



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Statistical Modeling for Epidemiology

2627-2-FDS02Q043-FDS02Q04301

Aims

This course aims to provide the basic concepts of epidemiology that are at the basis of a proper methodological approach to a research project in public health. The student will be able to deal with big data in public health particularly focusing on several aspects including design, data management and analysis. The student will be able to implement optimal design strategies on registries, administrative health data, clinical and omics data.

1. Knowledge and Understanding

By the end of the course, students will have acquired:

- Core concepts of epidemiology and clinical research methodology.
- The rationale behind various epidemiological study designs.
- Characteristics, structures, and limitations of health-related Big Data.

2. Applied Knowledge and Understanding

Students will be able to apply statistical and methodological knowledge to:

- Design, manage, and perform statistical analysis of Big Data in public health.
- Implement specific design strategies for administrative, clinical, and omics data.
- Use the Bioconductor environment

3. Independent Judgment

Students will develop the ability to:

- Independently select the study design and statistical tool that best suit to the epidemiological/clinical question.
- Critically evaluate data quality, identifying and correcting bias and confounders, where possible.

4. Communication Skills

Students will be able to:

- Translate complex statistical results into clear reports and indicators for multidisciplinary audience
- Work and communicate effectively in multidisciplinary public health teams.

5. Learning Skills

Students will have developed independent learning skills that will enable them to:

- Keep up to date with advanced statistical models and new methods for managing health data.

Contents

Population epidemiology. Study designs. Survival analysis. Statistical methods with application to various types of health data. Integration of different data sources.

Detailed program

Basics in population epidemiology. Advanced study designs to combine data from different sources (registry data, biomarkers, biobanks, surveys). Survival analysis: survival estimate and Cox model regression. Use of the Bioconductor environment.

Prerequisites

Descriptive and inferential statistics. Use of the software R (<https://cran.r-project.org/>).

Teaching form

Lectures with the use of active methodologies (such as microsimulations) will be interspersed with computer labs in supervised small groups activities. Critical reading of methodological public health papers.

- 2 2-hour lectures conducted in in-person delivery mode;
- 3 2-hour lectures conducted in a remote (asynchronous) delivery mode;
- 10 lectures of 3 hours conducted in delivery mode in the initial part that is aimed at engaging students interactively in the later part.

Textbook and teaching resource

Kenneth J. Rothman Sander Greenland, Timothy L. Lash . Modern Epidemiology. Lippincott Williams & Wilkins; 3 ed.

Eric Vittinghoff, David V. Glidden, Stephen C. Shiboski, Charles E. McCulloch. Regression Methods in Biostatistics Linear, Logistic, Survival, and Repeated Measures Models. [Statistics for Biology and Health](#) book series. Springer;

2 edition (March 6, 2012)

Marie Reilly "Beyond classic epidemiological designs" <https://www.routledge.com/Controlled-Epidemiological-Studies/Reilly/p/book/9780367186784> Chapman & Hall/CRC Biostatistics Series 2023

Modern Statistics for Modern Biology, by Susan Holmes and Wolfgang Huber, Cambridge University Press (2019). ISBN: 9781108705295.

Semester

first semester

Assessment method

Final questionnaire with closed answer to evaluate the preparation on the overall program (50% of the overall grade).

Final project exercise on data to test the ability of the student in the application of clinical research methodology to be done independently at home. The appropriateness of analyses and their presentation will be evaluated (50% of the overall grade).

Office hours

Tuesday 10-12 with appointment.

Sustainable Development Goals

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