# Lista Exercícios 3a

Resolver os exercícios 4.1 e 4.2 do livro-texto, páginas 121 a 125 (2ª edição,2007).

**4.1** A study used logistic regression to determine characteristics associated with $Y =$ whether a cancer patient achieved remission (1 = yes). The most important explanatory variable was a labeling index ($LI$) that measures proliferative activity of cells after a patient receives an injection of tritiated thymidine. It represents the percentage of cells that are "labeled." Table 4.8 shows the grouped data. Software reports Table 4.9 for a logistic regression model using $LI$ to predict $\pi = P(Y = 1)$.

**a.** Show how software obtained $\hat{\pi} = 0.068$ when $LI = 8$.

**b.** Show that $\hat{\pi} = 0.50$ when $LI = 26.0$.

**c.** Show that the rate of change in $\hat{\pi}$ is 0.009 when $LI = 8$ and is 0.036 when $LI = 26$.

**d.** The lower quartile and upper quartile for $LI$ are 14 and 28. Show that $\hat{\pi}$ increases by 0.42, from 0.15 to 0.57, between those values.

**e.** When $LI$ increases by 1, show the estimated odds of remission multiply by 1.16.

**Table 4.8. Data for Exercise 4.1 on Cancer Remission**

| LI | Number of Cases | Number of Remissions | LI | Number of Cases | Number of Remissions | LI | Number of Cases | Number of Remissions |
|---|---|---|---|---|---|---|---|---|
| 8 | 2 | 0 | 18 | 1 | 1 | 28 | 1 | 1 |
| 10 | 2 | 0 | 20 | 3 | 2 | 32 | 1 | 0 |
| 12 | 3 | 0 | 22 | 2 | 1 | 34 | 1 | 1 |
| 14 | 3 | 0 | 24 | 1 | 0 | 38 | 3 | 2 |
| 16 | 3 | 0 | 26 | 1 | 1 | | | |

*Source*: Reprinted with permission from E. T. Lee, *Computer Prog. Biomed.*, **4**: 80–92, 1974.

**Table 4.9. Computer Output for Problem 4.1**

| Parameter | Estimate | Standard Error | Likelihood Ratio 95% Conf. Limits | | Chi-Square |
|---|---|---|---|---|---|
| Intercept | −3.7771 | 1.3786 | −6.9946 | −1.4097 | 7.51 |
| li | 0.1449 | 0.0593 | 0.0425 | 0.2846 | 5.96 |

| Source | DF | LR Statistic Chi-Square | Pr > ChiSq |
|---|---|---|---|
| li | 1 | 8.30 | 0.0040 |

| Obs | li | remiss | n | pi_hat | lower | upper |
|---|---|---|---|---|---|---|
| 1 | 8 | 0 | 2 | 0.06797 | 0.01121 | 0.31925 |
| 2 | 10 | 0 | 2 | 0.08879 | 0.01809 | 0.34010 |
| .... | | | | | | |

**4.2** Refer to the previous exercise. Using information from Table 4.9:

**a.** Conduct a Wald test for the $LI$ effect. Interpret.

**b.** Construct a Wald confidence interval for the odds ratio corresponding to a 1-unit increase in $LI$. Interpret.

**c.** Conduct a likelihood-ratio test for the $LI$ effect. Interpret.

**d.** Construct the likelihood-ratio confidence interval for the odds ratio. Interpret.

**BOM ESTUDO!!!**