

Examples of Consequences of Climate Change on Diseases

Excerpted from Milliman's detailed literature review, "Impact of climate change on disease prevalence"



1. Frequent Extreme Heat

- 25% of heat-related deaths in the United States link to cardiovascular diseases, reports the Environmental Protection Agency.⁽¹⁾
- Hot days escalate dehydration, concentrated urine—raising kidney stone risks to 56% by 2050.⁽²⁾



2. Extreme Cold Snaps

- While milder winters globally may decrease cold exposure, intensified extreme cold events due to Arctic warming pose health risks.⁽³⁾
- Health risks include increased cardiovascular diseases, strokes (7.3% of deaths due to these diseases in 2019 in the UK were attributed to low temperatures).⁽⁴⁾



3. Environmental Degradation and Climate Migrations

- Forced migrations result in mental health challenges (increased rates of depression, anxiety, PTSD, suicides, and psychoses among refugees compared to settled populations).⁽⁵⁾



4. Changes in Vector Ecology

- Climate change worsens diseases, extends transmission—predictions indicate 5-6 billion Dengue cases by 2080 and increases in Lyme/West Nile viruses as warming increases.⁽⁶⁾
- Climate change drives deforestation and encroachment on animal habitats, aiding the spread of vector-borne diseases such as Ebola.⁽⁷⁾



5. Reduction of Food and Water Supply

- Poor water and food quality impacts health, leading to diseases like Ebola, cholera (contamination), various infections (listeria, salmonella), bacterial water-borne diseases, and algae-induced illnesses.⁽¹²⁾



6. Frequent Natural Catastrophes

- Extreme events intensify post-traumatic stress disorder (PTSD) rates (ranging from 2.6% after a Vietnamese typhoon in 2006 to 90% after a Nicaraguan hurricane in 1998).⁽¹⁰⁾
- Global mental health conditions increased by 17%, affecting 30% to 40% of disaster victims within the first year post-event.⁽¹¹⁾

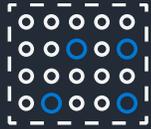


7. Air Pollution

- Long-term exposure to pollutants links significantly to cardiovascular and respiratory diseases, notably contributing to 3.9% of UK's cardiovascular deaths due to air pollution.⁽⁸⁾
- Respiratory ailments, causing 4.7% of deaths among young Britons in 2019, persisted across age groups due to air pollution.⁽⁹⁾

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Modelling Morbidity Impacts from Climate Change



Data

- **Climate data:** The volume of data is substantial, and its precision is remarkable.
- **Health data:** Gathering health data is complex due to stringent national privacy rules. Our study focused on health spending and disease prevalence:
 - Health expenditure and disease prevalence data were discovered on a global scale, with specific databases available in countries such as the United States, South Korea, multiple European nations, Canada, and the United Kingdom
 - Several European countries including Switzerland, France, Germany, Austria, and the UK have comprehensive databases



Methodology

The evaluation methodology outlined by **Metcalf et al.**⁽¹³⁾ for discerning climate drivers in disease incidence involves three primary steps:

- **Identification** of the phenomenon from a spatial and temporal point of view
- **Estimation** of the phenomenon, using several kinds of models designed to consider the distinct characteristics of the phenomena being modeled (GLM, time series decomposition and wavelet analysis, time-series susceptible-Infected-recovered models ...)
- **Projection** of the phenomenon, with the application of climate models



Example of Case Study

Impact of heat waves on kidney stone presentations:

Kaufman et al.⁽¹⁴⁾ modeled the effect of temperature on kidney stone occurrences in South Carolina, using historical data and a conditional quasi-Poisson regression integrated with distributed lag non-linear models (DLNMs) accounting for a 10-day delay.

The outcomes of the model are:

- Risk of presenting a kidney stone as a function of temperature
- Risk of occurrence of kidney conditions following a heatwave as function of number of days
- Number of cases and excess charges associated

Insurance Perspectives



Consequences for Health Insurers

Climate change poses significant threats to insured health portfolios and insurance liabilities.

For example, it:

- Exacerbates chronic diseases and weakens individuals through increased heat waves.
- Facilitates disease spread via natural disasters and ecosystem changes.
- Potentially impacts various lines of business, notably affecting outdoor workers' compensation and safety.⁽¹⁵⁾
- Influences the asset side of the insurers' balance sheet through physical and transition risks.⁽¹⁶⁾



Prevention Actions

To mitigate the impact of climate change on human health, **Moreira et al.**⁽¹⁷⁾ suggest three levels of prevention actions:

- The **macro level** involves national and international health systems adopting measures like the extensive use of renewable energy.
- The **meso level** pertains to local health system improvements through specific policies such as outdoor insecticide spraying and efficient waste management.
- The **micro level** suggests how individuals can contribute by reducing outdoor activities during peak heat hours and using mosquito repellents to help alleviate health risks associated with climate change.

Prevention and mitigation actions can play a big role in reducing the impact of climate change on the incidence of diseases.

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