



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Clinical Research

2324-4-H4102D059-H4102D198M

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#### Aims

The course aims to explore theoretical and practical aspects of the statistical analysis of clinical data with a particular focus on the application of causal inference methods to observational studies with survival outcomes.

The student will learn:

- the main tools to describe survival outcomes
- the basic methods to assess the association between an exposure and a survival outcome
- the basic concepts in causal inference
- the standard causal inference methods to assess the marginal treatment effect in observational studies (with focus on survival outcomes)

#### Contents

The course will review basic concepts in survival analysis, main quantities of interest and non-parametric estimators, Cox regression model.

Furthermore, an introduction to causal inference methods to assess the association between an exposure and a survival outcome in observational studies will be provided.

Real examples will be considered and practical guidance on the application of the methods will be provided. Analysis with R software will be shown to demonstrate the application of the methods.

#### Detailed program

##### Introduction

Recap on basic concepts in statistics (study designs, descriptive methods, statistical inference, regression methods).

### **Review of survival analysis**

Basic theory in survival analysis: complexities of life time data, survival/incidence functions, rate, hazard function, Kaplan Meier estimator, epidemiological rate (exponential) estimator, Cox regression model.

### **Introduction to causal inference**

Basic concepts in causal inference: confounders bias, effect modification, Direct Acyclic Graphs (DAGs), Average Treatment Effect (ATE)

Causal inference methods: Propensity Score (PS), PS-matching, PS-weighting (Inverse Probability Weighting IPW)

### **Additional content (not mandatory)**

R commands to apply causal inference methods for the estimation of a marginal treatment effect on real data with survival outcome

### **Prerequisites**

- Basic descriptive and inferential statistics.

### **Teaching form**

Lectures and R labs in presence.

### **Textbook and teaching resource**

Course slides, datasets and R lab commands and outputs will be available on the elearning page.

### **Semester**

Second semester

### **Assessment method**

Written exam

## **Office hours**

Upon request by email, in the Webex room of the teacher.

## **Sustainable Development Goals**

GOOD HEALTH AND WELL-BEING

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