

## Hot and bothered: our health under climate change

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**As citizens living in a developed economy, we have a certain level of control over our health. Most of us have access to medicines, treatments and health services designed to cure our ills, or at least minimise pain. We also have access to information about dietary and lifestyle choices to help ensure we lead healthy, active and productive lives.**



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But what will happen to our relatively healthy way-of-life under climate change? What good, for example, would a painkiller be in the face of a prolonged heatwave? Or a cholesterol-lowering drug, when the crops we rely on for nourishment are deficient in nutrients? Or an anti-viral drug against [dengue fever](#) or [Chikungunya virus](#), if populations of carrier-mosquitoes were to become widespread down the east coast of Australia?

While much of the public discourse about climate change has focused on environmental changes – carbon dioxide concentrations, increasing global average temperatures, melting polar ice, rising sea levels – it seems we've overlooked a very important issue: the threat to human health.

That's the view of Emeritus Professor Tony McMichael from the Australian National University's (ANU's) Research School of Population Health.

'Where we've struggled is to have the community and decision-makers understand that the wellbeing, health, and physical survival of human populations is, sooner or later, the bottom line in all the adverse effects of climate change,' says Prof. McMichael.

While scientists focus on the adverse impacts of climate change on the biology and ecology of the Great Barrier Reef or the mountain pygmy possum, a change in climate will have many similarly adverse impacts on human beings, he argues. Indeed many impacts on human health will result from adverse changes to those ecosystems.

‘That’s a hard concept for many people, to think that we’re in the same bracket as frogs, possums and polar bears. But we’re all dependent on nature’s life-support systems and climate change is going to disrupt that in many ways.’

### **Killer heatwaves**

While the health impacts of climate change will vary around the globe, in Australia, heat will be the cause of most of climate-related deaths and health problems. Few people are aware that, in the week prior to Victoria’s 2009 ‘Black Saturday’ bushfires – which caused the loss of 173 lives – an additional 374 people died as a result of the record heatwave.

In January this year, a heatwave that struck south-east Australia resulted in double the average number of deaths for that month. On a single day when the temperature soared to 44°C, Ambulance Victoria reported a 700 per cent increase in the number of call-outs for cardiac arrests.

Indeed, the Australian Government’s [2013 State of Australian Cities report](#) predicts that heatwave-related deaths in Australian cities will more than double over the next four decades.

Dr Elizabeth Hanna, an ANU research fellow and president of the [Climate and Health Alliance](#), says Australia’s urban design process is poorly adapted to extremes of temperature.

‘You see the same housing design from Hobart to Emerald to even Darwin, and that’s madness.’

Houses with little shade, green space or surrounding trees, and with dark roofs and low ceilings, mean that the only way to cool them is to turn on the air-conditioning, Dr Hanna says.

‘We have houses built so close together; this gives no space for a garden, no space for shade trees to provide important garden shading that entices people to sit outside and shade the house which allows for passive cooling.’

Heatwaves disproportionately affect the more vulnerable people in our society, especially the elderly and Australians on low incomes, amplifying existing inequalities that already cause health problems.

For example, both the elderly and those earning less may not be able to afford an air conditioner, or pay the bills to run it at the time when it can literally make the difference between life and death.

The elderly are also at greater risk because they are less able to regulate their body temperature, and less able to get out of the house and seek relief from the heat in air-conditioned venues such as shopping malls.

Other extreme weather events, such as floods, bushfires and cyclones, also have a far greater impact on more vulnerable parts of the population, including those living with a disability.

### **The most vulnerable at higher risk**

Rae Walker, Emeritus Professor at Latrobe University, has been researching the impact of climate change on these communities and the institutional changes needed to the primary health care system in Australia to reduce this impact.

‘The existing emergency planning response and recovery is premised on the assumption that everybody is like us,’ says Professor Walker. ‘So the needs of people with disabilities are poorly addressed, and the mortality rate among people with disability is probably very high.’

The final report of the [Victorian Bushfires Royal Commission](#) into the Black Saturday bushfires found that half the people who died in the fires were classed as ‘vulnerable’ by virtue of being very young, elderly, suffering from an acute or chronic illness, or having a disability.

Extreme weather events can also disrupt the vital service lifelines that many elderly, chronically ill and disabled individuals rely on.

‘There’s a substantial number of organisations who say they wouldn’t be able to reopen for a week – and still a significant proportion who say they may never reopen – after an extreme climate event, whether fire, floods or storms,’ Prof. Walker says.

‘That means the services they provide, upon which people are dependent day by day [are unavailable] – if that person doesn’t get that routine care, then there can be very serious impacts on them.’

Similarly, these essential primary health care services are often unable to ramp up their services during times of crises

to meet the needs of those affected by extreme events.

## Infectious disease

While extreme weather events tend to affect some sections of the community more than others, infectious disease is less discriminating. There is growing concern that climate change will cause major shifts in the distribution and frequency of infectious diseases – particularly those spread by insects such as mosquitoes.

‘The overarching pattern we see is [that] if we have more of the right kind of rainfall for mosquitoes, we see more endemic arboviruses, such as Ross River virus, Murray Valley encephalitis, and Kunjin virus,’ says Dr Nigel Beebe, senior lecturer in the School of Biological Sciences at the University of Queensland.

[Arboviruses](#) are usually spread by mosquitoes. While Australia has so far escaped the worst of these, that’s likely to change. Until now, many of these viruses have naturally cycled through native hosts, such as kangaroos and wallabies, and only rarely spilled over into humans.

‘That may change because the longer the periods of no rain, the more chance of our native fauna generating and breeding young animals that are completely naive to these viruses,’ says Dr Beebe, who is involved with [CSIRO’s Biosecurity Flagship](#).

This means that when the rains do come, bringing the mosquitoes and viruses, explosive outbreaks can occur in native animal populations because of a lack of herd immunity. And, as drought brings native fauna into urban areas seeking food and water, the potential for transmission to humans increases significantly.

Another concern is the changing distribution of mosquitoes, especially *Aedes aegypti* and *A. albopictus*, which transmit dengue and Chikungunya virus.

Last century, *A. aegypti* travelled as far south as NSW, aided in part by the prevalence of open water tanks, which enabled the mosquitoes to breed. However, a concerted public health campaign to get rid of these water sources has pushed the mosquito – and dengue – back north to Queensland, where it has since lurked. Climate change that brings warmer, wetter conditions to the southern states, and an increase in water tank use, could once again see this tropical insect travel down the coast, bringing disease with it.

The *A. albopictus* mosquito – endemic to South-east Asia and now appearing in Australia’s Torres Strait islands – is more worrying, in terms of its potential spread.

‘Modelling suggests *A. albopictus* would go all the way down to Tasmania,’ says Dr Beebe. ‘It exists in Japan and North America, and can tolerate a cool winter and [like *A. aegypti*] the eggs can also lay dormant.’

With global travel increasing the likelihood of these viruses and their hosts being brought into Australia by travellers, Dr Beebe says it’s a matter of when this happens, not if.

Water and food-borne disease rates will also be given a boost from climate change. Warmer water means the bacteria responsible for diarrhoeal disease, such as salmonella and campylobacter, multiply more readily. Likewise, warmer temperatures will mean more cases of food poisoning, according to Dr Hanna.

‘There has been some excellent work done by some of our colleagues here at ANU in terms of the increased rate of food-borne diseases with increasing temperature, and it’s a pretty close association,’ she says.

## Enough to eat?

As governments grapple with the prospect of how to feed ever-increasing populations, the idea of ‘food security’ has become a national and international obsession. But research indicates population pressures aren’t the only risk to future food security. Rising carbon dioxide levels – which are known to increase yields, because carbon dioxide is effectively a plant fertiliser – may actually decrease the quality of cereals.

Plant physiologist Professor Michael Tausz and a team of University of Melbourne and Victorian Department of Environment and Primary Industry researchers have been investigating the ‘carbon dioxide fertilisation effect’, and found that it’s not quite the silver lining it was first thought to be.

‘Just imagine you change your diet by eating 40 per cent more sugar, but everything else is the same,’ says Prof. Tausz, program leader at the University of Melbourne. The consequence of increased yield – predicted to be around a 25 per cent boost from a 40 per cent increase in carbon dioxide concentrations – is a decrease in vital nutrients such as iron,

zinc, and most importantly, protein.

While in Australia we will have the means to supplement that decreased protein with other protein sources, in the developing world these deficiencies have far more serious consequences.

‘Iron and zinc are responsible for a lot of what they call hidden hunger in developing countries that’s already a problem,’ Prof. Tausz says.

‘Researchers are keen to do something about it by, for example, improving the iron in rice or wheat, but we sort of forgot that the situation will be even a bit worse than we thought because carbon dioxide works against that.’

## **Mental health**

If you think all this is depressing now, imagine your state of mind in 30 or 40 years. Professor Helen Berry, from the University of Canberra, says the idea that climate change will affect mental health is relatively new, but is intuitively obvious.

‘When you talk about it a bit, people can pretty easily start to see that if climate change means more unstable weather conditions – and that means more extremes of one sort or another, and more weather disasters among other things – they could see that as well as [being affected] physically through injury or starvation or disease, they could also be traumatised.’

This would be compounded in people with existing mental health issues, not only because they are more vulnerable to stress and anxiety, but because even their medications may be compromised. For example, lithium, a treatment for bipolar disorder, is unstable at higher temperatures.

‘When people’s physical health is affected in any serious way, that often has mental health implications – partly physiologically, and partly because people get really anxious about whatever it is they’ve got, or their injury, and all of those are pathways to mental health impacts,’ says Prof. Berry.

However, Prof. Berry says by far the greatest impact of climate change on mental health will come from damage to the social fabric and support networks that bind communities together.

‘These kinds of disasters eat away at the economic fabric of individuals and communities and whole states or even a country.’

‘When that happens, you get pressure on the social infrastructure of individuals and communities, because people don’t have the time and money or the energy or will sometimes to keep up their social connections and interest in their communities like they used to.’

Prof. Tony McMichael says the scientific evidence to date shows that climate change will make a mockery of our illusion of control over our health and wellbeing.

‘We’re imbued with this idea that health is about personal choice and access to hospitals and doctors, whether you’re lucky with the genes you inherit,’ he says. ‘All those are important at the individual level, but climate change doesn’t pick out individuals, it impinges on whole communities.’

‘It disrupts the ecology of human life and livelihoods. Somehow we’ve got to understand that the risks to human health are not some sort of regrettable side show, some collateral damage: they’re a signal that things are going wrong at a pretty fundamental level.’

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