

15.WAIS

```
library(mosaic)
```

Exercise 15.WAIS.

Referring to exercise 15.3 in Agresti, one of the WAIS subtests called *picture completion*, asks questions about 20 pictures that have one vital detail missing. It is considered a test of attention to fine detail.

The observations for 20 subjects on (x,y) , where x =picture completion score(0-20) and y =symptoms of senility(1=yes):

```
pictSen <-  
read.table("https://asta.math.aau.dk/datasets?file=pictSen.csv",header=T)  
pictSen
```

```
##      pictComplScore  senility  
## 1                7          1  
## 2                5          1  
## 3                3          1  
## 4                8          1  
## 5                1          1  
## 6                2          1  
## 7                9          1  
## 8                3          1  
## 9                6          1  
## 10               4          1  
## 11               6          0  
## 12               9          0  
## 13               7          0  
## 14               7          0  
## 15              10          0  
## 16              12          0  
## 17              14          0  
## 18               8          0  
## 19               8          0  
## 20              11          0
```

- Assume a simple logistic model and estimate the logistic regression equation.

```
mod <- glm(senility ~ pictComplScore, data = pictSen, family = binomial)  
coef(summary(mod))
```

```
##              Estimate Std. Error  z value  Pr(>|z|)  
## (Intercept)   5.426569  2.6279764  2.064923 0.03893027  
## pictComplScore -0.772115  0.3578408 -2.157706 0.03095074
```

- Why is there a significant effect of picture completion on symptoms?
 - **p-value is small.**
- Estimate the probability that symptoms are present when (i) $x=0$, (ii) $x=20$.
 - (i) $\text{ilogit}(5.4266)=0.9956212$.

- (ii) $\text{ilogit}(5.4266 - 0.7721 * 20) = 4.4704128 \times 10^{-5}$.
- Over what range of x-scores is the estimated probability of senility greater than 50%?
 - It is greater than 50% for any score below:

```
a <- 5.4266
b <- -0.7721
-a/b
```

```
## [1] 7.028364
```

- Estimate the effect of a one-unit increase in picture completion on the odds of senility symptoms.
 - For every one-unit increase in picture completion the odds decrease approximately 50%:

```
exp(b)-1
```

```
## [1] -0.5379582
```

- Provide a 95% confidence interval of this effect.
 - From the model output we know the std. error of the effect is 0.358. An approximate 95% confidence interval is:

```
exp(b+c(-2, 2)*0.358)-1
```

```
## [1] -0.77419873 -0.05455541
```