

**LAB 3: GEE software - GENMOD**

In this lab we will analyze the backpain data. This is a simulated dataset patterned after the back pain example from the course. The variables in the dataset are:

Doctor – Doctor ID number.

Cost – Cost of treatment in dollars.

Logcost – Logarithm of cost.

Actlim – Number of days in the past six months in which activity has been limited.

Undrstnd – Did the patient understand the doctor's advice (1=yes, 0=no)

Age – Age of the patient.

Educ – Education of the patient (0 means  $\leq 12$  years, 1 means 13-16 years, 2 means  $\geq 16$  years education).

Thoraic – Whether the back pain was cervical/thoraic or other (1=yes, 0=no).

Pracstyl – Practice style of the doctor (0=low, 1=medium, 2=high frequency of prescription of medicines and hospitalization for treatment of back pain).

- 1) Analyze the response Undrstnd using SAS Proc GENMOD. For now we will ignore the fact that we have multiple observations per doctor.
  - a) Declare Educ and Pracstyl to be categorical predictors.
  - b) Fit a model with Age, Educ and Pracstyle as predictors
  - c) Provide an interpretation of the coefficient for age.
- 2) Analyze the response Actlim using SAS Proc GENMOD. Follow the steps as in question 1)
- 3) Repeat questions 1) and 2) but now add an extra line below the model statement: `repeated subject=doctor / type=exch;`  
What is the purpose of this command? What differences do you notice?

```
proc genmod data=work.backpain descending;
  class educ pracstyl;
  model undrstnd=educ pracstyl age/ type3 dist=bin;
run;
proc genmod data=work.backpain descending;
  class educ pracstyl doctor;
  model undrstnd=educ pracstyl age/type3 dist=bin;
  repeated subject=doctor/ corrw type=exch;
run;
proc genmod data=work.backpain;
  class educ pracstyl;
  model actlim=educ pracstyl age /type3 dist=poisson;
run;
proc genmod data=work.backpain;
  class educ pracstyl doctor;
  model actlim=educ pracstyl age / type3 dist=poisson;
  repeated subject=doctor/ corrw type=exch;
run;
```

```
library(gee)
library(MASS)
bpain<-read.table("backpain.txt", header=TRUE)
bpain<-bpain[order(bpain[, "Doctor"]),]
bpain$Educf<-factor(bpain$Educ)
#GEE analyses for Understand
gee(Undrstnd ~ Age + Educf, family=binomial, data=bpain, id=Doctor)
gee(Undrstnd ~ Age + Educf, family=binomial, data=bpain, id=Doctor,
corstr="exchangeable")
```