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DEEPER INSIGHT FROM BIG DATA AND SMALL AREAS

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Spatial-temporal analysis of climate factors effects on hospitalization due to falls

Oliveira CM^{1,2,3}, Alves SM^{1,2,3}, Bessa AC^{1,2}, Pina MF^{1,2,4,5}

¹i3S - Instituto de Investigação e Inovação em Saúde, Universidade do Porto, Portugal;

²INEB - Instituto de Engenharia Biomédica, Universidade do Porto, Portugal;

³ESS/IPP - Escola Superior da Saúde do Porto, Instituto Politécnico do Porto, Portugal;

⁴ICICT/FIOCRUZ - Instituto de Comunicação e Informação em Saúde/ Fundação Oswaldo Cruz, Rio de Janeiro, Brasil;

⁵FMUP - Faculdade de Medicina da Universidade do Porto, Portugal; (e-mail:coliveir@ineb.up.pt)

Introduction: A higher risk of falls in winter, when compared to summer, has been reported, although climatic factors as risk factors for falls have been little studied. Our aim is to identify the effects of climatic factors (CF) on the spatial-temporal distribution of hospitalization for fall-related injuries in older adults (2000-2010).

Methods: From the National Hospital Discharge Register we selected admissions of patient's ≥ 65 years-old, with diagnosis of fall-related injuries. Data from meteorological stations were obtained from national institute of meteorology ("Instituto Português do Mar e da Atmosfera"). An exposure inference for Portugal was performed by a geostatistical procedure: first, a suitable semivariogram was selected to characterize the spatial dependence, based on the geographical coordinates of the stations, of the year/monthly mean of daily precipitation

(Prec, mm), mean temperature (meanTemp, °C), relative humidity (RelHum, %), sunshine daily hours (SunDur, hours) and atmospheric pressure (AtmPres, hPa); second, a kriging technique was used to interpolate data to each of the places of interest. A spatio-temporal generalized Poisson additive model was used to estimate the relative risk (RR) of fall-related injuries associated with variation in CF adjusting for seasonal pattern, socioeconomic status, rural condition and age-group. A stepwise procedure was used to select the final model based on the smallest Akaike Information Criterion (AIC). Models without and with CF were assessed.

Results: We selected 192,422 hospitalizations for fall-related injuries episodes (69.4% in women). On average, women were older than men 80.337.7 vs 77.937.7 years ($p < 0.001$) at admission. Model with better performance (lowest AIC) was the one with all the CF and with interaction between space and time. Seasonality pattern was observed. An increase risk over time and an increase of areas at higher risk was observed in the study period. A significant inverse association between CF and falls was found in women: $RR_{Prec} 0.916$ (0.896-0.935) per 10 mm, $RR_{meanTemp} 0.977$ (0.967-0.988) per 5°C, $RR_{AtmPres} 0.925$ (0.923-0.927) per 10 hPa and in men: $RR_{Prec} 0.894$ (0.869-0.920) per 10 mm, $RR_{DurSun} 0.991$ (0.985-0.998) per 1 hour, $RR_{HumRel} 0.997$ (0.996-0.998) per 1 % and $RR_{AtmPres} 0.923$ (0.921-0.926) per 10 hPa.

Conclusion: The risk of falls has been increasing over time and across regions and the pattern of seasonality continues to be observed even after adjusted for the weather factors. Policy measures should be taken to lock this increase in falls in individuals over 65 years of age.