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Spatial-temporal analysis of forest fires effects on hospitalizations for respiratory disease (2001-2010)

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Introduction: A notable increase in the prevalence of fires has been noticed in the last decades in our country, thereby increasing a wide range of organic fuels, which level of toxicity of particulate can lead to serious health problems. The short-term exposures to fine particulate generated from the fires have been associated with increased mortality and morbidity. Our aim is to identify the effects of forest fire (FF) on the spatial-temporal distribution of hospitalizations for respiratory disease in Portugal (2001-2010).

Methods: From the National Hospital Discharge Register we selected admissions of patients ≥ 65 years-old, with diagnosis of respiratory disease (codes ICD-10 460-66, 480-87, 491, 492, 493 e 496). Data from FF were obtained from the national Institute for Conservation of Nature and Forests (ICNF) and data from meteorological stations were obtained from national institute of meteorology (IPMAR). A spatio-temporal generalized Poisson additive model was used to estimate the relative risk (RR) of respiratory disease associated with variation of FF adjusting for mean temperature and relative humidity. Space and time covariates were used to control for differences that may arise due to weekly, year and space pattern. A stepwise procedure was used to select the final model based on the smallest Akaike Information Criterion (AIC). Models without and with FF were assessed.

Results: We selected 219 166 episodes (52% in men). During hospital admissions, we found higher mean age in women than in men (77.738.4 vs 76.137.2 years; $p < 0.001$). Model with better performance (lowest AIC) was the one with FF adjusted for climate variables. Forest fire increase the risk of hospitalizations for respiratory disease in both sexes (women: RR 1.02 (1.01-1.03) and men: RR 1.03 (1.02-1.04)). There was a significant spatial effect ($p < 0.001$) in the distribution of hospitalizations for respiratory disease, however no significant difference in space was observed when taking into account the forest fire.

Conclusion: Forest fire explains some of the hospitalizations for respiratory disease. Including the forest fire variable, no significant difference was observed in space, showing that forest fire did not explain the spatial distribution of hospitalization for respiratory disease.