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Rainfall events and adverse health outcomes

Health professionals and policy makers need to take action

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Climate change involves progressively more extreme weather events, leading to an increase in risk of adverse health outcomes. In a linked paper, He and colleagues (doi:10.1136/bmj-2024-080944) found that rainfall events with a five year return period—in meteorological terms, intense rainfall events that are expected to occur every five years—were associated with an 8% increase in all cause mortality, a 5% increase in cardiovascular mortality, and a noticeable 29% increase in respiratory mortality during a 0-14 day period after the rainfall event.¹

Three novel features of the study are particularly noteworthy. Firstly, the authors used an intensity-duration-frequency model to analyse rainfall events, which offered more insights than traditional single metric analyses. Secondly, rainfall has dual positive and negative effects on health, and moderate to heavy rainfall showed protective effects (relative risk <1) by potentially reducing air pollution and promoting behaviours such as staying indoors. At extreme rainfall levels, however, the protective effects diminished, and the relative risk shifted to harm (relative risk >1), possibly through damage to infrastructure, water contamination from sewerage overflow, and exposure to harmful microorganisms. Thirdly, the study's extensive global scope—encompassing 645 locations across 34 countries—highlighted varying regional differences in mortality risks, uncovering factors that contributed to local resilience.¹

Champion climate health

Although the association between meteorology and medicine might seem an emerging specialty, the two share a history. A report in 1924 and republished in 2024, described how doctors in the 19th century used rudimentary weather diaries to track health outcomes.² For example, sunlight was observed to have beneficial properties that helped in the treatment of tuberculosis and rickets, a connection we now understand through the role of ultraviolet light in stimulating vitamin D synthesis, calcium absorption, and boosting immune mechanisms against infections. Even without full scientific explanations, health professionals intuitively recognised the connection with climate health, written a century ago: “Climatology, from the human standpoint, has not yet reached the dignity of an exact science.”² Today, symbiosis is growing between observational studies and physiological research in climate health. New tools, including advanced models, satellite imaging, and biological approaches such as environmental epigenetics, are enhancing our understanding—offering an opportunity to refine the previously inexact science.

Health professionals are among the most trusted members of society and are ideally placed to drive both individual and systemic climate action by educating patients about climate related health risks and fostering resilience within communities. In the Anthropocene, health professionals are called on to expand the interpretation of *primum non nocere* (first, do no harm) and beneficence to include the health of the planet as fundamental to human wellbeing.³ One practical resource for health professionals to fulfil this role is a *BMJ* Practice Pointer article that offers guidance on climate sensitive health hazards during healthcare screenings, patient history taking, management of long term conditions, discharge planning, and the promotion of civic engagement.⁴

Vegetation coverage as adaptation

An area beyond the direct control of health professionals but critical to how health systems adapt to climate change is vegetation coverage, which serves as a strategy to reduce the effects of climate change. Previous research consistently found that green spaces were associated with better health outcomes by promoting healthy lifestyles, enhancing wellbeing, and mitigating heat related illnesses such as heat exhaustion and heat stroke.⁵ He and colleagues' study builds on these findings by showing that regions with higher vegetation coverage are more resilient to the health effects of extreme rainfall. The study found that vegetation coverage was a more important factor influencing health outcomes during extreme rainfall events than annual average precipitation or population density.¹ Vegetation helps to absorb excess rainwater, stabilise soil, and reduce surface run-off, thereby lessening the harmful effects of flooding and the spread of waterborne diseases.

The urgency of the climate crisis is echoed by the editors of more than 200 medical journals, including *The BMJ*, who have declared it the greatest threat to health.⁶ Yet, despite the clear science, climate action remains difficult. The novelist John Steinbeck offered an analogy in his book *East of Eden*,⁷ describing California's Salinas Valley as follows:

I have spoken of the rich years when the rainfall was plentiful. But there were dry years too, and they put a terror on the valley. The water came in a thirty-year cycle . . . And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way

People often forget the lessons of scarcity during times of abundance—a risky form of amnesia for

climate change. The stakes are far too high, for when it rains, it pours—and in this era of escalating climate extremes, it will pour harder than ever before.

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