

## CLIMATE CHANGE AND CHILD HEALTH

Public health measures are needed to protect the health of current and future generations.

*This policy brief summarises new research from the CHAMNHA (Climate, Heat and Maternal and Neonatal Health in Africa) and AWARD-APR (Addressing Extreme Weather Related Diarrheal Disease Risks in Asia Pacific Region) projects funded by the Belmont Forum under the Climate Environment and Health collaborative research action (CEH1).*

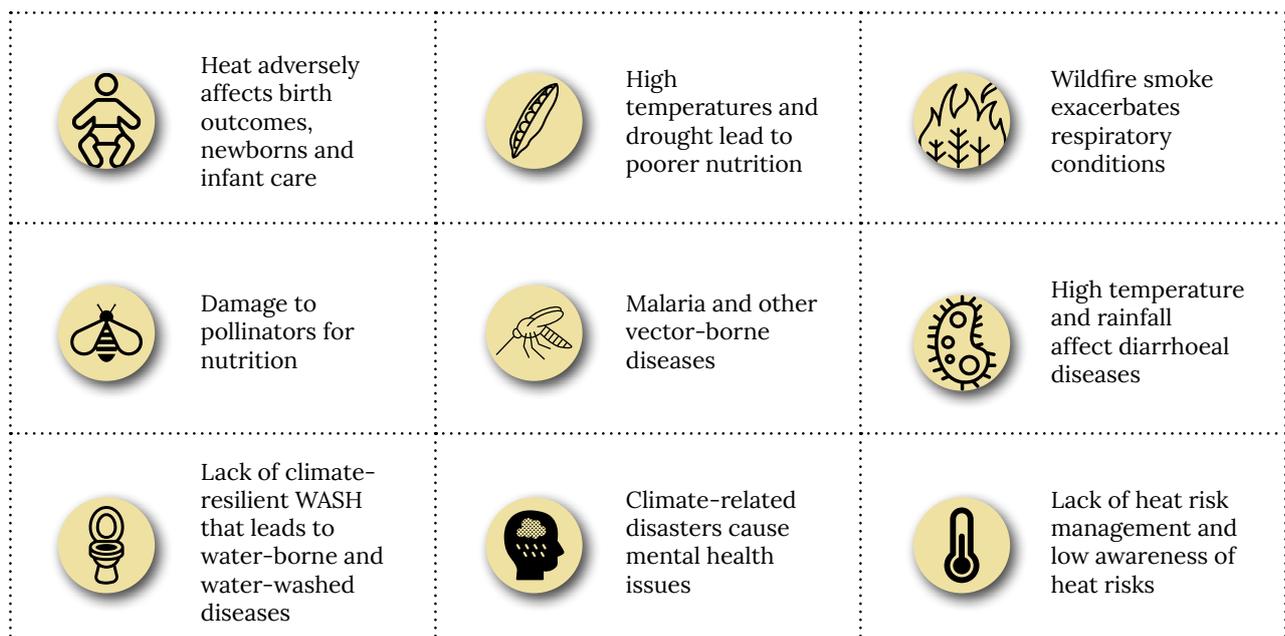


*A mother comforts her young son who has been ill with severe diarrhoea for several days, Mahakhali, Dhaka. Photo credit: Louis Leeson/LSHTM*

### Key messages

- Climate change disproportionately affects the health of children. Children bear the greatest burden of climate-sensitive diseases, particularly malnutrition, diarrhoeal disease and life-threatening dehydration.
- Climate change already affects child health. Observed warming has offset the benefit from health improvement for heat-related child mortality in Africa.
- More effective interventions are needed to protect infants and children from extreme heat and extreme precipitation.
- Better investment in the research and implementation of climate-resilient WASH (water, sanitation and hygiene) interventions is needed.
- Multi-sectoral responses are needed to prevent climate impacts on children, including policies to ensure that children have access to cool spaces in the hot season.
- Early warning systems with a longer lead time (weeks or months as opposed to days) are needed so public health practitioners can anticipate and prepare for climate hazards ahead of time and protect health and wellbeing of children.

### Pathways by which climate change affects child health



Children will bear the greatest burden from climate change on their health because climate-sensitive diseases, such as diarrhoeal disease, malaria, dengue, dehydration and malnutrition have a greater impact on young children.

Children under five years are highly vulnerable to climate factors due to physiological, behavioural and social factors (Fig 1). Children in low-income settings with high temperatures are particularly vulnerable to heat due to pre-existing burdens of infection and undernutrition, poor healthcare systems, and dwellings that do not provide sufficient protection from the heat.

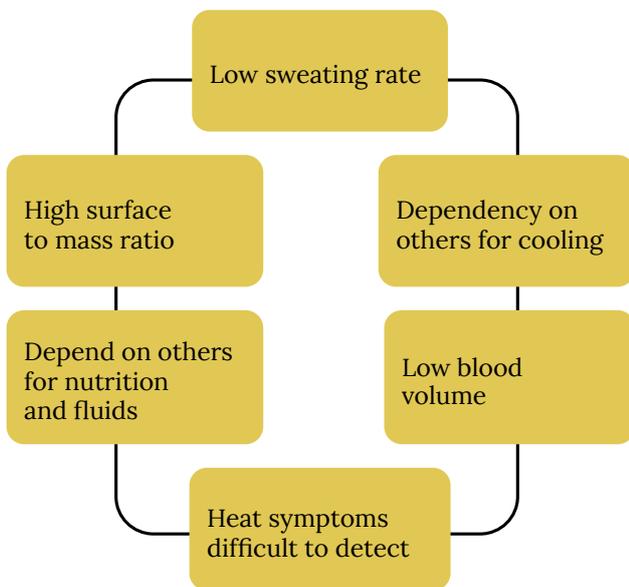


Figure 1: Risk factors for infants vulnerability to heat



**Climate change is already affecting child health**  
 Researchers in the CHAMNHA project estimated the impact of climate change on annual heat-related child deaths in Africa for the current (1995–2020) and future time periods (2020–2050). By 2009, heat-related child mortality was double what it would have been without climate change. The increase due to higher temperatures outweighed reductions in heat mortality from improvements in health care and living standards. These findings confirm the climate penalty by which climate change is already impacting on child health.

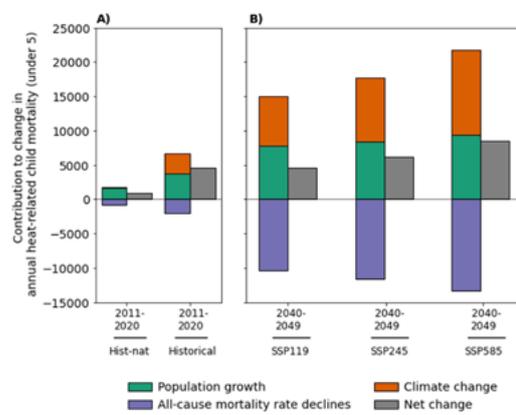


Fig 2. Annual heat-related child mortality in Africa (Chapman et al. 2022)

In the future, climate change is projected to increase burdens of child mortality. Under the high emission scenario (SSP585), including changes to population and mortality rates, heat-related child mortality is projected to double by 2049 compared to 2005–2014. If 2050 temperature increases were kept within the Paris Agreement’s target of 1.5 °C (SSP119 scenario), approximately 4000–6000 child deaths per year could be avoided in Africa. These estimates of future heat-related mortality include the assumption of the significant population growth projected for Africa, and declines in child mortality consistent with Global Burden of Disease estimates of health improvement.

A mother breastfeeds a newborn at a rural health centre in Ethiopia.  
 Photo: Credit: IDEAS/Paolo Patrino

## Child health, climate and diarrhoea

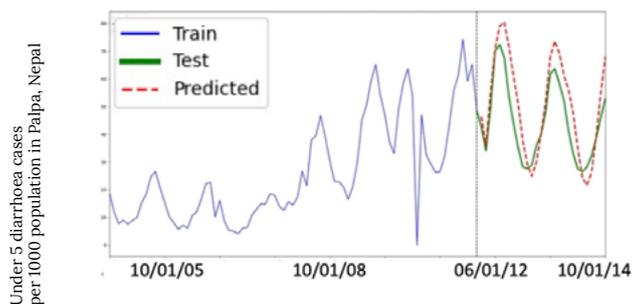


Fig. 3a Diarrhoeal disease rate, Kathmandu, Nepal.

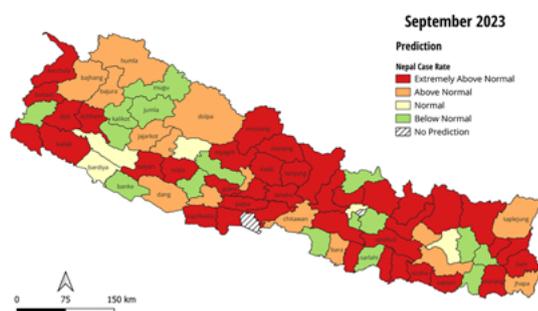


Fig. 3b Predicted diarrhoeal disease rate, Nepal

Diarrhoeal diseases are the second leading cause of death in children younger than five years worldwide, accounting for approximately 1.7 billion cases and over half a million deaths each year. A comprehensive study in Nepal by researchers in the AWARD-APR project, reported a direct link between elevated temperatures, increased rainfall, and an increase in reported cases of diarrhoea among children under five years. The risk of diarrhoea among young children was higher in mountainous regions compared to hilly or lowland areas of Nepal. Likewise, diarrhoeal risk varied by season and phases of El Niño Southern Oscillation (ENSO). Using modern machine learning based methods, the team has developed predictive models and tested them using historical data (Figure 3a). Building on this work, the team has developed AI based prototype early warning system for diarrhoeal disease for Nepal (Figure 3b), Vietnam and Taiwan. These early warnings have a lead time ranging from few weeks to several months, allowing public health practitioners enough time to prepare for the impending disease threats.

## Newborns, breastfeeding and heat

Newborns are particularly vulnerable to heat stress and dehydration from heat exposure due to their immature thermal regulatory system. Newborns are dependent upon adults to keep them cool, feed and care for them when environments threaten their health. High temperatures are associated with a greater risk of renal disease, respiratory disease, electrolyte imbalance, and over heating in newborns.

Extreme heat can also affect newborn health by undermining infant care and breastfeeding. CHAMNHA research indicates that women spend less time breastfeeding during the hottest days (Fig 4). Mothers with infants around four months of age, daily breastfeeding decreased by 23 minutes per 10°C increase in mean temperature. There was also evidence that infants under three months were less likely to be exclusively breastfed as temperatures rose.

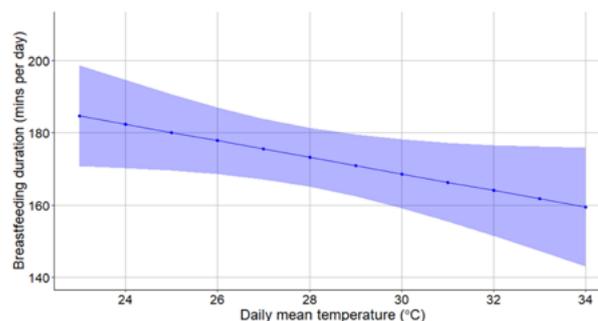


Fig. 4. Association between daily mean temperature and breastfeeding duration (minutes per day) in Bobo-Dioulasso, Burkina Faso [Part et al. 2022].

A review of the evidence indicates that infants under six months old do not require additional food or fluids, given that the mother produces enough milk and is well hydrated, so supplementation during breastfeeding should be discouraged, especially in low-income settings. An exception may be a baby born too soon, who may need some extra to grow and develop well. Interviews with mothers in rural Kenya and Burkina Faso found that newborns exposed to high temperatures may develop heat rash and skin problems causing discomfort that may reduce breastfeeding and skin-to-skin contact.

## Impacts of heat on children at different life stages

Conception	In utero/foetus	Newborn	Infant
High temperatures around time of conception increase risk of hypertensive disorders and preeclampsia - that increases risk of preterm birth	High temperatures are associated with low birthweight, and increased risk of stillbirth and preterm birth  Maternal heat stress increases risk of congenital abnormalities	High temperatures interfere with infant care and exclusive breastfeeding  Newborns are at risk of heat stress  High temperatures increase risk of newborn morbidity and mortality	Heat-related mortality in infants  Heat impacts on morbidity and the exacerbation of health conditions

### Policy recommendations

- Investment in effective and low-cost climate-resilient WASH (water, sanitation and hygiene) is needed to protect the health of children from diarrhoeal diseases.
- Improved health surveillance of diarrhoeal diseases and heat-related illness in children is needed to improve understanding of causal mechanisms and the development of interventions.
- Support measures to increase awareness and knowledge around heat risks in infants and children in the general public and clinicians must be prioritised.
- Risk communication around heat risks in children need to be developed as part of heat health action planning. Messages for women and other care givers need to be developed in partnership with communities.
- Multisectoral responses are needed to prevent climate impacts on children, including policies to ensure that children have access to cool spaces in the heat season.
- Support interventions for exclusive breastfeeding, and to ensure mothers have access to good nutrition and are well hydrated is crucial.
- Early warning systems need to be developed in partnerships between health professionals and climate services.

### Research recommendations

- Research to better understand how temperature and rainfall affect child mortality and morbidity, especially in very high heat settings in Africa, Asia and central America.
- Research is needed to better understand how clinical conditions are exacerbated by heat and to update guidelines for diagnoses, treatment and prevention.
- Health services and health systems research to understand the impact of heat on quality of care and access to services that has implications for child health.
- Research to understand community perceptions of heat-related risks in children to develop culturally acceptable and practical interventions.
- Development and evaluation of climate-based early warning systems that are targeted to high-risk groups such as children.
- Development of effective communication of seasonal precautionary measures or the implementation of non-pharmaceutical interventions by health departments to reduce the burden of diarrhoeal disease and other climate-sensitive diseases in children.

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