

THE USE OF STATISTICAL METHODS FOR MODELING OF MEASLES  
EPIDEMIC PROCESS

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Relevance. Using statistical forecasting methods used in this study, we can predict a new wave of measles to be prepared for them. Therefore, the topic is currently relevant.

Formulation of the problem. Development of forecasting models of the dynamics of the epidemic of measles process

The purpose of the work is to build a forecast of measles morbidity. The object of study - a measles epidemic process. The subject of the study is the methods for analyzing time series and constructing a forecast in epidemic systems. The objective was to develop a prediction model of the dynamics of the epidemic process measles. Methods of forecasting infectious diseases are actively developing since the beginning of the XX century. In recent years, the number of works on this topic has grown rapidly due to the development of information systems for surveillance and the emergence of large volumes of statistics available for analysis.

Epidemiological forecasts are performed for different terms and depending on them serve different purposes. So, the short-term forecast for several weeks ahead is used in operational management and in the detection of epidemic outbreaks of morbidity. The most useful medium-term forecast can be from two months to six months, used in tactical management. Of course, it is less accurate than short-term, but leaves enough time to prepare for possible emergencies and take preventive measures. When making strategic decisions can not do without long-term forecasts for the year ahead and more. Achievement of high quality of such predictions in most cases is impossible, but they are necessary, for example, when estimating the necessary volumes of production of medicines and vaccines, equipping medical institutions and training staff.

Results. Regression analysis is a basic approach to prediction of time series of any nature, is easily implemented through any system of computer mathematics. In the exponential smoothing method, each new forecast is based on the account of the value of the previous forecast and its deviation from the actual value. Exponential smoothing models in certain cases are able to give predictions that are not inferior to the accuracy of forecasts obtained using more sophisticated models, while again confirming the fact that the most complicated model is far from always the best. Construction of ARIMA models is a reliable method for short-term forecasts of time series. Such models can be used only for stationary time series, in which current values depend only on the previous ones and do not depend on other external factors. The complexity of constructing the model is its meticulousness to the input data, but after realizing their verification

and conversion at the output, we obtain a model for a fairly accurate forecast. In the work, examples of both models were constructed and their accuracy was proved.

The user loads the file with the data. For different methods, there are different data transformations. This is necessary in order for the forecast will be correct. By choosing the forecast method, the user can also choose the time that the forecast will be made. The graphs show the forecast and two intervals: where the predicted value will fall with a probability of 80% (blue), and with a probability of 95% (light blue).

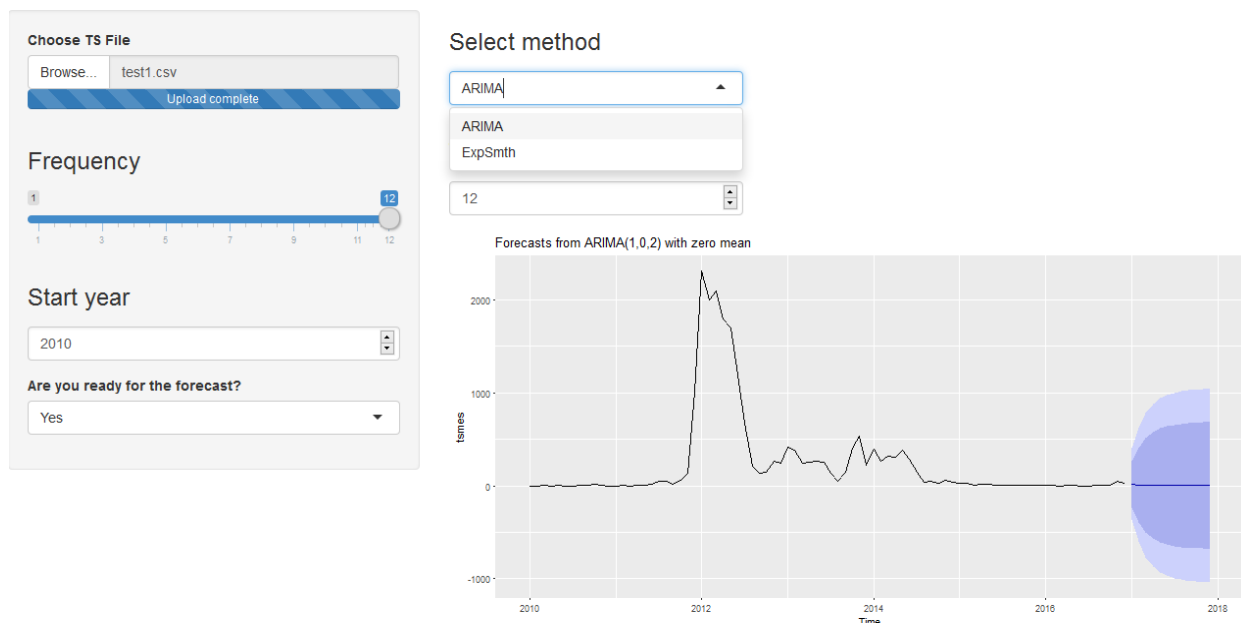


Fig. 1. An example of a program with measles incidence data for 2010-2017

In the course of work, a software product was developed that builds on the two models a forecast that quite accurately reflects the level of morbidity. The software product itself checks and transforms the data into a form that requires a particular model. The results of the work are built immediately in real time, responding to user data changes.

The results of the work are implemented in the educational process of the Kharkiv National Medical University.

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