

Statistical Analysis of Epidemiological Indices of Tuberculosis in Armenia During Last 20 Years

Evgueni Haroutunian

Institute for Informatics and Automation Problems of the

National Academy of Sciences of Armenia and of the Yerevan State University

P. Sevak 1

Yerevan, Armenia

evhar@ipia.sci.am

Harutyun Shahumyan

Institute for Informatics and Automation Problems of the

National Academy of Sciences of Armenia and of the Yerevan State University

P. Sevak 1

Yerevan, Armenia

harutiun@yahoo.com

In this article, we study measures of morbidity, prevalence, mortality of tuberculosis to compare situation before and after independence of Armenia.

We have developed a program for time series investigation using STATISTICA BASIC which is a specialized data transformation and graphics programming language integrated into computer package STATISTICA. This application allows to choose several online and offline (a posteriori) and also parametrical and non-parametrical methods.

The problem and data on tuberculosis for the investigation are provided by Department of Physiatics of the National Institute of Health of Armenia. There are no correct official data on population of Armenia for 1990-1999 because of significant unregistered migration (after the last census in 1989 the new one is planned for this year). Therefore for age-sex data of population of the Republic in 1990-1999 we are based on our own estimations (Haroutunian E. A, Shahumyan H. A. (2000)).

At the first stage of investigation the epidemiological characters of tuberculosis in 1980, 1987 and 1999 are compared. The selection of 1987 year is agreed with change of socio-economic and political situation caused by the horrid earthquake of 1988 and proclamation of independence of Armenia in 1990.

The rates of morbidity, prevalence and mortality are analyzed. The most significant increase in last years is noticed for the morbidity. Therefore we have done a detailed research on the data of morbidity by age and sex. Calculations show that the morbidity increase mostly for males. The most significant increase is observed for men at the ages of 15-39. A significant increase for female is observed only for the age group 0-14.

We analyzed the time series of morbidity, prevalence and mortality of tuberculosis from 1980 to 2000. The change points of these time series are estimated by online methods using parametrical Z_0 statistics. According to this investigation the most considerable change points of tuberculosis characteristics time series (where statistics Z_0 accepts its maximal value) are:

- for morbidity - 1997,
- for prevalence - 1997,
- for mortality - 1990.

Besides these years we have detected also other significant change moments for the level of significance $\alpha = 0.05$.

Detected change points are useful in further analysis of mentioned characteristics, especially in regression analyzes. They allow to use piecewise linear regression, which estimates two separate linear regression equations, one for the values that are less than or equal to the change point and one for the values that are greater than the change point.

REFERENCES

Aivazian S. A., Buchstaber V. M., Yenyukov I. S., Meshalkin L. D. (1989) Applied statistics: classification and reduction of dimensionality. *Finansy i statistika. Moscow.*

Brewer, T. F., Heymann, J., Colditz, G., Wilson, M. E., Auerbach, K., Kane, D. and Fineberg H. V. (1996) Evaluation of tuberculosis control policies using computer simulation. *JAMA*, **276(23)** 1898-1903.

Gu M. (1993) Time - sequential methods in clinical trials and related fields. in: proceedings of the theme term change point analysis. *Empirical reliability. Tech. Rep. Ser. Lab. Res. Statist. Probab. 244, Carleton U.- U. of Ottawa.* 63-73.

Haroutunian E. A, Shahumyan H. A. (2000). A statistical indirect method for demographic structure estimation. *Statistics, Development and Human rights. IAOS. Montreux.*

Kuzma J. W. (1998) Basic statistics for the health sciences. *Mayfield Publishing Company. London.*

RESUME

Special online parametrical methods are applied for statistical analysis of the main epidemiological indices of tuberculosis in Armenia during 1980-2000.