METHODS FOR CONSTRUCTING A PROBABILISTIC MODEL OF THE EFFECT OF DRUGS ON THE TIFFENEAU-PINELLI INDEX

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This study looks at the effects of various drugs on overall respiratory function, namely the Tiffeneau-Pinelli index, which is a key indicator of respiratory function and is defined as the ratio of forced expiratory volume in the first second (FEV1) to vital lung capacity (FVC). The normal value of the Tiffeneau-Pinelli index is 70-80%. The purpose of the work is to build a probabilistic model for calculating the probabilities that the actual values of the index of patients of different ages will lie within three defined limits: more than 70%, from 40 to 70% and below 40%, which will allow comparing the effect of drugs on the Tiffeneau-Pinelli index. The input data of the study are indicators of the Tiffeneau-Pinelli index for patients of different age groups who took different drugs, data of the mean value and standard deviation.

Beta distribution was used to calculate the probabilities of falling into groups with different levels of the Tiffeneau-Pinelli index [1]. Beta distribution is a continuous probability distribution that is used to model random variables lying within limits. Its probability density is determined by the formula:

$$f(x,\alpha,\beta) = \frac{1}{B(\alpha,\beta)} x^{\alpha-1}(1-x)^{\beta-1}$$

where: x – random variable; α, β – parameters of the distribution shape, which can be determined through the mean and variance of a random variable; $B(\alpha,\beta)$ – beta function. The calculation of the probabilities of the Tiffeneau-Pinelli index falling into the interval $(p_1; p_2)$ for each age of the patient is calculated using the formula:

$$P(p_1 \le X \le p_2) = \int_{p_1}^{p_2} f(x,\alpha,\beta)dx$$

Fig.1 shows an example of calculations

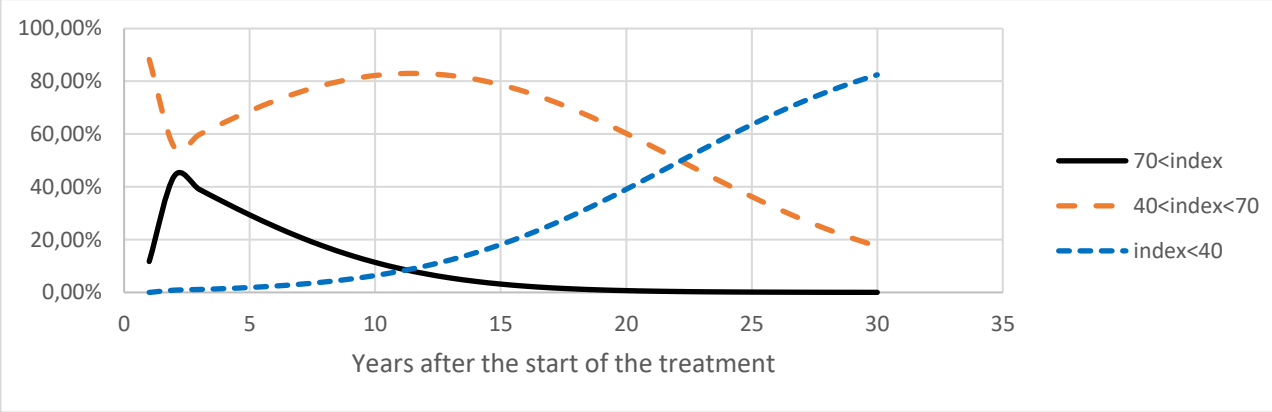

Fig.1. The value of the Tiffeneau-Pinelli index depending on the time

References (translated):

1. Olkin I., Gleser L.J., Derman C. Probability Models and Applications Revised 2nd Edition / September 2019 Pages: 732 *Columbia University, USA* https://doi.org/10.1142/10315