Stat 8053, Fall 2013: Proportional Odds Model

```
 library(car)
 library(MASS)
 library(effects)
 Womenlf$partic <- factor(Womenlf$partic,
      levels=c("not.work", "parttime", "fulltime"))
 mod.polr <- polr(partic ~ log(hincome) + children, data=Womenlf)
 summary(mod.polr)
```

```
Call:
polr(formula = partic ~ log(hincome) + children, data = Womenlf)

Coefficients:
                 Value Std. Error t value
log(hincome)    -0.666      0.233   -2.86
childrenpresent -1.948      0.287   -6.80

Intercepts:
                  Value  Std. Error t value
not.work|parttime -2.747  0.654     -4.200
parttime|fulltime -1.837  0.640     -2.869

Residual Deviance: 441.12
AIC: 449.12
```

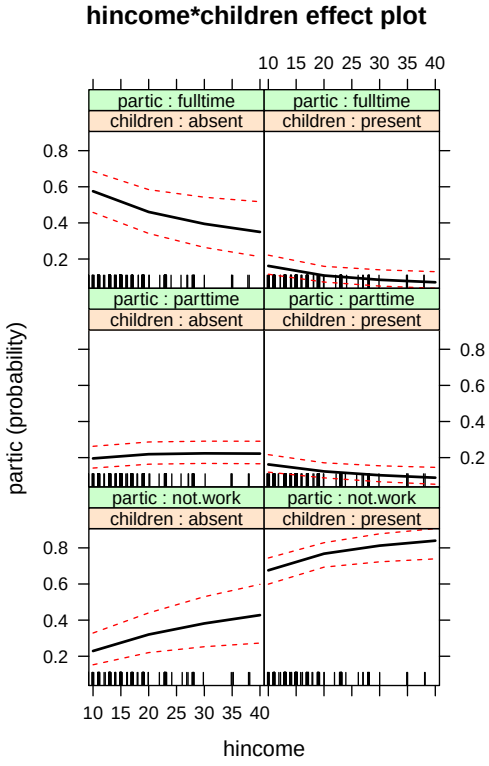
```
 library(nnet)
 mod.multinom <- multinom(partic ~ log(hincome) + children, data=Womenlf)
```

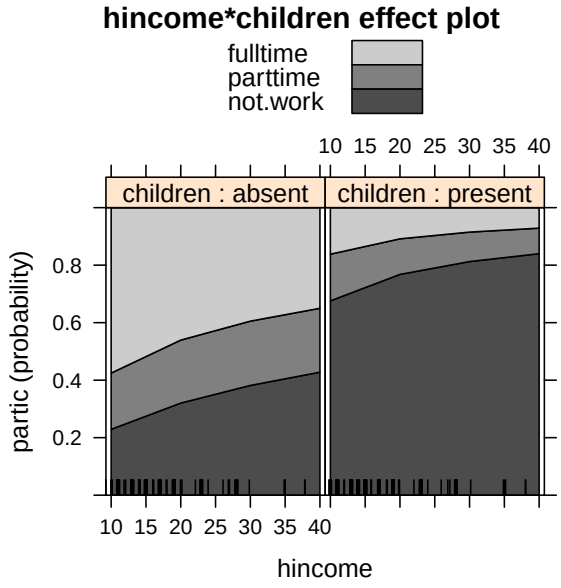
```
# weights:  12 (6 variable)
initial  value 288.935032
iter  10 value 212.336493
final  value 212.316905
converged
```

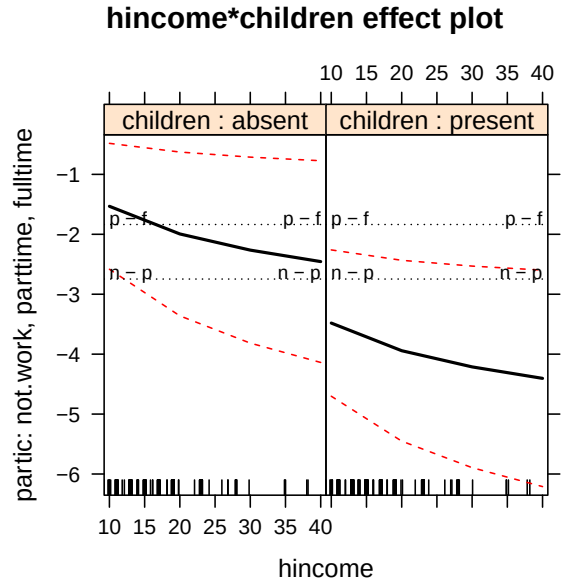
```
 pchisq(deviance(mod.polr) - deviance(mod.multinom), df = 6 - 4, lower.tail=FALSE)
```

```
[1] 0.0002637
```

```
plot(effect("log(hincome)*children", mod.polr))

plot(effect("log(hincome)*children", mod.polr), style="stacked",colors=grey(c(.3, .5, .8)))

plot(effect("log(hincome)*children", mod.polr, latent=TRUE))
```







Happiness Data

Data from Agresti (2013), Table 8.5. Subjects between age 18–22 from the General Social Survey. `race` is white or black. `trauma` is the number of traumatic events in the last year, between 0 and 5. `happy` is a factor with levels "very happy", "pretty happy" and "not too happy". $n = 79$.

```
loc <- "http://www.stat.umn.edu/~sandy/courses/8053/Data/aatab85.Rda"
load(url(loc))
str(aatab85)
```

```
'data.frame':        97 obs. of  3 variables:
 $ race  : Factor w/ 2 levels "white","black": 1 1 1 1 1 1 1 1 1 1 ...
 $ trauma: int  0 0 0 0 0 0 0 0 0 0 ...
 $ happy : Factor w/ 3 levels "very happy","pretty happy",..: 1 1 1 1 1 1 1 2 2 2 ...
```

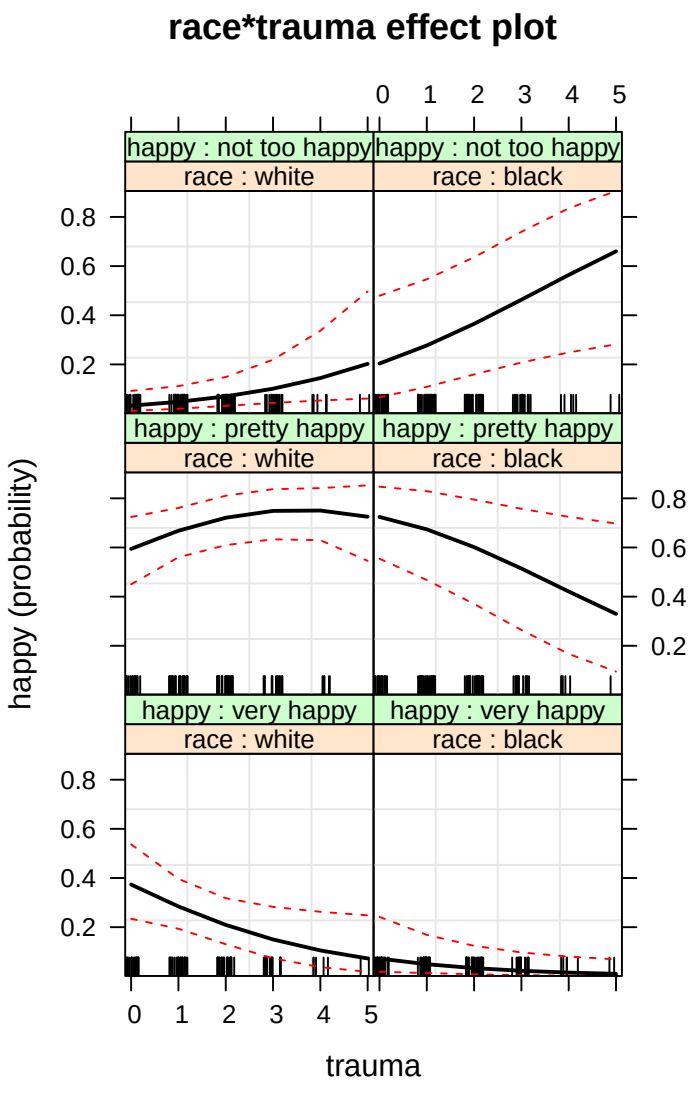
```
summary(h1 <- polr(happy ~ race + trauma, aatab85))
```

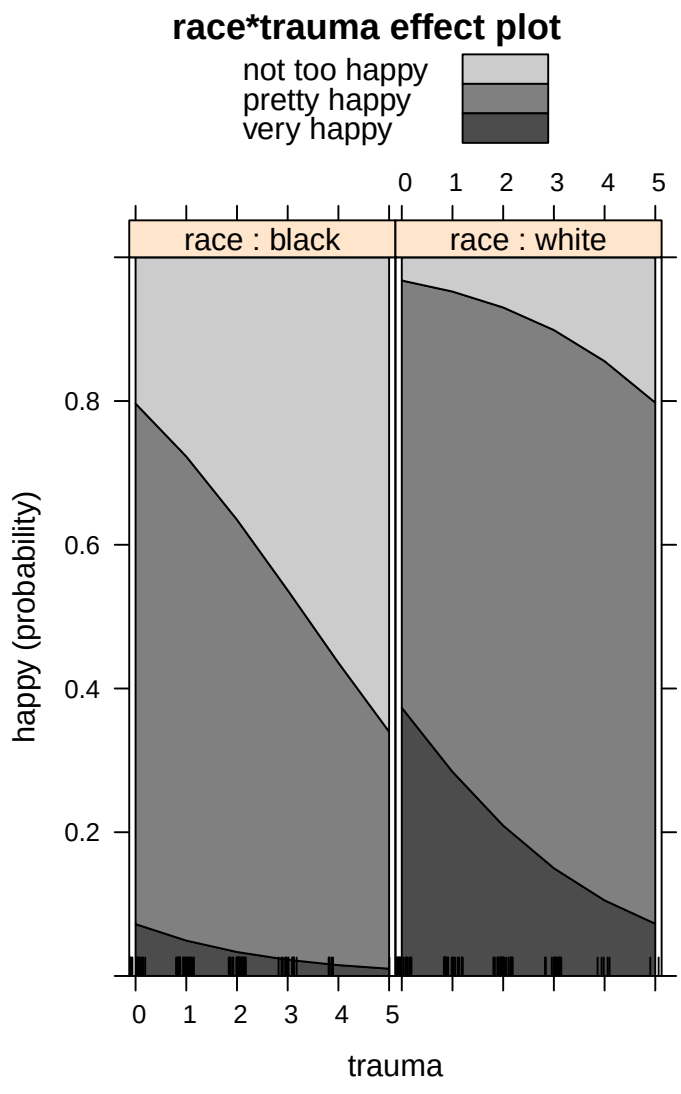
```
Call:
polr(formula = happy ~ race + trauma, data = aatab85)

Coefficients:
          Value Std. Error t value
raceblack 2.036      0.686    2.97
trauma    0.406      0.183    2.22

Intercepts:
                           Value  Std. Error t value
very happy|pretty happy    -0.518  0.340     -1.524
pretty happy|not too happy  3.401  0.568      5.987

Residual Deviance: 148.41
AIC: 156.41
```

```
Anova(h2 <- update(h1, ~ (.)^2))
```

```
Analysis of Deviance Table (Type II tests)

Response: happy
            LR Chisq Df Pr(>Chisq)
race            9.23  1     0.0024
trauma          5.07  1     0.0244
race:trauma     1.05  1     0.3056
```

```
plot(effect("race:trauma", h1), grid=TRUE, row=1, col=1, nrow=1, ncol=2, more=TRUE)
plot(effect("race:trauma", h1), style="stacked",colors=grey(c(.3, .5, .8)),
    row=1, col=2, nrow=1, ncol=2, more=FALSE)
```


race*trauma effect plot
happy : not too happy
race : white
happy : not too happy
race : black
happy : pretty happy
race : white
happy : pretty happy
race : black
happy : very happy
race : white
happy : very happy
race : black
happy (probability)
trauma


race*trauma effect plot
not too happy
pretty happy
very happy
race : black
race : white
happy (probability)
trauma