Industry Factsheet

# Preparedness for extreme heat

PEER REVIEWED

This factsheet is primarily addressed to older people, their carers and allied health professionals. However, it is also relevant to young children, their parents, teachers and carers.

It provides information on how heatwaves affect older people and which home modifications can contribute to the safety and wellbeing of older residents during extreme heat phenomena.

## Extreme heat and heatwaves

Summers in Australia can be very hot, especially in urban areas and locations that do not benefit from the sea breeze. The number of days with temperatures above the range that is expected for the summer period is increasing, due to global climate change.

According to the Australian Bureau of Meteorology, a heatwave is when the maximum and minimum temperatures are unusually hot over 3 days, when compared to the local climate and past weather[i]. There is scientific evidence that heatwaves in Australia have increased in intensity, frequency and duration over the past 67 years, with major increase recorded after the 2000s[ii]. Specifically, there were 43 extremely warm days in 2019 – more than triple the number in any of the years prior to 2000. This increasing trend is observed at all locations across Australia [iii].Heatwaves are projected to continue to intensify throughout the 21st century[iv].

Extreme heat is the most dangerous natural hazard in Australia. Heatwaves are especially dangerous for the most vulnerable, including older people and young children. They can also affect the transport, agriculture and energy sectors and associated infrastructure, including interruptions to cooling and refrigeration[v].

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## The impact of extreme heat on older people

Older adults are more sensitive to extreme heat because their thermoregulatory system can be impaired, preventing them from promptly adjusting to very high or low environmental temperatures[vi]. Older people also have lower thirst levels and receive less water than younger adults when dehydrated, while it takes longer for them to recover from dehydration, making the risks from high environmental temperatures even more severe[vii].

Pre-existing health issues increase the risk for complications as well. The individuals in greater risk from heat are those with obesity, cardiovascular disease, respiratory disease, and diabetes mellitus[viii]. The mechanisms that are impaired in the bodies of older adults with these health conditions include the heat-sensing and/or heat dissipating abilities[ix], adequate ability to increase cardiac output, the control of blood flow in the skin and thus the ability of the skin to dissipate heat, sweating response, etc[x].

Medication often consumed by older people, such as diuretics, sedatives, tranquilizers, and certain heart and blood pressure drugs, can contribute to heat intolerance, reduce sweating or cause other issues that increase vulnerability to heat[xi]. There is also evidence that during heat waves, not only the number of hospital admissions due to mental disorders (organic illnesses, including symptomatic mental disorders; dementia; mood disorders; neurotic, stress related, and somatoform disorders; disorders of psychological development; and senility) is increased, but mortalities attributed to mental and behavioural disorders in people between 65 and 74 years also tend to rise[xii, xiii].

The increased health risks during heatwaves put additional pressure on the health-care system with increase in emergency department visits and ambulance emergency callouts [xiv].

## The impact of extreme heat on services and infrastructure

Extreme heat can have a significant impact on critical infrastructure. In Australia, the impact on the electricity sector has been the most severe, with disruption of electricity generation and transmission under conditions of extreme heat, while the impact is less significant on water, telecommunications, airports, rail transport and roads[xv]. During heatwaves, the electricity use can be three to four times higher than during days with temperatures closer to the seasonal average due to the extensive use of air conditioning. This places stress on the power grid and can lead to power shortages and blackouts. At the same time, generators, transformers, transmission lines and solar panels are less efficient when overheated [xvi]. Research shows that transmission lines will be 6% less efficient in carrying power by mid-century, while transformers' life decreases by four years for every 1-degree rise in temperature [xvii].

The reduced efficiency of electricity infrastructure increases the risk for people depending on telecommunications or on a continuous supply of electricity to run critical medical equipment,

such as oxygen concentrators, kidney dialysis equipment or ventilators. The pressure on electricity infrastructure and on healthcare, combined with the increased risk for health implications makes the development of effective prevention strategies necessary both on a personal/home and a community level.

## Heat resilient environments for older people

There is valuable information, provided by the Australian Commonwealth and the State Governments, on how to keep older people safe during heatwaves (see Where can I find more information? paragraph below). However, there is little information on how older people, their carers or allied health professionals can improve their homes to reduce the impacts of extreme heat on older people's wellbeing. The following paragraphs summarize the home modifications that most effectively keep the home cool during heatwaves[1]. Advice on where to go when a house is too hot or when there is a power failure is also provided.

### Home modifications and equipment to keep older people safe from extreme heat in the house

- **Monitoring the temperature inside and outside the older person's home and turn on the cooling system when appropriate**. Even though there is no commonly agreed threshold of indoor temperature above which air conditioning should be turned on, research has shown that older Australians report experiencing fewest health symptoms for temperatures between 21 and 24 degrees Celsius [xviii], while other studies show that nursing home residents felt more comfortable when indoor temperatures are between 20 and 26 degrees Celsius [xix]. Smart sensors that measure the temperature inside and outside a home can be used to notify the residents or their carers when they should turn on the cooling system.
- **Insulating windows**. Windows contribute highly to heat gains and losses of our buildings. Insulating windows offer maximum thermal and acoustic comfort and energy savings for mechanical heating and cooling. When selecting windows for a new building or a retrofit, consider the elements that contribute to their insulating properties, which are:
    - The frame materials. Generally, vinyl, wood, fiberglass, and some composite frame materials offer reduced heat losses than metal frames[xx]. However, if the house is in a bush fire prone area, metal and wood frames (Class 1 durability timber) are preferred for the level of fire protection they provide[xxi].
    - The glazing or glass features. Single-pane glass units are not considered insulating,

[1] Be mindful that home modifications could be impacted by Rental Tenancy laws and renters might not be able to influence their landlord for retrofits.

as they allow significant amounts of heat to be exchanged between the interior and exterior of the house. Glazing units with two or more panes of glass, with a space between them filled with inert gases (usually Argon or Krypton) and high-quality spacers guarantee maximum insulation properties. Low-Emissivity (Low-E) and spectrally selective coatings can increase the insulating properties of double/triple glazing units even more[xxii].

- The type of operation. Generally, windows that are hinged at one side and open inward or outward have lower air leakage than sliding windows. The weatherstripping and the seals of all window types will deteriorate over time due to use. Timely replacement will provide energy savings and thermal comfort to the residents[xxiii].

- **Openable windows that allow cross-ventilation.** Having windows on opposite sides of the house enables cross-ventilation opportunities when there is some wind. During the warm months, ventilation is very important in the nighttime, when the exterior temperature drops. The cool air can reduce the temperatures of the interior surfaces (walls, floor and ceiling) which will delay reaching high temperatures the following day.

- **External shading of East, West and North facing windows.** All window types will let some of the heat from the exterior environment leak into the house. By adding external shading to the East, West and North facing windows of a building, some or all the solar radiation that would fall on the window is blocked and the heat gains are considerably reduced.

  The external shading elements can come in many forms, such as shutters, awnings, louvers, or even plants and trees located outside the exposed windows. The shading elements can be operable to enable the house users to tailor their environment depending on the season and the sun position. The materials of external shading elements are not of extreme importance, as their role is to shade the glass units and not to insulate the building fabric.

  External shading options depend on Rental Tenancy and/or Landlord approvals.

  Interior shading elements can protect the occupants from glare and reduce visual and acoustic discomfort. However, they are not as efficient in keeping the heat outside as exterior units.

- **Heavyweight construction materials for at least the external walls and the floors.** It is unlikely that the slabs or the exterior walls of a house will be upgraded during renovation. However, it is advisable to prefer homes with heavyweight construction materials when older people or people with chronic conditions move to a new home environment. Heavyweight materials or materials with “thermal mass”, such as concrete, brick and stone, are important in areas with cooling and/or heating

needs. The thermal mass stores heat for longer. That means that it does not allow the heat to escape the interior quickly during winter and it delays the transfer of external heat inside during the summer, while offering improved thermal comfort to the residents[xxiv].

- **Cooling systems.** As the summers get hotter and the heatwaves more frequent, all the homes of older people or people with conditions affected by the heat should have efficient cooling systems. Ceiling and/or free-standing fans can offer improved thermal comfort, reduce an individual's core temperature, cardiovascular strain and risk of dehydration. In hot, humid conditions, fans can assist even during heatwaves, however, they are not advised in very hot and dry conditions and areas, such as South Australia[xxv].

  Air-conditioners and evaporative coolers are more powerful, but also more energy consuming cooling devices. The choice of which type of cooling system is appropriate for each household depends on the size of the house and the local climate. Comprehensive information on the available systems is provided by the YourHome website of the Australian Government.

- **Low internal heat gains**. Internal heat gains are generated by the activity of occupants in the house (metabolic heat) and by the thermal emissions of electrical devices and artificial lighting[xxvi]. It is important to choose devices and lighting equipment, such as Light Emitting Diodes (LEDs), with low heat output, as this will keep the temperature in the house lower and reduce the need for mechanical cooling. During heatwaves the use of heat emitting devices, such as ovens and dryers, should be avoided.

- **Cool materials for the external walls and roof**. Every construction material reflects part of the solar radiation that falls on it, while the rest is either absorbed and/or transmitted through the material. When a material absorbs much of the solar radiation, it becomes hot and increases the temperature in the building.

  Materials that have bright colours usually reflect more of the solar radiation than darker materials. However, new materials, called "cool roofs" or "cool walls", that are not necessarily white or light-coloured and can strongly reflect sunlight (solar energy) and cool themselves by efficiently emitting any absorbed heat, have been developed during the last few decades. If a building does not have air conditioning, cool materials keep it cooler and at a constant temperature for longer. If a building is air conditioned, cool materials contribute to reduce the energy consumption for cooling[xxvii].

  Another important application of cool materials is when photovoltaic (PV) modules are installed on roofs. PVs may present substantially high surface temperatures

during the warm period. High summer temperatures negatively affect the efficiency of the PV modules and contribute to environmental overheating. Using cool roof materials where PVs are installed contributes to reduce the ambient temperature around the modules, decrease their surface temperature, boost their energy performance and the corresponding final energy yield, while co-acting upon urban overheating[xxviii].

There is a variety of cool products for residential buildings, ranging from coatings to tiles. The Cool Roof Rating Council provides a directory with more than 3,000 rated products.

- **Avoid placing heat sources close to the house**. Areas, elements and devices that emit high amounts of heat should be placed as far away from the house as possible. For example, an exposed carpark with asphalt next to a window will increase interior temperatures and the need for mechanical cooling.

### Public "cooling shelters" during heatwaves and/or power failures

When the thermal conditions in an older person's house are not appropriate and might put their wellbeing at risk, they should temporarily move to a cooler place. During heatwaves, many local councils provide cooling centres or shelters, usually a community centre, a school or a library, where people can spend the hottest period of the day in a cool and safe environment[xxix].

## Where can I find more information?

The following websites include resources and checklists with actions that should be taken before or during a heatwave to keep vulnerable people safe.

- Australian Red Cross
- New South Wales Health
- Victoria – Better Health Channel
- Queensland Health
- Western Australia – HealthyWA
- South Australia Health – Healthy in the heat
- Tasmania Health
- Australian Capital Territory Health
- Northern Territory Health
- Caring for older people in heatwaves – Home Care and CHSP

- Caring for Older People in heatwaves – Residential Aged Care

***This information was correct at time of printing.*

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