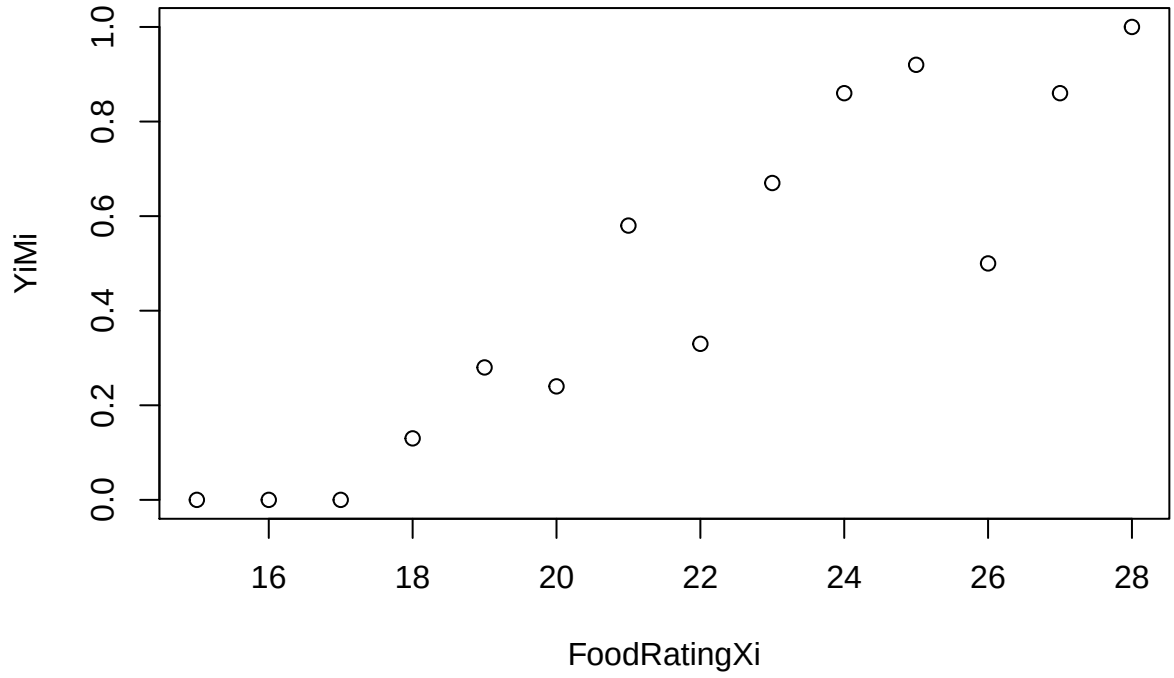
GLM Sheather

```
michelin <- read.table("michelin.csv", header=T,sep=";")
attach(michelin)
```

```
head(michelin)
```

```
##   FoodRatingXi InMichelinYi MiYi Mi YiMi
## 1           15            0    1  1 0.00
## 2           16            0    1  1 0.00
## 3           17            0    8  8 0.00
## 4           18            2   13 15 0.13
## 5           19            5   13 18 0.28
## 6           20            8   25 33 0.24
```

```
plot(FoodRatingXi,YiMi)
```



Logistic regresion output from R

```
Michelin.food <- glm(cbind(InMichelinYi,MiYi) ~ FoodRatingXi, family = binomial)
```

```
summary(Michelin.food)
```

```
##
## Call:
## glm(formula = cbind(InMichelinYi, MiYi) ~ FoodRatingXi, family = binomial)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.4850  -0.7987  -0.1679   0.5913   1.5889
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -10.84154    1.86236  -5.821 5.84e-09 ***
## FoodRatingXi   0.50124    0.08768   5.717 1.08e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 61.427  on 13  degrees of freedom
## Residual deviance: 11.368  on 12  degrees of freedom
## AIC: 41.491
##
## Number of Fisher Scoring iterations: 4
```

```
knitr::include_graphics("fit_model.PNG")
```

The fitted model is

$$\hat{\theta}(x) = \frac{1}{1+\exp(-\{\hat{\beta}_0 + \hat{\beta}_1 x\})} = \frac{1}{1+\exp(-\{-10.842+0.501x\})}$$

Figure 8.2 shows a plot of the of the sample proportions of "success" (i.e., inclusion in the Michelin guide) against x, Zagat food rating. The fitted logistic regression model is marked on this plot as a smooth curve.

Rearranging the fitted model equation gives the log(odds) or logit

$$\log\left(\frac{\hat{\theta}(x)}{1-\hat{\theta}(x)}\right) = \hat{\beta}_0 + \hat{\beta}_1 x = -10.842+0.501x$$