

**Public Health**

Code: 104887  
ECTS Credits: 6

Degree	Type	Year	Semester
2503852 Applied Statistics	OT	4	0

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Other comments on languages**

Most of the supporting documentation and related scientific articles will be in English.

**Teachers**

José Ríos

**Prerequisites**

Previous and appropriate knowledge in both statistics theory and applied statistical software are key prerequisites. Basic knowledge of SAS is not a formal prerequisite, but it is recommended; alternatively, the student could use R or Stata to follow the program of the course.

A sufficient level of English to understand scientific articles is also a prerequisite.

**Objectives and Contextualisation**

Provide basic and applied knowledge on the main studies in Public Health regarding design, organization, conduction, supervision, analysis, interpretation and dissemination.

The general objectives of the course are:

1. To learn the basics of the design of studies in terms of logistical, ethical and methodological aspects.
2. To learn the different type of studies and differentiate their specific characteristics.
3. To acquire knowledge about the basic aspects in the analysis and interpretation of the results.
4. To acquire knowledge in advanced SAS programming.

**Competences**

- Analyse data using statistical methods and techniques, working with data of different types.
- Correctly use a wide range of statistical software and programming languages, choosing the best one for each analysis, and adapting it to new necessities.

- Critically and rigorously assess one's own work as well as that of others.
- Formulate statistical hypotheses and develop strategies to confirm or refute them.
- Identify the usefulness of statistics in different areas of knowledge and apply it correctly in order to obtain relevant conclusions.
- Interpret results, draw conclusions and write up technical reports in the field of statistics.
- Make efficient use of the literature and digital resources to obtain information.
- Select statistical models or techniques for application in studies and real-world problems, and know the tools for validating them.
- Select the sources and techniques for acquiring and managing data for statistical processing purposes.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Use quality criteria to critically assess the work done.
- Work cooperatively in a multidisciplinary context, respecting the roles of the different members of the team.

## Learning Outcomes

1. Analyse data corresponding to epidemiological studies or clinical trials.
2. Carry out the most suitable sampling for epidemiological studies.
3. Critically assess the work done on the basis of quality criteria.
4. Design and conduct hypothesis tests in the different fields of application studied.
5. Draw conclusions that are consistent with the experimental context specific to the discipline, based on the results obtained.
6. Draw up technical reports that clearly express the results and conclusions of the study using vocabulary specific to the field of application.
7. Identify the most commonly statistical inference techniques used in epidemiology studies.
8. Interpret statistical results in applied contexts.
9. Justify the choice of method for each particular application context.
10. Make effective use of references and electronic resources to obtain information.
11. Reappraise one's own ideas and those of others through rigorous, critical reflection.
12. Recognize the importance of the statistical methods studied within each particular application.
13. Recognize the most commonly used databases in the Health Sciences.
14. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
15. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
16. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
17. Use different programmes, both open-source and commercial, associated with the different applied branches.
18. Work cooperatively in a multidisciplinary context, accepting and respecting the roles of the different team members.

## Content

Brief description of the contents

- Concepts of health, public health, illness and health education
- Health services and programs, policies and health organization
- Epidemiology and prevention of diseases
- Concept and applications of Epidemiology
- Measures of frequency, association and impact

- Types of primary epidemiological studies. Cross-sectional, ecological, case-control studies and cohorts. Meta-analysis.
- Design, analysis and interpretation of the main types of studies
- Basic statistics applied to epidemiological studies

#### Learning outcomes

- Analyze, synthesize, solve problems and make decisions in the professional field
- To Know and to apply the scientific method to solve problems
- Search, manage and interpret information from different sources
- Design observational and experimental studies, know how to analyze them and interpret their results
- Obtain applied knowledge in knowing how to design and analyze the main epidemiological studies using specific statistical software
- Develop autonomous learning and have organizational and planning skills.
- Work individually and in a team, uni-disciplinary or multidisciplinary, as well as in an international environment
- Communicate effectively, orally and in writing, to a professional and non-professional audience, in their own languages and / or in English

## Methodology

The methodology used to achieve the learning process is based on directed and autonomous activities. For the later the students are expected to work on their own using the provided information.

#### Directed activities:

- Theoretical classes (TE). Each thematic block will begin with one or several theoretical classes where the teacher will explain the key concepts, promote interaction and discussion of doubts, and will give the guidelines guide for the follow-up and preparation of complementary autonomous activities. The teaching support material will contain the essential contents of the theoretical classes, will be available in advance of the Virtual Campus of the subject, and it is recommended that the students have it available during the class (computer, tablet or paper format) to facilitate its tracking.
- Classroom Practices (PAUL). Practical sessions where work will be done to expand and consolidate previous scientific and technical knowledge, and scientific articles that encourage discussion will be used. Standard teaching innovation tools are used that control participation in class. Students must have read the indicated support material to facilitate the discussion.
- Laboratory Practices (PLAB). The student will be prepared in the design and analysis of the main types of epidemiological studies in computer rooms using practical cases, and will be used in the use of software suitable for the purpose of these practices.

#### Autonomous activities

- Self-learning test. Self-assessment tests will be provided with feedback, using the Moodle classroom questionnaire utilities in the virtual campus of the subject, to facilitate the revision of the subject synchronized with the teaching of the syllabus.
- Work in group. A teamwork will be carried out where the knowledge will be applied by approaching a real situation supervised by the teacher. It will be necessary to solve a problem raised in which it will be necessary to consult several sources and the use of statistical software. The student's ability to analyze, reason, and expertise will be promoted in the resolution of problems related to the professional field.
- Exercises. A list of exercises aimed at the design and evaluation of the different types of epidemiological studies will be provided.
- Personal study. Although the subject is eminently focused on the practical implementation of knowledge in the design and analysis of epidemiological studies, there will be a minimal individual effort to establish the theoretical classes.

## Activities

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Title	Hours	ECTS	Learning Outcomes
Type: Directed			
#01. Introduction to public health, epidemiology, the disease and its determinants. Introduction to the type of studies.	3	0.12	11, 8, 16, 14, 15, 13, 10
#02. Measures of frequency, association and impact.	3	0.12	8, 16, 14, 15, 17
#03. Design, analysis and interpretation of the main study types.	3	0.12	11, 4, 5, 2, 8, 9, 16, 14, 15, 12, 13, 10
#04. Introductory applied statistics for epidemiological studies.	3	0.12	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#05. Cross-sectional Studies. Ecological Studies.	3	0.12	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#06-08. Case-Control Studies.	9	0.36	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#09-11. Cohort Studies.	9	0.36	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#12-13. Experimental Studies.	6	0.24	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#14. Meta-analysis.	3	0.12	1, 11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
Type: Autonomous			
#01. Personal study.	37	1.48	4, 5, 2, 7, 8, 9, 14, 15, 12, 13, 17, 10
#02. Performing Exercises.	24	0.96	1, 11, 3, 4, 5, 2, 7, 8, 9, 14, 15, 12, 17
#03 Realization of group work.	34	1.36	1, 11, 3, 4, 6, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#04. Carrying out self-evaluation tests.	6	0.24	11, 3, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13

## Assessment

To evaluate the achievement of the competences, the following items and weights will be used:

Weight	Type
(%)	

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Directed

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Theory (TE)	-	-
Classroom Practices (PAUL)	10.0%	Assistance + Individual Evaluation
Laboratory Practices (PLAB)	-	Assistance
Autonomous		
Presentation of the compulsory group work	25.0%	Collective Evaluation *
Self-learning tests	5.0%	Individual Evaluation
Evaluatory activity		
Exam	60.0%	Individual Evaluation
TOTAL	100.0%	

*\*Collective evaluation: collective evaluations may be individualized in the case of manifest heterogeneity*

It is considered that the natural learning of the subject requires a minimum of 80% attendance for both classroom (PAUL) and laboratory (PLAB) practices. In case the student foresees that this fact could be a problem due to his personal situation, he should contact the coordinator of the subject to set up complementary alternative tutoring plan.

The course will be passed if the weighted grade of all the sections is at least 5 points out of 10, and there has also been attendance at least 80% of the classroom and laboratory practices, and the compulsory work has been presented.

### Exams

The knowledge acquired by the student of the theory and the seminars will be evaluated individually, as well as their capacity for analysis and synthesis. The total weight in the final score will be 60%. The exam will consist of 2 parts:

a) Resolution of a problem of analysis and interpretation of results. It will include critical reading of an epidemiological study and resolution of questions about it. 40% rating

b) An examination on theoretical knowledge that will consist of a series of multiple-choice questions with 4 possible answers, of which there is only one correct answer. There will be a penalty on wrong answers. 60% rating

### Classroom Practices (PAUL)

There will be a continuous evaluation of the participation in the seminars in the classroom.

Specific cases will be raised by groups that will be discussed in a generic way. Students must have prepared several readings of scientific articles where they will test and consolidate theoretical knowledge. Throughout the course the use of knowledge related to the topics of the seminars will be evaluated.

### Presentation of compulsory group work

There will be an oral presentation of the compulsory work that will count in the final evaluation. The obligatory homework will be carried out in groups and the presentation will be in charge of one of the members of the group that will be randomly designated on the day of the presentation.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
#01. Problems class (PAUL)	10% - Attendance (minimum 80%) + Individual Evaluation	1	0.04	11, 3, 4, 5, 7, 8, 9, 16, 14, 15, 12, 18, 10
#02. Laboratory practices (PLAB)	Obligatory attendance (minimum 80%)	1	0.04	1, 11, 3, 4, 5, 7, 8, 9, 16, 14, 15, 12, 18, 17, 10
#03. Realization of group work.	25% (Collective Evaluation)	1	0.04	1, 11, 3, 4, 6, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13, 18, 17, 10
#04. Carrying out self-evaluation tests.	5% [if < 100% tests done: (a) >=80%-<100%, 3%; (b) if <80%, 0%]	1	0.04	11, 3, 4, 5, 7, 8, 9, 14, 15, 12, 10
#05. Exam.	60%	3	0.12	11, 3, 4, 5, 2, 7, 8, 9, 16, 14, 15, 12, 13

## Bibliography

### Bibliography

#### Applied Statistics

- Armitage P, Berry G. Estadística para la investigación biomédica. 3a ed. Madrid; Barcelona: Harcourt Brace de España; 1997.

#### Clinical trials

- Pocock SJ. Clinical Trials: A Practical Approach. John Wiley & Sons; 1 edition. 1984.

#### Epidemiology and Public Health

- Argimon Pallás JM, Jiménez Villa J. Métodos de investigación clínica y epidemiológica. 4a ed. Barcelona: Elsevier; 2013.
- Gordis L. Epidemiología. 5a ed. Barcelona: Elsevier; 2014.
- Hernández-Aguado I, Gil A, Delgado M, Bolumar F. Manual de Epidemiología y Salud pública. Para licenciaturas y diplomaturas en ciencias de la salud. Editorial Médica Panamericana, 2005 Madrid.
- Martínez-González MA, editor. Bioestadística amigable. 3a ed. Barcelona: Elsevier; 2014.
- Strom BL. Pharmacoepidemiology. 3rd ed. Chichester: John Wiley, 2000.

#### Dictionaries

- Baños JE, Brotons C, Farré M. Glosario de investigación clínica y epidemiológica. Monografías Dr. Antonio Esteve, n. 23. Barcelona: Fundación Dr. Antonio Esteve; 1998.

- Beaglehole R, Bonita R, Kjellström. Basic Epidemiology. World Health Organization, Geneva. 1993.  
Last JM. Diccionario de epidemiología. Salvat Editores, SA, Barcelona. 1989.

#### Links

- Centro Nacional de Epidemiología:  
<http://www.isciii.es/ISCIII/es/contenidos/fd-el-instituto/fd-organizacion/fd-estructura-directiva/fd-subdireccion>
- Organización Mundial de la Salud (OMS): (<http://www.who.int/es/> )
- EQUATOR-network (Enhancing the Quality and Transparency of Health Research)  
<http://www.equator-network.org/resource-centre/library-of-health-research-reporting/>