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# Setting priorities for climate and health adaptation

**Siddhanth Sharma and colleagues** argue that adaptation to cope with the health effects of climate change requires more focused local data and dedicated funding

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Climate change is often called “the greatest 21st century health threat.”<sup>1</sup> Substantial and growing evidence shows its harmful effects on health through various pathways, including heat stress, drought, and shifting infectious disease patterns.<sup>2–8</sup> Although these effects are well established, methodological challenges limit our ability to measure the full scale of climate change effects relative to other global health priorities such as infectious diseases.<sup>2</sup> This risks counterproductive responses, such as ineffective adaptation or deprioritisation of other pressing global health challenges.<sup>9–10</sup> To foster a more nuanced understanding of the health effects of climate change, we need to direct resources towards helping countries quantify local impacts and evaluate adaptation measures, while ensuring climate health funding supplements rather than displaces existing health aid.

## Current knowledge of impacts

The health effects of climate change are diverse, wide ranging, and compounding, affecting both direct health outcomes and broader health determinants. A key conceptual approach to studying these impacts involves assessing historical links between environmental exposures and health outcomes and comparing these with counterfactual scenarios without human induced climate change or projecting future scenarios with increased warming.<sup>11</sup>

Heat related mortality represents one of the most direct and well documented effects. The 2023 Lancet Countdown report shows that global heat related mortality has increased by 65% since the 2000s, rising from an average of 188 000 deaths a year to 310 000 deaths a year in the 2020s.<sup>2</sup> Although these numbers are concerning, they are much lower than death rates from single diseases such as tuberculosis (1 361 000 in 2021) and malaria (748 000),<sup>12</sup> which have more reliable counting methods and surveillance systems.

A critical question is how death rates will change under different climate warming scenarios. Current estimates<sup>3–5</sup> rely on multiple uncertain and to some extent unknowable assumptions about future temperature patterns, population demography, and human capacity for adaptation. Future mortality projections depend heavily on the assumed level of global emissions and warming. Under the Intergovernmental Panel on Climate Change’s medium emissions scenario of 2.4°C warming by 2100 (representative concentration pathway (RCP) 4.5), estimates suggest between 1.0 and 1.7 million annual excess temperature related deaths by 2100; under the more extreme but less likely high emissions scenario (4.3°C by 2100, RCP 8.5), both the projected mortality and uncertainty increase substantially, with estimates ranging from 2.4 million to 7.3 million annual deaths (fig 1).<sup>13</sup>

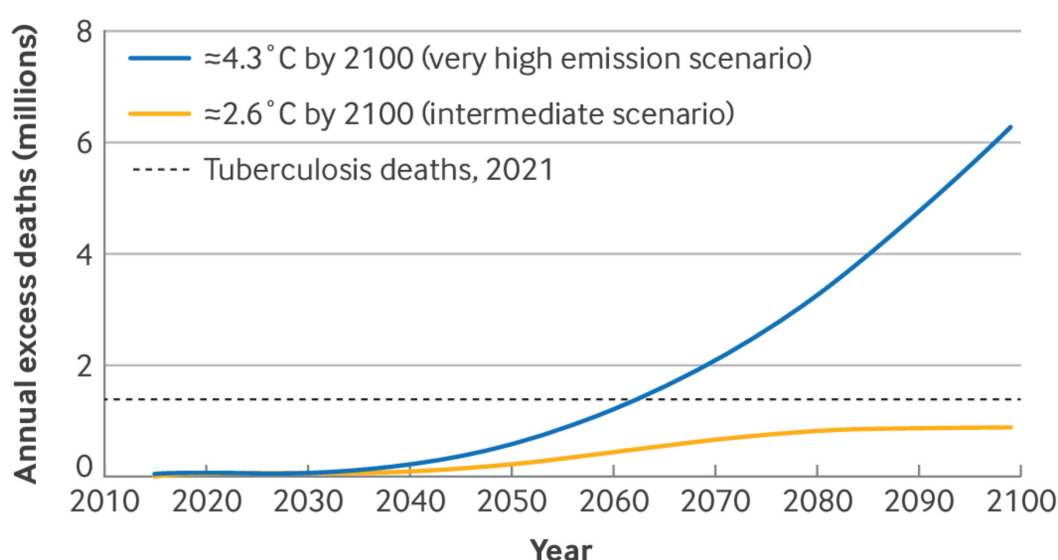


Fig 1 | Projected increase in annual temperature related deaths resulting from climate change compared with 2015 baseline under two representative concentration pathways (RCPs): RCP 4.5, a ~2.4°C increase in global temperatures by 2100 compared with 1850–1900, and RCP 8.5, a ~4.3°C increase.<sup>13</sup> As of 2025, global temperatures have already risen by 1.25°C–1.5°C.<sup>14</sup> Reproduced with permission from Jamison DT et al.<sup>15</sup> Original data adapted from Carleton et al 2022<sup>5</sup>

Beyond heat, several groups (Lancet Countdown, World Health Organization, World Bank, Institute for Health Metrics and Evaluation) have assessed the health effects of climate change using different methods (table 1). Despite their valuable contributions,

these assessments share common limitations: focusing only on certain health effects, using different measurement units that make comparisons difficult, and inadequately accounting for how societies might adapt.

Table 1 | Comparison of key findings and methodological limitations of major reports assessing the health impacts of climate change

Report	Key findings	Limitations
Lancet Countdown <sup>2</sup>	Heat related mortality increased by 65% from 2000s (188 000 annual deaths) to 2020s (310 000) Drought affected land increased from 18% (in 1951-60) to 47% (2013-22) Dengue transmission potential increased 28% (2013-22 v 1951-60)	Most indicators lack health endpoints Limited geographical granularity Difficult to compare with burden from other health issues
WHO 2014 report <sup>6</sup>	Projects 250 000 additional annual deaths (2030-50): <ul style="list-style-type: none"><li>• 38 000 from heat exposure (elderly)</li><li>• 48 000 from diarrhoeal disease</li><li>• 60 000 from malaria</li><li>• 95 000 from childhood undernutrition</li></ul>	Only focused on mortality Regional level estimates only Limited consideration of adaptation Based on outdated socioeconomic scenarios
Institute for Health Metrics and Evaluation <sup>7</sup>	450 000 deaths worldwide, 0.5% of global DALYs (2021) Greatest risks identified in Africa, Middle East, South Asia	Unclear specific climate change contribution Other pathways outside of heat and particulate matter still being developed
World Bank 2024 report <sup>8</sup>	Projects 580 000-624 000 annual deaths (2026-50) Economic cost of \$8.6tn-\$20.8tn by 2050 Sub-Saharan Africa and South Asia have ~75% of deaths	Limited to 69 low and middle income countries with >10 million population Uses generic risk functions applied across all countries Captures only selected climate-health pathways currently understood
Heat related health projections <sup>3,5</sup>	2.4°C rise: 1-1.7 million annual excess deaths by 2100 4.3°C rise: 2.4-7.3 million annual excess deaths by 2100	Do not account for morbidity or health system effects Lack of standardisation of assumptions Limited consideration of adaptation

Policy responses

Unlike diseases with clear causal pathways, climate change acts as a complex risk multiplier operating through diverse, interconnected pathways. This has led to three concerning trends. First, national health adaptation plans often appear generic and lack evidence based local specificity.<sup>16</sup> Second, evidence suggests that climate funding often represents redirection rather than addition of resources,<sup>9</sup> raising concerns climate-health funding may displace other health priorities. For example, analysis shows that bilateral development finance decreased from \$142bn in 2021 to \$135bn in 2022, while the proportion allocated to climate increased from 17% to 25%.<sup>10</sup> The broad scope of climate effects on health allows existing programmes to be relabelled as climate adaptation without funders genuinely providing additional resources. Third, because current measurements capture relatively few deaths from climate change compared with deaths caused by other global health priorities, some stakeholders may underestimate the magnitude of climate related health risks, potentially leading to insufficient action.

The challenge lies in balancing the serious health implications of climate change while maintaining focus on immediate, high impact health interventions.<sup>15</sup> With this in mind, we propose three recommendations to the global health community: expand measurement of climate-health relationships locally; fund and rigorously evaluate adaptation measures; and ensure climate funding genuinely supplements rather than relabels existing health aid.

Expand local measurement of climate-health relationships

To enable more evidence based resource allocation, we need broader exploration of the health effects of climate change beyond heat. Research should quantify relationships across multiple pathways, including vector borne diseases and extreme weather events

(particularly droughts). For example, analysis of data from 1995 to 2014 showed climate change increased the incidence of dengue by 18% (95% confidence interval 12% to 27%) in the Americas and Asia, with projections of 49-76% by mid-century.<sup>17</sup> Similarly, analysis of global crop production projects a significant decline in yields—equivalent to 4.6% of current production per 1°C rise.<sup>18</sup>

These pathways affect health through both acute and chronic mechanisms, affecting not only mortality but also morbidity. Climate driven droughts worsen food insecurity thereby increasing malnutrition and related diseases. Vector borne diseases such as dengue cause substantial morbidity and burden health systems. Capturing these broader health outcomes is essential to quantify the effect of climate change. Once established, this foundation can be expanded to include more complex indicators that capture the full spectrum of effects such as mental wellbeing and cultural identity.

To translate these broader insights into effective local action, low and middle income countries need practical tools and training to understand climate-health relationships within their contexts. This analysis should draw on local historical health data and investigate how they relate to climate variables such as temperature, humidity, and precipitation. Climate-health funders should invest in the development of simple, accessible tools that enable researchers and local institutions to analyse these relationships, generating the localised evidence needed to inform policy responses and efficient resource allocation. Existing work on location specific heat mortality offers a useful template for other climate-health issues.<sup>19</sup> Throughout, local communities must have a central role, as their firsthand knowledge and lived experience can guide investigations towards the most relevant health concerns.

These localised approaches should inform and enrich global climate-health projections. Separately, researchers must work

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towards addressing the limitations of current modelling efforts (table 1). Models could seek to incorporate the effects of income growth and regional adaptation differences, acknowledging how economic development buffers vulnerability. Adopting standardised health metrics such as disability adjusted life years (DALYs) would capture both deaths and illness, allowing better comparison with other health priorities.

Beyond the established climate-health pathways lies a broader spectrum of potential impacts, including tail risks (low probability but high impact events), unquantified risks (those we can conceptualise but haven't yet measured), and potentially unquantifiable risks (unknown societal responses). The localised approach to evidence generation could help identify previously unrecognised risks specific to different regions and populations.

## Fund and rigorously evaluate adaptation measures

Many countries worldwide have developed national adaptation plans to address the health impacts of climate change,<sup>20</sup> but the effectiveness of these interventions remains poorly understood.<sup>16</sup> The plans often target specific risks—whether hazards (eg, heatwaves, flooding, and drought), population exposure (eg, geographical or demographic distribution), or underlying vulnerabilities (eg, poor infrastructure or social inequalities). This leads to a focus on three main areas: surveillance and response systems for critical risks such as heat waves, infectious diseases, and food insecurity; integration of climate risks into existing vertical health programmes; and supporting adaptation and resilience in “health determining” sectors, including water and sanitation services, the built environment (eg, air conditioning), and food security programmes.<sup>16</sup> However, the current evidence base for these strategies is limited, presenting challenges for policy makers in prioritising and implementing the most effective interventions.

A comprehensive review of 99 studies across 66 low and middle income countries highlighted some promising interventions.<sup>21</sup> For example, physical infrastructure improvements such as flood barriers have produced improvements in water, sanitation, and hygiene indicators of 1–47%; climate smart agricultural practices have been shown to increase food security by up to 133%; and targeted interventions for vector borne diseases have reduced incidence by up to 18%. These adaptations necessarily vary with local climate risks. Nevertheless, evaluation timelines are typically short and methodologically weak, and important gaps persist, hindering evidence based prioritisation.<sup>21</sup> The review highlighted a concerning lack of prospective evaluations and potential publication bias—just 3.5% of all 1117 reported health outcomes were negative.<sup>21</sup>

This evidence gap reflects a broader challenge: funders are reluctant to support adaptation measures without evidence of effectiveness, yet generating this evidence requires implementing and evaluating interventions at scale. Breaking this cycle requires funders to create dedicated funding streams for pilot programmes with robust evaluation components, enabling researchers to rigorously assess impact and cost effectiveness to identify potential “best buys.” These include both direct and indirect measures of effectiveness.

Although health outcomes such as mortality and morbidity are important, measurement of these outcomes for all adaptation interventions may not be feasible. Many climate adaptations affect health through delayed pathways, requiring years or decades of observation. Instead, proxy indicators can provide timely evidence. Drought interventions, for instance, can be evaluated using crop yields or adoption rates of climate smart agriculture. Evaluations should also consider potential co-benefits such as health system strengthening and embrace a planetary health perspective that

recognises the interdependence between human health and ecosystems. To make this evidence accessible and enhance the comparability of interventions, evaluations should be collated and synthesised into an accessible format. This could be similar to the Disease Control Priorities project,<sup>22</sup> which systematically summarises evidence on the effectiveness and cost effectiveness (eg, cost per health outcome gained) of interventions, facilitating comparison and guiding evidence informed policy decisions.

Beyond adaptation measures, countries must address future risks through Paris Agreement decarbonisation targets.<sup>23</sup> Mitigation and adaptation complement each other: emission reductions provide global benefits by lowering the severity and likelihood of hazards worldwide, whereas adaptation offers targeted protection by lessening local exposure and vulnerability. Many low and middle income countries, however, face acute adaptation challenges with minimal resources. It is justifiable for these countries to prioritise building resilience against immediate local climate threats while contributing to global emission reduction efforts where possible.

## Ensure climate funding supplements existing health aid

Current climate-health funding remains modest relative to both present and projected needs, particularly given the disproportionate climate vulnerability of regions with already strained health systems.<sup>24</sup> Distinguishing genuinely new climate finance from existing aid that has been relabelled is a key challenge. For example, analysis suggests at least a third of the \$100bn climate finance target involved reclassifying existing development funds, rather than providing truly additional resources.<sup>10</sup> This challenge is particularly acute given current constraints on overall global development budgets.

Simply relabelling existing health aid as climate related without mobilising new resources risks undermining both climate adaptation efforts and established health priorities. A more effective approach requires clear baselines, standardised definitions, and consistent reporting requirements that include accountability mechanisms for tracking both financial flows and outcomes.

The financing challenge is compounded by barriers that limit the ability of low and middle income countries to access available funds. These include unfavourable financing conditions as well as institutional constraints that hamper their capacity to identify funding opportunities and develop robust proposals. These barriers are substantial—according to a 2021 WHO survey, over half of countries reported difficulty accessing international climate-health funding because of lack of awareness about available opportunities.<sup>25</sup>

Beyond securing and tracking funding, attention must be paid to strengthening countries' institutional and operational capacity to effectively absorb and use new resources. This is particularly critical given that projected climate finance flows would exceed 30% of gross domestic product for many lower income countries; simultaneously investing in public financial management capacity is imperative.<sup>26</sup> Ensuring additionality and maintaining focus on overall health priorities requires complementary actions: donor governments and financing institutions must improve transparency and accountability in reporting, while recipient countries need to strengthen the public financial management systems required to effectively absorb and utilise funds.

Climate change presents a clear and significant threat to health, but current measurement challenges obscure the full impact and risk the ineffective use of resources in low and middle income countries. While building a stronger evidence base, we should

simultaneously implement and evaluate promising adaptation measures. A nuanced approach is vital to manage climate risks without neglecting other urgent health needs.

#### Key messages

- Persistent methodological challenges limit our ability to fully quantify climate health effects relative to other global health priorities
- These challenges hinder effective adaptation planning and resource allocation
- To improve our understanding we must expand local measurement of climate-health relationships and rigorously evaluate adaptation measures
- New climate funding should genuinely supplement rather than relabel existing health resources

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