

SUPPLEMENTARY MATERIAL

Modeling ordinal longitudinal outcomes: an applied perspective of marginal and conditional approaches

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This file contains supplementary material for this article. The material consists of R and SAS code to duplicate the analyses reported in the article.

Communications regarding the code should be e-mailed to the authors at E-mail: nivea.bispo@gmail.com

```
#####  
## Syntax related to the analyses presented in section 4.1 of the paper ##  
#####
```

```
#####  
# MARGINAL MODEL #  
#####
```

```
# The syntax to adjust the partial proportional odds model in SAS was  
the following:
```

```
libname a 'c:\';  
proc print data=a.infection_SAS;  
run;  
data infec2; set a.infection_SAS;  
do; if resp=1 then new_resp=1;  
else new_resp=0; logtype=1; output; end;  
do; if resp=1 or resp=2 then new_resp=1;  
else resp=0; logtype=2; output; end;  
run;  
  
proc print data=infec2;  
run;  
  
proc genmod descending order=data;  
class Id group logtype;  
model new_resp= grupo age Phase logtype  
      logtype*group logtype*age logtype*Phase/  
      link=logit dist=bin type3;  
repeated subject=Id / logor=exch;  
run;
```

```
#####  
# CONDITIONAL MODEL #  
#####
```

In R this analysis was conducted using the following code:

```
require(ordinal)  
  
# Testing the assumption of proportional odds model  
  
b1 <- clmm2(ordered(Poliparasit) ~ 1, nominal = ~ Group + Age + Phase,  
  data = infec, link = "logistic", nAGQ = 50, random = factor(Id),  
  Hess = TRUE, threshold = "flexible")  
  
b2 <- clmm2(ordered(Poliparasit) ~ Group + Age + Phase, random = factor(Id),  
  nAGQ = 50, Hess = TRUE, threshold = "flexible")  
  
anova(b1,b2)  
  
# If the proportional odds assumption of the model is rejected, we should fit  
# the partial proportional odds (PPO) model.  
  
# function for PPO  
end_model <- clmm2(ordered(Poliparasit) ~ 1, nominal = ~ Group + Age + Phase,  
  data = infec, link = "logistic", nAGQ = 50, random = factor(Id), Hess = TRUE,  
  threshold = "flexible")  
  
summary(end_model)
```

```
#####
## Syntax related to the analyses presented in section 4.2 of the paper. ##
#####
```

For this application all models were fitted using R software.

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#####
```

```
# MARGINAL MODEL #
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#####
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```
require(geepack)
```

```
require(repolr)
```

```
m1 <- ordgee(ordered(response) ~ Time + Group + age, id = id,
  mean.link = "logit", corstr = "exchangeable", int.const = TRUE,
  rev = TRUE)
summary(m1)
```

```
m2 <- ordgee(ordered(response) ~ Time + Group + age, id = id,
  mean.link = "logit", corstr = "unstructured", int.const = TRUE,
  rev = TRUE)
summary(m2)
```

```
m3 <- ordgee(ordered(response) ~ Time + Group + age, id = id,
  mean.link = "logit", corstr = "independence", int.const = TRUE,
  rev = TRUE)
summary(m3)
```

```
# Testing the assumption of the proportional odds model
```

```
a <- repolr(formula = response ~ Time + Group + age, subjects = "id",
  data = vas, categories = 3, times = c(1,2,3,4,5,6,7,8,9), corstr = "uniform",
  po.test = TRUE, fixed = FALSE)
summary(a[["gee"]])
```

```
#####
```

```
# CONDITIONAL MODEL #
```

```
#####
```

```
require(ordinal)
```

```
glm <- clm(response ~ Group + age, data = vas)
summary(glm)
```

```
glmm1 <- clmm(ordered(response) ~ Time + Group + age + (1|id), nAGQ = 50,
  Hess = TRUE, threshold = "flexible")
summary(glmm1)
anova(glm, glmm1)
```

```
glmm2 <- clmm(ordered(response) ~ Time + Group + age + (1|id) + (1|Tempo),
  Hess = TRUE, threshold = "flexible")
summary(glmm2)
anova(glmm1, glmm2)
```

```
# Testing the assumption of the proportional odds model

adj1 <- clmm2(ordered(response) ~ Time + Group + age, random = factor(id),
  nAGQ = 50, Hess = TRUE, threshold = "flexible")

adj2 <- clmm2(ordered(resp_eva) ~ 1, nominal = ~ Tempo + Grupo + age_pac,
  data = vas, link = "logistic", nAGQ = 50, random = factor(id),
  Hess = TRUE, threshold = "flexible")

anova(adj1, adj2)
```