USE OF FORECASTING CAPABILITY INDICATORS FOR PREDICTION VALIDATION OF THE FAMILIES OF AIR-POLLUTION HEALTH EFFECT MODELS

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The study assessment and the epidemiologically sound interpretation of air-pollution health effects is an important problem of modern environmental epidemiology. For the purpose of the reasonable assessment and explanation of those effects, it is very important that the models used must have an essential prediction capability.

The objectives of this work were to develop new indicators of the prediction capability and investigate this capability for the specific models based on the most "popular" generic model families (such as Generalized Linear Models, Hierarchical Quasi-Fourier Interaction Models, Hierarchical Residual Models and Generalized Additive Models with cubic splines smoothing for Gaussian and Poisson distributed dependent variables) by means of the already known and new developed indicators.

Among the known statistical indicators for quantitative evaluation of the goodness of the model prediction, we used Index of Agreement, Root-Mean Square Error, Normalized Mean-Square Error, and Correlation Coefficient. Additionally, we developed and used the following new indicators: Normalized Index of Agreement, Interval Predicted Ratio and Agreement Rate. Their validity was tested on real-life data.

For the prediction capability comparison, we exploited daily time-series total mortality data, which were collected in the city of Philadelphia (USA) over 8 years from 1973 till 1980; the data also contained daily observations of some meteorological and air-pollution variables.

In addition, learning sample approach was used for the same reason. For each type of the model families certain models were built on the 6-year-period learning sample (1973 – 1978). The constructed models were tested with all capability indexes, and then verified on the two last years from the database.

With all the indexes applied, the most effective for prediction models are: Hierarchical Quasi-Fourier Interaction Model and Normal Generalized Additive Model. But Hierarchical Quasi-Fourier Interaction Model has more epidemiological meaning and is better for interpretation of air-pollution health effects.

The reason why we put forward the new indicators was the fact that the existed indicators had the series of drawbacks in estimation. Therefore, we modified some of the known indicators and proposed some new ones. All these indicators have been proved effective. The models, which we found the effective ones, can be used for more adequate prediction and assessment of air-pollution health effects.