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El Niño will cost \$35 trillion by 2100 as planet warms, study warns

Climate-driven weather extremes linked to El Niño are quietly eroding life expectancy in Japan, Australia, South Korea, Singapore, and the United States, with impacts that linger for more than a decade, according to new research.

By [Robin Hicks](#)

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El Niño events do not just cause short-term spikes in deaths during heatwaves, floods or disease outbreaks – they leave a long shadow on human health that can shave years off average life expectancy and cost trillions of dollars, a new study has found.

The El Niño-Southern Oscillation, or ENSO, is the biggest driver of year-to-year climate swings, shaping temperature, rainfall, and extreme weather around the world, with impacts ranging from heatwaves and floods to air pollution and food security disruptions, which impact human health and economic growth.



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Analyses of six decades of mortality data across 10 high-income Pacific Rim economies, including the United States, Japan, Australia, South Korea and Singapore, show that strong El Niño events persistently slow improvements in survival rates long after the climate phenomenon fades, according to the study, *Enduring impacts of El Niño on life expectancy in past and future climates*.

Led by researchers from Nanyang Technological University (NTU) and City University of Hong Kong, the study examined how El Niño disrupts “mortality improvement” – the long-term decline in death rates driven by advances in healthcare, sanitation and living standards.

Its findings challenge the assumption that El Niño’s health impacts are temporary and highlight an under-recognised human cost of climate variability that is expected to intensify as the planet warms.

The team found that a single El Niño event can weaken mortality improvement for at least five years, and in some cases up to 16 years. Air pollution, for instance, is **exacerbated** by El Niño events in Southeast Asia, where peatland fires in 2015 could have caused more than 100,000 premature deaths in Indonesia, Malaysia, and Singapore.

“Even after the floods recede or temperatures normalise, the damage to population health continues to accumulate,” noted the study’s lead author Yanbin Xu from NTU’s Nanyang Business School.

Two of the strongest El Niño events on record illustrate the scale of the problem. The 1982–83 El Niño reduced average life expectancy across Pacific Rim countries by about 0.5 years, while the 1997–98 event cut it by 0.4 years, even after accounting for partial rebounds during subsequent La Niña phases.

In the United States alone, the 1997–98 El Niño resulted in a net loss of nearly half a year of life expectancy at birth.

When translated into economic terms, the losses are significant. The researchers estimate that the 1982–83 El Niño imposed a monetary loss of US\$2.6 trillion, while the 1997–98 event cost US\$4.7 trillion in today's dollars. The higher price tag of the later event reflects population growth, ageing societies and the rising economic value placed on human life.

Unlike many health risks, the financial burden is not borne evenly across age groups. While younger people suffer the largest slowdown in mortality improvement – likely due to higher exposure to heat, pollution and outdoor work – the biggest economic losses fall on middle-aged adults, whose deaths carry higher welfare and productivity costs.

Climate change is curtailing lives

Looking ahead as climate impacts worsen, the study paints a sobering picture. Climate model projections suggest that El Niño events will become more intense under most emissions scenarios, amplifying their long-term health impacts.

Under a moderate emissions pathway aligned with current climate pledges, cumulative life expectancy losses linked to El Niño could reach a median of 2.8 years by the end of the century. The associated economic cost is estimated at around US\$35 trillion – roughly 1 per cent of total economic output in the countries studied over the 21st century.

Even under more ambitious climate scenarios, projected losses remain substantial, implying that mitigation alone will not eliminate El Niño-related health risks in the coming decades.

The authors argue that current public health and economic forecasts significantly understate the true costs of climate variability by focusing on short-term mortality spikes rather than long-lasting effects, such as from air pollution.

“El Niño should be treated as a chronic public health strain, not just a short-term shock,” Xu told Eco-Business.

They call for targeted adaptation strategies, such as integrating El Niño forecasts into health system planning, heat-health action plans, labour protections and climate-informed

insurance schemes – particularly in regions strongly linked to Pacific climate variability.

While the study focuses on wealthier Pacific Rim countries with robust data, the researchers caution that impacts could be even more severe in lower-income regions, where health systems and social safety nets are weaker.

The study emerges a few months after the [latest Lancet Report](#) pointed to worsening health impacts from climate change in recent years. Heat-related deaths have risen by 23 per cent since the 1990s, averaging 546,000 deaths per year. Droughts and heatwaves left 124 million more people facing moderate to severe food insecurity in 2023, while extreme heat caused US\$1.09 trillion in lost labour productivity in 2024, with low-income nations bearing a greater economic losses.

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