



PRESENTATION

Biostatistics

The course *Biostatistics* has a mixed (theoretical / experimental) approach. It stresses the practical use of statistics in collecting, organizing, analysing, interpreting and presenting data. The students are expected to learn the most basic statistical methods, as well as some advanced topics, such as multiple linear regression and logistic regression. The knowledge acquired should enable students for critical readings of scientific papers where statistical methods are extensively used, and for the planning and development of a research project, including statistical analysis of the data which are generated.

Professors:

Dra. Marta García-Granero Márquez, Biochemistry and Genetics Department of the University of Navarra (Subject coordinator, mggranero@unav.es)

Credits: 3 ECTS

Degree 1: Master in Biomedical Research

Module: Module III

Area: Specialty complement

Department and School: Biochemistry and Genetics

Calendar description: first semester: [Calendario del Máster](#)

Classroom and schedule: specified in the master calendar

Type of subject: elective for all specialties

Language: spanish/english

LEARNING OUTCOMES (Competencies)

Basic competences

- BC6: Possess and understand knowledgeable facts that serve as a basis or opportunity for being original in the development and/or application of ideas, frequently within the context of research.
- BC7: The students will be able to apply acquired knowledge and problem solving abilities to fields outside this program, including that which is new and scarcely known, within a more ample or multidisciplinary context related to the research, development and innovation of drugs.
- BC8: The students will be able to integrate concepts and manage the complex task of drawing valid conclusions from information which, in spite of being incomplete or limited, includes reflections regarding social and ethical responsibilities linked to the application of general knowledge, specific concepts and common sense to the research, development and innovation of drugs.



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- BC9: The students will learn to relay their conclusions -and the most recent facts and reasoning supporting said conclusions- to specialized personnel and to the general public in a clear and precise manner.
- BC10: The students will have acquired learning abilities that will permit them to continue studying in a self-directed and autonomous manner.

General competences

CG1: Ability to deal with biomedical challenges in depth, from different viewpoints, identifying the state of present-day science.

CG2: Identification of significant questions or hypotheses regarding biomedical issues or problems and definition of the steps necessary to resolve such questions.

CG3: Possession of creative ability and originality in order to be able to respond to the questions raised in biomedical research.

Competences of the speciality complement

SCS3: Acquire specific technical bases to understand scientific literature and/or to execute the research project.

PROGRAM

The subject is organized in 2-hour sessions:

Theory (18 hours; Dra Marta García-Granero)

- Basic statistical concepts:
 - Individual, population and sample
 - Parameters and statistics
 - Variables and measurement scales
 - Descriptive statistics:
 - Qualitative (categorical) variables
 - Quantitative variables
 - Probability distributions:
 - Normal distribution
 - Log-normal (semi log) distribution
 - Binomial distribution
 - Poisson distribution
 - Other distributions
 - Normality checking
 - Parametric statistical inference (I): one and two samples



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- Mean estimation: point and interval
- Hypothesis test concept
- One sample mean test
- Comparison of two sample means: related (matched) samples and independent samples.
 - Non-parametric statistical inference (I): one and two samples
- One sample median: confidence interval estimation and one sample tests
- Two sample medians: confidence interval estimation for the difference and two sample tests (related and independent samples).
 - Parametric statistical inference (II): ANOVAS
- One-way ANOVA
- Factorial ANOVA (2^2 and 2^3 designs)
- Repeated measures ANOVA
 - Non-parametric statistical inference (II): K samples
- Kruskal-Wallis test
- Friedman test
 - Categorical data analysis: chi-square tests
- Confidence interval for a proportion
- Goodness of fit test
- Contingency tests for independent samples
- Contingency tests for related samples
 - Correlation and linear regression
- Differences between both methods
- Correlation
- Simple linear regression
 - Survival analysis

- Multiple linear regression

- Logistic regression

Practical training program (10 hours; Dra. Marta García-Granero)



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Practice sessions with R+RStudio

1. Data management with R+RStudio
2. Descriptive statistics. One- and two- samples analysis
3. K samples analysis
4. Correlation and linear regression
5. Categorical data analysis. Survival analysis

EDUCATIONAL ACTIVITIES

This is a subject of 3 ECTS (75 h). The work is distributed as follows:

1. Class activities: (1.20 ECTS, 30 h)

- Theoretical classes. 18 hours (0.72 ECTS)
- Practical training with R+RStudio. 10 hours (0.40 ECTS)
- Final examination. 2 hours (0.08 ECTS)

2. Personal work: (1.80 ECTS, 45 h)

- Practice questionnaire. 3 hours (0.12 ECTS)
- Personal study and proposed exercises. 20 hours (0.80 ECTS)
- Report on the statistical methods used in a published paper. 22 hours (0.88 ECTS)

ASSESSMENT

To obtain a pass in this subject it is necessary to obtain a final grade of 5 (50%) or above. Students are required to obtain at least 5/10 in the final examination.

- Continuous assessment: 30%
- Written reports: 30%
- Practical exercises: 10%
- Final examination: 30%

Re-sit examinations

Students who fail will repeat the written exam and submit again the "Report on the statistical methods used in a published paper"

Grades:

10-9.0: SB

8.9-7.0: NT

5.0-6.9: AP

0-4.9: SS

Those students with a final grade of 9 or above are eligible for Honors.



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HORARIOS DE ATENCIÓN

Office hours: Mondays and Wednesdays from 11 am to 1 pm.

Please make an appointment previously by e-mail: mggranero@unav.es

“Edificio de Investigación. Despacho 3321”

BIBLIOGRAPHY AND RESOURCES

- **Estadística Básica.** Marta García-Granero. Class notes (available at ADI).
- **Statistics at Square One.** Ten Edition. T D V Swinscow. Revised by M J Campbell, University of Southampton: <http://www.bmj.com/about-bmj/resources-readers/publications/statistics-square-one> [Find it in the Library](#)
- **Statistics Notes in the British Medical Journal:** <http://www-users.york.ac.uk/~mb55/pubs/pbstnote.htm>
- **Bioestadística para no estadísticos: Bases para interpretar artículos científicos.** E Cobo, P Muñoz y JA González. Elsevier-Masson. [Find it in the Library](#)
- **How to Report Statistics in Medicine.** TA Lang y M Secic. ACP. [Find it in the Library](#)