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# Tuberculosis in Russia: comparison of TB control programmes

Tuberculosis is recognized as a major global public health problem, so development of TB control strategies and estimation of their efficiency are important tasks. Mathematical modelling can be a tool for solving these problems.

We compared control programmes for 14 regions related to the Central Federal District of Russia. The initial values of indicators for monitoring TB control programmes were obtained from data analysis [1]. Average smear-positive case detection rate equals 74%, average treatment success rate equals 78%, average smear-negative case detection rate equals 34%.

We considered two TB control programmes. The programme 1 is recommended by WHO, the targets of programme are detection of 80% of new smear-positive cases and cure of 85% of such cases. Russian health system considers two consecutive stages of tuberculosis: smear-negative and smear-positive. Detection of smear-negative cases is an important part of the Russian TB control programme and therefore we considered programme 2 focused on improvement of smear-negative case detection. The target of programme 2 is detection of 40% of new smear-negative cases.

To compare control programmes we used a mathematical model that describes the spread of TB in population of Russia, the values of model parameters were obtained from model fitting [1]. To analyze sensitivity of model solution to changes in model parameters we used a method of adjoint equations, also we obtained formulas for calculation of changes in basic epidemiological indicators [2].

The changes in TB mortality rate, TB incidence and number of people who infected by mycobacteria per year were calculated for each programme. Programme 1 is more effective than programme 2 in 9 regions and less effective in 3 regions. They are approximately equal in 2 regions. The results obtained show that type of control programme should be chosen separately for each region after analysis of epidemic situation.

The technique developed can be used to estimate the efficiency of other TB control programmes that were not considered in this study. It can be a usefull tool to choose the most effective programme.

## References

[1] O.A. Melnichenko, A.A. Romanyukha *A model of tuberculosis epidemiology: estimation of parameters and analysis of factors influencing the dynamics of an epidemic process* Russ. J. Numer. Anal. Math. Modelling, 2008, vol. 23, No. 1, pp. 63-75.

[2] O.A. Melnichenko *Model of tuberculosis epidemiology: sensitivity analysis* Proc. of 4th International Conference on Control Problems, Moscow, 2009, pp. 857–863. (in Russian)