Developing prediction model of number of heat stroke patients and future prediction of heat stroke risk in Japan

Ryogo Sato[1], Hiroyuki Kusaka[2], Takuto Sato[1]

(1) Graduate School of Life and Environmental Sciences, University of Tsukuba, Japan

(2) Center for Computational Sciences, University of Tsukuba, Japan

In this study, we developed a prediction model of the number of heat stroke patients that can be used to assess social impacts of heat stroke in the future climate. The model was used to predict the heat stroke risk in the future by each municipality in Japan.

The model is generalized linear model with the number of patients as objective variable and daily maximum temperature as explanatory variable. By accounting for regional, seasonal (short-term heat acclimatization), and age differences in heat stroke risk, MAE and RMSE were reduced by 30% and 34%, compared to the previous model (with only daily maximum temperature as explanatory variable).

Future predictions were made for the RCP8.5 scenario (2031-2050), taking into account temperature rise and demographic changes. As Japan has serious problems with the declining birth rate and aging population, it is important to take into account demographic changes. In Tokyo Metropolis, part of the most populous metropolitan area in the world, the rate of increase (relative to current levels) was +139% due to temperature rise and +26% due to demographic changes. On the other hand, in Ibaraki Prefecture (a rural area near Tokyo), the rate of increase was +118% due to temperature rise and -20% due to demographic changes. These results indicate that the number of patients more increase in urban areas due to growth elderly population, and that the increase in the number of patients tempered by the depopulation in rural areas.

In addition, peak ambulance occupancy rate for Tokyo during the same period was estimated. The results showed that on the hottest day, the ambulance occupancy rate reached maximum of 108% for the transport of heat stroke patients alone. It suggests that the increase in the number of patients could put a strain on the emergency transport system.

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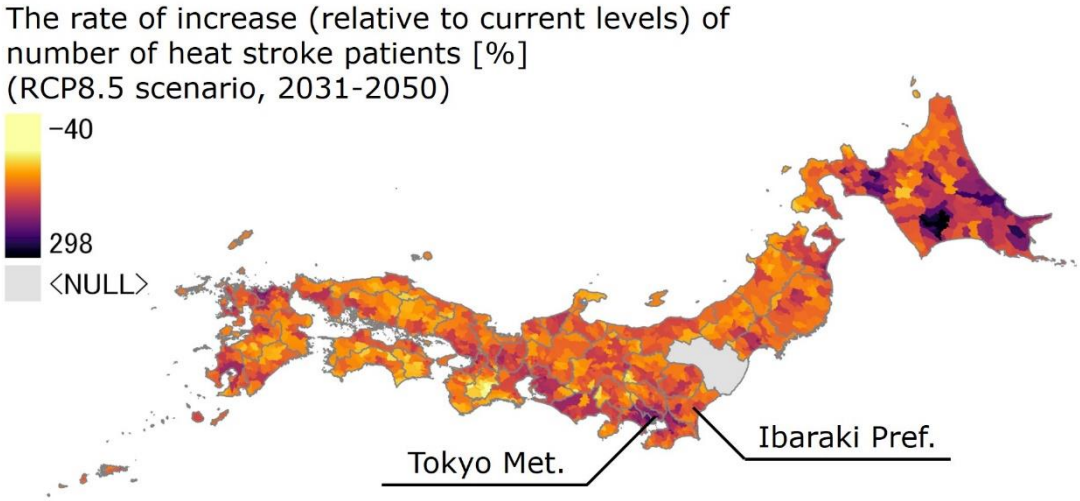
The rate of increase (relative to current levels) of
number of heat stroke patients [%]
(RCP8.5 scenario, 2031-2050)
−40
298
<NULL>
Tokyo Met.
Ibaraki Pref.