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VIEWPOINT

Climate Change and Health: Transcending Silos to Find Solutions

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Abstract

BACKGROUND Climate change has myriad implications for the health of humans, our ecosystems, and the ecological processes that sustain them. Projections of rising greenhouse gas emissions suggest increasing direct and indirect burden of infectious and noninfectious disease, effects on food and water security, and other societal disruptions. As the effects of climate change cannot be isolated from social and ecological determinants of disease that will mitigate or exacerbate forecasted health outcomes, multidisciplinary collaboration is critically needed.

OBJECTIVES The aim of this article was to review the links between climate change and its upstream drivers (ie, processes leading to greenhouse gas emissions) and health outcomes, and identify existing opportunities to leverage more integrated global health and climate actions to prevent, prepare for, and respond to anthropogenic pressures.

METHODS We conducted a literature review of current and projected health outcomes associated with climate change, drawing on findings and our collective expertise to review opportunities for adaptation and mitigation across disciplines.

FINDINGS Health outcomes related to climate change affect a wide range of stakeholders, providing ready collaborative opportunities for interventions, which can be differentiated by addressing the upstream drivers leading to climate change or the downstream effects of climate change itself.

CONCLUSIONS Although health professionals are challenged with risks from climate change and its drivers, the adverse health outcomes cannot be resolved by the public health community alone. A phase change in global health is needed to move from a passive responder in partnership with other societal sectors to drive innovative alternatives. It is essential for global health to step outside of its traditional boundaries to engage with other stakeholders to develop policy and practical solutions to mitigate disease burden of climate change and its drivers; this will also yield compound benefits that help address other health, environmental, and societal challenges.

KEY WORDS adaptation, climate change, environmental change, global health, multidisciplinary collaboration, mitigation, prevention

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INTRODUCTION

Over the course of the past decade, the hardening reality of anthropogenic climate change has demonstrated the need to understand its future effects on health outcomes as well as the critical need for collaboration across disciplines to find appropriate solutions that prevent, prepare, and respond to climate change. As of 2000, climate change was directly accountable for the loss of at least 5.5 million disability-adjusted life years.[1] The Intergovernmental Panel on Climate Change (IPCC) projected average global temperatures will increase between 1.8°C and 4°C over the next century,[2] and extreme weather events and shifting patterns of disease are expected to have significant effects on global disease burden, water and food security, and social conflict—although the extent and direction of these effects will be differentially felt.[3-5] Given the complexity of social and environmental factors that influence disease and health outcomes, the precise degree of past and future effects on health is unclear; however, best estimates indicate that climate change will tip the scales of health outcomes unfavorably.[6,7] The World Health Organization (WHO), for example, estimated in the early 2000s that climate change was already accounting for 150,000 additional deaths globally (ie, deaths above the baseline) per annum. This number has been updated such that compared with a future without climate change (for the year 2030) an additional 38,000 deaths annually are projected due to heat exposure in elderly people, 48,000 due to diarrhea, 60,000 due to malaria, and 95,000 due to childhood undernutrition. This corresponds to an additional 250,000 deaths per year for the years 2030-2050—not including all climate-sensitive health effects (eg, pollution, injuries, nonmalarial infectious disease, and others for which projection data is lacking).[8] Direct health costs are projected to increase from US$1.2 trillion to between US$2 and $4 trillion per year,[8] and, when agricultural loss, damage due to extreme weather events, and decreased productivity are added, the estimated economic loss could reach 3.2% of global output.[9]

Many linear and nonlinear relationships exist between the environment and health, as anthropogenic activity influences health through a variety of ecosystem and climate-mediated pathways. Causal pathways can also be reversed: societal needs related to health can influence climate.[10] For instance, health practices themselves have a large carbon footprint. Nutritional demands lead to land use change for agricultural expansion, increased carbon release, and pressure on water resources; the administration of vaccines and health support resources, particularly in rural locations, requires carbon-emitting transportation[11]; and public health infrastructure, especially in developed countries, entails significant electricity usage[12]—all of which increase greenhouse gas emissions and concomitantly compound pressures on natural systems.

Even for more linear causal links—mortality and morbidity caused by extreme weather events and disease—complexity reigns. The effects of climate change cannot be isolated from social and ecological determinants of disease that will mitigate or exacerbate forecasted health outcomes. Demographic factors, health status, culture or life condition, limited access to resources and services, and sociopolitical conditions have been characterized as affecting vulnerability to health effects of climate change.[13] Geographically vulnerable regions, low-income countries, and refugees are more likely to bear a higher burden of adverse effects. In this regard, causal links may reinforce cyclical links between poverty and high health burden, whereas areas with higher human activity (land-use changes, urbanization, and rising populations) may motivate disease trajectories and adverse health outcomes.[4]

Because of this complexity, multidisciplinary and cross-sectoral collaboration will be critical to address health challenges related to climate change. This is reflected in the literature; for example, the hundreds of papers published relating to this topic (Web of Science search term [up to June 25, 2015] "health AND climate change AND collaboration") cover an expansive range of expected challenges, broad sectors, and manifestations, including toxic algal blooms, food systems, pest control, built environment, remote-sensing technologies, health provider concerns, and environmental education. However, emphasis has been placed primarily on vulnerabilities, preparedness, adaptation, and resiliency. With notable exceptions, the explicit reference to collaboration aimed at outright prevention has been less prominent.

Collaboration is certainly pressing to address both realized and near-term effects of carbon emissions and copollutants. However, less attention has been given to the underlying drivers of climate change to prevent, rather than only respond to, health effects.[14] Given that there is a critical 15- to 30-year window for greenhouse gas emissions—with projections exceeding the "tipping point" for stability if continued at current levels throughout that time frame, urgent action is required if we are