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El Nino events reduce life expectancy, cause trillions in economic losses: Study

Source(s): Nanyang Technological University (/organization/nanyang-technological-university)

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The El Niño-Southern Oscillation (ENSO), the planet's greatest driver of year-to-year climate swings, shapes temperature, rainfall, and extreme weather around the world.

Its impact ranges from heatwaves and floods to air pollution and disruptions to food security, with growing evidence that these climate fluctuations influence human health and economic growth.

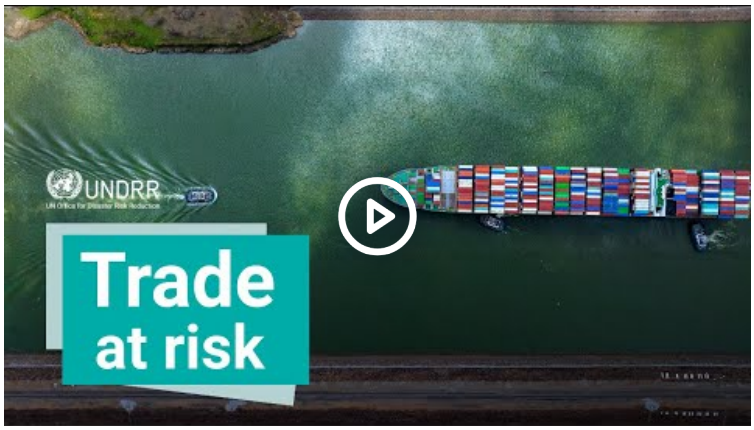
A new interdisciplinary study led by researchers from Nanyang Technological University, Singapore (NTU Singapore), with collaborators from the City University of Hong Kong, has found that the intensifying positive phase of ENSO, also known as El Niño events, could significantly reduce life expectancy across high-income Pacific Rim countries, resulting in economic losses of up to US$35 trillion by the end of the 21st century.

Using over six decades of mortality records from 10 high-income Pacific Rim countries, the research team shows that El Niño is a persistent driver of health and economic loss, not just a short-term weather anomaly. El Niño-driven climate extremes, such as heatwaves and air pollution, disrupt healthcare systems and raise long-term mortality risks, particularly among vulnerable populations.

The research, published in the scientific journal Nature Climate Change and part of NTU's Climate Transformation Programme, shows that El Niño events not only cause immediate health impacts but also persistently slow long-term improvements in mortality rates, leading to enduring reductions in life expectancy.

The paper's first author, Dr Yanbin Xu, Research Assistant Professor from NTU Nanyang Business School's Department of Banking and Finance, said: "Our study finds that in a warming climate, recurring El Niño events quietly chip away at the health gains that Pacific Rim societies usually achieve over time. Even in relatively wealthy and well-resourced countries and regions, each major El Niño event can slow the improvements in life expectancy that people would otherwise have enjoyed."

Co-author Associate Professor Wenjun Zhu, Deputy Head of Division of Banking and Finance, Nanyang Business School said: "This research makes clear that El Niño is not just a climate phenomenon - it is a long-term societal and economic shock. We found that the societal costs of ENSO are much larger than they first appear by showing how climate variability persistently slows improvements in mortality. The impact accumulates quietly over decades, shaping economic growth, inequality and fiscal sustainability across entire societies."



Extreme weather patterns reduce life expectancy gains

ENSO swings between two opposing phases: El Niño (warming of the central and eastern Pacific Ocean) and La Niña (cooling), and is well known for its strong influence on climate patterns across the Pacific Rim and Southeast Asia.

The researchers' analysis of mortality data from 1960 to 2022 found that major El Niño events slow down long-run improvements in mortality and life expectancy. ENSO events disrupt mortality improvement, slowing down advancements in healthcare and living conditions.

The researchers found that during periods of ENSO-neutral years, all-age mortality across the Pacific Rim declined by an average of 2.1 percentage points per year. However, five years after an El Niño event, this improvement weakens dramatically to -0.6 percentage points, indicating a deterioration in human mortality outcomes linked to more deaths from projected El Niño-related climate stresses.

The researchers estimated that the 1982-83 and 1997-98 episodes reduced life expectancy gains at birth by about 0.5 and 0.4 years respectively. This translates to associated economic losses of roughly US$2.6 trillion and US$4.7 trillion.

Co-author Dr Dhrubajyoti Samanta, Senior Research Fellow at NTU's Earth Observatory of Singapore, said: "ENSO is the dominant mode of climate variability at interannual scale, and our study shows that ENSO's influence extends far beyond short-term weather disruptions. By integrating climate dynamics, long-range ENSO teleconnections, and state-of-the-art climate model simulations with observed data, we uncover a persistent climate signal that alters mortality trends for decades. As El Niño events intensify in a warming world, their long-lasting effects on population health become increasingly evident, emphasising the critical role of climate variability in shaping societal outcomes. These scientific insights also indicate that understanding and anticipating ENSO-driven risks will be increasingly important for early warning system and long-term planning."

Co-author Professor Benjamin Horton, Dean and Chair Professor of the School of Energy and Environment at City University of Hong Kong, said: "Our research shows that El Niño events do not just disrupt weather - they silently shorten lives and drain economies. Past events have cost high-income Pacific Rim countries up to half a year of life expectancy and trillions of dollars. Looking ahead, without decisive action, climate change will erode global health and stability for generations. Adaptation is not optional - it's urgent."

Future projected losses of US$35 trillion by 2100 under moderate emissions

While mitigation efforts to curb greenhouse gas emissions remain critical, the researchers say that adaptation measures are essential to reduce long-term losses.

Future projections under moderate emissions scenarios suggest a cumulative decline of 2.8 years in life expectancy by 2100.

This corresponds to roughly US$35 trillion in losses, or around 1 per cent of projected economic output for the region, highlighting the importance of incorporating El Niño-related health risks into long-term planning.

The research findings indicate that the health burden is greatest for younger and older people, while the economic burden is concentrated among middle-aged working adults.

Factors such as heat extremes, air pollution, and higher health expenditures disproportionately affect younger individuals, who are more frequently engaged in outdoor labour and activities, increasing exposure to El Niño-driven stressors.

The older population (aged 60 and above) is the second most affected group, likely due to reduced physiological resilience to environmental stressors.

View the study (https://www.ntu.edu.sg/docs/default-source/corporate-ntu/hub-news/ntu-singapore-led-study-reveals-el-ni%C3%B1o-could-reduce-life-expectancy-gains-by-2-8-years-b

Read the original story here (https://www.ntu.edu.sg/news/detail/el-nino-events-reduce-life-expectancy--cause-trillions-in-economic-losses--study)

Editors' recommendations

- International cooperation to reduce the impact of El Niño phenomenon (/publication/international-cooperation-reduce-impact-el-nino-phenomenon)
- La Niña and rainfall (/publication/la-nina-and-rainfall)
- Unpacking La Niña (/news/unpacking-la-nina)
- El Niño and climate change pose existential threat to Pacific islands (/news/el-nino-and-climate-change-pose-existential-threat-pacific-islands)

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