

**DESCRIPTION OF COURSE UNIT FOR DOCTORAL STUDIES  
AT VILNIUS UNIVERSITY**

<b>Scientific Area/eas, Field/ds of Science</b>	Medical and Health Sciences (M 000): Medicine (M 001); Odontology (M 002); Pharmacy (M 003); Public Health (M 004); Nursing (M 005)			
<b>Faculty, Institute, Department/Clinic</b>	Faculty of Medicine Institute of Health Sciences Department of Public Health			
<b>Course unit title</b> (ECTS credits, hours)	<b>Biostatistics in Public Health</b> 5 credits (135 hours)			
<b>Study method</b>	<b>Lectures</b>	<b>Seminars</b>	<b>Consultations</b>	<b>Self-study</b>
Number of ECTS credits	0.5	1	1	2,5
<b>Method of the assessment</b> (in 10 point system)	<p>Presentation and evaluation of the study: presentation of the methodology of the dissertational study (the PhD student must analyse, briefly review and present the latest scientific publications related to the topic of his/her dissertation, consider and present the possibilities of data collection and analysis).</p> <p>Criteria for the evaluation (minimum readable score - 5):</p> <p>(a) importance, novelty and relevance of the material presented (2 points);</p> <p>(b) ability to reason the choice of methods for data collection and analysis (3 points);</p> <p>(c) ability to foresee issues of the study process, evaluate the weaknesses and strengths of the research methodology (3 points);</p> <p>(d) organization of visual aids, ability to participate in a discussion, answers to questions, oratory skills (2 points).</p>			
<b>PURPOSE OF THE COURSE UNIT</b>				
<p>To provide theoretical and practical knowledge about methodologies of population studies, data collection tools and sources, preparation of collected data for analysis and methods of statistical analysis, and interpretation of its results. To promote the consideration of statistical analysis methods in the early stages of research, as well as to promote an interdisciplinary, holistic approach to biomedical research, modern research methods to address individual problems of relevant doctoral topics in different disciplines and fields.</p>				
<b>THE MAIN TOPICS OF COURSE UNIT</b>				
<p>Health information systems and data sources. Functions of health information systems. Demographic statistics. Demographic change, its stages. The most important factors of population change. Population pyramid. Main demographic indicators. Number of residents, demographic aging rate, migration, birth rate, death rate, natural population increase, infant mortality, life expectancy, survival, avoidable mortality. Officially registered morbidity and mortality. Proportional morbidity, proportional mortality, ratio of proportional morbidity and mortality. Description of the concept of risk. Prevalence of diseases. Lost years of potential life. Indicator of potential life years lost. Structure of research methods: observational and experimental methods. Literature review and its purpose, search for literature. Compilation of the list of references. Principles of systematic literature review. Principles of critical evaluation of scientific articles. Principles of</p>				

research implementation. Data collection tools. Research planning. Control of systemic errors in research planning: selection of the population for research, information collection methods. Confounding factors and mixing of effects. Ways to control confounders. Data sample and characteristics of it. Calculation of the sample size and assessment of power of the criteria. Principles of data analysis. Preparation of data for analysis and stages of the analysis. Data types. Techniques for visualizing data with many variables. Analysis plan, data description, principles of study group formation, significance of descriptive statistics. Testing of parametric and nonparametric hypotheses, first and second type errors, significance level, and p value. Evaluation of central tendency and distribution of the data, frequency tables. Initial visual evaluation of the data. Probability, risk and chance. Proportions and binomial distribution. Comparison of two proportions.  $\chi^2$  test. Mean, standard deviation and standard errors. Normal distribution. Confidence interval of mean. Comparison of two means. Hypothesis testing. Interpretation of statistical analysis results using p-values and confidence intervals. Comparison of the means of several groups using various methods of analysis of variance (ANOVA, MANOVA, ANCOVA). Logistic regression: comparison of two or more exposure groups, identification of side effects, and other extensions. Description of diagnostic tests: validity and reliability of results. Sensitivity and specificity of verification tests. The association between sensitivity and specificity. Predictive value of test result. Accidental and systemic errors and principles for their control. Bayesian theorem. Probability relations. ROC curve. Statistical modelling. Probability. Regression adjustment. Linear regression and correlation. Classical multiple regression model. Logistic regression model. Regression diagnostics. Cox proportional hazards model. Poisson regression model. Cluster analysis. Assessment of the regression model and testing hypotheses about the significance of regression parameters. Standardization, its significance in research. Direct and indirect standardization.

### RECOMMENDED LITERATURE SOURCES

1. Bonita R, Beaglehole R, Kjellström T (eds). Basic epidemiology. 2nd ed. World Health Organization. 2006. Available on the internet: [https://apps.who.int/iris/bitstream/handle/10665/43541/9241547073\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/43541/9241547073_eng.pdf?sequence=1&isAllowed=y)
2. Rothman KJ. Epidemiology: an introduction. Oxford: Oxford University Press. 2012.
3. Schoenbach VJ, Rosamond WW. Understanding the Fundamentals of Epidemiology an evolving text. 2000. Available on the internet: <http://www.epidemiolog.net/evolving/FundamentalsOfEpidemiology.pdf>
4. Kalėdienė R, Petrauskienė J, Rimpela. Šiuolaikinė visuomenės sveikatos mokslo teorija ir praktika. Kaunas: "Šviesa". 1999.
5. Kalėdienė R, Gaižauskienė A, Petrauskienė J, Sauliūnė S, Cicėnienė V. Sveikatos statistikos vadovas. Kaunas: LSMU Leidybos namai. 2013.
6. Čekanavičius V, Murauskas G. Statistika ir jos taikymai (I, II, III d.). Vilnius: TEV. 2000, 2002, 2009.
7. Dadonienė J, Žagminas K, Beržanskytė A. Introduction to research methodology, Vilniaus university, 2013. Available on the internet: [http://www.vu.lt/site\\_files/LD/Introduction\\_methodology\\_2013.pdf](http://www.vu.lt/site_files/LD/Introduction_methodology_2013.pdf)
8. Shahbaba B. Biostatistics with R. Springer, 2012.
9. Kardelis K. Mokslinių tyrimų metodologija ir metodai. Vilnius: Mokslo ir enciklopedijų leidybos centras. 2017.
10. Crawley M. The R Book. 2nd edition. Didžioji Britanija: Willey. 2013. Available on the internet: <https://www.cs.upc.edu/~robert/teaching/estadistica/TheRBook.pdf>
11. Charan J, Biswas T. How to calculate sample size for different study designs in medical research?. Indian J Psychol Med 2013, 35(2), 121-126. Available on the

internet:

<https://journals.sagepub.com/doi/pdf/10.4103/0253-7176.116232>

**CONSULTING LECTURERS**

1. Coordinating lecturer: Donatas Austys (Assist. Prof. Dr.).

2. Rimantas Stukas (Prof. Dr.).

3. Mindaugas Butikis (Assist. Prof. Dr.).

**APPROVED:**

By Council of Doctoral School of Medicine and Health Sciences at Vilnius University:  
29<sup>th</sup> of September 2022

Chairperson of the Board: Prof. Janina Tutkuvienė