

Academic Year/course: 2022/23

25643 - Applied Statistics in Health Sciences

Syllabus Information

Academic Year: 2022/23

Subject: 25643 - Applied Statistics in Health Sciences

Faculty / School: 127 - Facultad de Ciencias de la Salud

Degree: 605 - Degree in Physiotherapy

ECTS: 6.0

Year: 1

Semester: Second semester

Subject Type: Basic Education

Module:

1. General information

1.1. Aims of the course

Statistics is a basic tool to understand and analyze reality. Health Sciences are essentially experimental and, therefore, they are subject to inductive reasoning, which aims to extend the conclusions obtained in a part of the population to the entire population. The statistical methodology allows validating these extensions. On the other hand, the scientific publications usually reviewed by physiotherapists often use a statistical language for which it is necessary to have a minimum knowledge.

The main goal of this subject is that the student incorporates statistical skills in his/her future professional work and develops knowledge based on scientific evidence. The student must have contact with the basic statistical tools that help to design, execute, analyze, and interpret applied research in health sciences (learning to define a problem; collecting and analyzing data; drawing conclusions or making decisions based on the analysis carried out, etc.). All this knowledge also will allow him/her to be critical of the studies carried out by other researchers.

The contents of this subject themselves do not enable the student to achieve the objectives of the 2030 Agenda. However, they are essential to base the subsequent knowledge of some subjects of the degree, which are more directly related to the Sustainable Development Goals (SDG) of the United Nations 2030 Agenda.

1.2. Context and importance of this course in the degree

This subject is part of the basic training module of the degree. Its purpose is to introduce the student to the basic knowledge in Statistics and provide him/her the methodological fundamentals to be able to face certain aspects in the investigation of other more advanced subjects in the degree.

1.3. Recommendations to take this course

Given the nature of basic training that this subject has, and that it is taught in the second semester of the first year of the degree, it does not have any essential requirements, although it is advisable to present an adequate basic mathematical knowledge.

The use (user level) of a word processor and basic computer skills are recommended, although not essential. A basic level of technical English is also recommended.

To achieve the learning results of the subject, it is recommended to attend both theoretical lectures and practical sessions. These activities make easier the understanding of the concepts and the development of skills in the use of computer resources, both for the statistical analysis of data and for information searching in scientific papers.

2. Learning goals

2.1. Competences

Once the student passes the subject, he/she will be more competent in the following four aspects:

1. To demonstrate knowledge and understanding in:
 1. The bases of Statistics as a tool in scientific research.
 2. The fields of application of Statistics in researching and the problems it can solve, as well as its limitations.

3. Statistical language and statistical analysis that appear in scientific papers.
 4. The phases of a statistical study in a scientific study within the field of Physiotherapy, from the design of the experiment to the analysis of the conclusions.
 5. The most common tools in statistical analysis in research in Health Sciences (Physiotherapy).
2. To demonstrate that he/she knows:
 1. To recognize the need to use Statistics in problems that may arise in an investigation.
 2. To design the experiment and data collection process.
 3. To recognize the most appropriate statistical technique for each problem, apply it correctly, and validate the study carried out.
 4. To interpret and summarize the results appropriately.
 5. To learn when a problem is solved using basic techniques or requires the participation of an expert in Statistics.
 6. To manage a statistical program.
 3. To be able:
 1. To maintain an attitude of learning and improvement.
 2. To show interest and acting in a search for information and self-improvement.
 3. To work responsibly and maintain a critical and scientific attitude.
 4. To collaborate and cooperate with others.

2.2. Learning goals

To pass this subject, the student must demonstrate the following results:

1. He/she is able to critically read a scientific article in the field of physiotherapy (analysis, synthesis and critical scientific reasoning).
2. He/she knows the statistical language and understands basic statistical concepts.
3. He/she is able to perform a descriptive analysis of a set of variables using the appropriate graphical and numerical techniques.
4. He/she knows how to carry out a basic statistical inference analysis (point estimation, estimation by confidence intervals, and hypotheses tests).
5. He/she uses some software for the statistical analysis of a data set.
6. He/she properly interprets and summarizes the results of an analysis.
7. He/she knows how to present the results and conclusions of a simple analysis, that is, he/she is capable of generating knowledge from the information stored in a database.
8. He/she is able to work in a team.
9. He/she knows how to search for relevant documentation in electronic databases, in the field of physiotherapy.
10. He/she has initiative and autonomous learning ability, he/she knows how to adapt the acquired statistical knowledge, and he/she knows his/her limitations.

2.3. Importance of learning goals

Learning goals provide the student with basic instrumental knowledge which allows acquiring knowledge in subsequent subjects in the degree and in his/her professional future in the field of physiotherapy. In the first place, basic knowledge of statistical concepts and techniques is necessary to read and interpret scientific publications, since many of the advances in the field of Health Sciences are supported by research studies based on statistical analysis. In the second place, the course provides a solid foundation for simple data analysis, which can help the student to make decisions in a scientific way and respect methodological issues in scientific research.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he/she has achieved the expected learning goals through the evaluation activities below.

The student will be evaluated globally in each of the two calls to which he/she is entitled and on the assigned dates. These dates will be published on the website, on the notice board of the Faculty of Health Sciences, and on the website MOODLE of the subject.

The course grade will be obtained from the following four evaluation activities (EA):

(EA1) Summary and commentary of a research article on physiotherapy, selected from the databases of electronic

journals accessible to their content on the Internet from the library of the University of Zaragoza.

- Description: Each student carries out this activity in a group of three people and it consists of the selection, summary and enumeration of statistical descriptors, in a physiotherapy research article in which an analysis of data is addressed by means of statistical techniques.
- Timeline:
 1. Choice of the article: at the proposal of the group and with prior confirmation from the teachers, the reference of the chosen article must be submitted. This reference should contain the following: authors, year, title, journal, volume and pages.
 2. Summary and identification of statistical concepts: within 2 weeks from the choice of the article, a PDF file containing the chosen article must be submitted along with a summary that includes the aims of the study, material and methods, and results and conclusions. Furthermore, group members should list what they believe to be statistical concepts, statistical analyses, and statistical results in the article. This list of concepts can be expanded or modified later. Submission will be made on the MOODLE page of the subject.
 3. Description of the statistical concepts: on the last day of class, the group must complete the work by submitting an addendum indicating the statistical concepts listed in the previous point that have been learned in the subject (as already noted, this list may be expanded or modified at this point).
- The following aspects will be taken into account in the evaluation of the activity:
 1. Clarity and accuracy in the description of the article. The literal copy of the original will be negatively valued.
 2. Identification and description of statistical concepts.
 3. Originality and difficulty of the chosen article. If the chosen article is written in English, it will be taken into account.
 4. Presentation, writing and orthography. Accuracy and clarity in writing will be valued and misspellings will be penalized. It will also be valued if the work is partially or totally written in English.
- Exceptions: in a justified way (specially for non-face-to-face teaching students), the work may be carried out by one or two people. Also, submission deadlines may be extended.
- Grade: in the range from 0 to 10 points. This mark will be unique for all members of the group.

(EA2) Individual resolution of practical cases

- Description: this individual activity consists of the resolution of a few practical cases, by using the statistical analysis software R-Commander. Both the proposal of the exercises and their submissions will be done on the MOODLE page of the subject.
- Timeline: for each proposed case, the submission of solutions must be made within 1 week from its proposal.
- Exceptions: in a justified way (specially for non-face-to-face teaching students), submission deadlines may be extended.
- Grade: the sum of the individual grades for each resolution. This sum goes from 0 to 10 points.

(EA3) Individual face-to-face written test, consisting of solving test-type questions with 5 possible answers each, and some theoretical or theoretical-practical questions. The duration of this part is 1 hour and 30 minutes and class notes or books will not be allowed. Rating: from 0 to 10 points.

(EA4) Individual face-to-face practical test using a computer: it consists of solving statistical questions on a database, using the computer as a data analysis tool. The duration of this part is 1 hour and 30 minutes. Class notes and books will be allowed. Rating: from 0 to 10 points.

The course grade will be obtained using the following formula: $C=0.10*AE1+0.20*AE2+0.35*(AE3+AE4)$, that is, the weights of each of the activities in the final grade are 10%, 20%, 35%, and 35%, respectively.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process designed for this subject is based on the combination of lectures in a large group, practical classes with a computer in small groups, and individual and group work, which enhance the co-responsibility and commitment of each one of the group members.

We are committed to a non-rote learning based on:

- the critical reflection of the concepts
- initiative and creativity
- the use of bibliographic sources, and
- a systematic use of statistical methodology.

4.2. Learning tasks

The program offered to the student to help him to achieve the expected results includes the following four activities:

1. Lectures or theoretical classes in a large group (1 ECTS)

They consist of explanation and orientation for the personal study of the different contents of the subject, beyond the mere enumeration of them (motivating a deeper subsequent reflection, seeking the interrelation of concepts, scope and limitations, etc.) with the final aim of training a critical and autonomous learning method.

All available interactive resources and the support of any useful audiovisual support will be used. The student will have the class notes in advance.

2. Face-to-face practical classes in small groups (1 ECTS)

They are based on training on practical assumptions and problem solving individually and in groups, applying the theoretical bases of the subject. The R-Commander data analysis software will be used as a tool and emphasis will be placed on the interpretation of results and conclusions. The student will have in advance the scripts and notes of the practical sessions.

3. Tutoring and monitoring work (individual or in group) (0.5 ECTS)

We encourage the students to personal initiative and creativity, the management of documentary sources, student's reflection on previously learned theoretical aspects, and the structuring of a logical discourse that goes from the approach of a problem to its conclusion. Students can make inquiries in person and through emails or the subject's MOODLE page.

4. Non-face-to-face personal study (3.5 ECTS)

From the rest of the indicated activities, the student must be responsible in creating and consolidating a structured work program, taking into account both the progressive sequence in the theoretical and practical contents of the subject and the interaction with the work programs of other subjects. All this must promote autonomous and critical learning and initiative in the generation of quality knowledge in the field of physiotherapy.

The personal study must consider the preparation of works, documentation search, non-face-to-face work sessions, learning activities, personal study, co-responsibility in group work, etc.

4.3. Syllabus

Chapter 1: Introduction to statistical methods in Health Sciences. Basic terminology.

Chapter 2: One-dimensional descriptive statistics.

Chapter 3: Probability, random variables and probability distributions.

Chapter 4: Inferential statistics: point estimation, confidence interval estimation, and hypothesis tests.

Chapter 5: Relationships between two variables. Descriptive and inferential aspects.

The planning of the subject may be modified for unforeseen reasons (group performance, changes in the academic calendar, etc.) and, therefore, it should not be considered as definitive and closed.

4.4. Course planning and calendar

Schedule of face-to-face sessions and presentation of works:

- Lectures: 2 hours per week throughout the semester.
- Practical classes in small groups: 2 hours per week throughout the semester.
- Submission of individual case studies: 7 days after the proposal.
- Submission of group work: a first part at the end of practice 1 and the rest at the end of the semester.
- Individual global evaluation: at the end of the semester and, where appropriate, in the second call in September.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25643>