

Responding to heat-related health risks: the urgency of an equipoise between emergency and equity

Purnamita Dasgupta, Vikram Dayal, Rajib Dasgupta, Kristie L Ebi, Clare Heaviside, William Joe, Rupa Kumar Kolli, Meeta Keswani Mehra, Arabinda Mishra, Pankaja Raghav



In the summer of 2024, there were higher temperatures than usual in several parts of India. Temperatures in Delhi, a huge city with millions of residents, broke several previous records. Low-income households have dwellings that do not offer much protection from the heat, and individuals struggle to access basic amenities, such as water. With accumulating evidence on consequent impacts for mortality and morbidity, governance structures are seeking to respond in a timely and efficient manner. There is a need to recognise that heat-related illnesses and deaths are not best addressed merely as an acute disaster but as public health and economic challenges that require planned responses. Responses that are sustainable and equitable combine long-term structural efforts at resilience building with emergency preparedness and prove to be most effective in averting the largely preventable deaths, morbidities, and economic shocks arising from heat-related health risks among exposed and vulnerable communities. Joint action on climate and health enhances achievement of multiple developmental goals with multistakeholder participation. Diverse sectors, including medical care, surveillance, risk communication, disaster preparedness, livelihoods and jobs, and adaptation and urban planning, are needed to raise public awareness and engagement, induce behavioural change, and focus resources for the much-needed structural changes in urban planning and health systems that can save lives and avert damages. To reduce heat-related health risks, vulnerability, inequity, and climate action in the Indian context must be urgently addressed.

Introduction

June 17, 2024, was yet another scorching day in northern India. The Jafarpur weather station in the capital city, Delhi, recorded a maximum temperature of 46.9°C. Neighbours brought to the hospital a man aged 60 years who had fainted while working in the heat. At the time of admission, his body temperature was 105°F (40.5°C).¹ On June 19, the busiest crematorium in Delhi recorded 136 cremations, twice the normal number, signifying substantial excess deaths. Three major hospitals in Delhi reported 45 deaths, with dozens critically ill or on ventilators by June 20. Leading newspapers in India have carried distressing reports of deaths and illnesses from extreme heat conditions throughout this summer.

Temperatures in Delhi, which is home to 33 million people, surged in May and June, 2024, breaking several previous records. The daily average temperature exceeded 35°C around mid-May and stayed above or close to this mark for several weeks. The mean maximum temperature in May was 41.4°C, 1.5°C above its climatological mean for the month.² The weather station at Safdarjung recorded a maximum temperature of 46.8°C on May 30, the second highest temperature since 1901.² Newspapers reported that the minimum temperature was several degrees above normal on multiple occasions and, on the night of June 18, exceeded the previous highest recorded temperature.³

This tale is not about Delhi alone. Heatwave conditions prevailed for consecutive and many days at several places across northern, central, and eastern India this summer.⁴ Daily maximum and minimum temperatures were well above normal, with evidence that the recent high temperatures were made more extreme by climate change and El Niño.⁵ In inland and coastal cities, there

were unprecedented heatwave conditions. Jodhpur, located in the state of Rajasthan in western India, recorded daily average temperatures higher than 39°C for several days in May, 2024. In Bhubaneswar, a city in the state of Odisha on the eastern coastal region, daily average temperatures exceeded 30°C, exacerbated by humidity levels at 70% or higher on most days. In Delhi, Jodhpur, and Bhubaneswar, the median daily temperatures from May 1 to June 10, 2024, were higher than those in the previous 4 years, signalling the sustained nature of the rise in temperatures (figure). Between 2015 and 2020, the number of heatwave-affected states in India increased from nine to 23, and the average number of heatwave days increased from 7.4 to 32.2.⁶

Heat-related health risks: a sustained and inequitable crisis

The physiological strain of heatwaves is exacerbated when hot days are followed by hot nights. The risk is greater when humidity is also high. Heat exposure is worse in cities than in rural areas due to the urban heat island effect, whereby low moisture levels and differing building materials and morphology lead to local heating. Low-income households have dwellings that offer little respite from the unrelenting heat, with some not having fans or cooling mechanisms. Houses with tin roofs are usually the hottest.⁷ At night, indoor temperatures remain high and exceed outdoor temperatures. Media reports point to a persistent shortage of water, especially in low-income settlements, with extreme heat conditions adding to prevailing power shortfalls,⁸ compounding inequities in coping with heat stress. Women in low-resource settings might experience higher stress

Lancet Planet Health 2024;
8: e933–36

Environmental and Resource Economics Unit (Prof P Dasgupta PhD), Indian Economic Services Unit (Prof V Dayal PhD), and Population Research Centre (W Joe PhD), Institute of Economic Growth, Delhi, India; Centre of Social Medicine and Community Health (Prof R Dasgupta PhD) and Centre for International Trade and Development (Prof M K Mehra PhD), Jawaharlal Nehru University, New Delhi, India; Centre for Health and the Global Environment, University of Washington, Seattle, WA, USA (Prof K L Ebi PhD); Bartlett School of Environment, Energy and Resources, University College London, London, UK (C Heaviside PhD); Indian Institute of Tropical Meteorology, Pune, India (R K Kolli PhD); Development and Environment Futures Trust, Bhubaneswar, India (A Mishra PhD); Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur, India (Prof P Raghav MD)

Correspondence to: Prof Purnamita Dasgupta, Environmental and Resource Economics Unit, Institute of Economic Growth, Delhi 110 007, India
pdg@iegindia

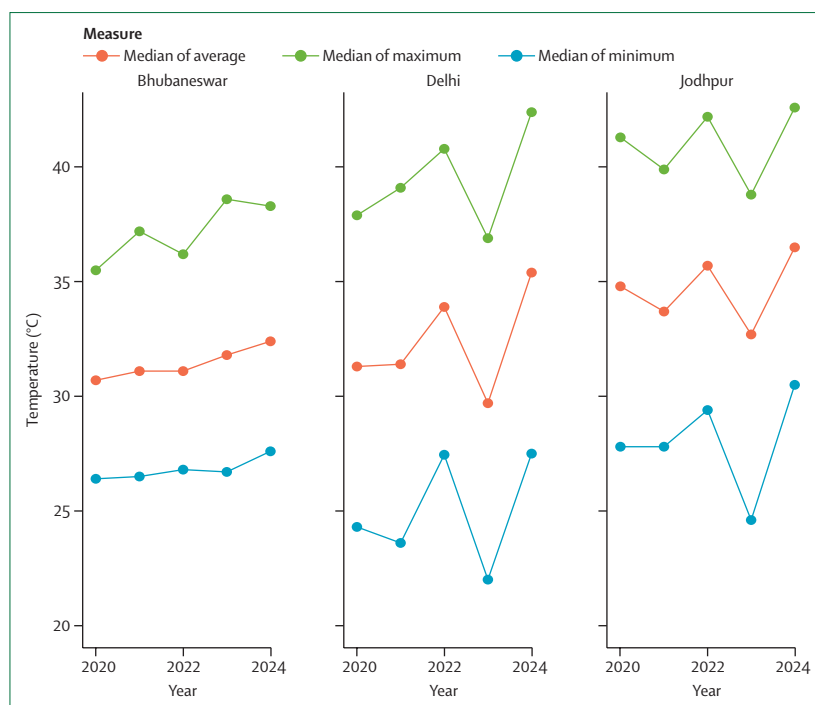


Figure: Sustained extreme heat in 2024

Median of daily average, maximum, and minimum temperatures in three cities in India from May 1 to June 10, 2020–24. Data were obtained using the R climate package.

levels due to social constraints on choices related to cooking, clothing, and space for sleeping.

Data matter. Reports of heatwave-related deaths vary hugely, with estimates at 143 deaths and over 41789 suspected heatstroke cases in India in 2024, by June 21, being considered an underestimate.⁹ The recently concluded parliamentary elections witnessed at least 33 deaths among polling staff in the most heat-affected parts of the country.¹⁰ With the introduction of the national heat-related illness and death surveillance platform¹¹ under the National Programme on Climate Change and Human Health, reporting is gradually improving. It is generally agreed that morbidity and mortality at the population level might be much higher than reported.¹² There is an urgent need to record and share information on cause-specific mortality linked to heat events and the occurrence of heat-related illnesses and their determinants.¹³

Bracing for the challenges ahead

Motivated by the heat experienced in India in the summer of 2024, in this Viewpoint, we emphasise the importance of timely and integrative action through planned responses on climate and health. Risks are spreading geographically and increasing in magnitude. Apart from mortality, heat-related health risks include the occurrence of new illnesses, exacerbation of existing chronic conditions, adverse impacts on mental wellbeing, and increased domestic violence. Abrupt curtailment of working hours

adversely affects the profitability of businesses, labour productivity, and the livelihoods of populations who are particularly exposed to heat-related risks, such as outdoor workers, leading to economic shocks.^{14,15} Heat stress adversely impacts livestock production systems and can lead to substantial economic losses.^{16,17} Altered work timings can impact parental childcare outcomes if they adversely affect time available for the family and can cause disruptions in schedules for domestic chores. An estimate for India suggests that work hours lost due to heat stress could increase to about 34 million full-time jobs by 2030, with half of these in agriculture.¹⁸ Although assessments of future loss of gross domestic product for India from declining labour productivity attributable to temperature and precipitation changes vary, long-lasting adverse effects are likely if timely action is not taken.¹⁹

A localised drought and heatwave can lead to falling labour and farm productivity, resulting in income losses and higher treatment or prevention costs relating to heat stress among farm workers. Cascading impacts, depending on the severity, frequency, and length of heatwaves, include inflationary pressures on food prices, availability of produce and trading (with economic and health implications for geographical clusters), vulnerable communities, resource allocations, and coping capacities beyond local contexts. The strength of evidence on this wider chain of events attributable to specific heatwaves varies, but there is sufficient empirical evidence on individual subcomponents of these linkages from across the world.

The governance response to extreme heat has primarily taken an acute disaster response framing, although heatwaves are yet to be notified as disasters under the Disaster Management Act, 2005.²⁰ Heat action plans have been developed for various cities and states.²¹ Odisha, which has Bhubaneswar as its capital, was the first state to develop a heat management plan, in 1999, and Ahmedabad had the first city-level heat action plan, in 2013.²² Jodhpur has recently begun to develop a heat action plan. Even as heatwave management is framed as disaster management, it is evident that preparing for a hotter future calls for a sustained and long-term approach to bring about structural changes and multisectoral action, integrating diverse expertise and governance scales. There are several evidence-based examples of such approaches.²³ City-level adaptation measures include increasing green infrastructure, providing shading and cooling centres, and implementing cool (reflective) building coatings to reduce the worst impacts of urban heat. Effective communications at national and subnational levels on reducing heat health risks should be tailored around the risk signatures of vulnerable communities, aiming to change risk perceptions and induce behavioural change. Collaborations between the public sector and businesses to promote affordable cooling technologies and amenities at workplaces lower risks. Early warnings, heat-health advisories, sharing information on roles and responsibilities of implementation actors, training of

health-care workers, and behavioural guidance for at-risk groups advance community resilience.²³

Joint action on climate and health enhances the achievement of multiple developmental goals. State-level data published by the National Institution for Transforming India, NITI Aayog²⁴ (a public policy think tank of the Government of India), show a positive association between the scores achieved by Indian states on good health and wellbeing (Sustainable Development Goal [SDG] 3) and disaster preparedness for climate action (SDG 13). Actions for advancing health and reducing risks span several departments. As climate change-induced heatwave conditions are here to stay,²⁵ planning and practice must incorporate measures to reduce the extra heat generated by urban heat island effects, indoor heat conditions, and cascading economic impacts. For example, short-term weather and heatwave predictions have improved vastly, but longer-term systematic shifts in heat-related health risks attributable to climate change can improve with diverse inputs. Advance planning helps to avoid time lags between the generation of scientific knowledge and implementation of action to protect health infrastructure from heat-related damages. This approach ensures improved functionality of health facilities in terms of adequacy of capacities and resources during heat incidents. Civil society-led, city-based forums on heat and health could bring together multiple stakeholders before the start of the heat season, suitably adapting lessons learned from worldwide experience on enhanced user engagement in managing climate risks and impacts.²⁶ Investing in accessible green spaces, especially for low-income settlements in cities, reduces inequities in managing heat-health risks. Additionally, powering infrastructure related to health, schools, and community services with renewable energy can ensure independence from power outages due to failure of large gridded supplies, and building low-income housing with green materials advances living conditions.

Approaches that systematically address the multiple heat-health exposure pathways among vulnerable communities could enable progression on several dimensions of health and wellbeing. The health sector must play a central role in the heat-health interface, given the extensive interplay between heat and health across the economy and society. The framing by the Intergovernmental Panel on Climate Change of risks in terms of the links between hazard, exposure, and vulnerability provides a basis for aligning multipronged actions.^{27,28} Reducing heat-related health risks provides a unique opportunity to urgently recognise these linkages and act to simultaneously promote good health and wellbeing, equity, and climate action in the Indian context.

Contributors

All authors contributed to the writing of this paper in terms of conceptualisation, resources, writing—original draft, and writing—review and editing.

Declaration of interests

We declare no competing interests.

Acknowledgments

The authors are co-principal investigators on a project funded by the Wellcome Trust (226740/Z/22/Z). The funder has not played any role in the writing or development of this manuscript.

References

- 1 Jaiswal A. Delhi heat stroke alert: five in hospitals, three critical. *The Times of India*, June 18, 2024. <https://timesofindia.indiatimes.com/city/delhi/heat-stroke-alert-five-in-hospitals-three-critical/articleshow/111068803.cms> (accessed June 26, 2024).
- 2 India Meteorological Department. Current weather status and extended range forecast for next two weeks (30 May–12 June 2024). May 30, 2024. https://internal.imd.gov.in/press_release/20240603_pr_3037.pdf (accessed June 25, 2024).
- 3 Express News Service. Delhi sets a new record this summer: hottest June night in over 50 years. *The Indian Express*, June 20, 2024. <https://indianexpress.com/article/cities/delhi/delhi-witnesses-warmest-june-night-temperature-humidity-heatwave-imd-9401506/> (accessed June 25, 2024).
- 4 Indian Meteorological Department. Heat wave; extended range outlook issued for week 1 valid for 27th June to 3rd July and week 2 valid for 4th to 10th July 2024. June 20, 2024. https://internal.imd.gov.in/section/nhac/dynamic/heat_extended.pdf (accessed June 25, 2024).
- 5 World Weather Attribution. Climate change made the deadly heatwaves that hit millions of highly vulnerable people across Asia more frequent and extreme. May 14, 2024. <https://www.worldweatherattribution.org/climate-change-made-the-deadly-heatwaves-that-hit-millions-of-highly-vulnerable-people-across-asia-more-frequent-and-extreme/> (accessed June 25, 2024).
- 6 National Disaster Management Authority, Government of India. Beating the heat: how India successfully reduced mortality due to heat waves. 2021. <https://ndma.gov.in/sites/default/files/IEC/Booklets/HeatWave%20A5%20BOOK%20Final.pdf> (accessed June 25, 2024).
- 7 Tasgaonkar P, Zade D, Ehsan S, et al. Indoor heat measurement data from low-income households in rural and urban South Asia. *Sci Data* 2022; 9: 285.
- 8 Times of India City Desk. On cam: no end to Delhi's water crisis, long queues seen at tankers across capital. *The Times of India*, June 19, 2024. <https://timesofindia.indiatimes.com/city/delhi/on-cam-no-end-to-delhis-water-crisis-long-queues-seen-at-tankers-across-the-city/articleshow/111102374.cms> (accessed June 25, 2024).
- 9 Times of India City Desk. Severe heatwave: death toll rises to 143 in India, true figures likely higher. *The Times of India*, June 21, 2024. <https://timesofindia.indiatimes.com/city/delhi/severe-heatwave-death-toll-rises-to-143-true-figures-likely-higher/articleshow/111161566.cms> (accessed June 25, 2024).
- 10 Hindustan Times correspondents. 58 more die of heat stress as mercury soars across India. *Hindustan Times*, June 2, 2024. <https://www.hindustantimes.com/india-news/58-more-die-of-heat-stress-as-mercury-soars-across-india-101717269557131.html> (accessed June 25, 2024).
- 11 National Centre for Disease Control. Frequently asked questions on heat-related illness and death surveillance. https://ncdc.mohfw.gov.in/wp-content/uploads/2024/07/FAQ-on-Heat-Related-Illness-Death-Surveillance_2024.pdf (accessed Sept 12, 2024).
- 12 Desai K. How will cities find a solution if they don't even count heat wave deaths? *The Times of India*, June 23, 2024. <https://timesofindia.indiatimes.com/india/how-will-cities-find-a-solution-if-they-dont-even-count-heat-wave-deaths/articleshow/111194978.cms> (accessed June 23, 2024).
- 13 Dasgupta R. Who dies in a heatwave? High temperatures affect everyone equally. *The Indian Express*, June 25, 2024. <https://indianexpress.com/article/opinion/columns/who-dies-in-a-heat-wave-high-temperatures-dont-affect-everyone-equally-9406406/> (accessed June 26, 2024).
- 14 Somanathan E, Somanathan R, Sudarshan A, Tewari M. The impact of temperature on productivity and labor supply: evidence from Indian manufacturing. *J Polit Econ* 2021; 129: 1797–827.
- 15 Sett M, Sahu S. Effects of occupational heat exposure on female brick workers in West Bengal, India. *Glob Health Action* 2014; 7: 21923.

- 16 Thornton P, Nelson G, Mayberry D, Herrero M. Impacts of heat stress on global cattle production during the 21st century: a modelling study. *Lancet Planet Health* 2022; **6**: e192–201.
- 17 Choudhary BB, Sirohi S. Economic losses in dairy farms due to heat stress in sub-tropics: evidence from North Indian Plains. *J Dairy Res* 2022; **89**: 1–7.
- 18 International Labour Organization. Working on a warmer planet: the impact of heat stress on labour productivity and decent work. 2019. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_711919.pdf (accessed Sept 12, 2024).
- 19 Kahn ME, Mohaddes K, Ng RN, Pesaran MH, Raissi M, Yang JC. Long-term macroeconomic effects of climate change: a cross-country analysis. *Energy Econ* 2021; **104**: 105624.
- 20 National Disaster Management Authority, Government of India. DM Act 2005. https://ndma.gov.in/Reference_Material/DMAct2005 (accessed Sept 12, 2024).
- 21 Ministry of Earth Sciences. Heat action plans (HAPs). Dec 6, 2023. <https://piib.gov.in/PressReleaseIframePage.aspx?PRID=1982978> (accessed June 25, 2024).
- 22 Magotra R, Tyagi A, Shaw M, Raj V. Review of heat action plans. 2021. <https://climateandcities.org/wp-content/uploads/2022/01/Review-of-Heat-Action-Plans.pdf> (accessed Sept 12, 2024).
- 23 WHO. Heat and health in the WHO European region: updated evidence for effective prevention. World Health Organization, Regional Office for Europe, 2021.
- 24 NITI Aayog. SDG India index and dashboard 2020–21. 2021. https://sdgindiaindex.niti.gov.in/assets/Files/SDG3.0_Final_04.03.2021_Web_Spreads.pdf (accessed June 25, 2024).
- 25 Arulalan T, AchutaRao K, Sagar AD. Climate science to inform adaptation policy: Heat waves over India in the 1.5° C and 2° C warmer worlds. *Clim Change* 2023; **176**: 64.
- 26 Daly M, Dessai S. Examining the goals of the regional climate outlook forums: what role for user engagement? *Weather Clim Soc* 2018; **10**: 693–708.
- 27 Field CB, Barros VR, Mastrandrea MD, et al. Summary for policymakers. In: Field CB, Barros VR, Dokken DJ, et al, eds. Climate change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. Contribution of Working Group II to the fifth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press: 2014, 1–32.
- 28 Dodman D, Hayward B, Pelling M, et al. Cities, settlements and key infrastructure. In: Pörtner H-O, Roberts DC, Tignor M, et al, eds. Climate change 2022: impacts, adaptation and vulnerability. Contribution of Working Group II to the sixth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press: 2022, 907–1040.

Copyright © 2024 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY-NC-ND 4.0 license.