Heat stress at work

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Acknowledgements

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Cover Image: Man engineer drinks water in container transportation. Credit: Me 3645 Studio via Getty images.

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What is PERC?

The Post-Event Review Capability (PERC) is a systematic framework for the analysis of a disaster event. It focuses on how a specific hazard event became a disaster and what worked and what didn't work in terms of disaster risk reduction, preparedness, response, and recovery with the goal of developing considerations for building resilience to future hazard events. PERCs have been carried out across the globe after floods, bushfires, and tropical cyclones, and have been applied in both urban and rural settings. This study is the first PERC on extreme heat.

Extreme heat is the deadliest climate hazard in Australia - it kills more people than all other natural hazards combined[1]. This PERC, collaboratively delivered by Australian Red Cross, ISET-International, Monash University, the International Federation of Red Cross and Red Crescent Societies, and Zurich Australia explores the effects of ongoing extreme heat events in Adelaide, and in Australia more generally.

The objective of this research is to gain a deeper understanding of how communities adapt to extreme heat, the strain placed on local resources by repeated extreme heat events, and the long-term health and social impacts of these events.

This brief is one of three from the PERC Adelaide study. See also, "Understanding extreme heat and entry points for action" and "Strengthening resilience to extreme heat: an Adelaide case study".

Methodology used in this study

This study is based on in-person and online interviews conducted primarily in June and July 2025, complemented by desk research. A wide range of actors - including representatives from local and state governments, researchers, engineers, meteorologists, city planners, educators, emergency responders, health professionals, union representatives, and community organisations - contributed to the study through key informant interviews, offering a rich mix of experience, expertise, and insights.

Over the summer of 2024-2025, Adelaide experienced many hot days and an extended hot season. Overall, 2024 was the second hottest year on record (after 2019), and minimum temperatures were the hottest on record. However, interviewee insights reflected how intangible and fleeting the experience of extreme heat can be. Rather than focusing just on heat experienced in the 2024-2025 summer, what emerged from this PERC was a broader picture, informed by interviewee experiences of hot summers over the past decade, and of what heat impacts can and might look like as temperatures continue to rise.

Urban Climate Resilience Program

The PERC Adelaide study is aligned with and complementary to the Urban Climate Resilience Program UCRP brings together global actors - including the International Federation of Red Cross and Red Crescent Societies (IFRC), ICLEI, C40 Cities, R-Cities and Plan International—to advance climate resilience initiatives in urban contexts across nine countries. Funded by the Z Zurich Foundation, Australian Red Cross, in partnership with Zurich Australia, is leading UCRP implementation in Australia with a focus on Western Sydney. The PERC Adelaide study highlights shared experiences of extreme heat and common challenges faced by urban communities, which are applicable to both Adelaide and Sydney and demonstrate the broader relevance of the findings for cities across Australia and beyond. In this context, UCRP Australia represents an integrated approach to urban climate resilience, combining community-led, ground-up action with engagement of local governments and city-level actors to drive sustained policy change. Together, PERC and UCRP enable Australian Red Cross to deepen understanding of heat risk through diverse expert and stakeholder perspectives, while building locally led solutions that translate evidence into tangible improvements in people's lives.

Contents

Introduction

Extreme heat[2] is a growing threat to workers' health, safety, wellbeing, and productivity. In Australia, it is projected that the coming decades will see sharp increases in heatwaves, heat injuries and deaths, and exposure-related productivity losses[3].

Working in hot outdoor and indoor environments jeopardises the health of workers, especially for those with little agency to control the conditions of their work or their choice to take protective measures (e.g. seek shade, rest, hydrate etc), including people in insecure or precarious jobs. Excess heat exposure can lead to serious illness or death, especially when there is no relief at night and/or when there is high humidity[4].

Socioeconomic and systemic inequities such as low incomes and poor housing limit people's ability to protect themselves and stop working to stay safe. This can be further exacerbated if essential systems fail during heatwaves (e.g. power, transportation, critical services, etc.); impacts will disproportionately affect those already at risk.

Conversations we had with workers in Adelaide underscore how, when extreme heat occurs, many workplaces are underprepared. The need for broader attention was readily apparent, as were initial entry points for action.

The study highlighted that heat is a collective hazard that should be addressed through workplace and city-level disaster risk reduction strategies. Taking strong action now is necessary to reduce current heat impacts, strengthen protections for workers, and address anticipated future impacts as heat continues to rise.

Extreme heat is a growing threat

Extreme heat is already compromising the health, wellbeing, and livelihoods of many workers[5], and impacting the industries and economies those workers are engaged in. Globally, 2.4 billion paid[6] workers - over 70 percent of the global workforce - are at risk of extreme heat[7]. This problem will only escalate as heat continues to increase.

According to Australia's National Climate Risk Assessment's 3°C scenario, the average number of severe and extreme heatwave days per year could almost quadruple, while heat deaths could quintuple[8]. Heat exposure could impact worker productivity with potential ensuing losses to economic output of AUD 135-423 billion by 2063[9].

Of the many impacted sectors, agriculture, construction, manufacturing, and mining could bear the worst of heat impacts, with about 700,000 additional days of work lost every year due to heat by 2061[10]. These figures only represent the formal work sector; including the informal workforce and unpaid labour would substantially increase these numbers.

When people experience more heat than they can handle, it can cause both rapid-onset and slow-onset impacts. This creates two distinct, interrelated sets of challenges for action - acute challenges and longer-term challenges.

On hot days, if workers aren't able to stay hydrated and don't have the opportunity to regularly cool down, the risk of heat illness and death rapidly rises, even for young, healthy workers. Workplace heat stress impairs alertness and decision-making, which can lead to workplace accidents and acute injuries[11]. In addition, workers may be vulnerable to heat-related health impacts due to pre-existing physical and mental health conditions, pregnancy, age, or medications.

Heat impacts can occur because it is too humid or the air is too still for sweat to help people cool off, because they don't have access to fans or active cooling[12], or because they are unable to seek shade and rest. High humidity and hot nights further jeopardise worker health and contribute to a cycle of worsening health impacts from heat. High humidity reduces the effectiveness of sweating as a cooling mechanism and makes active cooling much more critical. If nighttime heat remains high then workers without access to cooling are less able to recover from the heat of the day, putting them at greater risk of heat illness the following day. Additionally, hot nights tend to result in poor sleep, contributing to the risk of injury at work due to lack of sleep.

The longer-term impacts of health can be equally insidious because they are often invisible until it's too late. Long-term heat stress is already known to lead to severe long-term health conditions. For example, an estimated 26.2 million people globally live with chronic kidney disease caused by workplace heat stress[13]. However, impacts also extend beyond just health; longer hot seasons and higher average temperatures can upend livelihoods, create new pressures on social services, undermine food security, and challenge centuries-old ways of life and coping mechanisms.

Workplace conditions can contribute to heat vulnerability

Workers across many sectors are highly exposed to the impacts of heat. Workers are particularly at risk if they work outdoors, are engaged in intense physical activities, or wear protective clothing that traps heat close to the body. Indoor workers can be at elevated risk if they work in heat-intensive industries that are not adequately climate controlled and\or in spaces that are poorly ventilated.

Workers are also at greater risk when they lack control over and have limited agency to speak up about their employment conditions. This can include limitations on their duties, work times, location, clothing, and exposure to additional sources of heat (e.g. equipment). Workers are more vulnerable when they are unable to take adaptive actions like seeking shade, rest, or accessing water and cool spaces as frequently as they need due to workplace policies or employer expectations.

Image: Construction worker working feeling tired and thirsty at construction site.
Source: iStock.

Workers in insecure, low-paid, and precarious employment, such as apprentices, migrant workers, gig workers, or casual employees, are particularly lacking in agency to assert their right to a safe workplace.

There are additional implications of extreme heat for workers who are both highly exposed and provide critical services. First responders, power network maintenance technicians, medical staff, and law enforcement (amongst others) are critical for responding to heat emergencies. However, there is a tension between workplace safety regulations that limit their working time and the lack of workplace safety regulations that results in worker heat stress. Resolving the tensions between keeping the workforce safe and critical systems running requires taking heat seriously and being proactive about identifying and implementing solutions

Certain people and groups are more at risk

Factors such as existing structural inequalities, lower socioeconomic status, insecure and precarious employment, and individual physical characteristics, including underlying health conditions, increase worker vulnerability to heat. Workers facing these circumstances often also experience a range of financial stressors, including lack of health insurance, that exacerbate worker precarity, making it difficult to commute, stop working when conditions become dangerous, and get treatment when ill.

These same workers are often doubly exposed to heat because they also experience high-heat living conditions (i.e. housing with inadequate insulation and cooling) and have fewer resources to cope (i.e. prohibitive energy costs). These same conditions make them more vulnerable to the impacts of essential system failure (power, transportation, health, etc.) and more exposed to high nighttime temperatures and associated impacts on sleep and health.

Fundamentally, however, anyone exposed to excess heat when they work is at risk. This is increasingly evident when young, healthy people with no underlying conditions or risk factors are impacted by extreme heat at work.

Case study: Workers and heat in Adelaide

Over recent decades there has been a clear increase in extreme heat in the city of Adelaide, the capital of South Australia, with more hot days and hot nights[14]. This trend is expected to continue[15], making it critical to take action now to protect the current and future workforce from workplace heat stress.

Regulation for worker protection in Adelaide is under Section 19 of the Work, Health, and Safety Act 2012 (SA). It is based on the principle of duty of care from employers to keep workers safe, and the responsibility of workers to keep themselves safe. While the Act does not specifically address heat or workers' rights under extreme heat conditions, SafeWork SA provides guidance in a 2020 Code of Practice "Managing the work environment and facilities. "The Code of Practice specifies that in extreme heat conditions, workers must be able to work "without a risk to their health and safety, so far as is reasonably practicable"[16]. SafeWork SA notes that specific heat thresholds that require work to cease are the responsibility of each employer–in consultation with their workers–since working environments vary.

In spite of these regulations and resources, however, when extreme heat occurs, many workplaces are under or unprepared and both employers and employees are unsure of how to stay safe. Union representatives we spoke with for this study noted that during extreme heat they receive a surge in enquiries from their members seeking to understand their rights; this is happening more frequently as summer seasons have become hotter and longer. They further identified an absence of clear regulation, guidance, and planning for extreme heat and described this lack as a 'perfect storm' for increasing the risk of serious accidents and fatalities.

> *We had a heatwave here about eight years ago which got up to 46.3 [degrees Celsius] on a Friday. There were bushfires, there was orange smoke in the air and people were still working and accidents were just waiting to happen, bad decisions were being made. It's very important to have something known, understood, simple, so you know what to do before it hits you.*
>
> *— Union representative, Adelaide*

Some industries and organisations have put in place heat policies that specify temperature thresholds when work should cease. For instance, at some large construction sites, there are cease work policies that go into effect when temperatures recorded by the Bureau of Meteorology reach 37°C, and have onsite managers to enforce them. However, many industries and worksites, including some factories and smaller building sites, have no effective policies or enforcement. In addition, the temperature that workers are exposed to can be significantly higher than the recorded temperature due to hot indoor environments (e.g. kitchens, laundries, roof spaces), and outdoor direct sun exposure, sources of radiant heat, and heat-retaining surfaces.

> *People start to lose their faculties. We've had situations where people are just wandering around a [construction site] roof in a daze because of the heat…people don't think clearly.*
>
> *— Union representative, Adelaide*

Heat vulnerability is further compounded for workers of lower socioeconomic status, and/or those working in insecure and precarious employment, and for workers from culturally and linguistically diverse (CALD) backgrounds, especially recent migrants who may be unaware of Australian regulations and face added economic, cultural, and language barriers.

> *With a broad stroke I can say that the outside workforce are a mid- to lower- socioeconomic demographic. Because of that do they have functioning air conditioners at home? Do they have access to green space where they live? You have to keep those things in mind as well. And then there are the young people that might be still going out on the weekend; going out and partying and getting dehydrated as well. So you have to think about all of these things. It impacts everything.*
>
> *— Parks and gardens supervisor, local council in Adelaide*

Finally, how people respond to the heat is heavily influenced by expectation and perception. There are strong cultural norms in Adelaide where 'toughing it out' and 'not complaining' are viewed as part of the Australian way of life. These cultural issues lead employers and workers to underestimate and dismiss risks, framing heat as an individual challenge and not a collective problem. Interviews with workers reveal how cultural expectations to push through the heat, together with a lack of clear planning, have created significant personal risks. Workers talk about how quickly and unexpectedly heat stress can strike, putting them in serious danger.

> *I've had heatstroke at work and gone home and had to go to the hospital. And it creeps up on you, it hits you suddenly. When they say you stop sweating and you stop being thirsty, it's true. There was a point where I wasn't thirsty and I wasn't sweating. I thought I was fine. I was working outside against a massive electrical transformer in a substation. The heat that those things put out generally, and the heat that they put out on a hot day, and we were working on the sun side. So the sun was bouncing off of the metal back onto us, and it was like the sun was behind us and the heat was in front of us... and there was no plan put in place on that day for what we were going to do about the heat so we just kept working and as a result got heat stroke.*
>
> *— Union member, Adelaide*

> *This summer was pretty bad. People were consistently fainting or going home sick and they wouldn't come to work the next day. Especially people with pre-existing conditions... there seems to be a relative unawareness in companies about the true impact. It doesn't get reported as heat stress, it's just that they weren't feeling well.*
>
> *— Union representative, Adelaide*

Image: Food delivery driver shows signs of fatigue on a hot day. Source: iStock

Considerations for strengthening worker heat protection in Australia

An all-of-society approach is needed to shift how we think about heat from an individual issue to a collective responsibility. All stakeholders, including governments, industry groups, unions, employers, and workers must ensure that all workers are protected from heat stress through regulation, policy and planning, and education and outreach. Workplaces and workers must have clear, agreed plans in place to ensure worker safety before heat events occur.

This must be backed by high-level policy and regulatory frameworks requiring compliance and enforcement. Both workplace plans and broader policies and regulations should be complemented with guidelines that clearly delegate compliance and enforcement roles and responsibilities. Taking action now to protect workers from extreme heat will help minimise cascading impacts to worker health, business operations, and economic productivity.

Regulation, policy, and planning

- **Regulations and enforcement of worker heat safety** for workers in heat-exposed jobs (e.g. outdoor work, hot or poorly ventilated environments). This should go beyond the 'duty of care' to specify temperature thresholds that will trigger specific actions, behaviours, and expectations. These should include specifications on indoor and site-specific temperatures and additional considerations for reducing risk to workers, such as those outlined by SafeWork SA.
- **Develop added protections and training for essential workers who work in extreme heat or multi-hazard conditions** (e.g. shorter shifts, modified work hours, more breaks, access to backup cooling vehicles, paid time off for recovery, etc.) to reduce heat stress injuries and maintain essential services for the whole of society during extreme heat events.
- **Reporting of workplace injuries and illnesses during and for a specific number of days following extreme heat events.** Clear data collection regulations will help develop a database articulating the scope and scale of the problem to support needed action.
- **Develop nuanced codes of practice for heat and work.** Civil society organisations should support government to develop extreme heat codes that reflect a nuanced understanding of the heat vulnerabilities of different groups, sectors, and industries they work with - including self-employed workers, gig workers, and CALD workers, among others. These codes should inform extra protections such as flexible work hours, translated materials, and welfare checks.
- **Inclusive design for heat action plans and policies.** Actively engage heat-exposed workers, including gig and informal sector workers, in the development of heat action plans and policies. This will help ensure policies and plans effectively address the risks faced by workers.
- **Regular review and updating of heat policies and regulations.** As heat continues to rise, new challenges and needs will emerge. Heat planning will need to be responsive and adaptive.

Education, outreach, and uptake

- **Train supervisors and workers to manage work in hot conditions to prevent heat stress and injuries, identify signs of cognitive fatigue and stress early, and provide first aid care.** Indications of stress should trigger planned rest and recovery mechanisms, linked to regulations and enforcement of worker heat protection policies. Develop industry-specific safeguards that enable work to continue under heat-safe conditions and/or for workers to stop work and seek care.
- **Create and disseminate extreme heat educational resources for employers and workers.** These should be tailored for specific, pre-defined audiences, i.e. in more than one language, adapted to the context, etc. This might look like job site posters on heat safety and stop-work protocols, or an online repository where employers can access educational materials they can adapt to their workplaces, or where workers can go to learn more about their rights or to understand how to mitigate/adapt to the impacts of heat.
- **Foster a cultural change around heat and work.** Reframe the idea that suffering in extreme heat at work is an individual problem or something people need to accept to one that recognises heat as something that can and should be addressed collectively. One entry point to start this shift is for employers to include working in extreme heat as an occupational hazard in workplace plans so that it is included in standard operating procedures and workplace emergency protocols.

Further resources

Work Right Hub, Australian Red Cross: *Information and resources on rights and staying safe in the workplace*.

Climate Change and Workplace Heat Stress, World Meteorological Organization (WMO); World Health Organization (WHO): *Report and technical guidance on the impact of rising temperatures on the health and productivity of workers*.

Ensuring Safety and Health at Work in a Changing Climate, International Labour Organisation: *Critical evidence related to the impacts of climate change on occupational safety and health (OSH)*.

Heatwave Guide for Cities, Red Cross Red Crescent Climate Centre: *Introductory guide to heat waves and a resource for cities to start planning for extreme heat*.

Your Rights Working in Heat, Australian Unions: *Factsheet on worker rights during heat including a summary of measures to be taken for indoor and outdoor work*.

Managing the risks of working in heat, Safe Work Australia: *Guidance information on how to manage the risks associated with working in heat and what to do if a worker begins to suffer from a heat-related illness*.

Heat & UV, SafeWork SA: *resources to help employers and workers manage the risks associated with working in hot conditions*.

1 Australian Climate Service (2025). Heatwaves and temperature extremes. https://www.acs.gov.au/pages/27598d551928496fb1c2507bdbc6f3db

2 This brief uses the terms 'extreme heat' and 'heat' interchangeably. 'Heat' in this context refers to heat that is problematic.

3 Australian Climate Service (2025). Australia's National Climate Risk Assessment. https://www.acs.gov.au/pages/national-climate-risk-assessment

4 World Health Organization (2024). Heat and Health. https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health

5 Guterres, A. (2024). United Nations Secretary-General's Call to Action on Extreme Heat. https://www.un.org/sites/un2.un.org/files/unsg_call_to_action_on_extreme_heat_for_release.pdf

6 While the focus of this brief is on paid labourers, many people, mostly women, carry out additional unpaid labour in hot conditions, which further contributes to their risk.

7 International Labour Office (2024). Ensuring safety and health at work in a changing climate, Geneva.. https://www.ilo.org/sites/default/files/2024-04/ILO%20OSH%20report%202024%20at%20a%20glance.pdf

8 Climate Council (2025). Compounding climate risk: New government report warns that Australia could face severe impacts. https://www.climatecouncil.org.au/resources/briefing-paper-national-climate-risk-assessment-ncra/

9 Commonwealth of Australia (2023). Intergenerational Report 2023 Australia's future to 2063. https://treasury.gov.au/sites/default/files/2023-08/p2023-435150.pdf

10 The numbers listed in this paragraph are based on a "3°C Scenario", where global temperatures rise above 3°C pre-industrial levels. Australia's National Climate Risk Assessment assessed climate impacts based on three scenarios: 1.5°C, 2°C, and 3°C above pre-industrial levels.

11 Ibid.

12 World Health Organisation and World Meteorological Organisation (2025). Climate change and workplace heat stress: technical report and guidance. Geneva. Licence: CC BY-NC-SA 3.0 IGO. https://www.who.int/publications/i/item/9789240099814

13 Ibid.

14 The Australia Institute. (2020). HeatWatch Extreme heat in Adelaide. https://australiainstitute.org.au/wp-content/uploads/2020/12/P666-Heatwatch-Adelaide-WEB-.pdf

15 Australian Climate Service. (2025). Australia's National Climate Risk Assessment. https://www.acs.gov.au/pages/national-climate-risk-assessment

16 Government of South Australia, Safe Work SA. "Managing the work environment and facilities: Code of Practice" Section 2.8, p.17. https://safework.sa.gov.au/__data/assets/pdf_file/0007/136276/Managing-the-work-environment-and-facilities.pdf

This report presents a snapshot of heat events and responses in Adelaide, South Australia. It is not comprehensive – much more could be said on the degree of resilience of South Australia during heat events. What this report does provide is a collection of short, field-tested examples of resilient systems and actions, and a discussion of what it is that makes those resilient. It also describes factors that limited the ability of people and systems to respond effectively, and highlights what we can learn from this to increase our resilience moving forward.

For a downloadable PDF of this report, please visit: https://www.redcross.org.au/stories/2026/heatwave-research/

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