Addiction - Multinomial Model with Hierarchically Structured Response

February 8, 2012

First the "addiction" data are loaded and attached.

```
> library(catdata)
> data(addiction)
> attach(addiction)
```

For the Multinomial Model with hierarchically structured response we use simple Logit Models. For the first model, which models the effect of categories 0 and 1 versus 2, a new response "ill01" is created. In addition the variable "age2" for the squared effect of age is created.

```
> ill01 <- ill
> ill01[ill==0] <- 1
> ill01[ill==2] <- 0
> age2 <- age^2
```

Now the model for categories 0 and 1 versus 2 is fitted.

```
> m01vs2 <- glm(ill01 ~ as.factor(gender) + as.factor(university) + age + age2,
+ family=binomial())
> summary(m01vs2)

Call:
glm(formula = ill01 ~ as.factor(gender) + as.factor(university) +
    age + age2, family = binomial())

Deviance Residuals:
    Min      1Q   Median      3Q      Max
-1.9573   0.5416   0.6492   0.7702   1.0774

Coefficients:
                        Estimate Std. Error z value
(Intercept)            2.1788569  0.5145020   4.235
as.factor(gender)1    -0.0171594  0.1828231  -0.094
as.factor(university)1 0.0894869  0.2067492   0.433
age                   -0.0342091  0.0255108  -1.341
age2                   0.0001307  0.0002881   0.454
                      Pr(>|z|)
```

```
(Intercept)             2.29e-05 ***
as.factor(gender)1         0.925
as.factor(university)1     0.665
age                        0.180
age2                       0.650
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 756.98  on 681  degrees of freedom
Residual deviance: 736.74  on 677  degrees of freedom
  (30 observations deleted due to missingness)
AIC: 746.74

Number of Fisher Scoring iterations: 4
```

For the next model the data set has to be reduced, only observations with response categories 0 or 1 are needed. Then the variable "age2" is built.

```
> detach(addiction)
> addiction2 <- addiction[addiction$ill!=2,]
> attach(addiction2)
> age2 <- age^2
```

Finally the model for categories 0 versus 1 is fitted.

```
> m0vs1 <- glm(ill ~ as.factor(gender) + as.factor(university) + age + age2,
+ family=binomial())
> summary(m0vs1)

Call:
glm(formula = ill ~ as.factor(gender) + as.factor(university) +
    age + age2, family = binomial())

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.3539  -0.9427   0.5316   0.8918   1.9496

Coefficients:
                        Estimate Std. Error z value
(Intercept)           -3.5468017  0.5443388  -6.516
as.factor(gender)1     0.5433231  0.2054682   2.644
as.factor(university)1 1.4655504  0.2600787   5.635
age                    0.1719897  0.0283914   6.058
age2                  -0.0017344  0.0003341  -5.191
                        Pr(>|z|)
(Intercept)            7.23e-11 ***
as.factor(gender)1      0.00819 **
as.factor(university)1 1.75e-08 ***
age                    1.38e-09 ***
```

```
age2                    2.10e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 689.93  on 515  degrees of freedom
Residual deviance: 583.94  on 511  degrees of freedom
  (27 observations deleted due to missingness)
AIC: 593.94

Number of Fisher Scoring iterations: 4
```