

Linkages of climatic change with Human Health: Exploring the Effects

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ABSTRACT

Climate change endangers human health, affecting all sectors of society, both domestically and globally. The environmental consequences of climate change, both those already observed and those that are anticipated, such as sea-level rise, changes in precipitation resulting in flooding and drought, heat waves, more intense hurricanes and storms, and degraded air quality, will affect human health both directly and indirectly. Addressing the effects of climate change on human health is especially challenging because both the surrounding environment and the decisions that people make influence health. For example, increases in the frequency and severity of regional heat waves—likely outcomes of climate change—have the potential to harm a lot of people. Certain adverse health effects can probably be avoided if decisions made prior to the heat waves result in such things as identification of vulnerable populations such as children and the elderly and ensured access to preventive measures such as air conditioning. This is a simplified illustration; in real-life situations a host of other factors also come into play in determining vulnerability including biological susceptibility, socioeconomic status, cultural competence, and the built environment. In a world of myriad “what if” scenarios surrounding climate change, it becomes very complicated to create wise health policies for the future because of the uncertainty of predicting environmental change and human decisions. The need for sound science on which to base such policies becomes more critical than ever. This paper highlights the effects of climatic change in humans.

Keywords: Climate change, environmental consequences, precipitation

I DISEASES AND CLIMATE CHANGES

(a) Asthma, Respiratory Allergies, and Airway Diseases

Respiratory allergies and diseases may become more prevalent because of increased human exposure to pollen (due to altered growing seasons), molds (from extreme or more frequent precipitation), air pollution and aerosolized marine toxins (due to increased temperature, coastal runoff, and humidity) and dust (from droughts). Mitigation and adaptation may significantly reduce these risks. Research should address the relationship between climate change and the composition of air pollutant mixtures (e.g., how altered pollen counts and other effects of climate change affect the severity of asthma) to produce models to identify populations at risk. Such tools support the use of science in understanding disease risks and as such, are an integral component of developing effective risk communication and targeting the messages to vulnerable populations.

(b) Cancer

Many potential direct effects of climate change on cancer risk, such as increased duration and intensity of ultraviolet (UV) radiation, are well understood; however the potential impact of changes in climate on exposure pathways for chemicals and toxins requires further study. Science should investigate the effects of mitigation and adaptation measures on cancer incidence so that the best strategies can be developed and implemented; for example, research to inform understanding of the benefits of alternative fuels, new battery and voltaic cells, and other technologies, as well as any potential adverse risks from exposure to their components and wastes. Better understanding of climate

change impacts on the capacity of ocean and coastal systems to provide cancer curative agents and other health-enhancing products is also needed.

(c) Cardiovascular Disease and Stroke

Climate change may exacerbate existing cardiovascular disease by increasing heat stress, increasing the body burden of airborne particulates, and changing the distribution of zoonotic vectors that cause infectious diseases linked with cardiovascular disease. Science that addresses the cardiovascular effects of higher temperatures, heat waves, extreme weather, and changes in air quality on health is needed, and this new information should be applied to development of health risk assessment models, early warning systems, health communication strategies targeting vulnerable populations, land use decisions, and strategies to meet air quality goals related to climate change. In some areas, cardiovascular and stroke risks resulting from climate change could be offset by reductions in air pollution due to climate change mitigation.

(d) Food borne Diseases and Nutrition

Climate change may be associated with staple food shortages, malnutrition, and food contamination (of seafood from chemical contaminants, biotoxins, and pathogenic microbes, and of crops by pesticides). Science research needs in this area include better understanding of how changes in agriculture and fisheries may affect food availability and nutrition, better monitoring for disease-causing agents, and identification and mapping of complex food webs and sentinel species that may be vulnerable to climate change. This research could be used to prepare the public health and health care sectors for new illnesses, changing surveillance needs, and increased incidence of disease, as well as development of more effective outreach to affected communities.

(e) Heat-Related Morbidity and Mortality

Heat-related illness and deaths are likely to increase in response to climate change but aggressive public health interventions such as heat wave response plans and health alert warning systems can minimize morbidity and mortality. Additional science should be focused on developing and expanding these tools in different geographic regions, specifically by defining environmental risk factors, identifying vulnerable populations, and developing effective risk communication and prevention strategies.

(f) Vector borne and Zoonotic Diseases

Disease risk may increase as a result of climate change due to related expansions in vector ranges, shortening of pathogen incubation periods, and disruption and relocation of large human populations. Research should enhance the existing pathogen/vector control infrastructure including vector and host identification; integrate human with terrestrial and aquatic animal health surveillance systems; incorporate ecological studies to provide better predictive models; and improve risk communication and prevention strategies.

(g) Waterborne Diseases

Increases in water temperature, precipitation frequency and severity, evaporation-transpiration rates, and changes in coastal ecosystem health could increase the incidence of water contamination with harmful pathogens and chemicals, resulting in increased human exposure. Research should focus on understanding where changes in water flow will occur, how water will interact with sewage in surface and underground water supplies as well as drinking water distribution systems, what food sources may become contaminated, and how to better predict and prevent human exposure to waterborne and ocean-related pathogens and biotoxins.

II OTHER HEALTH DISORDERS & CLIMATE CHANGES

(a) Mental Health and Stress-Related Disorders

By causing or contributing to extreme weather events, climate change may result in geographic displacement of populations, damage to property, loss of loved ones, and chronic stress, all of which can negatively affect mental health. Research needs include identifying key mental health effects and vulnerable populations, and developing migration monitoring networks to help ensure the availability of appropriate health care support.

(b) Human Developmental Effects Two potential consequences of climate change would affect normal human development:

(i) **malnutrition**—particularly during the prenatal period and early childhood as a result of decreased food supplies, and exposure to toxic contaminants

(ii) **biotoxins**—resulting from extreme weather events, increased pesticide use for food production, and increases in harmful algal blooms in recreational areas. Research should examine the relationship between human development and adaptations to climate change, such as agriculture and fisheries changes that may affect food availability, increased pesticide use to control for expanding disease vector ranges, and prevention of leaching from

toxic waste sites into floodwaters during extreme weather events, so that developmental consequences can be prevented.

(c) Neurological Disorders Climate change, as well as attempts to mitigate and adapt to it, may increase the number of neurological disorders in humans. Research in this area should focus on identifying vulnerable populations and understanding the mechanisms and effects of human exposure to neurological hazards such as biotoxins (from harmful algal blooms), metals (found in new battery technologies and compact fluorescent lights), and pesticides (used in response to changes in agriculture), as well as the potentially exacerbating effects of malnutrition and stress.

(d) Weather-Related Morbidity and Mortality

Increases in the incidence and intensity of extreme weather events such as hurricanes, floods, droughts, and wildfires may adversely affect people's health immediately during the event or later following the event. Research aimed at improving the capabilities of healthcare and emergency services to address disaster planning and management is needed to ensure that risks are understood and that optimal strategies are identified, communicated, and implemented.

III CONCLUSION

Humans have successfully adapted to environmental change over the time, from evolving natural physiological responses to the use of science, technology, and knowledge to improve their lives and advance their health. From the dawn of the industrial age, people have made great strides in improving health, and enjoy a markedly improved quality of life. However, these improvements have come at a cost that must now be understood and addressed. Climatic change will force humans to negotiate with their changing environment as never before to find ways to reshape it both for short-term protection and long-term alleviation of health consequences. There is no doubt that we have the capacity to find ways to avoid many of the worst health effects of climatic change, and indeed, given the universality and potential magnitude of such effects, we have an ethical imperative to do so.

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