SYLLABUS

STATISTICS AND EPIDEMIOLOGY

Doctoral study (PhD) for both internal and external participants

The aim of doctoral study is to gain competences in science and research to be applied in scientific disciplines of 7.4.2. Public health.

Skills gained through the coursework

Graduates of the course are introduced into the fundamental procedures for statistical processing of data and the use of epidemiological methods and research for planning and evaluation of the results of intervention studies. After completing the course the student will be able to derive scientific conclusions indicate the pros and cons, analyse causal relationships and derive conclusions for today. It will also have knowledge on evaluating power of statistical tests using epidemiological approaches in intervention studies. After completing the course the student will be able to discuss the principles of measuring the burden of disease and their implications, give the pros and cons, analyse causal relationships and derive conclusions for today. It will also have knowledge of the approaches to communicating the results of scientific work.

Structure of the course

1. Basics of biostatistics, principles of statistical inference.
2. Tools for statistical computing, such as statistical environment R or program PSPP or other statistical program (not Excel).
3. Creation of a database.
4. Routine collection, analysis of data and their sources.
5. Epidemiological studies.
6. Essay.

Notes to individual items

Ad 1 Basics of biostatistics, principles of statistical inference.

a) Read a book on biostatistics, as for example DANIEL, W. W. 2009. *Biostatistics: Basic Concepts and Methodology for the Health Sciences* John Wiley & Sons Ltd. alebo ARMITAGE, P., BERRY, G. & MATTHEWS, J. N. S. 2008. *Statistical Methods in Medical Research*, Wiley and practice on examples.
b) Pay special attention to calculation of the sample size, error I. and II. type and power of statistical test.
c) Correctly interpret statistical significance of statistical test results both statistically and clinically.

Ad 2. Tools for statistical computing

a) Download and install the selected statistical environment or program. The Department PH mainly used statistical environment R (https://www.r-project.org/) with user environment R-Commander (found in the library R), which is free. You can also use the program PSPP (http://www.gnu.org/software/pspp/get.html), a freely distributable version of SPSS. Unless a doctorand has an access to commercial statistical programs, for example. SPSS, STATA or other, he/she will naturally use these. Excel is not considered a statistical program. EPI INFO program is aimed at use in epidemiology and therefore is not recommended as well.

Ad 3. Creating a database

a) Get acquinted with the ACCESS database environment either from Microsoft (not a standard part of MS Office), or BASE of LibreOffice, which is freely available at

(https://www.libreoffice.org/download/libreoffice-fresh/) or MySQL database on the Internet (consult with your system administrator). The relevant manuals are available along with the software. Should anyone be interested in deeper understanding of the nature of use of databases there are numbers of books available.

b) Download mortality data from WHO EURO site, off-line version of the database DMDB. Select mortality data for your home country and neighbouring countries and paste them into your preferred database environment.

Ad 4. Routine collection, analysis and source of data

a) Study the book RUSNAK, M., RUSNÁKOVÁ, V. & PSOTA, M. 2013. *Health Statistics* (available online …..). Focus mainly on the sources of statistical data on processes of data standardization, indicators of disease burden and health statistics.
b) Compare data from the database DMDB WHO by direct standardization to the calculated standard populations between countries bordering the Slovak and interpret differences.
c) Calculate PYLLs for selected causes of death in your home country and neighbouring countries.
d) Find the published data on incidence and prevalence of selected diseases and interpret them.

Ad 5. Epidemiologic studies

a) Read any of the books: BEAGLEHOLE, R., BONITA, R. & KJELLSTROM, T. 2006. *Basic Epidemiology*, Geneva, WHO or GORDIS, L. 2008. *Epidemiology*, Saunders, or CDC 2011. *Principles of Epidemiology in Public Health Practice*. Third Edition. An Introduction to Applied Epidemiology and Biostatistics, CDC (to be downloaded from www.cdc.gov/ophss/csels/dsepd/SS1978/SS1978.pdf).
b) Go through the course from CDC (http://www.cdc.gov/ophss/csels/dsepd/ss1978/) and/or from ECDC on Field Epidemiology Manual FEM WIKI (https://wiki.ecdc.europa.eu/training/epiet/w/wiki/1263.aspx).
c) Based on the knowledge gained suggest an appropriate study design, which will be the subject of doctoral research.

Materials to be submitted for exam:

a) Substantiate listings progress and results of examples from a book read (item 1);
b) Print the calculation of sample size, which is to be used in your PhD research (Item 1b);
c) Interpret statistical tests from two published articles relevant to the field of your PhD research (Item 1c).
d) Deliver a listing of a database structure with data DMDB WHO for your home country and neighbouring countries (Item 3).
e) Print procedure and results of the comparison of data from 4b.
f) Compute PYLLs and interpretation (4c).
g) Print found prevalence and incidence (4d).
h) Describe appropriate study design outlining the methodology of random selection, development and confounding bias.
i) Compile results of a) to h) in a form of an assay.

Assembled by prof. MUDr. Martin Rusnák, CSc