UAB
Universitat Autònoma de Barcelona

Statistics in the Health Sciences

Code: 104873
ECTS Credits: 6

2025/2026

Degree	Type	Year
Applied Statistics	OB	3

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The student is supposed to:

- Be familiar with the binomial and the normal distributions,

- Be able to fit and interpret linear regression models,

- Be able to work with R and LaTeX.

Objectives and Contextualisation

The main aims of the course are:

- Learn about the main types of study designs in the field of Epidemiology.

- Learn about the potential impact of both missing data and error measurement on the results of a statistical analysis.

- Learn about the main indicators to measure the presence of a disease or an exposure.

- Learn about the main indicators to measure the association between exposure and disease, specially in the case where both exposure and outcome are binary.

- Be able to identify the appropriate statistical tools for the assessment of the association between a given exposure (potential risk or protective factor) and a given health outcome, according to the characteristics of the study design, in the context of epidemiological studies.

- Learn about the design and implementation of an exact test according to the study design.

- Learn about the design and implementation of simulation studies related to concepts such as empirical power or sample size calculation.

- Be able to search scientific papers using PubMed efficiently.

- Get familiar with the reading of scientific papers.

- Be able to apply the concepts studied in the subject to solve exercises based in true epidemiological data.

- Improve the efficiency when programming in R to solve the practical tasks proposed during the course.

- Be able to write reproducible statistical reports using LaTeX and the R package knitr.

Learning Outcomes

1. CM14 (Competence) Propose the statistical model needed to analyse data sets belonging to real studies.
2. KM17 (Knowledge) Recognise the statistical models for the analysis of data with different structures and complexities that frequently appear in different fields of application.
3. KM18 (Knowledge) Recognise the language of applications of economics and finances, biomedical science and engineering, provided by research and innovation in the field of statistics.
4. SM16 (Skill) Select appropriate sources of information for the statistical work.
5. SM17 (Skill) Discuss scientific articles in which the analysis of a study of the different areas of application is considered.
6. SM18 (Skill) Refine the information available for subsequent statistical processing.
7. SM19 (Skill) Analyse complex data, whether this is due to their characteristics or their size.

Content

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1. Introduction to the contents. Introduction to reproducible research using the R package knitr.

2. PubMed: Searching scientific papers. Structure of a paper.

3. Classification of studies

(a) Topics in biostatistics

(b) Epidemiological studies

i. Notation

ii. Classification criteria

iii. Types of epidemiological study design: Randomised epidemiological trials, Cohort, Case-control, Case-crossover, Cross-sectional, Ecological

(c) Studies classification diagram

4. Classification of variables and related regression models

(a) According to the measure type

(b) According to the role in the study

(c) Types of explanatory variables

(d) Types of regression models according to the metric of the response variable

(e) Response variables of type time

5. Dealing with missing data

(a) Introduction

(b) Types of missing data

(c) Dealing with missing data

6. Example of statistical methods in Health Sciences: Integration of multiple imputation in cluster analysis

(a) Overview of cluster analysis

(b) Overview of multiple imputation

(c) Integration of multiple imputation in cluster analysis

(d) Software

7. Measures of disease presence

(a) Introduction

(b) Prevalence

i. Definition

ii. Estimation

iii. Comments

(c) Cumulative incidence

i. Definition

ii. Comments

(d) Incidence rate

i. Definition

ii. Comments

iii. Comparing two incidence rates

8. Measures of association between exposure and disease

(a) Introduction

(b) The relative risk

i. Definition

ii. Comments

(c) The odds ratio

i. The odds

ii. The odds ratio

iii. Comments

(d)Confidence intervals for OR and RR

(e) The attributable risk

i. Population attributable risk

ii. Exposureattributable risk

9. Causality, confusion and interaction

(a) Introduction

(b) Causality

(c) Confusion

(d) Interaction

10. Example of statistical methods in Health Sciences: Regression models with transformed variables. Interpretation and software

(a) Overview of the linear regression model

(b) Logarithm transformation in linear regression models. Why?

(c) Interpretation of results in the original scale of the variables

(d) Software

* Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Theory sessions	28	1.12	
Type: Supervised			
Practice sessions	28	1.12	
Type: Autonomous			
Personal work	94	3.76	

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- Theory sessions: In these sessions, the different concepts of the subject as well as illustrative examples are introduced. Also, some exercises are proposed to be solved (usually requiring R usage). The methodology is based in the presentation and discussion of slides as well as the presentation of some additional materials (mainly news published in online media and scientific papers searched in PubMed).

- Practice sessions: In these sessions, several practical examples and exercises will be proposed. Activities related to R usage, PubMed search, papers reading and statistical analyses will be developed. Some of the proposed exercises will be mandatory.

- Seminars attendance: The Department of Mathematics and the UAB Statistical Service organize statistical seminars. The students and the teacher would attend some of them, depending on the topic and the schedule.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Assignments in group	30%	0	0	CM14, KM17, KM18, SM16, SM17, SM18, SM19
Exam (or compensatory exam)	50%	0	0	CM14, KM17, KM18, SM19
Exercises in group	20%	0	0	CM14, KM17, KM18, SM16, SM17, SM18, SM19

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- Assiignments in grup during the course. Teacher could assess individual participation with oral questions.

- Exam (face-to-face).

- Optional compensatory exam (face-to-face). To participate in the compensatory exam, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two-thirds of the subject's total grade. He or she must also have obtained a minimum grade of 3.5 out of 10 in the average of the subject. If the student attend the compensatory exam, its qualification will substitute the score in the previous, ordinary exam, regardless of the score obtained in bothe exams.

- The final scoring of the course out of 10, Q, will be:

Q = min{T, E}, if T is less than 4 or E is less than 3.5,

Q = (T + E) / 2, if T is greater than or equal to 4 and E is greater than or equal to 3.5,

on T i E are the scoring, out of 10, of the assignments and the exam, respectively.

- This subject does not offer the possibility of a single assessment (i.e. "evaluación única").

* Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Bibliography

Basic: All concepts developed in the class sessions will be published at Moodle, including the slides that will be discussed in the theory sessions.

Further readings: Students interested in going further can explore the following items.

- Agresti, Alan. Categorical Data Analysis. Wiley, 3rd Edition, 2013.

- Breslow, N., N. Day. Statistical methods in cancer research. International Agency for Research on Cancer, 1980.

- Clayton D., Hills, M. Statistical models in epidemiology. Oxford University Press, 1993.

- Dalgaard, P. Introductory Statistics with R. Springer, 3rd Edition, 2002.

- dos Santos, I. Cancer epidemiology: principles and methods. International Agency for Research on Cancer, 1999.

- Gordis, L. Epidemiology. W.B. Saunders, 2004.

- Lachin, J.M. Biostatistical Methods: The Assessment of Relative Risks. Wiley, 2000.

- Motulsky, H.J. Intuitive Biostatistics. Oxford University Press, 1995.

- Rothman, K., Greenland, S. Modern epidemiology. Lippincott Williams & Wilkins, 1998.

- Rothman, K. Epidemiology: an introduction. Oxford University Press, 2002.

- Wassertheil-Smoller, S. Biostatistics and epidemiology: a primer for health and biomedical prefessionals. Springer, 3rd Edition, 2004.

Software

- R
- LaTeX
- RStudio

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	1	Catalan/Spanish	first semester	afternoon
(TE) Theory	1	Catalan/Spanish	first semester	afternoon