Nuevos doctores en matemáticas en Estados Unidos

J. Ramajo

2020

library(alr4)

## Loading required package: car

## Loading required package: carData

## Loading required package: effects

## Registered S3 methods overwritten by 'lme4':  
## method from  
## cooks.distance.influence.merMod car   
## influence.merMod car   
## dfbeta.influence.merMod car   
## dfbetas.influence.merMod car

## lattice theme set by effectsTheme()  
## See ?effectsTheme for details.

dim(AMSsurvey)

## [1] 24 5

# Reordenación de los niveles de acuerdo el número de Tesis en cada nivel  
AMSsurvey$type <- factor(AMSsurvey$type, levels=levels(AMSsurvey$type)[order(xtabs(count ~ type, AMSsurvey))])  
#  
AMSsurvey

## type sex citizen count count11  
## 1 I(Pu) Male US 132 148  
## 2 I(Pu) Female US 35 40  
## 3 I(Pr) Male US 87 63  
## 4 I(Pr) Female US 20 22  
## 5 II Male US 96 161  
## 6 II Female US 47 53  
## 7 III Male US 47 71  
## 8 III Female US 32 28  
## 9 IV Male US 71 89  
## 10 IV Female US 54 55  
## 11 Va Male US 34 42  
## 12 Va Female US 14 21  
## 13 I(Pu) Male Non-US 130 136  
## 14 I(Pu) Female Non-US 29 32  
## 15 I(Pr) Male Non-US 79 82  
## 16 I(Pr) Female Non-US 25 26  
## 17 II Male Non-US 89 116  
## 18 II Female Non-US 50 56  
## 19 III Male Non-US 53 61  
## 20 III Female Non-US 39 30  
## 21 IV Male Non-US 122 153  
## 22 IV Female Non-US 105 115  
## 23 Va Male Non-US 28 27  
## 24 Va Female Non-US 12 17

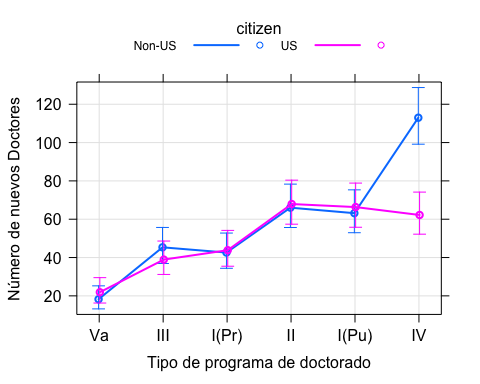
#  
Po\_PHDs <- glm(count ~ type\*sex + type\*citizen, poisson, AMSsurvey)  
S(Po\_PHDs)

## Call: glm(formula = count ~ type \* sex + type \* citizen, family = poisson, data  
## = AMSsurvey)  
##   
## Coefficients:  
## Estimate Std. Error z value Pr(>|z|)   
## (Intercept) 2.4696 0.2282 10.820 < 2e-16 \*\*\*  
## typeIII 1.1732 0.2668 4.397 1.10e-05 \*\*\*  
## typeI(Pr) 0.6296 0.2814 2.237 0.025281 \*   
## typeII 1.3976 0.2570 5.438 5.39e-08 \*\*\*  
## typeI(Pu) 0.9713 0.2664 3.646 0.000266 \*\*\*  
## typeIV 2.1606 0.2449 8.824 < 2e-16 \*\*\*  
## sexMale 0.8690 0.2336 3.719 0.000200 \*\*\*  
## citizenUS 0.1823 0.2141 0.852 0.394423   
## typeIII:sexMale -0.5265 0.2805 -1.877 0.060486 .   
## typeI(Pr):sexMale 0.4363 0.2878 1.516 0.129553   
## typeII:sexMale -0.2234 0.2652 -0.843 0.399502   
## typeI(Pu):sexMale 0.5404 0.2721 1.986 0.047011 \*   
## typeIV:sexMale -0.6753 0.2570 -2.627 0.008609 \*\*   
## typeIII:citizenUS -0.3347 0.2634 -1.271 0.203829   
## typeI(Pr):citizenUS -0.1539 0.2545 -0.605 0.545486   
## typeII:citizenUS -0.1540 0.2450 -0.628 0.529746   
## typeI(Pu):citizenUS -0.1332 0.2411 -0.553 0.580477   
## typeIV:citizenUS -0.7790 0.2413 -3.228 0.001247 \*\*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## (Dispersion parameter for poisson family taken to be 1)  
##   
## Null deviance: 521.4440 on 23 degrees of freedom  
## Residual deviance: 1.9568 on 6 degrees of freedom  
##   
## logLik df AIC BIC   
## -69.67 18 175.35 196.55   
##   
## Number of Fisher Scoring iterations: 4  
##   
## Exponentiated Coefficients and Confidence Bounds  
## Estimate 2.5 % 97.5 %  
## (Intercept) 11.8181818 7.3656398 18.0615580  
## typeIII 3.2322087 1.9422542 5.5457446  
## typeI(Pr) 1.8767773 1.0915138 3.3017073  
## typeII 4.0456356 2.4849722 6.8250189  
## typeI(Pu) 2.6412459 1.5888484 4.5280440  
## typeIV 8.6762019 5.4739235 14.3302472  
## sexMale 2.3846154 1.5270945 3.8323506  
## citizenUS 1.2000000 0.7896619 1.8333786  
## typeIII:sexMale 0.5906406 0.3372017 1.0156596  
## typeI(Pr):sexMale 1.5469534 0.8731954 2.7079792  
## typeII:sexMale 0.7998005 0.4698766 1.3330588  
## typeI(Pu):sexMale 1.7167339 0.9967119 2.9060599  
## typeIV:sexMale 0.5090282 0.3034469 0.8339725  
## typeIII:citizenUS 0.7155797 0.4257249 1.1975882  
## typeI(Pr):citizenUS 0.8573718 0.5191107 1.4108114  
## typeII:citizenUS 0.8573141 0.5287585 1.3844084  
## typeI(Pu):citizenUS 0.8752621 0.5439479 1.4025257  
## typeIV:citizenUS 0.4588840 0.2848878 0.7353123

#  
Anova(Po\_PHDs)

## Analysis of Deviance Table (Type II tests)  
##   
## Response: count  
## LR Chisq Df Pr(>Chisq)   
## type 233.336 5 < 2.2e-16 \*\*\*  
## sex 182.983 1 < 2.2e-16 \*\*\*  
## citizen 5.923 1 0.01494 \*   
## type:sex 71.169 5 5.851e-14 \*\*\*  
## type:citizen 26.075 5 8.628e-05 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#  
plot(Effect(c("type", "citizen"), Po\_PHDs), multiline=TRUE, ci.style="bars", main="", xlab="Tipo de programa de doctorado", ylab="Número de nuevos Doctores", rescale.axis=FALSE, grid=TRUE)



#  
plot(Effect(c("type", "sex"), Po\_PHDs), multiline=TRUE, ci.style="bars", main="", xlab="Tipo de programa de doctorado", ylab="Número de nuevos Doctores", rescale.axis=FALSE, grid=TRUE)

