October 31, 2016
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PhD Course in Basic Biostatistics
Exam (J.nr.: 1050/26)

Practical information

Submission 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).

Your solution has to be submitted no later than November 25, 2016, at 9 AM.

Guidelines, requirements, and hints for preparing solutions

- Answer all questions. In particular, be aware that some questions comprise several sub-questions 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.
- 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 commands used for the analysis (the do/syntax-files) and log/output-files in appendices.
  For the log file it is most convenient to use a monospaced font like Courier, Courier New, Lucida Console, Monaco and Consolas.
- No Stata 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

The data is on the weight gain during pregnancy. The data set contains the information listed below on 1660 women, who gave birth later than 36 weeks.

Variable	Obs	Unique	Mean	Min	Max	Label
birthweight	1658	306	3595.531	1540	5490	Birth weight(g)
parity	1660	10	.8801205	0	10	Parity
prepregwei	1660	244	69.00506	39	199	Weight(kg) of woman before pregnancy
height	1635	42	1.675266	1.44	2	Height of woman in (m)
endwei	910	355	84.77692	51.2	166	Weight(kg) of woman just before birth
id	1660	1660	1003.191	1	1998	Unique identifier

Part A

As can be seen the weight just before birth (endwei) is only known for 910 out of the 1660 pregnancies. The reason for the missing weights is unknown, but one could fear that it could lead to bias in the analysis of weight gain during pregnancy.
The midwifes suspect that the pre-birth weight is registered more often for overweight or obese women.

1. Describe and compare the risk of not having registered the pre-birth weight among women who before pregnancy were obese (BMI>30kg/m^2) and non-obese.

2. Write a short conclusion on the association between pre-pregnancy obesity and the risk of not having the pre-birth weight reported.

Part B

Now we turn to the weight gain for the 910 with both pre-pregnancy and pre-birth weight reported. It is in general believed, that the weight gain on average is independent of weight of the woman, i.e. that it is better to measure weight gain on an absolute scale compared to a relative scale.

3. Discuss, based on relevant plots, if the assumption of weight gain on average being independent of weight of the woman is reasonable.

In the rest of this exam we will let weight gain denote the difference between pre-pregnancy and pre-birth weight, i.e. `weightgain=endwei-prepregwei.`

4. Give a short description of the weight gain including a 95%-prediction interval.

Consider the association between parity and weight gain. To keep it simple we will just compare the women giving birth for the first time to the rest.

5. Describe the difference in weight gain between the two groups.

6. Write a short conclusion on the association between parity and weight gain.

Part C

It seems reasonable to assume that some of the variation in the weight gain is associated with the size of the child and it would be of interest to compare the weight gain in the two parity groups adjusting for birth weight.
A first step is to try to model the association between weight gain and birth weight by a linear regressions in each of the parity groups.

7. Do this for the 'first pregnancy' group.

8. Write a conclusion including interpretations of all the parameters in the model. The conclusion should also contain estimates of the weight gain for a woman having her first child weighing 3500 g and the expected difference in weight gain for two women where one woman gives birth to child weighing 3200g and the other 3700g.

One could make a similar analysis for the women not giving birth for the first time – you do not need to do this.

9. Make a comparison of the weight gain in the two parity groups adjusting linearly for birth weight.

10. Write a conclusion summarizing the analyses in question 5 and 9.