Additionally, targeted interventions that address the unique challenges faced by different regions and populations can play a crucial role in alleviating food insecurity and promoting a healthier future.

Mental Health and Climate Change

The relationship between mental health and climate change has emerged as an increasingly critical issue in recent years. The impacts of climate change, such as extreme weather events, rising temperatures, and natural disasters, can have profound effects on individuals' mental well-being. Climate-related stressors can lead to anxiety, depression, post-traumatic stress disorder (PTSD), and other mental health conditions. Additionally, the looming threat of an uncertain future due to climate change can cause eco-anxiety, a specific form of anxiety linked to climate-related concerns.

One of the primary ways in which climate change affects mental health is through the exposure to natural disasters and their aftermath. Individuals who

experience or witness extreme weather events, such as hurricanes, wildfires, or floods, may suffer from trauma and emotional distress. The loss of homes, livelihoods, and communities can trigger feelings of hopelessness and helplessness, leading to long-term mental health challenges.

Moreover, the gradual impacts of climate change, such as rising sea levels and prolonged droughts, can result in significant economic and social disruptions. Communities that heavily rely on agriculture or industries affected by climate change may experience increased unemployment and poverty rates, leading to stress and anxiety about an uncertain future.

Climate change can also exacerbate existing mental health disparities. Vulnerable populations, such as low-income individuals, marginalized communities, and those with pre-existing mental health conditions, are disproportionately impacted by climate change. These populations often lack access to resources, mental health services, and social support networks, making them more susceptible to the adverse effects of climate-related stressors.

On a global scale, the collective

awareness of climate change and its potential consequences has given rise to a phenomenon known as eco-anxiety or climate anxiety. This mental health condition is characterized by a deep concern about the environmental crisis and feelings of powerlessness to prevent or mitigate its effects. The overwhelming scope of climate change, coupled with uncertainties about the future, can lead to feelings of distress, helplessness, and despair among individuals of all ages.

Addressing the mental health impacts of climate change requires a comprehensive approach that involves both climate mitigation and mental health support. Implementing effective climate policies and sustainable practices can alleviate some of the anxieties related to the future. Simultaneously, providing accessible and culturally sensitive mental health services, community support networks, and education about coping mechanisms can help individuals build resilience in the face of climate-related challenges. By recognizing the intersection of mental health and climate change and taking appropriate action, societies can work towards creating a healthier, more sustainable, and resilient future for all.

Vulnerable Populations: Children,

Elderly, and Marginalized Communities

Vulnerable populations refer to groups of individuals who are at higher risk of experiencing adverse health, social, or economic outcomes due to various factors. Three key vulnerable populations are children, the elderly, and marginalized communities. These groups face unique challenges that require targeted support and interventions to ensure their well-being and inclusion within society.

Vulnerabilities of Children

Children, as a vulnerable population, depend on caregivers for their well-being and development. They are more susceptible to health issues, such as infectious diseases and malnutrition, and are vulnerable to abuse, neglect, and exploitation. Access to quality education, healthcare, and a nurturing environment is critical for their physical, cognitive, and emotional growth. Addressing the needs of children is crucial for building a healthy and prosperous future for society.

Vulnerabilities of the Elderly

The elderly population faces a different set of vulnerabilities. As people age, they may encounter health challenges, chronic conditions, and limitations in mobility. Social isolation, financial insecurity, and limited access to healthcare can exacerbate their vulnerabilities.

Providing adequate support and care for the elderly, promoting age-friendly environments, and recognizing their contributions to society are essential for ensuring their well-being and dignity in their later years.

Vulnerabilities of Marginalized Communities

Marginalized communities, such as racial and ethnic minorities, refugees, and LGBTQ+ individuals, often experience systemic disadvantages that contribute to their vulnerability. Discrimination, poverty, and limited access to resources and opportunities can impact their physical and mental health, educational attainment, and overall quality of life. Advocating for social justice, reducing inequalities, and fostering inclusive policies are critical steps toward empowering and supporting marginalized communities.

Addressing Vulnerabilities and Building Resilience

Recognizing the vulnerabilities faced by children, the elderly, and marginalized communities is crucial for designing targeted interventions and policies that address their specific needs. Empowering these populations through social support programs, accessible healthcare, quality education, and inclusive policies can enhance their

resilience and enable them to lead fulfilling lives. Collaborative efforts from governments, non-governmental organizations, and communities are vital in creating a society that safeguards and uplifts its most vulnerable members. By fostering a culture of empathy, compassion, and equality, we can collectively work towards a more inclusive and just society for all.

Summary:

This article explores the effects of climate change on human health. Climate change is a global phenomenon with far-reaching consequences for various aspects of human well-being. This study examines the direct and indirect impacts of climate change on human health, considering both physical and mental health dimensions. The research investigates the relationship between climate change and the prevalence of infectious diseases, extreme weather events, air pollution, food and water security, and mental health disorders. Through a comprehensive review of existing literature and empirical evidence, this study highlights the complex interactions and pathways through which climate change influences human health outcomes. The findings emphasize the urgency of addressing

climate change as a critical determinant of human health and provide insights into potential adaptation and mitigation strategies. The keywords associated with this study include climate change, human health, infectious diseases, extreme weather events, air pollution, food security, water security, mental health, and adaptation.

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