EJEMPLO MODELO LOGISTICO DATOS ALIMENTACION EN BEBES

```
> library(faraway)
> data(babyfood)
> babyfood
  disease nondisease  sex   food
1      77        381  Boy Bottle
2      19        128  Boy  Suppl
3      47        447  Boy Breast
4      48        336 Girl Bottle
5      16        111 Girl  Suppl
6      31        433 Girl Breast
```

Datos en dos columnas

```
> xtabs(disease/(disease+nondisease)~sex+food,babyfood)
      food
sex         Bottle     Breast      Suppl
  Boy  0.16812227 0.09514170 0.12925170
  Girl 0.12500000 0.06681034 0.12598425
```

Las probabilidades a modelar son las de **enfermarse**

```
> md1<-glm(cbind(disease,nondisease)~sex+food,family=binomial,babyfood)
> summary(md1)

Call:
glm(formula = cbind(disease, nondisease) ~ sex + food, family = binomial,
    data = babyfood)

Deviance Residuals:
      1        2        3        4        5        6
 0.1096  -0.5052   0.1922  -0.1342   0.5896  -0.2284

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -1.6127     0.1124 -14.347  < 2e-16 ***
sexGirl      -0.3126     0.1410  -2.216   0.0267 *
foodBreast   -0.6693     0.1530  -4.374 1.22e-05 ***
foodSuppl    -0.1725     0.2056  -0.839   0.4013

    Null deviance: 26.37529  on 5  degrees of freedom
Residual deviance:  0.72192  on 2  degrees of freedom
AIC: 40.24
Number of Fisher Scoring iterations: 4
```

Los parámetros estimados tienen signo negativo, por lo que tienen un efecto protector.

```
> ###para interpretar los coeficientes
> exp(-0.313)
[1] 0.7312499
> exp(md1$coefficients[2])
 sexGirl
0.731577
> #En las ninas  los momios de enfermarse   son  un 73 %   de los momios en  los ninos
> exp(c(-.313-1.96*0.141, -.313+1.96*0.141 ))
[1] 0.5546822 0.9640231


> exp(-0.669)
[1] 0.5122205
> exp(md1$coefficients[3])
foodBreast
 0.5120696
> exp(c(-.669-1.96*0.153, -.669+1.96*0.153 ))
[1] 0.3795078 0.6913424
```

```
> exp(-0.1725)
[1] 0.8415583
> exp(md1$coefficients[4])
foodSuppl
0.8415226
> exp(c(-.1725-1.96*0.205, -.1725+1.96*0.205 ))
[1] 0.5630989 1.2577193
> fitted(md1)
         1          2          3          4          5          6
0.16621356 0.14365654 0.09262485 0.12727653 0.10931093 0.06948992


                              > ### Este es el modelo saturado
> mdfull<-glm(cbind(disease,nondisease)~sex*food,family=binomial,babyfood)
> summary(mdfull)

Call:
glm(formula = cbind(disease, nondisease) ~ sex * food, family = binomial,
    data = babyfood)

Deviance Residuals:
[1]  0  0  0  0  0  0

Coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)        -1.59899    0.12495 -12.797  < 2e-16 ***
sexGirl            -0.34692    0.19855  -1.747 0.080591 .
foodBreast         -0.65342    0.19780  -3.303 0.000955 ***
foodSuppl          -0.30860    0.27578  -1.119 0.263145
sexGirl:foodBreast -0.03742    0.31225  -0.120 0.904603
sexGirl:foodSuppl   0.31757    0.41397   0.767 0.443012

    Null deviance: 2.6375e+01  on 5  degrees of freedom
Residual deviance: 2.6401e-13  on 0  degrees of freedom
AIC: 43.518
Number of Fisher Scoring iterations: 3

                              > ### Este es el modelo nulo
> mdnull<-glm(cbind(disease,nondisease)~1,family=binomial,babyfood)
> summary(mdnull)

Call:
glm(formula = cbind(disease, nondisease) ~ 1, family = binomial,
    data = babyfood)

Deviance Residuals:
      1       2       3       4       5       6
 3.3810  0.5419 -1.4044  0.6221  0.3917 -3.4839

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.04307    0.06889  -29.66   <2e-16 ***

    Null deviance: 26.375  on 5  degrees of freedom
Residual deviance: 26.375  on 5  degrees of freedom
AIC: 59.893

Number of Fisher Scoring iterations: 4
```

```
> # modelo con una variable
>   md2<-glm(cbind(disease,nondisease)~sex ,family=binomial,babyfood)
> summary(md2)

Call:
glm(formula = cbind(disease, nondisease) ~ sex, family = binomial,
    data = babyfood)

Deviance Residuals:
       1         2         3         4         5         6
 2.32857  -0.03126  -2.41107   1.75294   1.04279  -2.34573

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.89991    0.08966 -21.190   <2e-16 ***
sexGirl     -0.32613    0.14036  -2.323   0.0202 *

    Null deviance: 26.375  on 5  degrees of freedom
Residual deviance: 20.899  on 4  degrees of freedom
AIC: 56.417

Number of Fisher Scoring iterations: 4
> fitted(md2)
        1         2         3         4         5         6
0.1301183 0.1301183 0.1301183 0.0974359 0.0974359 0.0974359



> # modelo con una variable
>   md3<-glm(cbind(disease,nondisease)~food,family=binomial,babyfood)
> summary(md3)

Call:
glm(formula = cbind(disease, nondisease) ~ food, family = binomial,
    data = babyfood)

Deviance Residuals:
       1         2         3         4         5         6
 1.16335   0.05492   1.08856  -1.32306  -0.05930  -1.18475

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.74676    0.09693 -18.022  < 2e-16 ***
foodBreast  -0.67645    0.15281  -4.427 9.57e-06 ***
foodSuppl   -0.17435    0.20531  -0.849    0.396

    Null deviance: 26.375  on 5  degrees of freedom
Residual deviance:  5.699  on 3  degrees of freedom
AIC: 43.217

Number of Fisher Scoring iterations: 4

> fitted(md3)
         1          2          3          4          5          6
0.14845606 0.12773723 0.08141962 0.14845606 0.12773723 0.08141962
```

Para selección de variables

```
> anova(md1)
Analysis of Deviance Table

Model: binomial, link: logit

Response: cbind(disease, nondisease)

Terms added sequentially (first to last)


     Df Deviance Resid. Df Resid. Dev
NULL                     5    26.3753
sex   1   5.4761         4    20.8992
food  2  20.1772         2     0.7219
```

#Aquí modelo la probabilidad de NO enfermarse

```
> md1bis<-glm(cbind(nondisease, disease)~food+sex,family=binomial,babyfood)
> summary(md1bis)

Call:
glm(formula = cbind(nondisease, disease) ~ food + sex, family = binomial,
    data = babyfood)

Deviance Residuals:
      1        2        3        4        5        6
-0.1096   0.5052  -0.1922   0.1342  -0.5896   0.2284

Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   1.6127     0.1124  14.347  < 2e-16 ***
foodBreast    0.6693     0.1530   4.374 1.22e-05 ***
foodSuppl     0.1725     0.2056   0.839   0.4013
sexGirl       0.3126     0.1410   2.216   0.0267 *

    Null deviance: 26.37529  on 5  degrees of freedom
Residual deviance:  0.72192  on 2  degrees of freedom
AIC: 40.24

Number of Fisher Scoring iterations: 4
```