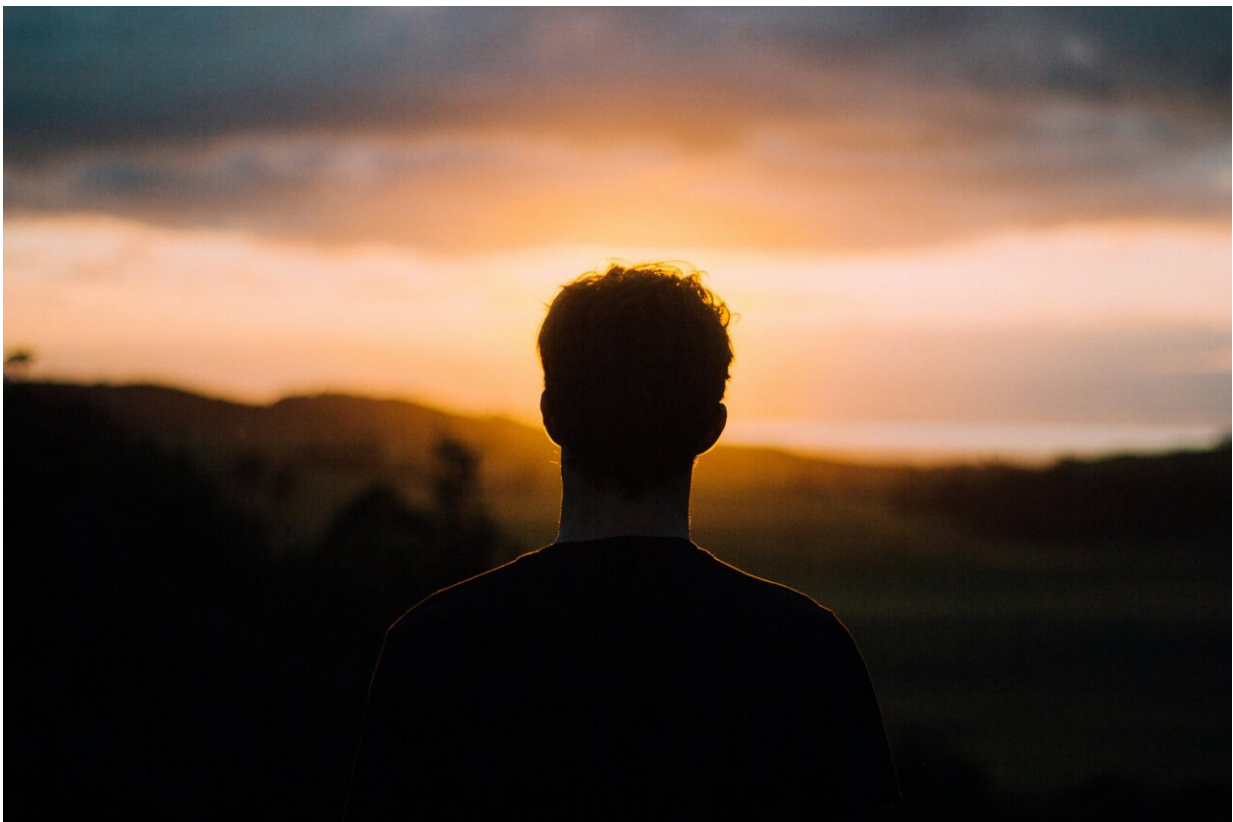


# Chronic kidney disease progresses faster in patients living in hot countries, new study finds

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Chronic kidney disease patients living in the hottest countries experienced an additional 8% drop in kidney function each year

compared to those living in temperate climates, finds a new study from researchers at UCL and the London School of Hygiene & Tropical Medicine (LSHTM).

The study, [published](#) in *The Lancet Planetary Health*, is the first global, medium-term analysis of the relationship between [chronic kidney disease](#) and heat. The results suggest that heat is a clinically important factor in poorer outcomes for [kidney patients](#) in hot countries, regardless of whether the country was high- or [low-income](#) and other health variables such as diabetes.

Chronic kidney disease (CKD), which describes kidney problems due to a range of causes, often leads to a gradual loss of kidney function over time and affects one in ten people worldwide. Once a patient's kidneys no longer work well enough to keep them alive, kidney replacement therapy—dialysis or a kidney transplant—is required.

While the cost of treating individuals with CKD is relatively low, kidney replacement therapies are hugely expensive and reduce the patient's quality of life. Kidney failure alone accounts for around 3% of the NHS's budget, with dialysis costing £30-40,000 per person each year. Currently, around 70,000 people receive kidney replacement therapy in the UK, with around 45% on dialysis and 55% with functioning kidney transplants.

In less developed countries, these therapies are often unavailable—meaning [kidney failure](#) is fatal.

It has long been known that patients with CKD fare badly in many hot countries. But whether heat makes CKD progress more rapidly has been a difficult question to answer, due to differing rates of underlying kidney disease and other [health issues](#), varying access to medical care in different regions, as well as the need to collect standardized data from

patients while they are otherwise well.

In this study, researchers at UCL and LSHTM compared CKD clinical trial data, provided by AstraZeneca, to heat index data to assess whether high levels of heat exposure corresponded to changes in kidney function in patients with CKD. This included 4,017 individuals in 21 countries, representing a wide range of climates as well as a mix of middle- and high-income nations.

The analysis showed that patients living in very hot climates had an additional 8% decline in kidney function each year compared to those living in temperate climates. There was no difference in the association between heat and kidney function according to national income or whether a patient was overweight, had high blood pressure or had diabetes.

Professor Ben Caplin, a senior author of the study from UCL Division of Medicine, said, "We already knew individuals with kidney disease have worse outcomes in many hot, poor countries around the world. But until now it's been impossible to say whether temperature and humidity are important drivers of disease progression or whether this was accounted for by access to quality health care, living conditions, diet, diabetes and a whole host of other factors.

"Our findings suggest that heat exposure itself, at levels experienced by individuals living in the hotter parts of the world, does cause kidney function to deteriorate more rapidly in those with pre-existing chronic kidney disease and to a degree that is meaningful for patients.

"Clearly, this is concerning given that the planet is getting hotter due to climate change. But now that the evidence suggests heat is important, we can test interventions to do something about it, whether this is through hydration, avoiding direct sun exposure or other measures to combat the

effects of extreme heat."

As the study only looked at patients with CKD, the results do not provide insights into the relationship between heat and kidney function in people with normal kidneys.

Professor Dorothea Nitsch, a senior author of the study from the London School of Hygiene & Tropical Medicine, said, "The hot countries in our study vary in terms of economic status, from wealthy countries like the US and Japan to middle-income countries like Vietnam, but our findings were not explained by GDP. Access to measures such as air conditioning and readily available drinking water, which could be used to help reduce the impact of [heat](#), are not always accessible to patients."

Global heating is a growing threat to people and the planet. The [average surface temperature](#) is now 1.1 C hotter than it was before the Industrial Revolution. Scientists say that the world must keep this rise to 1.5 C in order to maintain a livable climate and avoid the worst climate impacts, yet current progress on reducing carbon emissions would see an increase of 3 C by 2100.

Professor David Wheeler, a senior author of the study from UCL Division of Medicine, said, "Ultimately, our findings indicate that patients with chronic kidney disease in hot countries are more likely to end up on dialysis or require a [kidney transplant](#), both of which are life-saving but also impact quality of life and are expensive where available.

"Unfortunately some of the hottest countries are also those where kidney replacement therapies are not available, which is a huge concern for individuals and public health systems."

**More information:** Zhiyan Zhang et al, Ambient heat exposure and kidney function in patients with chronic kidney disease: a post-hoc analysis of the DAPA-CKD trial, *The Lancet Planetary Health* (2024). DOI: [10.1016/S2542-5196\(24\)00026-3](https://doi.org/10.1016/S2542-5196(24)00026-3)

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