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## Agent-based simulation of HIV epidemic social impact in Kharkiv region of Ukraine

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**Objectives.** Prevention of new HIV infections and HIV-related deaths is one of the keystones in ending the AIDS epidemic. It is very important to know the main groups under risk and factors of transmission of the pathogen for better understanding local epidemics, assessment of effectiveness, responsiveness, and cost-effectiveness current HIV programs and its correction. Mathematical modeling is the most effective approach to investigate the dynamics of the epidemic process and of the factors influencing it.

**Material and methods.** Morbidity of HIV/AIDS in a different social group of the population of Kharkiv region in Ukraine during 2000-2016 years was conducted. The characteristics of the population's behavior were studied in a survey. To study the role of each of the factors studied in the spread of the HIV epidemic, a mathematical model was constructed. As an approach to modeling, the agent-based simulation was chosen, which allows representing objects of the system similar to real ones, and their interaction is similar to the real behavior of the population. The agent-based simulation model of HIV infection spreading has been developed. The structure of the model represented as expanded classical SIR model. First of all, this model was tested on real data in the Kharkiv region. The next step was to identify the most significant factors for making decisions about methods of preventing the disease. To this end, experiments were conducted with each control variable independently of each other (from the minimum value to the maximum).

**Results.** The results of the experiments showed that the most important factor for reducing the percentage of patients is the frequency of HIV-testing and voluntary HIV counseling. The second most important factor was the constancy of the sexual partner. The third was the condom use frequency, and finally, the fourth was the number of occasional sex partners.

**Conclusions.** The results of modeling allow defining the directions of HIV infection prevention and the main factors in reducing the incidence. As can be seen from the results of modeling, social factors prevail over medical ones, which gives grounds for conducting public health explanatory policy among the population, especially young people.

**Keywords:** HIV; AIDS; agent-based simulation; epidemic process; behavior.