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471 - HEAT INEQUITIES AND ELDERLY HOSPITAL ADMISSIONS IN PORTUGAL: A MACHINE LEARNING STUDY

M.M. Oliveira, A.P. Oliveira, A.M. Alho, P.J. Nogueira

ISAMB, Faculdade de Medicina, Universidade de Lisboa; CoLAB+ATLANTIC.

Resumen

Background/Objectives: Climate change exacerbates health inequalities, disproportionately affecting older adults. Traditional regression models often fail to capture complex, non-linear relationships between extreme heat and health outcomes across diverse geographies. This study quantifies the impact of extreme heat on hospital admissions among the elderly (? 65 years) across mainland Portugal, applying advanced machine-learning methods to identify geographic disparities in heat-health risk.

Methods: We conducted a nationwide retrospective ecological study across 278 Portuguese counties over 19 summer seasons (2000-2018). Daily hospital admissions were linked with high-resolution meteorological data. Heat exposure was assessed using the GATO IV index from the E-OBS dataset, a dynamic indicator that accounts for local acclimatisation and uses a 1950-1999 climatological baseline, serving as the basis for the Portuguese national heat-health warning system. We applied GPBoost, combining gradient-boosted decision trees with mixed-effects models, enabling non-linear effect estimation while explicitly modelling spatial dependencies. The model was trained using 80% stratified random split and validated on the remaining 20%.

Results: The GPBoost model demonstrated strong predictive performance (R^2 = 0.69, RMSE = 7.89, MAE = 3.90). Extreme heat was associated with a substantial healthcare burden, with a national average increase of 24.6% in elderly hospital admissions. Spatial clustering was identified, with several municipalities - predominantly in western and northwestern Portugal- experiencing surges exceeding 60%, while other areas showed moderate increases. These patterns indicate heterogeneous vulnerability, likely reflecting local demographic, environmental, and contextual factors captured by the model's spatial component.

Conclusions/Recommendations: Climate vulnerability is unevenly distributed, and uniform national heat alerts are insufficient. Heat action plans should incorporate spatially targeted resource allocation and strengthen hospital surge capacity in high-risk counties, ensuring protection of vulnerable populations regardless of geographic location.

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