World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Climate Change Impact on Mortality from Cardiovascular Diseases: Case Study of Bucharest, Romania

Authors : Zenaida Chitu, Roxana Bojariu, Liliana Velea, Roxana Burcea

Abstract : A number of studies show that extreme air temperature affects mortality related to cardiovascular diseases, particularly among elderly people. In Romania, the summer thermal discomfort expressed by Universal Thermal Climate Index (UTCI) is highest in the Southern part of the country, where Bucharest, the largest Romanian urban agglomeration, is also located. The urban characteristics such as high building density and reduced green areas enhance the increase of the air temperature during summer. In Bucharest, as in many other large cities, the effect of heat urban island is present and determines an increase of air temperature compared to surrounding areas. This increase is particularly important during heat wave periods in summer. In this context, the researchers performed a temperature-mortality analysis based on daily deaths related to cardiovascular diseases, recorded between 2010 and 2019 in Bucharest. The temperature-mortality relationship was modeled by applying distributed lag non-linear model (DLNM) that includes a bi-dimensional cross-basis function and flexible natural cubic spline functions with three internal knots in the 10th, 75th and 90th percentiles of the temperature distribution, for modelling both exposure-response and lagged-response dimensions. Firstly, this study applied this analysis for the present climate. Extrapolation of the exposure-response associations beyond the observed data allowed us to estimate future effects on mortality due to temperature changes under climate change scenarios and specific assumptions. We used future projections of air temperature from five numerical experiments with regional climate models included in the EURO-CORDEX initiative under the relatively moderate (RCP 4.5) and pessimistic (RCP 8.5) concentration scenarios. The results of this analysis show for RCP 8.5 an ensemble-averaged increase with 6.1% of heat-attributable mortality fraction in future in comparison with present climate (2090-2100 vs. 2010-219), corresponding to an increase of 640 deaths/year, while mortality fraction due to the cold conditions will be reduced by 2.76%, corresponding to a decrease by 288 deaths/year. When mortality data is stratified according to the age, the ensemble-averaged increase of heat-attributable mortality fraction for elderly people (> 75 years) in the future is even higher (6.5 %). These findings reveal the necessity to carefully plan urban development in Bucharest to face the public health challenges raised by the climate change. Paper Details: This work is financed by the project URCLIM which is part of ERA4CS, an ERA-NET initiated by JPI Climate, and funded by Ministry of Environment, Romania with co-funding by the European Union (Grant 690462). A part of this work performed by one of the authors has received funding from the European Union's Horizon 2020 research and innovation programme from the project EXHAUSTION under grant agreement No 820655.

Keywords : cardiovascular diseases, climate change, extreme air temperature, mortality
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020