UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biostatistics

2526-2-H4102D009

Aims

This course aims to provide the basic tools of medical statistics that are at the basis of a proper methodological approach to a research project in medicine. The student will be able to calculate the main descriptive indexes and to appreciate the characteristics of a sample by descriptive statistics and plots. The student will be able to evaluate the accuracy of a diagnostic test by the sensitivity, specificity and predictive value indexes. The student will be able to calculate specific probabilities from Gaussian and Binomial distribution. The student will be able to calculate and interpret statistical tests for means and proportions and confidence intervals. The student will know how to critically read the methodology and results paragraphs of a clinical paper. The student will be able to use statistical software (STATA) to produce the main descriptive statistics.

Knowledge and understanding

At the end of the course the student should know the fundamental concepts of descriptive (summary and variability indexes) and inferential (hypothesis testing and confidence interval) statistics and of regression models (linear and logistic models).

Applying knowledge and understanding

The student should be able to plan a study, calculate the proper sample size and apply statistical methods for the analysis of data using a statistical software (STATA).

Making judgements

The student should be able to select the study design depending on the aim and to choose the proper statistical analysis method depending on the nature of data. Furthermore, the student should be able to understand and evaluate, from a statistical point of view, the solidity of findings of published studies.

Communication skills

The student will be able to correctly report the results of a study, justifying the methods used for the statistical analysis.

Learning skills

At the end of the course, the student will manage the basic concepts of statistical analysis and will be able to fully understand the results of studies published in the biological literature.

Contents

Uncertainty in medicine. Methods for data description. Probability. Statistical inference: hypothesis testing, sampling and introduction to modelling. Sample size calculation. Type of studies. Use of the main functions of a statistical software (STATA)

Detailed program

DESCRIPTIVE STATISTICS FOR BIOLOGICAL VARIATION: Statistical unit, target population, sample, variables and data. Types of variables. Summary indicators (central tendency and dispersion). DATA COLLECTION AND PRESENTATION OF DATA: Methods for collecting and coding data; quality control; Data-bases for statistical analysis; Presentation of data in graphs and tables. RANDOM VARIABLES AND PROBABILITY DISTRIBUTIONS: definitions of probability; conditional probability and independence; probability distributions and random variables (examples of Gaussian and Binomial distribution). DIAGNOSTIC PROCESS EVALUATION: sensitivity, specificity; clinical decision: probability as uncertainty measure; predictive value of a test. EVALUATION OF RESULTS IN A CLINICAL STUDY: population parameter, sample estimate and standard error; confidence intervals; statistical hypothesis test, significant level and power; application of a statistical test, p-value; sample size calculation; statistical inference; basic concepts of regression and correlation; different types of studies in clinical and epidemiological research, observational and experimental studies; efficacy measures (relative risk, odds ratio).

Prerequisites

None

Teaching form

Lectures with the use of active methodologies (such as microsimulations). The team-based learning approach will be also used for critical reading of clinical papers.

Lessons in attendance.

Textbook and teaching resource

Marc M. Triola, Mario F. Triola, Jason Roy. Biostatistics for the Biological and Health Sciences, 2nd Edition, ISBN 978-0-13-403901-5, published by Pearson Education © 2018.J.

Martin Bland. An Introduction to Medical Statistics, Oxford 2015

https://www.stata.com/ The software used is available as academic license

Semester

2nd year - 1st semester

Assessment method

Final written test including:

-3/4 exercises to test the ability of the student in the application of statistics

-4/5 questions with closed answer to evaluate the preparation on the overall program

-1 test on an extract of a clinical paper to evaluate the interpretation of basic statistics in medical literature.

Office hours

Tuesday 10-12 with appointment

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | GENDER EQUALITY