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## Heat-wave health impacts forecasting model in Korea: development and evaluation

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Currently, heat-wave warning systems are based on temperature in many countries. However, heat-wave impacts depend not just on temperature but by socio-economic contexts, including age, occupation, income, household type, etc. This study developed a heatwave health impacts forecast model by considering socio-economic characteristics. In addition, this study evaluated the developed forecasting model by using Area Under the Curve (AUC).

This study used health and meteorological data from 2011 to 2017. For the health data, we used two different measures, the number of mortality and the number of emergency department visits with heat-wave related diseases (respiratory diseases, cardiovascular diseases, trauma, infectious diseases, mental and behavioral disorders). Those numbers were obtained from the National Statistical Office and the National Health Insurance Corporation, respectively. For meteorological data, we used temperature and humidity data, which were interpolated at 1 km spatial resolution. We analyzed the health impacts of heat-wave on health by age, type of work, and income. In addition, we analyzed the weighted effects of humidity on health. The results showed age over 65, outdoor workers and low-income groups are relatively vulnerable to heat-wave. Moreover, high relative humidity was a factor that increased the risk of mortality for the population of age over 65.

Based on the analysis results, we categorized warning level to 5 levels (from 0 to 4), level 0 means low risk and level 4 means high risk. Warning levels were classified by considering the increased risk of disease and mortality with temperature. We developed warning levels for three different groups, the general public, the elderly, and the outdoor workers.

The performance of the model measured based on AUC by using 2018 Heat-related illness monitoring data obtained from the Korea Centers for Disease Control. In the assessment for the risk level 4, the AUC ranged from 0.71 to 0.92, with an average of 0.80. The AUC value of above the risk level 3 also ranged from 0.71 to 0.92, with an average of 0.85.

These results indicate that the health impact forecasting model suggested in the study is applicable as an operational forecast model. The results are expected to be used to develop a heat-wave early warning system in Korea.