October 26, 2014
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PhD Course in Basic Biostatistics
Exam (J.nr.: 1050/22)

Practical information

Submission options and deadline

Individual solutions should be handed in as a single pdf-file by email to the following email-address:

BBEKSAMEN@BIOSTAT.AU.DK

The pdf-file should be named: fullname.pdf. The file must contain both your written answers and the appendix (see below). If more than one pdf-file is submitted, neither of them will be considered in the evaluation.

Regardless of format, your solution has to be submitted no later than Friday November 21, 2014, at 9 AM.

Guidelines, requirements, and hints for preparing solutions

- Answer all questions. In particular, be aware that some questions comprise several subquestions that all must be addressed.
- Plot the data whenever reasonable using scatter plots, histograms, Q-Q plots, etc.
- Always specify the statistical model used in the analysis. This can either be done using Greek letters or in a verbal description, although in the latter case care should be taken to avoid ambiguity.
- Any quantification of the findings of a statistical analysis in terms of estimates should be accompanied by confidence intervals. Any comparative statement should be backed up by a test and a p-value.
- Model validation is an integral part of any statistical analysis. It is not necessary to ask for relevant model validation to be performed, this should always be done.
- Include the Stata/SPSS commands used for the analysis (the do/syntax-files) and log/output-files in appendices.
- No Stata/SPSS code or output (except graphs) outside the appendix!
- Formulate the conclusions using relevant terms from the context of the study (it is important to be able to translate the findings from the statistical analysis into conclusions regarding the initial scientific question).

Background information on the data

In a clinical trial of a new promising drug Lecxe, 35 patients were randomized to Lecxe and 35 patients were randomized to a placebo 'drug' (Study A). The effect of the treatment was measured as the change (after-before) in the concentration of a specific substance *Tatsoib* in the blood. The objective of the treatment was to increase the level of *Tatsoib*. An increase of 1mg/l was considered clinically important.

The mean change of *Tatsoib* in the Lecxe group was 1.13 (95%CI: 0.46-1.80) mg/l and in the placebo group 0.37 (95%CI: -0.37-1.11) mg/l. The common standard deviation observed in the two groups was 2.1 mg/l. The mean increase in *Tatsoib* for the Lecxe compared to placebo was 0.76(-0.22;1.74) mg/l. This difference was not statistically significant (p=13%).

It was decided to perform a new study on the effect of Lecxe.

1. Based on the results from Study A, how many should be included in each group to find a clinical difference of 1mg/l with a statistical power of 80%?

In the new study it was furthermore decided to include a second generation of the drug labeled Atats.

The file *tatsoib2.dta* contains data concerning of the new study (Study B) with the variables:

variable name	storage type	display format	value label	variable label
age	float	%9.0g		Age (years)
group	float	%9.0g	grouplab	Treatment
before	float	%9.0g		Before Tatsoib in mg/l
after	float	%9.0g		After Tatsoib in mg/l

2. Which of the two measures (after-before) and (after/before) seem the most appropriate measure describing the change in the concentration of *Tatsoib*?

3. Compare the increase in *Tatsoib* of the Lecxe group to the placebo group. Similarly, compare the increase in *Tatsoib* of the Atats group to the placebo group. Create an overall test comparing the increase in *Tatsoib* in the three treatment group.

4. Compare the increase in *Tatsoib* of the Lecxe group to the Atats group.

5. Is the increase in *Tatsoib* of the Lecxe group in the current study (Study B) compatible to the *Tatsoib* increase in the first study (Study A)?

It was expected that the effect of both Lecxe and Atats, as compared to placebo, would be higher for patients aged 50 years and older compared to patients younger than 50 years.

6. Quantify the increase in *Tatsoib* of the Lecxe group compared to the placebo group for patients younger than 50 years.
   Quantify the increase in *Tatsoib* of the Lecxe group compared to the placebo group for patients aged 50 years and older.
   Repeat this analysis for the Atats drug.

7. Compare the difference between Lecxe and Atats for patients younger than 50 years to patients aged 50 years and older.

A number of patients dropped out of the study and had no “after” measurement.

8. Estimate and compare the drop-out frequency between the three treatment groups.

9. Write a brief summary of your analyses and conclusions.