

# Longitudinal Data Analysis

## Assignment 1: Continuous Longitudinal Data 2021–2022

### 1 Introduction on Renal transplant data

The dataset contains information on 1160 patients who received a renal graft (kidney transplant). The patients have been followed for at most 10 years.

### 2 Data file

- SAS file renal.sas7bdat
- Variables:
  1. ID: identification number
  2. MALE: 0=female, 1=male
  3. AGE: Age at transplantation
  4. CARDIO: has the patient experienced a cardio-vascular problem during the years preceding the transplantation? 0=no, 1=yes
  5. REJECT: has the patient shown symptoms of graft rejection during the first three months after the transplantation? 0=no, 1=yes
  6. Hc0: Haematocrit level at moment of transplantation
  7. Hc06: Haematocrit level 6 months after transplantation
  8. Hc1, Hc2, ..., Hc10: Haematocrit level 1 year, 2 years, ..., 10 years after transplantation

### 3 Assignments

1. Describe the data, and use graphical techniques to explore the mean structure, the variance structure and the correlation structure. Summarize your conclusions. What are the implications with respect to statistical modelling ?
2. What summary statistics are appropriate for the analysis of these data ? Why ? Do they yield the same results ? Summarize your conclusions.
3. Fit a multivariate model, and find the most parsimonious mean structure which can be used to describe the average evolutions in the data. What covariance structures are applicable in this case ? What is the most parsimonious structure you can find ?
4. Use an explicit two-stage analysis to get an initial impression about trends and effects of covariates.
5. Formulate a plausible random-effects model. Fit your model, and compare the results with those from the multivariate model. Check the appropriateness of your random-effects model. Calculate the subject-specific intercepts/slopes and compare them with the ones you obtained from a two-stage analysis. What do you conclude ?

### 4 General remarks

- For each question, motivate your choice of techniques, estimation methods, assumptions you make, and describe possible advantages/disadvantages, problems.
- For each of the above questions, summarize your conclusions and report them to a clinician.
- Carefully reflect on the parameterization of your models.
- Do you have any recommendations with respect to future similar experiments ?