ABSTRACT

The thesis is presented in 135 pages. It contains 3 appendixes and bibliography of 149 references. Thirty seven figures and 15 tables are given in the thesis.

Topic relevance. Influenza is a severe infectious seasonal disease that can lead to pandemics, have severe complications and cause high mortality, if not prevented (vaccination, isolation). All age groups of the population are susceptible to influenza. Planning for flu season is extremely important for effective control of seasonal diseases. The spread of flu can be described using mathematical models that predict seasonal increases in morbidity and preventive strategies. In future pandemics, the timely and effective distribution of antiviral drugs can be important for reducing the number of diseases and preventing severe consequences.

Thesis connection to scientific programs, plans, and topics. The thesis was prepared according to the scientific research plan of the Applied Mathematics Department of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute."

Research goal and objectives. The goal of this thesis is to reduce the incidence of influenza during the season, and optimize the prevention of influenza by constructing stochastic epidemiological models.

To accomplish this goal, the following objectives were reached:

− definition of the state of development of the issues of the chosen scientific problem in the national and foreign literature;

− processing of statistical data for the construction of seasonal epidemiological models;

− construction and analysis of epidemiological models of influenza vaccine;

− parametrization of models of vaccine prevention of influenza and analysis of characteristics of their parameters;

− solving the problem of optimizing vaccine prophylaxis of the population based on the constructed models and implementing it programmatically;

− analysis of the sensitivity of the solutions to changes in various parameters of the model.

Object of research is multi-year static data on influenza in Ukraine.

Subject of research is epidemiological mathematical models of seasonal diseases, methods of economic evaluation in health care.

Methods of research. To solve the task, the following methods were used: methods of probability theory and mathematical statistics (for representing the parameters of epidemiological models and numerical experiments).

Scientific contribution consists of the following:

− to solve these problem, an approach is proposed that differs from the existing one by suggesting the prediction of transmission parameters of the pathogen and the parameters of the rate of recovery of the presented epidemiological models, which is a new approach to solving this problem and makes it possible to more accurately forecast the demand and optimize the prevention of influenza;

− for the first time, this type of research is being conducted for Ukraine.

Practical value of obtained results. The developed mathematical and software for forecasting demand and optimizing the prevention of influenza simplify the optimization of the schedule of vaccination against the influenza.

Approbation of the thesis results. Basic ideas and results of the research were presented at X Conference of Young Scientists AMC-2018 "Applied mathematics and computing" (2018).

Publications. Thesis results are published in 1 scientific works:

− in 1 paper in proceedings of scientific conference.

Keywords: influenza, vaccination, vaccine prophylaxis, season, pandemic, pneumonia.