



## Assessment of heat exposure under a high-end climate change scenario and projected population scenario around Africa's Lake Victoria region.

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Recent global temperature increases and extreme heat events have raised concerns about their impact on health. The area surrounding Lake Victoria, accommodating over 45 million people and ranking among Africa's most densely populated regions, faces rapid population growth and urbanization, set to double its population by 2050 compared to 2022 for most countries in the region. Global-scale projections indicate a potential amplification in heat stress, reaching levels up to 200 times the current rates under high-end scenarios, with the Democratic Republic of the Congo and Uganda facing the most pronounced impacts. Children born in this area in 2020 may face about 1.4 times more heatwaves than their counterparts elsewhere. The combination of population growth and intensifying heat renders the region around the Lake Victoria particularly susceptible to future heat stress.

This research investigates the impacts of climate and population changes on heat exposure and heat stress in the region surrounding Lake Victoria. We analyze how dangerous heat stress by the end-of-the century could change under the ensemble mean climate change signal of the high-end SSP5-8.5 climate change scenario compared to the recent past. Furthermore, we evaluate to what extent and where the population could be affected by dangerous heat stress by these changes. Climate model simulations performed with the COSMO-CLM regional climate model at 0.025° are used, forced with ERA-5 data, applying a pseudo global warming approach for the end-of-century run. Dangerous heat stress is assessed based on categories of heat index and humidex heat stress metrics.

Results indicate a substantial rise in dangerous heat stress across the region. By the 2080s, up to 122 million people (i.e. 44% of the projected population) may experience dangerous heat stress for over 5% of the year (i.e. ~18 days), in contrast to an estimated 1 million people (i.e. 1% of the population) in 2010. Moreover, around 28% of the population (i.e. ~78 million people) might face

such dangerous heat for 15% of the time (i.e. ~55 days) by the 2080s. The inhabitants most exposed to dangerous heat stress are notably clustered along the northern shores of Lake Victoria and the southern region, including their urban areas. These findings emphasize the urgent need to address the escalating threat of dangerous heat stress in this region.