FACULTY OF MEDICINE

COURSE SYLLABUS Reg. no U 2019/50
Approved by FUN on 14 February 2019,
applies from 14 February 2019

Research Studies Board, FUN

Applied Statistics I, METSA02

Tillämpad statistik I – allmän inriktning

1,5 credits third cycle

General information

The course provides an introduction to statistical methodology and clear knowledge about commonly used statistical methods that are applicable in medical research. The target group is all doctoral students at the Faculty of Medicine. There are no entry requirements.

Language of instruction

The course is offered alternately in Swedish and English.

Purpose

To provide the participants with an introduction to a statistical mindset, statistical methodology and management of empirical data in a statistical software package. On completion of the course, the participants shall be able to implement and interpret results from basic statistical analyses and critically review elementary statistics in research studies.

Learning outcomes

For a course grade of Pass, the students shall be able to:

- give an account of different types of variable based on the level of measurement and determine how they can be appropriately presented, numerically and graphically
- give an account of the concepts sample, parameter and parameter estimate, and how the uncertainty in estimates (standard error) relates to sample size
- set up null hypotheses and alternative hypotheses and give an account of the concepts: significance level, statistical power, confidence interval and p-value
- in two-group comparisons, select and justify the choice of test (parametric or non-parametric) and know how to carry out analysis using a statistical software package and interpret the results
- discuss the concepts: statistical significance, clinical relevance and generalisability

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Course content

The course has three themes:

1. Introduction to medical statistics
   - Basic statistical concepts
   - Descriptive statistics
   - Study design
   - Generalisability

2. Estimation of parameters and hypothesis testing
   - Basic principles
   - Standard error, p-value, parameter estimation using confidence interval and statistical power
   - Common statistical tests for two-group comparisons
   - Statistically significant relationships, causal relationships and clinical relevance

3. Data management
   - Input and validation of data
   - Documentation
   - Basic handling of a statistical software package (R, SPSS, Stata or equivalent)
   - Reproducible analyses (script-based)

This introductory course discusses issues that can be studied using quantitative methodology and covers common study structures and basic statistical concepts, principles and methods.

The course introduces concepts such as variable, allocation, parameter, randomness and variation. The concepts are illustrated by examples from medical science. Furthermore, there is a discussion about the significance and interpretation of different measures of location and spread, as well as suitable graphic techniques for illustrating and examining properties of the collected data.

Concrete examples from medical science are used to introduce the concept of parameter estimation. Uncertainty in estimates is discussed and described using standard error and confidence interval, and this leads to the introduction of hypothesis testing, interpretation of p-values and statistical power. The course covers common statistical tests for two-group comparisons, e.g. t-test, Mann-Whitney test, Chi-squared test and Fisher's exact test.

Major emphasis is placed on interpretation of results and what conclusions can be drawn based on the concepts of statistical significance, evidence, effect size and generalisability.

Furthermore, the participants are given a practical introduction to a statistical software package. This session focuses in the principles of data management, but the participants also carry out the statistical analyses that are involved in the course.

Course design

The course consists of 3 teaching days, specifically 2 days of lectures and group discussions and 1 for an introduction to data management and analysis. Separate introductions are provided for R, SPSS and Stata.

The participants are expected to choose one of these software packages, or a software package with equivalent functionality, and use it subsequently in statistics courses at a higher level.

Assessment

Written examination and active attendance at teaching sessions.

Grades

Pass or Fail.

Required reading

Kirkwood B and Sterne J. Essential Medical Statistics. Blackwell Science, 2nd edition, 2003. Chapter B: 2-8 and C: 14, 15 and 17.
Available as an e-book at Lund University (see

www.lub.lu.se)

Alternative:

Björk J. Praktisk statistik för medicin och hälsa. Liber, 2010. Chapters 1-10 and 12.