Universitat de Lleida

DEGREE CURRICULUM

BIOSTATISTICS

Coordination: RUÉ MONNÉ, MONTSERRAT

Academic year 2019-20

BIOSTATISTICS 2019-20

Subject's general information

<table>
<tr><td>Subject name</td><td>BIOSTATISTICS</td></tr>
<tr><td>Code</td><td>100510</td></tr>
<tr><td>Semester</td><td>PRIMER QUADRIMESTRE</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Medicine</td><td>1</td><td>COMMON</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>6</td><td>1</td></tr>
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<tr><td>Coordination</td><td>RUÉ MONNÉ, MONTSERRAT</td></tr>
<tr><td>Department</td><td>BASIC MEDICAL SCIENCES</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Classroom hours: 60
Non-classroom hours: 90</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan
Teaching materials in English</td></tr>
<tr><td>Office and hour of attention</td><td>A concertar enviant un correu electrònic als professors</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BENÍTEZ IGLESIA, IVÁN DAVID	ivandavidbenitez@gmail.com	6	
FORNÉ IZQUIERDO, CARLES	carles.forne@udl.cat	6	
MARTÍNEZ ALONSO, MONTSERRAT	montserrat.martinez@udl.cat	6	
RUÉ MONNÉ, MONTSERRAT	montserrat.rue@udl.cat	3	

Subject's extra information

It is a subject taught during the first semester of the first year of the of the Bachelor of Medicine degree. This course aims to introduce students to statistical methods that allow to study phenomena where variability is an important component. Without statistical science is very difficult to generalize the observed results and to determine their significance. This is the case of observational and experimental studies in the medical field, where individual variability and the many factors that influence each health condition make difficult to perform an intuitive analysis of the problem. Learning the basics of statistical tools and applying them to situations of interest in medical practice is a key point in the training of the physician. As a methodological tool, statistics plays a role in Medicine, being essential for evidence based medicine. In this subject other key skills will be practiced, like using information technologies, group work, medical English, and oral presentations.

Learning objectives

To pass the course, the students should know how to use the basic concepts of statistical methods in relation to specific problems of their professional activity in Medicine, with particular attention to the critical appraisal of the results of observational and experimental studies.

As for skills, students who pass the course should be able to:

- Identify and know the main features of the designs used in health studies.
- Perform descriptive data analyses.
- Estimate and interpret probabilities of events.
- Estimate confidence intervals in the case of a group or in the comparison of groups.

In addition, students who pass the course must achieve the following skills:

- Interpret and describe the results of a specific study using descriptive statistics tools.
- Gather information, relate it to their knowledge, synthesize and report it.
- Using a statistical software to analyze data.
- Teamwork.
- English to understand scientific literature.

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Competences

Specific competences

• Master the basic statistical concepts used in the medical literature.
• Be able to design simple studies.
• Be able to analyze data and interpret the results correctly.
• Be able to interpret and present the results of a study.

Cross-sectional competences

• Teamwork
• Using Information Technologies
• Practice English

Subject contents

Part I

Introduction: Statistics in Medicine. Introduction to research in Health Sciences and presentation of the role of Statistics in the research process.

Chapter 1. Study designs in Health Sciences. Experimental studies and observational studies. The clinical trial as the "gold standard" of research in the health sciences. Study design. Validity of the measures. Factors that may influence the results. Randomization, blinding, intention to treat. Evaluation of the effect: primary and secondary variables. Ethical aspects of experimental studies. Descriptive observational studies. Analytical observational studies. The cohort and the case-control studies. Measurements of frequency and association between risk factors and diseases. Relative risk and odds ratio. Advantages and limitations of observational studies.

Chapter 2. Descriptive statistics. Looking at the data. Descriptive statistics. Type of variables. Measures of central tendency (median, quantile, mean) and measures of variability (variance, standard deviation, interquartile range). Graphical representation of variables.

Part Two

Chapter 3. Probability, Bayes' theorem, diagnostic tests. Probability as relative frequency. Rules of probability. Conditional probability. Bayes' theorem. Sensitivity, specificity and predictive values. Interpretation.

Chapter 4. Probability distributions. Theoretical probability distribution. Discrete and continuous distributions. Binomial and Poisson distributions. Normal, Student's t, chi-square, and exponential distributions. Reference intervals. Z-scores.

Part Three

Chapter 5. Statistical inference: confidence intervals and hypothesis testing. Population and samples. Sampling distribution of a parameter. Central limit theorem. Confidence intervals of means and proportions. Confidence intervals for means difference and difference of proportions. Confidence intervals for probability ratios. Statistical significance: p-value. **Tests to compare groups.** Comparison of two groups' means. Comparison of two groups' proportions. Comparison of proportions of three or more groups. Nonparametric tests.

Chapter 6. Correlation and regression. Relationship between two quantitative variables. The Pearson's correlation coefficient. The Spearman's correlation coefficient. The regression line. The univariate and multivariate regression models. Interpretation of the regression model parameters. The analysis of variance.

Chapter 7. Logistic regression. Studies where the variable of interest is dichotomous. The logistic regression model. Interpretation of coefficients. Obtaining the logit and the likelihood of the event of interest. Evaluation of the model: calibration and discrimination.

Methodology

To achieve the objectives and acquire the necessary skills the following activities are scheduled:

Lectures (Lec)

These will be conducted with all students and are not mandatory. They are intended to present the contents and highlight the most important aspects of the use of Statistics in Medicine.

Seminars (Sem)

These will be carried out with 1/6 of students. They are mandatory and must be done with the corresponding group. Each group will be divided into working groups of 5 students. They aim to deepen the contents and applications of the concepts introduced in lectures.

Virtual activities (Va)

These activities will be conducted through the Virtual Campus (Sakai) and other tools. Students will conduct activities related to the preparation of the contents of the subject, as well as activities of understanding and consolidation of statistical concepts.

Computer activities (Comp)

They will be conducted in groups of 1/6 students. They are mandatory. Students will complete exercises analysis and data presentation. They will deepen the statistical concepts presented in lectures and seminars.

Tutorials (Tut)

These will be conducted with 1/6 of students. They are not mandatory and can be done with the assigned group. They serve to bring together learning from one part of matter, to answer questions and highlight the topics of Biostatistics more applied to Medicine.

Evaluation

Evaluation type		
Midterm exam	30%	Written tests on contents and theoretical concepts and their application.
Assignment	30%	Evaluation of the ability to relate concepts and its application to solving problems.
Final exam	40%	Overall assessment of theory and practice.

To pass the subject is necessary to pass the final exam (minimum of 5 out of 10) and have an average score of the midterm exam and the assigmnment greater than or equal to 5.

Bibliography

Basic references:

Sorribas A, Abella F, Gómez X, March J. (1997) Metodologia estadística en ciències de la salut: Del disseny de l'estudi a l'anàlisi de resultats. Lleida: Edicions de la Universitat de Lleida.

(The book Sorribas et al. can be found in electronic format on the website www.bioestadistica.org.)

Cambell MJ, Swinscow TDV. Statistics at square one, 11th edition. Wiley-Blackwell, BMJ books. 2009.

Daniel WW. (1995) Bioestadística: base para el análisis de las ciencias de la salud. México: UTEMA.

Complementary references:

Bland M (2000). An introduction to medical statistics, 3rd ed. Oxford: Oxford University Press.

Altman DG. (1990) Practical statistics for medical research. Chapman & Hall/CRC; 1st ed.

Gonick L, Smith W. The cartoon guide to statistics. HarperCollins Publishers, Inc. New York, 1993.

Additional materials

Les notes i articles que es treballin durant el curs es trobaran a l'apartat Continguts de Sakai.