

# The Impact of Environmental Factors on Human Health

Mwende Muthoni D.

Faculty of Medicine Kampala International University Uganda

## ABSTRACT

The intricate relationship between environmental factors and human health is increasingly recognized as a critical area of study. This essay explores the influence of various environmental components—including air quality, water quality, climate change, and chemical exposures—on human health. Air pollution is linked to respiratory conditions and is exacerbated by urbanization. Contaminated water, a significant concern in low-income regions, contributes to widespread infectious diseases. Climate change affects the distribution of vector-borne diseases, with implications for global health. Additionally, chemical exposures from pollutants and consumer products are associated with chronic diseases and pose significant public health challenges. Through a comprehensive review of current literature and data, this essay highlights the multifaceted nature of environmental health issues and underscores the need for proactive measures and policy interventions to mitigate these risks.

**Keywords:** Environmental Health, Air Pollution, Water Quality, Climate Change, Vector-Borne Diseases

## INTRODUCTION

A growing number of investigations are aimed at determining the link between environmental exposures and human health. It has become evident that the suspected villains are varied, ranging from air pollution in urban regions that leads to various inflammatory conditions, to contaminated drinking water supplies in both rural and urban areas, to the spread of certain diseases, probably related to climate change, throughout the developed world. Environmental stressors can affect human health and disease in both social and biological pathways. The most vulnerable, due to age, genetics, or nutrition, will suffer the worst consequences. We live in a complex world, an interconnected web of air, water, climate, and at times chemical exposures where all of these elements are clearly interrelated. In this essay, we will examine the various components of the environment, which are having a direct or indirect impact on the health of populations, causing disproportionate disease in different communities. Many of these problems, although they have always existed, have received enormous attention, partly because we now have the technology to better diagnose such conditions, and governments have finally taken a more affirmative stance on these issues, than merely providing reactive as opposed to proactive public health. Environmental health studies began during ancient human history but received new vigor with the industrial revolution. With the toxic release of large amounts of heavy metals and hydrocarbons, the face of environmental problems changed from smog to ground-level pollution. At the end of the 20th century, acid deposition and global change were recognized as new threats. A deeper understanding of human health and ecosystems may harmonize these [1, 2].

## AIR QUALITY AND RESPIRATORY HEALTH

The environment exerts a significant impact on human health. For instance, air quality has a direct relationship with respiratory health. Air pollution encompasses a range of pollutants including particulate matter, sulfur dioxide, nitrogen oxides, volatile organic compounds, carbon monoxide, ozone, and lead. Particulate matter and ozone pollution have been of particular global concern. Exceedance of the air quality standards often precedes an increase in health effects. The acute health effects of poor air quality have been well documented, including worsening of asthma and chronic obstructive pulmonary disease, increased respiratory symptoms, reduced lung function, and a decline in the number of people with symptoms and diseases. There may potentially be long-term health effects for people living in areas of

higher air pollution as well. An array of studies indicates that an increase in ambient air pollution levels leads to an increase in the number of respiratory-related hospital admissions and death rates, and reduced life expectancy. Urbanization is likely to increase the risk of poor respiratory health as people are more likely to be exposed to air pollution sources and unhealthy lifestyle choices. Some members of the population may be more susceptible to the health effects of poor air quality, such as those with existing respiratory disease, children, and the elderly, who have lower respiratory reserves. Reducing air pollution concentrations may not only provide benefits to the population's respiratory health but also reduce the rate of decline in respiratory health that has been observed in past decades due to factors including improved nutrition and decreased exposure to smoking. Measures to reduce air pollution and improve air quality have been developed, including urban planning and transport-related initiatives, advances in clean fuel technologies, and regulatory controls that establish air quality standards. There is a concurrent need for policy measures that seek to improve public knowledge and awareness of air quality and its health impacts and to encourage lifestyle changes to improve air quality. In conclusion, air quality is of critical importance for respiratory health [3, 4].

#### **WATER QUALITY AND INFECTIOUS DISEASES**

The provision of safe drinking water is central to the prevention of infectious diseases. Water that has been contaminated with the excreta from another infected individual is the source of many disease outbreaks, including bacillary dysentery and cholera; water infrastructures that separate waste from drinking water help to maintain water quality. However, three in ten people worldwide still live without access to safe, nearby drinking water. While infrastructure expansion can effectively deliver higher drinking water quality, it is challenging to meet public health outcomes in regions with a higher risk of water quality deterioration. In comparison to infrastructure provision issues, climate change has been shown to alter both the availability and quality of water. Climatic variations can lead to substantial public health issues where drinking water quality is dependent on both natural water quality and quantity [5, 6]. Poor water quality is evident in the high rates of waterborne disease in low-income countries. In low-income countries where diarrhea is the fifth leading cause of death; the vast majority of these cases result from poor access to sanitation and unsafe drinking water. In sub-Saharan Africa, most waterborne disease is due to high contamination concentrations of both *Escherichia coli* and *Clostridium perfringens* in drinking water. In response to contaminated water, the practice of boiling water is widespread, with a significant percentage of people in sub-Saharan Africa reporting the use of boiled water for personal protection (although water quality remains a publicly unacknowledged public health issue even when this practice is employed). As well as improving water sanitation and hygiene behavior, global efforts and policies to improve water, sanitation, and infrastructure have resulted in millions of people gaining improved access to drinking water [7, 8].

#### **CLIMATE CHANGE AND VECTOR-BORNE DISEASES**

A warming climate zone can lead to the expansion of suitable habitat for some vectors while decreasing the conditions required for others. This may be contributing to the observed resurgence of some vector-borne diseases that were previously showing declines or were under control. In many settings, climate strongly influences vector survival, reproduction, and biting behavior, and human and vector movement are highly correlated with weather or climate patterns. There are epidemiological and sometimes entomological data to show that climate plays an important role in determining inter-annual fluctuations in disease incidence and prevalence, as well as large-scale variation in the measured intensity of transmission. Temperature and rainfall not only govern suitable habitat conditions, but also modulate mosquito abundance. Human behavior is also changed by weather and climate, and this can affect patterns and extent of disease transmission and risk. Another factor of relevance is where, spatially, vectors and/or parasites are [9, 10]. Vector-borne diseases are very much diseases of poverty and influenced by complex socio-economic forces, such as urbanization, deforestation, alteration of water management practices in agriculture, changes in human settlement patterns, and migration. The inception and spread of epidemics in developed countries often depend on the presence of disease and a chain of events, including the susceptibility, behavior, or immune status of a population. Preventive and control strategies can differ between settings, and knowledge of the local vector ecology, environmental conditions, human behavior, and other social factors is crucial. Numerous adaptations or response strategies have been proposed that include changes in the suite of existing preventive interventions and new tools, but also socio-economic measures. More long-term, sustainable strategies to cope with global climate change include efforts to undertake better epidemiological surveillance and compile and research the existing data to validate the models and to enable us to better interpret the burden of climate-sensitive diseases. Climate-sensitive vector- or disease-transmission models suggest some potential adaptation and coping strategies for vector-borne diseases in a changing world. These include the development of forecasting systems, early

warning schemes and trigger points for intervention, capacity-building and awareness, and the direct development of adaptive interventions. Monitoring of potential pathogen vectors, the environment, and inter-human interactions in space and time is also a crucial and long-term aspect of many of these. Efforts on the part of international and national public health and donor communities are aimed at understanding the risks and vulnerabilities posed by environmental impacts on health, promoting evidence-based policy responses, undertaking surveillance for some communicable and non-communicable diseases especially affected by climate, and developing economic and decision-support tools. Ultimately, we need to be prepared to allow proactive management of global environmental change that protects human health in the long term [11].

### CHEMICAL EXPOSURES AND CHRONIC DISEASES

The way we grow food, manufacture consumer products, and live in our built environment has permeated humans with an unprecedented number of toxic chemicals implicated in the development of chronic disease. A growing contemporary literature links chemical exposures from pollutants and consumer products to a spectrum of illnesses and diseases. These environmental health effects include epigenetic disturbances that can be passed on to future generations. Of significant concern, these chemicals and mixtures may have effects at low concentrations and at realistic exposures, such that many or most people are affected. The prevalence of disease from these toxicants can be particularly high in vulnerable populations due to environmental and social determinants of health. The failures in public and environmental health agencies to restrict exposure to known chemicals continue to disproportionately impact children and workers [12, 13]. The primary debate over chemical safety and protection from exposures is how to institute better regulation, including how to reform the rules that govern regulatory decision-making, increase the scrutiny put on companies operating in our environment and expose populations to their chemicals, ensure more effective safety standards are applied, and provide for the transparency of company-held data and the decision-making that is based on it. In this section, we discuss how environmental chemicals contribute to poor health, focusing on the specifics of pesticides, heavy metals, industrial chemicals, and the use of radiofrequency devices, before discussing methods of reform and building the capacity of communities to advocate for toxicity reduction. We conclude this section with a case study of air pollution in the context of poor health, despite having been the subject of a large body of regulation, public debate, and control efforts [14, 15].

### CONCLUSION

Environmental factors play a pivotal role in shaping human health outcomes, with each component—air quality, water quality, climate change, and chemical exposures—affecting health in distinct yet interconnected ways. The evidence underscores the urgent need for comprehensive strategies that address these environmental challenges. Improving air quality through regulatory measures and urban planning, enhancing water infrastructure and sanitation, adapting to climate-induced changes in vector-borne disease patterns, and implementing stricter regulations on chemical exposures are crucial steps toward safeguarding public health. Collaborative efforts involving policymakers, scientists, and communities are essential to develop and implement effective interventions. By advancing our understanding of these environmental impacts and fostering proactive approaches, we can better protect human health and promote a sustainable future.

### REFERENCES

1. Marselle MR, Hartig T, Cox DT, De Bell S, Knapp S, Lindley S, Triguero-Mas M, Böhning-Gaese K, Braubach M, Cook PA, De Vries S. Pathways linking biodiversity to human health: A conceptual framework. *Environment international*. 2021 May 1;150:106420. [sciencedirect.com](https://doi.org/10.1016/j.envint.2021.106420)
2. Tonne C, Adair L, Adlakha D, Angelovski I, Belesova K, Berger M, Brelsford C, Dadvand P, Dimitrova A, Giles-Corti B, Heinz A. Defining pathways to healthy sustainable urban development. *Environment international*. 2021 Jan 1;146:106236. [sciencedirect.com](https://doi.org/10.1016/j.envint.2020.106236)
3. Arias-Pérez RD, Taborda NA, Gómez DM, Narvaez JF, Porras J, Hernandez JC. Inflammatory effects of particulate matter air pollution. *Environmental Science and Pollution Research*. 2020 Dec;27(34):42390-404. [researchgate.net](https://doi.org/10.1007/s11356-020-09888-8)
4. Manisalidis I, Stavropoulou E, Stavropoulos A, Bezirtzoglou E. Environmental and health impacts of air pollution: a review. *Frontiers in public health*. 2020 Feb 20;8:14. [frontiersin.org](https://doi.org/10.3389/fpubh.2020.00014)
5. World Health Organization, United Nations Children's Fund. Progress on household drinking water, sanitation and hygiene 2000-2020: five years into the SDGs. World Health Organization; 2021 Sep 13. [google.com](https://www.who.int/publications/i/item/9789240016660)
6. Srivastava S, Flora SJ. Fluoride in drinking water and skeletal fluorosis: a review of the global impact. *Current environmental health reports*. 2020 Jun;7:140-6.

7. Ahmed T, Zounemat-Kermani M, Scholz M. Climate change, water quality and water-related challenges: a review with focus on Pakistan. *International journal of environmental research and public health*. 2020 Nov;17(22):8518. [mdpi.com](https://doi.org/10.3390/ijerph17228518)
8. Morgan CE, Bowling JM, Bartram J, Kayser GL. Attributes of drinking water, sanitation, and hygiene associated with microbiological water quality of stored drinking water in rural schools in Mozambique and Uganda. *International journal of hygiene and environmental health*. 2021 Jul 1;236:113804. [nih.gov](https://doi.org/10.1007/s00133-021-01804-4)
9. Buchwald AG, Garofalo JF, Gage KL, Beard CB, Rochford R. CLIMATE AND ITS IMPACTS ON VECTOR-BORNE DISEASES. *Global Climate Change and Human Health: From Science to Practice*. 2021 May 4:151. [HTML]
10. Agyekum TP, Botwe PK, Arko-Mensah J, Issah I, Acquah AA, Hogarh JN, Dwomoh D, Robins TG, Fobil JN. A systematic review of the effects of temperature on Anopheles mosquito development and survival: implications for malaria control in a future warmer climate. *International journal of environmental research and public health*. 2021 Jul 7;18(14):7255. [mdpi.com](https://doi.org/10.3390/ijerph18147255)
11. Zerbo A, Delgado RC, González PA. Aedes-borne viral infections and risk of emergence/resurgence in Sub-Saharan African urban areas. *Journal of Biosafety and Biosecurity*. 2020 Dec 1;2(2):58-63.
12. Naidu R, Biswas B, Willett IR, Cribb J, Singh BK, Nathanail CP, Coulon F, Semple KT, Jones KC, Barclay A, Aitken RJ. Chemical pollution: A growing peril and potential catastrophic risk to humanity. *Environment International*. 2021 Nov 1;156:106616.
13. Kumar M, Sarma DK, Shubham S, Kumawat M, Verma V, Prakash A, Tiwari R. Environmental endocrine-disrupting chemical exposure: role in non-communicable diseases. *Frontiers in public health*. 2020 Sep 24;8:553850.
14. Ali MM, Hossain D, Al-Imran A, Khan MS, Begum M, Osman MH. Environmental pollution with heavy metals: A public health concern. *Heavy metals-their environmental impacts and mitigation*. 2021 Jun 24:771-83. [intechopen.com](https://doi.org/10.1002/9781119500000.ch44)
15. Zaynab M, Al-Yahyai R, Ameen A, Sharif Y, Ali L, Fatima M, Khan KA, Li S. Health and environmental effects of heavy metals. *Journal of King Saud University-Science*. 2022 Jan 1;34(1):101653. [sciencedirect.com](https://doi.org/10.1016/j.jksus.2021.101653)

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