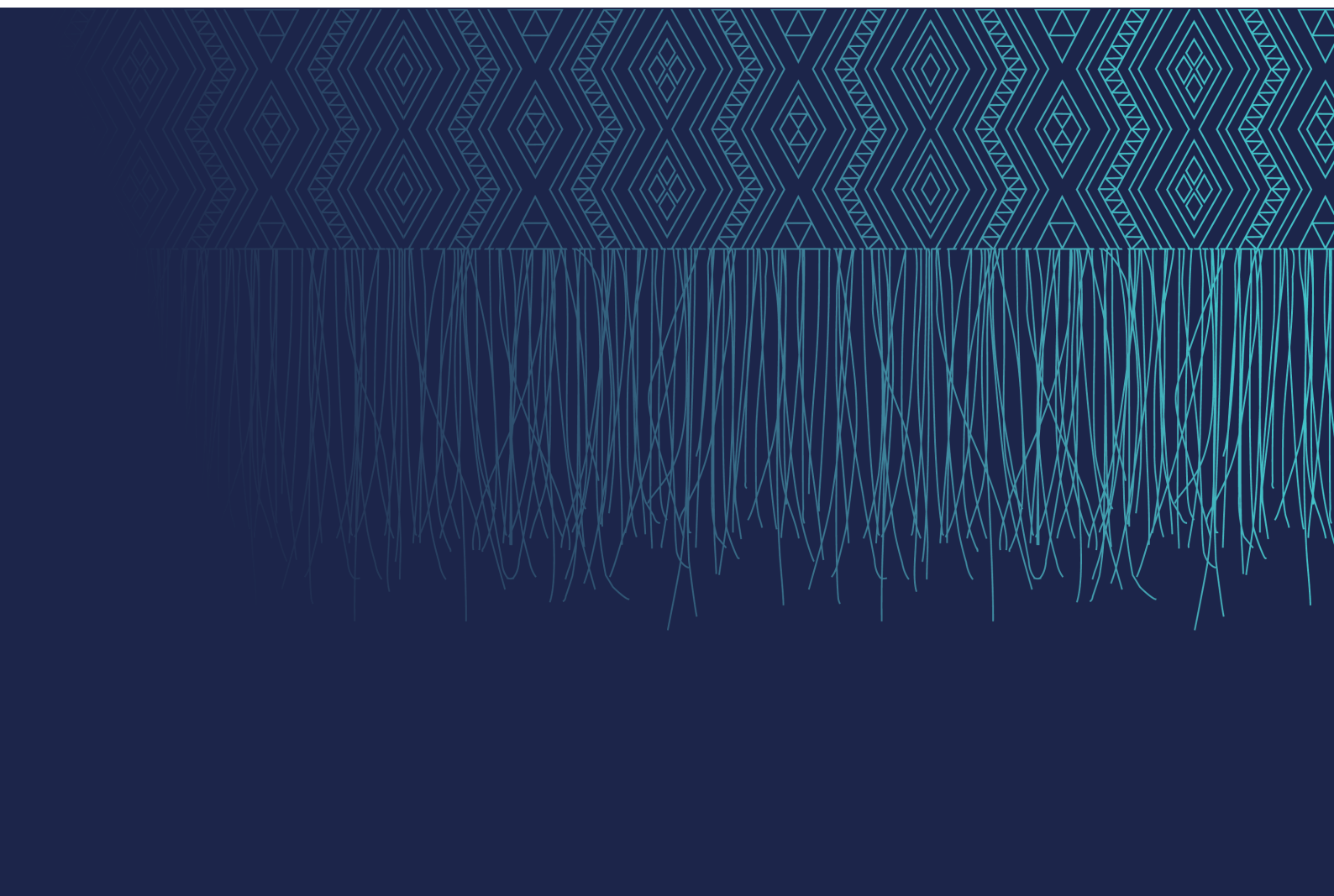


Heat Health Plans

Guidelines



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Contents

Introduction	4
Guideline format	4
Acknowledgements	5
Objectives and Scope	6
Objectives	6
Statutory framework	6
Heatwave Hazard	8
Defining extreme heat and heatwaves	8
Early warning signs	9
Other risks factors and impacts	9
Climate	10
Climate cycles	10
Climate change	10
Health Effects of Heatwaves	11
Effects of heat on health	11
Vulnerable populations	14
Equity	15
Rural communities	15
Urban heat islands	15
Heat Health Actions	16
Preparing a Heat Health Plan	16
Communication strategy	17
Taking action	18
Further Information	21
References	22

Introduction

Strong evidence shows that extreme heat and heatwaves have negative impacts on health (Hajat et al 2010; Kravchenko et al 2013; Luber and McGeehin 2008). Extreme heat can cause illness and death, but effective planning and actions can reduce its effects on health. Because effects of heat are associated with relative rather than absolute temperatures, even in New Zealand's temperate climate people can experience negative health effects with modest increases in seasonal temperature.

There is no formal definition for heatwaves in New Zealand. However, climate change is predicted to cause both average and maximum temperatures to rise, and the number of hot days experienced in New Zealand is expected to increase (Ministry for the Environment 2016).

Many countries around the world already have Heat Health Plans in place (Public Health England 2015a; Victoria State Government Health and Human Services 2015). Some are countries already considered hot, such as Australia, but others have temperature climates similar to New Zealand's, like England. Heat Health Plans set out the actions needed to prepare for periods of high temperatures, as well as important actions during and after those periods. These actions apply to individuals, organisations and national, local and regional government.

Everyone is vulnerable to extreme heat. However, babies and infants, older people, those with pre-existing medical conditions or on certain medications, and people living alone are more at risk.

These Heat Health Plan Guidelines are aimed at health and community service providers, health sector organisations, local government and other community organisations to help them prepare their own heat health response plans.

Guideline format

The main sections of these guidelines are:

- objectives and scope – objectives and scope for these guidelines and how they fit into existing statutory frameworks
- heatwave hazard – the potential of heatwaves as a health hazard and the relevance of heatwave health planning in New Zealand
- health effects of heatwaves – heatwave-related health effects and vulnerable populations
- heat health actions – risk management actions.

Acknowledgements

These guidelines have been adapted for use in New Zealand from the Victoria Department of Health and Human Services' *Heat Health Plan for Victoria* (Victoria State Government Health and Human Services 2015) and *Heatwave Planning Guide* (Victoria State Government Health and Human Services 2009), and also Public Health England's *Heatwave Plan for England* (Public Health England 2015a).

Objectives and Scope

This section sets out the aims of these guidelines, defines their scope and describes their statutory framework.

Objectives

The aims of these Heat Health Plan Guidelines are to:

- raise awareness of the negative health effects of high temperatures
- encourage and guide organisations to prepare Heat Health Plans
- highlight which sectors of the population are most vulnerable to high heat, and why
- outline the actions that can reduce the effects of high temperatures
- develop consistent messaging about the health impacts of extreme heat
- outline the potential impacts of extreme heat events on health services.

Studies have shown that many of the hospitalisations that occur during heatwaves are for preventable conditions that could have been avoided with better planning and communication of heat health messages (Hopp et al 2018). It is recommended that health and community service providers, local offices of the National Public Health Service, and local government prepare their own Heat Health Plans as part of their emergency planning. Including heat health planning as part of emergency planning is also encouraged for individuals and families, schools, businesses and community groups. This will lead to better health outcomes for all and improve community resilience to periods of extreme heat.

Statutory framework

These Heat Health Plan Guidelines support the National Health Emergency Plan (NHEP) (Ministry of Health 2015a). These guidelines should be read in conjunction with the National Civil Defence Emergency Management (CDEM) Plan and guide (National Emergency Management Agency 2015), in particular the hazard-specific information on heat (National Emergency Management Agency 2022).

The Civil Defence Emergency Management Act 2002 (and amendments) and the National Emergency Management Agency's National CDEM Plan outline the roles and responsibilities of key government agencies in an emergency.

Manatū Hauora NHEP specifies how the health and disability sector fits in the context of New Zealand emergency management and provides the overall strategic framework for response. A number of specific subplans, including these Heat Health Plan Guidelines, underpin the NHEP.

Heatwaves are not identified as a potential hazard of national significance in the National CDEM Plan, but the NHEP identifies extreme weather incidents (hot or cold) as a hazard at local to regional scales. Locally and regionally, local governments and district health boards are responsible for preparing their own emergency response and health emergency plans. It is envisaged that local governments and district health boards will prepare specific Heat Health Plans that integrate with existing emergency management documents. The National Emergency Management Agency (2022) hazard-specific information on heat offers guidance for individuals on how to cope with a heatwave.

The National Public Health Service should be considering the development of Heat Health Plans for its regions, and leading their development.

Heatwave Hazard

Even moderate increases in temperature beyond seasonal norms are associated with an increase in ill health and death. With the prospect of increasing temperatures and more hot days in the future due to climate change, it is important that the country is prepared for extreme heat events. This section discusses definitions and early warning signs for detecting heatwaves, risk factors that exacerbate the effects of heatwaves, and the potential effects of climate change on temperatures in New Zealand.

Defining extreme heat and heatwaves

There is no worldwide consensus on a definition of extreme heat or heatwave events. Different countries have different conditions for extreme heat events based on their local climate, which may include factors related to heatwave formation such as maximum daily temperature, average daily temperature, daily minimum (night-time) temperature, duration and humidity (Nairn and Fawcett 2013). It is the increase above average temperatures, rather than an absolute temperature, that causes adverse impacts on health. Evidence indicates that the effects of heatwaves on health are greater in temperate areas, as extreme heat occurs infrequently so residents in these areas are not used to it (Chestnut et al 1998; Keatinge et al 2000; McMichael et al 2008).

While New Zealand does not yet have a formal definition, the World Meteorological Organization (2015) defines a heatwave as:

a marked unusual hot weather (max, min and daily average) over a region persisting at least two consecutive days during the hot period of the year based on local climatological conditions, with thermal conditions recorded above given thresholds.

If we apply this definition to New Zealand, it is necessary to determine the appropriate thresholds for different regions based on demonstrated risks to human health (which will be related to the local climatological conditions). Some regions of New Zealand are at higher risk of experiencing heatwaves, and this risk will change as the effects of climate change are realised.

Some countries such as Australia and England issue heatwave warnings through their national weather bureaus. The warnings are issued when the 'trigger' conditions are met for a particular location. They are a signal to organisations and communities that they need to take extra health precautions.

No weather warnings about extremes in temperature are currently issued in New Zealand, although a system may be developed in the future. However, by recognising the early warning signs of heatwaves, and their own individual risk factors, organisations can prepare for such events and in this way reduce the risks to human health.

Early warning signs

With or without a national heatwave alert system, it is important to understand the early warning signs of heatwaves so that organisations can put their Heat Health Plans into effect and make appropriate preparations. Some factors contributing to the development of heatwaves are (Kravchenko et al 2013; Nairn and Fawcett 2013):

- **day-time temperatures** – average summer temperatures in New Zealand range from around 18 degrees in cooler areas such as Dunedin, Invercargill and the Chatham Islands to around 25 degrees in warmer areas such as Central Otago, Marlborough, Hawke's Bay, Gisborne, Tauranga and Whangarei (NIWA 2013). Daily maximum and average temperatures that exceed these averages may indicate an imminent heatwave
- **night-time temperatures** – cooler temperatures at night-time provide respite from heat during the day. Elevated night-time temperatures, which may be exacerbated by the urban heat island effect (see the following section on the health effects of heatwaves), can be another risk factor for heatwave conditions
- **humidity** – high levels of humidity can make it feel hotter (perceived heat) and negatively affect the body's cooling mechanisms
- **duration** – extended periods of hot and/or humid weather increase the risk to and impact on health.

Other risks factors and impacts

Other risk factors and impacts may exacerbate the effects of a heatwave and cause more widespread disruption during a period of extended heat. Examples include (Public Health England 2015a):

- disruption to transport networks when road surfaces deteriorate due to the heat
- traffic congestion, which keeps people in cars for long periods
- interruption to power supplies, particularly during times of drought or due to increased electricity use to run air conditioning units
- limited availability of and access to air conditioning
- reduced air quality with no wind
- reduced water quality due to algal blooms
- odour, dust and vermin infestations
- fires
- impacts on animal welfare
- water shortages
- increased risk of climate-sensitive illnesses, including food-borne illness outbreaks.

These factors may make it more difficult for service providers to operate at the required capacity. For example, they may lead to increased workloads for staff, staff absenteeism and/or disruptions to supply chains.

In preparing their own Heat Health Plans, it is important that individual organisations consider all of the risk factors and impacts, in addition to the examples listed above, that may be relevant to them during a heatwave.

Climate

Variations and trends in New Zealand's climate can increase or reduce the likelihood of heatwaves. It is important for organisations to be aware of these variations and trends when preparing their own Heat Health Plans.

Climate cycles

Climate in New Zealand is affected by the El Niño Southern Oscillation (ENSO). ENSO is an irregular climate cycle that disrupts normal patterns of wind and rainfall. The two extremes of the cycle are known as El Niño and La Niña. In El Niño years, there is typically an elevated risk of drought in the east coast of New Zealand and more rain in the west. During La Niña years, warmer temperatures typically occur over much of the country, and more rain is experienced in the north-east of the North Island and less rain in the south of the South Island. The effects of ENSO are sufficiently significant to warrant planning and management action when an El Niño or La Niña event is expected or in progress (NIWA 2018).

Climate change

Average temperatures are projected to continue rising, and extreme weather events – including extremely high temperatures and heatwaves – are also expected to become more likely (Ministry for the Environment 2016; Royal Society of New Zealand 2016). The number of days when temperature exceeds 25 degrees Celsius is expected to increase between 40 and 100 percent by 2040 and between 40 and 300 percent by 2090 (Ministry for the Environment 2016).

Health Effects of Heatwaves

Heatwaves can be serious events that cause death and illness. In Australia, heatwaves are responsible for more deaths than any other natural hazard (Nairn and Fawcett 2013). A heatwave in Europe in 2003 was estimated to cause over 70, 000 deaths across the continent (Robine et al 2008). In New Zealand, heatwaves of this magnitude are rarely experienced, but even so in Auckland and Christchurch an average of 14 high-heat-related deaths occur per year in people aged over 65 years (McMichael et al 2003). This number is likely to increase as climate change causes temperature levels in New Zealand to rise (McMichael et al 2003; Royal Society of New Zealand 2017).

This section describes the health impacts of heatwaves and which sectors of the population are most vulnerable.

Effects of heat on health

Many of the adverse health effects from excessive heat are preventable. Under normal warm conditions, the body regulates temperature by producing sweat that evaporates and cools the body. However, when a combination of high heat and high humidity occurs, the evaporation slows and the body must work harder to maintain a normal temperature. This extra work stresses the body and can lead to illness and death (Hajat et al 2010; Kjellstrom et al 2016; Kravchenko et al 2013; Public Health England 2015b).

The main causes of illness and death during a heatwave are related to cardiac conditions and to asthma and respiratory illness. Specifically, the cardiovascular system can experience stress from increased pumping of blood to the skin to cool the body, while higher levels of air pollution exacerbate respiratory symptoms. Kidney disease, diabetes, nervous system disease and cancer have also been identified as factors contributing to death during extreme heat events (Bunker et al 2015; Hajat et al 2010; Public Health England 2015b).

Table 1 describes other effects of high heat on health and how to treat them. General actions that can prevent or mitigate these health effects include staying cool and out of the heat, limiting physical activity and keeping hydrated (Public Health England 2015b).

Table 1: Heat-related conditions

Condition	Symptoms	Cause	Treatment
Heat rash	Small, red, itchy bumps	Excessive sweating	Move to a cooler, less humid environment. Keep the affected area dry. Dusting powder may be used to increase comfort but avoid ointments or creams
Heat cramps	Muscular pains and spasms, usually in the abdomen, arms or legs	Low salt level in the muscles due to dehydration and electrolyte imbalance causes painful cramps. Heat cramps may be the first sign of heat exhaustion and are often the first sign the body is having trouble with the heat	Those with heart conditions or on a low-sodium diet need medical attention. Otherwise: <ul style="list-style-type: none"> • replenish fluids (drink water or electrolyte replacement solutions) • rest in a cool environment • do not return to strenuous activity for a few hours after the cramps subside • seek medical attention if cramps do not subside within one hour
Sunburn	Red painful skin that is warm to the touch. Severe sunburn may result in fever, blistering and severe pain	Overexposure to UV radiation	Sunburn leads to an increased risk of skin cancer. Severe sunburn may require medical attention. Otherwise: <ul style="list-style-type: none"> • avoid repeated sun exposure • apply cold compresses or moisturising lotion (not salve, butter or ointment) to affected area • do not break blisters

Condition	Symptoms	Cause	Treatment
Heat exhaustion	Heavy sweating, paleness, muscle cramps, tiredness, weakness, dizziness, vomiting, headache, fast and weak pulse, fast and shallow breathing	Dehydration. Blood flow to the skin increases while blood flow to vital organs decreases, resulting in a mild form of shock. If left untreated, may evolve into heatstroke	Medical attention is required if symptoms are severe or for those with heart problems or high blood pressure. Otherwise: <ul style="list-style-type: none"> • replenish fluids • rest in a cool environment • cool down by taking a cool shower or bath • seek medical attention if symptoms worsen or last longer than one hour
Heatstroke/sunstroke	High body temperature (above 39.4 degrees Celsius), confusion, disorientation, unconsciousness, red hot dry skin (no sweating), throbbing headache, nausea, rapid strong pulse	Failure of body's thermoregulation mechanism. Can result in cell death, organ failure, brain damage or death	Immediate medical attention required. <ul style="list-style-type: none"> • Call for medical assistance. • Cool down in whatever way possible. • Monitor body temperature and continue cooling efforts until body temperature drops below 38.5 degrees Celsius.

Source: Adapted from Victoria State Government Health and Human Services (2009), National Emergency Management Agency (2022), and Public Health England (2015b)

Vulnerable populations

Some people's ability to regulate body temperature is compromised, which makes the body more vulnerable to overheating. This could be due to age, the effects of some medications or chronic illness. Risk factors for heat-related illness include (Kravchenko et al 2013; Public Health England 2015b; Victoria State Government Health and Human Services 2015):

- **older age** – especially those over 65 years of age, or living on their own and socially isolated
- **chronic, acute and severe illness** – including heart conditions, diabetes, respiratory or renal insufficiency, Parkinson's disease and severe mental illness. Medicines that potentially affect renal function, the body's ability to sweat, thermoregulation or electrolyte imbalance can make people in this group more vulnerable to the effects of heat
- **pregnant women** – who are more susceptible to heat exhaustion and heatstroke, which may in turn lead to birth defects and other reproductive problems (National Institute for Occupational Safety and Health 2018)
- **young age** – with infants vulnerable due to their immature thermoregulation and high level of dependency
- **homelessness** – due to higher rates of chronic disease, smoking, respiratory conditions, substance dependencies and mental illness among this group, as well as social isolation, lack of shelter and vulnerability to the effects of urban heat islands
- **alcohol and/or drug dependence** – which is associated with poorer overall health and social isolation
- **inability to adapt behaviour to keep cool** – which may include, for example, those with Alzheimer's disease, a disability or mental illness or who are bed bound
- **environmental factors and overexposure** – for example, living in urban areas, undertaking outdoor activities or jobs¹ that involve a high level of physical exertion, and attending outdoor public events
- **language barriers** – difficulty in understanding heat health messages and warnings.

Inadequately ventilated housing and lack of access to mechanical cooling systems can be other exacerbating factors (Hajat et al 2010), which may disproportionately affect those of lower socioeconomic status. In a moderate heatwave, it is generally vulnerable people that are affected; in a severe heatwave, however, fit and healthy people can also be affected (Public Health England 2015b).

¹ For WorkSafe New Zealand guidance on temperatures in the workplace and employers' obligations, go to: <https://worksafe.govt.nz/topic-and-industry/temperature-at-work/>

Equity

The effects of heatwaves will not be evenly distributed in New Zealand. Some regions are expected to see a greater increase in the number of hot days than others. For example, the top half of the North Island, Gisborne and Hawke's Bay are projected to have the greatest number of hot days in the future. These regions have large populations of Māori and Pacific peoples, as well as higher proportions of people living in areas of socioeconomic deprivation. Heatwaves could potentially increase the levels of inequity in these areas.

Rural communities

Heatwaves also disproportionately affect primary industries such as farming. Rural communities are more vulnerable during periods of hot weather than those living in urban and suburban centres, particularly in terms of water and food security and access to health services. Because drought also disproportionately affects them, heatwave planning and drought planning in rural communities should inform each other.

Urban heat islands

The effects of heatwaves are more keenly felt in urban areas due to the larger area of heat-absorbing materials such as pavement, reduced evaporation and shading from a lack of plants and trees, greater inputs of heat from buildings and transport, and higher levels of air pollution (Public Health England 2015b). With the 'urban heat island' effect these conditions create, temperatures in cities can be as much as 10 degrees Celsius higher than in surrounding areas (Kravchenko et al 2013). The heat that buildings and pavements absorb during the day is released during the night, locally elevating night-time temperatures (Luber and McGeehin 2008; Public Health England 2015b) and further contributing to heatwave conditions.

The form and intensity of the urban heat island effect depend on the local meteorological conditions, geography and urban development of an area. Long-term planning that considers building materials and green spaces can help to reduce its effects. For example, trees provide shade and allow cooler air to accumulate and circulate at ground level. Planting trees and other vegetation also alleviates the effects of extreme heat by providing shade and through the cooling effect of evaporation. Water features such as lakes, ponds and fountains are other ways of helping to cool the environment (Public Health England 2015b).

Heat Health Actions

Numerous organisations are involved in protecting, managing and servicing the health needs of the New Zealand population. This section outlines the actions these organisations can take throughout the year to prepare for heatwaves.

Preparing a Heat Health Plan

Heat Health Plans should outline the actions and systems in place to support those most at risk during periods of extreme heat. They should be integrated with existing emergency response plans and include the four Rs of emergency management: reduction, readiness, response and recovery. The National Health Emergency Plan contains guidance on the four Rs of emergency management and how to prepare a health emergency plan, which is relevant to preparing a Heat Health Plan.

The Victoria State Government has prepared guidance for developing heatwave plans that may be useful in developing Heat Health Plans in New Zealand as well. To access the Victorian guides, go to:

www.health.vic.gov.au/publications/heatwave-planning-guide-development-of-heatwave-plans-in-local-councils-in-victoria

Heat Health Plans need to consider both acute effects of heatwaves (that is, responding to incidences of heat-related illness) and support functions through engagement with other agencies (for example, the Ministry for Primary Industries during a drought).

Items that might be considered as part of a Heat Health Plan include (Victoria State Government Health and Human Services 2009):

- identifying appropriate stakeholders (representatives from affected groups and other organisations that will be involved in responding)
- setting appropriate staffing levels that take account of staff and client safety in hot weather
- considering staff wellbeing (as well as clients) during an extreme heat event and providing training to staff on explaining risks of high heat to clients
- considering appropriate actions to minimise effects of extreme heat and responses
- incorporating heat events into communication strategies and business continuity service plans
- maintaining continuity of care during an extreme heat event
- keeping buildings cool and shaded
- having loose, cool clothing available

- having water available
- monitoring indoor temperatures
- storing medicines appropriately
- taking long-term actions to reduce heat impacts such as urban planning, developing green spaces and reducing carbon emissions.

Communication strategy

As part of the heat health planning process, organisations should develop a communication strategy. This strategy should target specific groups for information, establish clear and consistent messages and set out timeframes and methods of communication.

Internal communication

An internal communication strategy should include the ability to:

- advise staff about actions, protocols and communication related to the Heat Health Plan
- alert staff if a period of extreme heat is forecast
- advise staff when an extreme heat event is finished.

Stakeholder communication

The Heat Health Plan should set out how and when stakeholders will be engaged.

Communication messages

Consistent messages about the risks of extreme heat are needed to increase the likelihood of behaviour change and reduce health impacts (Luber and McGeehin 2008). Messages during an extreme heat event need to provide timely and accurate information. Key information includes:

- which people are most at risk from the impacts of high heat, including babies and infants, the elderly and those with underlying medical conditions
- actions to prevent the impacts of high heat, including staying out of the sun, avoiding extreme physical exertion and drinking lots of water. Messages should also advise people to be SunSmart (see www.sunsmart.org.nz); to keep their houses cool by opening windows to catch the breeze and keeping curtains or blinds closed to keep the sun out; and not to leave children, the elderly or pets alone in parked cars. Civil Defence has also prepared advice for individuals and families, including advice for looking after pets and livestock, during heatwaves (National Emergency Management Agency 2022)

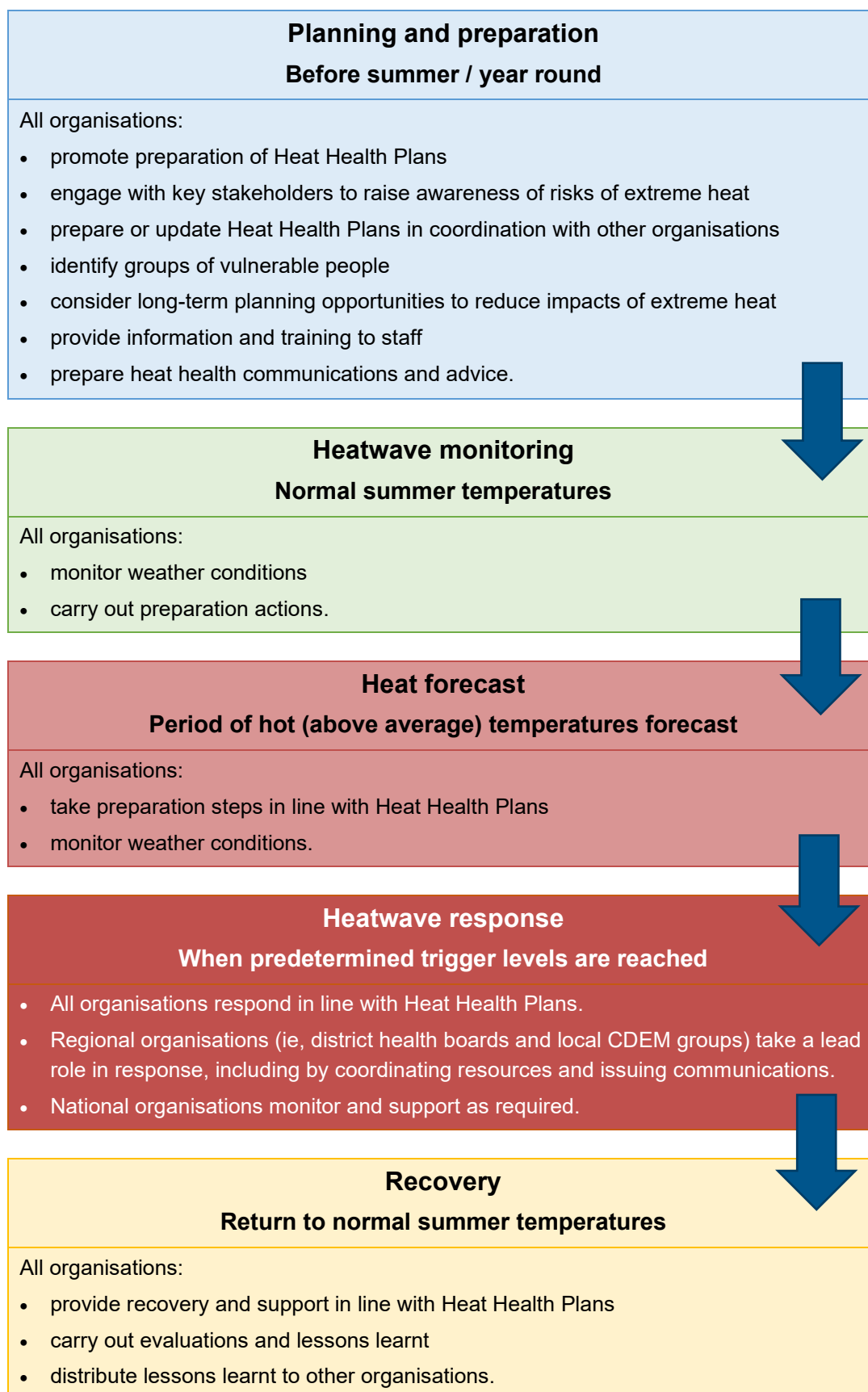
- what to do if feeling unwell – seek medical help if feeling weak or dizzy or if having intense thirst or a headache.

Taking action

When preparing a Heat Health Plan, it is important that each organisation considers its own needs in periods of hot weather and determines levels of action that are appropriate for its specific requirements. Actions at national, regional and local levels are needed to protect health, and the most effective responses will be coordinated between organisations at these different levels. Planning also needs to consider that heatwave effects can be localised or experienced more widely.

Figure 1 provides overall guidance for heat health planning actions at national, regional and local levels, and also suggests some trigger levels for escalating the response. Ideally the trigger levels would correspond to a change in risk to health. Note that because New Zealand has no formal heat-related notification system, individual organisations will need to consider setting trigger levels, monitoring weather conditions and implementing Heat Health Plans as appropriate.

Figure 1: Guidance on heat action escalation levels



Setting trigger levels

Trigger levels need to be set to suit local conditions. Currently only limited information about the effects of heat on health is available that is specific to New Zealand. In time, this body of knowledge will grow, allowing organisations to make evidence-based decisions about trigger levels for their area. In the meantime, the following resources are available to help with setting trigger levels.

- Overseas heat health planning and guidance can provide some ideas on the types of trigger levels that could be set. Public Health England (2015a, 2015b) and Victoria State Government Health and Human Services (2009, 2015) have both developed extensive resources on heat health planning.
- The National Institute of Water and Atmospheric Research (NIWA) monitors drought conditions using the New Zealand Drought Index. Although the index primarily relates to low levels of rainfall, it includes measures of temperature and could be used as an informative indicator.
- Previous climate range reports have used a temperature of 25 degrees Celsius to designate 'hot days'
- Local CDEM offices can help organisations understand their local and regional hazardscapes.

Further Information

- Te Whatu Ora. 2023. *Heat Health Plans: Key information*. Wellington: Te Whatu Ora. URL: www.tewhatauora.govt.nz/our-health-system/environmental-health/climate-change (accessed 20 September 2023).
- Advice for the public on protecting your health in an emergency <https://www.tewhatauora.govt.nz/our-health-system/environmental-health/environmental-health-in-emergencies> (accessed 20 September 2023).
- The *National Health Emergency Plan* (Ministry of Health 2015a). URL: www.health.govt.nz/our-work/emergency-management/national-health-emergency-plan (accessed 20 September 2023).

The following guidance is available from the National Emergency Management Agency's website (www.civildefence.govt.nz):

- *Consistent Messages for CDEM. Other Hazards: heat*. National Emergency Management Agency 2022). which provides advice for individuals and families, including advice for looking after pets and livestock URL: www.civildefence.govt.nz/cdem-sector/consistent-messages/ (accessed 20 September 2023).
- The National Civil Defence Emergency Management Plan (National Emergency Management Agency 2015). URL: www.civildefence.govt.nz/cdem-sector/plans-and-strategies/national-civil-defence-emergency-management-plan-and-guide (accessed 20 September 2023).

The SunSmart website (www.sunsmart.org.nz) provides information about protecting yourself and others from UV radiation from sunlight.

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