



Adaptation Gap Report 2023 – Case Study

The Pacific heat dome: Heatwave lessons from the United States of America

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With the climate crisis comes increasing exposure to extreme heat for people all over the planet, which has significant impacts on morbidity and mortality. However, deaths related to extreme heatwaves could potentially be prevented. As a result, adaptation is needed urgently to protect human health and well-being.

With the magnitude and the pattern of morbidity and mortality from the multiple extreme heatwaves that occurred in 2023 still being determined, it is illustrative to review the human health consequences of a heatwave that occurred over a period of several days in late June and July 2021 in the north-west of the United States of America and Canada.

This was one of the most extreme events recorded globally in 2021. Over the course of this event, the population of almost 2.3 million people living in Seattle and King County experienced several days of extreme, unprecedented heat, with temperatures reaching as high as 40°C, up to 17°C higher than historical averages, accompanied by historically hot nights. The indoor temperature in one residence was recorded at 51.7°C.

Five days before the event, computer models forecasted unprecedented temperatures. However, these forecasts were not believed because of the size of the anomaly. Detection and attribution analyses determined that the event was virtually impossible without anthropogenic climate change. The region had never experienced a heatwave of this magnitude and was thus unprepared. There was a failure of imagination in how far-reaching the impacts could be.

Seattle is one of the least air-conditioned major cities in the United States of America. The health consequences of this heatwave included the highest volume emergency calls ever recorded in King County. During the hottest night, visits to the emergency department more than doubled and multiple emergency departments were overwhelmed. There were also 441 excess deaths, which were potentially preventable.

The Pacific heat dome was a mass-casualty incident for which the medical system was not prepared; the human stories were stark. One physician walked into the emergency department at 10 p.m. to see a patient’s badly burned, blistered and bloody feet from walking barefoot on

the pavement. On the hottest night, the main emergency department received four to five critically ill patients every hour for 6–10 hours. The medical director of the main emergency department worked about 30 hours straight. Emergency departments found an effective approach to cool patients quickly was to put them in a body bag and fill it with ice and ice slurry. When one emergency department ran out of ice, it was sourced from the kitchen.

Almost everything experienced during the event, from patterns of morbidity and mortality to stress on front-line health-care providers, was highly predictable because it was consistent with extreme heat events in other regions.

Although King County had not developed a heatwave early warning and response system, significant efforts to implement elements of a system as the event evolved undoubtedly saved lives. These efforts included opening cooling shelters and launching educational campaigns about the risks of extreme heat. However, more could have been achieved if the understanding of the projected increases in the frequency, intensity and duration of heat events had been turned into actions that would protect vulnerable populations.

The example from King County shows that to protect human health and well-being from future heat events, adaptation can and should be occurring at the individual, community, building and landscape or urban level.

At the individual level, there are many options to maintain a healthy core body temperature. Such measures aim to accelerate heat losses from the skin, which result in reduced physiological heat strain and improved thermal comfort, without using air conditioning. Examples include electric fans, applying water to the skin, wearing damp clothing, immersing feet in cold water and using misting fans, evaporative coolers, or ice towels, among others. While these can be effective in maintaining a healthy core body temperature, depending on temperature and humidity, people need to know how to use these appropriately and have access to the necessary components.

At the community level, heatwave early warning and response systems save lives with relatively modest investments.

These systems integrate the surveillance of health outcomes with weather forecast information and provide effective actions for individuals, community actors, and others to implement to protect particularly vulnerable populations. Responses include communication plans, community-level response measures, such as cooling shelters and portable water stations, educating the public and training responsible actors, and monitoring and evaluation plans.

These systems require coordination across a wide range of community services, including not just the emergency medical services, police and fire departments, but also programmes responsible for elderly care facilities, the unhoused, schools and playgrounds, outdoor workers, people with mental health challenges, pregnant women, and any other group at risk during a heatwave. Hundreds of these systems are operational or under development worldwide.¹

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At the building level, roof coatings, insulation, glazing, window shading and natural cross-ventilation can limit the rise in indoor temperatures from conduction through building materials and direct radiation through windows. At the landscape level, water bodies, trees, grass, and plants, also known as blue and green infrastructure, can mitigate urban heat islands by providing natural cooling and shade. These are also associated with improved health and well-being, so their benefit is twofold.

Exposure to extreme heat is increasing because of the climate crisis, with significant impacts on morbidity and mortality. One estimate is that approximately 37 per cent of current heat-related deaths in over 700 locations across 43 countries is because of climate change. Adaptation is needed urgently to protect human health and well-being. Furthermore, the robust understanding of the policies and programmes required means that there are no justifications for delaying the necessary investments.

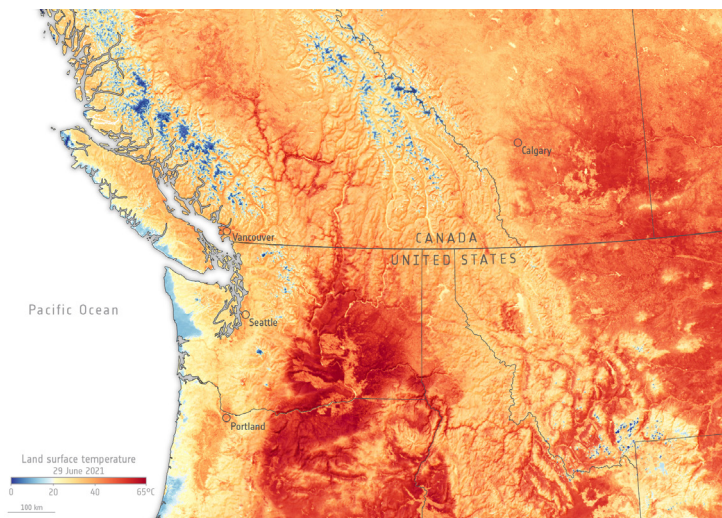
¹ See <https://ghin.org/>

Canada broke its temperature record for a third consecutive day: recording a whopping 49.6°C on 29 June 2021 in Lytton, a village northeast of Vancouver, in British Columbia.

Portland, Oregon, also broke its all-time temperature record for three days in a row.

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