

Dousing the burning inequity of global warming for people experiencing homelessness

The impact of extreme heat from global warming is felt disproportionately by people experiencing homelessness, representing a significant climate injustice. People experiencing homelessness face considerable challenges that impact on their capacity to cope with extreme heat, including a lack of safe, affordable and reliable housing, and higher rates of chronic health conditions and disability relative to people in stable housing.^{1,2} Addressing the complex intersection of homelessness and extreme heat requires a focus on the underlying social and structural determinants of homelessness. Equally important is achieving net-zero carbon emissions to limit the rise in global temperatures.³

Although limiting the prevalence of homelessness and global warming is paramount, understanding and mitigating the negative health impacts of extreme heat on people experiencing homelessness is a vital step in public health efforts. This article reports on the state of this pressing injustice in Australia by exploring what is already known and identifying critical knowledge gaps and limitations in addressing the issue. Emerging heat-response actions and recommendations are provided to guide research and action towards mitigating heat-health impacts and future harm for people experiencing homelessness in Australia.

characterised by barriers to spaces that provide respite from the heat, including reliable shelter and air conditioning.¹

In Australia, people experiencing homelessness predominantly reside in urban settings⁴ where they are exposed to the urban heat island effect — urban infrastructure intensifying heat. The physical and mental health conditions, compounded by factors such as alcohol and substance use, medication side effects, and a lack of social support, converge to impair their physiological and behavioural capacity to cope with extreme heat.^{1,2,7-10} A limited coping capacity likely increases heat, cardiovascular and renal strain, although this link has not been demonstrated in people experiencing homelessness. Nonetheless, evidence shows far greater heat-related hospital admissions, morbidity and mortality in people experiencing homelessness relative to housed populations.¹¹⁻¹³ This intersection of homelessness and extreme heat highlights a profound climate injustice: those who are most disadvantaged and least responsible for climate change endure its greatest impacts.¹

Addressing knowledge gaps: progress and challenges

Understanding of heat-health risks for people experiencing homelessness largely stems from cross-sectional, case-based, epidemiological and qualitative research.¹¹⁻¹⁶ Heat-health risk factors such as alcohol use,⁷ medication side effects,⁸ chronic disease⁹ and mental health conditions¹⁰ studied in other cohorts are used to describe heightened heat vulnerability in people experiencing homelessness.

Longitudinal studies are urgently needed to explore the heat exposure and thermal physiology and behaviour of people experiencing homelessness in greater depth. Although nascent studies in the field show high heat exposure and risk,¹¹⁻¹⁸ more research is needed. Further studies should measure the environmental parameters that a high proportion of people experiencing homelessness are exposed to, including air temperature, relative humidity, mean radiant temperature and wind speed. These measures could be collected in various urban settings: streets, parks, substandard housing, overcrowded dwellings, and makeshift shelters such as cars and tents. Crucially, there is a lack of data on thermal physiology and behaviour essential for assessing heat stress risk in homeless populations. Factors such as metabolic heat from physical activity, inadequate heat dissipation from excess or insulative clothing, dehydration from poor water access, and radiant heat exposure from minimal shade and urban infrastructure elevate heat, cardiovascular and renal strain.

In collecting these data, it is important to acknowledge that people experiencing homelessness often prioritise immediate survival beyond heat-health risks. Ethical

Multifaceted climate challenges for Australia's homeless

Heatwaves have become more frequent and intense with global warming.³ The intensification of heatwaves represents a growing public health and equity concern with the situation dire for ~122 500 people experiencing homelessness in Australia.^{3,4} Homelessness includes rough sleeping (eg, tents, cars, under bridges) and more hidden forms such as use of emergency shelters, couch surfing, or overcrowded boarding houses. The prevalence of people experiencing, or at risk of, homelessness is simultaneously rising alongside hotter and longer summers in Australia.^{3,4,5} Between 2020 and 2024, rough sleeping rose 22%, from a monthly average of 3808 to 4636.⁵ Rising living costs, a lack of affordable housing and emergent physical and mental health conditions contribute to this increasing prevalence.⁵ These concerning trends are mirrored, and in some cases more pronounced, in other countries, such as the United States.⁶

The Australian Government recognises people experiencing homelessness as a priority population, aiming to address inequity through investment and policy.⁵ This priority population is disproportionately affected by physical and mental health conditions and disability,^{1,2} with an over-representation of First Nations (20% of Australia's homeless) and LGBTQIA+ people due to social and historical inequities.^{4,5} They find themselves on the frontline of this climatic upheaval, facing systemic cooling poverty that is

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research must remunerate participants and support access to essentials such as food, water, hygiene, health care, and temporary accommodation. Researchers may face other barriers related to working with homeless populations such as distrust of large organisations — often rooted in trauma and mental health conditions² — hindering consent and participant recruitment. Challenges may also arise in maintaining and securing research equipment in urban environments and gaining access to homeless shelters and private dwellings.

Longitudinal environmental, physiological and behavioural data would enable the development of a heat stress risk scale tailored as a preparedness tool for health care and outreach services. Such a scale could refine emergency heat-response strategies, which evidence suggests would be activated earlier than for the general population.^{11–18} These data would also enable modelling future heat-health risks in Australia under global warming scenarios and evaluation of the effectiveness of interventions in providing heat relief and reducing hospital admissions.

Climate justice not only requires attention to the disproportionate impacts of climate change for Australia's homeless, but it also requires involvement of those most impacted in efforts to find solutions to eliminate or mitigate harms. This necessitates working in partnership with people experiencing homelessness,¹⁹ particularly individuals from First Nations communities, the LGBTQIA+ community, and those with physical and mental health conditions. Climate justice also requires a transdisciplinary approach that includes researchers, clinicians, government representatives and policy makers.¹⁹ Establishing and coordinating such a diverse and collaborative team is a significant undertaking, requiring substantial effort to align goals, share knowledge and co-design impactful interventions and research.¹⁹

There is considerable uncertainty about the ability of government and non-government organisations to effectively target specific heat-vulnerable populations, such as people experiencing homelessness, in heat-response policies.²⁰ A review is needed to assess the presence, content and effectiveness of interventions in Australia. Many policies continue to promote underutilised cooling centres as a solution,^{20,21} likely due to a lack of other public health interventions. Variability in policies, resources and population needs further complicates efforts to assess the effectiveness of heat-response measures.

Emerging heat-response action for Australia's homeless

In Australia and globally, public health efforts to address the unfair distribution of heat impacts in urban settings have focused on cooling centres to shield socially disadvantaged people from extreme heat.^{20,21} These publicly available centres are usually established buildings with air conditioning such as libraries, community halls and churches and are a key strategy in public health policy for heat

emergencies.²⁰ Laboratory evidence shows that exiting the heat to a cool room for two hours can limit heat and cardiovascular strain.²² However, cooling centres are only effective for those who can attend, which highlights the core challenge.

Homeless populations face significant barriers to accessing cooling centres. These barriers include transportation challenges, limited awareness due to minimal targeted outreach, a lack of secure spaces for belongings and pets, fear of stigma and exclusion, and environments that may trigger past trauma or foster distrust.^{2,20,21} There is also a lack of training for cooling centre staff in the specific social and health care needs of people experiencing homelessness, including requirements for culturally safe and trauma-informed care.²⁰

A range of personal cooling interventions other than air conditioning can alleviate heat strain. Unlike the static ambient cooling provided by air conditioning in cooling centres, these alternative cooling methods are highly mobile, cost-effective, and mitigate heat and cardiovascular strain. Shade is the simplest form of personal cooling, as obstructing the sun's radiant heat significantly limits heat stress. Electric fans enhance convective and evaporative heat losses by increasing airflow over the skin. The degree of cooling from a fan depends on humidity, age and sweating capacity with safe use found at environmental temperatures between 37°C and 39°C.²³ Recent evidence shows that fan use reduced heat-related cardiovascular strain by 86% in older adults with heart disease not taking beta-blockers at 38°C and high humidity.²⁴ Fans can also be used in combination with water dousing to enhance evaporative cooling and limit sweat rate, dehydration and cardiovascular strain.^{24,25} Cold water sprayed on the skin, immersing limbs in cold water, wetting clothing, or ice wrapped in wet towels and draped over the upper body offer immediate perceptual relief and mitigate heat strain through conductive, convective and evaporative heat loss.²⁵

These personal cooling options are far more sustainable due to their cost-effectiveness (fans are up to 50× cheaper than air conditioning) and their mobility increases their scalability and accessibility, which are crucial factors for timely field deployment in response to heat emergencies. These evidence-based personal cooling strategies widen the definition of what constitutes a “cool space” to provide heat relief — transitioning from expensive, fixed, generalised cooling centres,^{20,21} to low cost, mobile, individualised field-based cooling.

Building on this empirical evidence and with a transdisciplinary approach, our team is co-designing, co-implementing and co-evaluating a cost-effective, scalable alternative to traditional cooling centres: to our knowledge, the world's first co-designed mobile cooling hub (Box 1). Supported by an expert in co-design and homeless health services, our team uses a substantive co-design approach¹⁹ involving people with lived experience of homelessness, health care and government staff, academics, and international advisers. Lived and professional expertise are valued

1 Homelessness health care manager opening a mobile cooling hub with a registered nurse and a social worker



Source: Alejandro Vásquez Hernández

2 Applied and research recommendations to address heat-health impacts for Australia's homeless

Recommendation	Details
Reduce homelessness and carbon emissions	Drive systemic change by aligning policies with established global frameworks, such as the United Nations Sustainable Development Goals (SDG) — particularly SDG 1 (No Poverty), SDG 10 (Reduced Inequalities), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action) — while also leveraging climate action commitments outlined in the Paris Agreement.
Adopt a co-design transdisciplinary team approach	Establish co-design teams of researchers, clinicians, government representatives, policy makers and people with a lived experience of homelessness to address the multifaceted vulnerabilities of this cohort in extreme heat.
Enhance field data collection	Overcome barriers to field-based data collection by implementing innovative methods to use and secure equipment more effectively. Foster participant consent through trust-building initiatives, a culturally sensitive approach, and community engagement strategies. Efforts should address distrust of organisations and past trauma while emphasising the positive outcomes of research participation.
Prioritise longitudinal studies	Conduct longitudinal research to measure environmental conditions and track the physiological strain and thermoregulatory behaviours of people experiencing homelessness in their respective settings. Provide remuneration to research participants and support them to meet crucial survival needs of food, water, hygiene, health care and temporary accommodation.
Develop a heat stress risk scale	Create a tailored heat stress risk scale for health care and outreach services to activate emergency heat-response strategies specific to homeless populations.
Evaluate the effectiveness of field-based cooling interventions	Use longitudinal field data to assess the real-world effectiveness of interventions such as cooling centres and outreach efforts including mobile personal cooling technologies in delivering heat relief and reducing hospital admissions for people experiencing homelessness.
Refine and evaluate heat-response policies	Conduct a comprehensive review and refinement of heat-response policies to ensure they include targeted and effective interventions for people experiencing homelessness. This should address unique barriers to accessing resources such as cooling centres, while also identifying gaps, assessing equity, and standardising measures across diverse populations and resource levels.
Model future heat-health risks	Leverage data to model the long-term heat-health risks for people experiencing homelessness under global warming scenarios, supporting proactive policy and resource planning.

equally, with collaborative decisions made across all stages of hub design, piloting and evaluation.

The hubs offer immediate, personalised heat relief for people experiencing any form of homelessness, with a focus on individuals sleeping rough, who are most vulnerable. Mobile, low cost, and easy to set up, the hubs are strategically promoted and located for

accessibility and hosted by experienced health care staff who deliver both immediate aid and longer-term support. This proactive initiative aims to ensure essential services reach people where they are, addressing immediate heat-health risk and broader unmet needs that are informed by the voices and choices of people experiencing homelessness — a stark contrast to static cooling centres.

In line with co-design principles, the research evaluation of these hubs was co-determined with people with lived experience and key interest-holders. The co-evaluation involves a pilot mixed methods, quasi-experimental study design examining accessibility, heat-relief, acceptability and feasibility. The feasibility of the hubs will depend on space availability in suburbs with a high prevalence of homelessness, operational costs and staffing availability. A table of recommendations to address heat-health impacts for Australia's homeless is provided in [Box 2](#).

Conclusion

The intersection of homelessness and extreme heat is a critical public health and equity challenge. This article highlights the heat-health risks faced by people experiencing homelessness, gaps and limitations in research and public health strategies, and the urgent need for innovative, inclusive interventions. Addressing these limitations through co-designed, transdisciplinary approaches may better protect people experiencing homelessness and foster scalable, sustainable heat-resilience strategies. Prioritising the most vulnerable as temperatures rise is essential for a more equitable and climate-resilient Australia.

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