UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biostatistics

1920-2-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.

Contents

Uncertainty in medicine. Methods for data description. Probability. Statistical inference: hypothesis testing, sampling and introduction to modelling. Sample size calculation. Type of studies.

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) will be interspersed with practical exercises and computer labs in supervised small groups activities. The team-based learning approach will be also used for critical reading of clinical papers.

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

J. Martin Bland and Janet Peacock. Statistical Questions in Evidence-based Medicine, Oxford 2000

Semester

2nd year - 1st semester

Assessment method

Final written test including:

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

-4 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

on request by e-mail