



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Application of Biostatistics

2021-2-H4102D009-H4102D029M

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#### Aims

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 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.

#### Contents

Methods for data description. Statistical inference: hypothesis testing, sampling and introduction to modelling. Sample size calculation. 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**

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. During the Covid-19 emergency period, the laboratory will take place in mixed mode with exercises available on the course page (asynchronous) and remote activities in small groups.

## **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.

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

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

## **Semester**

2nd year - 1st semester

## **Assessment method**

Final exercises to test the ability of the student to produce descriptive plots and statistics. "Team-based learning".

## Office hours

Tuesday 10-12 am on appointment.

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