

Solutions to exercises

Exercise 12.3

The response y is “ideal number of kids”. The explanatory variable is religion. Taking no religion to be the reference group, we introduce the dummy variables

$$\begin{aligned}z_1 &= \begin{cases} 1 & \text{if Christian,} \\ 0 & \text{otherwise.} \end{cases} \\z_2 &= \begin{cases} 1 & \text{if Muslim,} \\ 0 & \text{otherwise.} \end{cases} \\z_3 &= \begin{cases} 1 & \text{if Jewish,} \\ 0 & \text{otherwise.} \end{cases} \\z_4 &= \begin{cases} 1 & \text{if other religion,} \\ 0 & \text{otherwise.} \end{cases}\end{aligned}$$

The prediction equation then becomes:

$$E(y|z_1, \dots, z_4) = \alpha + \beta_1 z_1 + \beta_2 z_2 + \beta_3 z_3 + \beta_4 z_4.$$

Exercise 12.5

- (a) The response y is “number of good friends” and the explanatory variable is “how often. . .” with three categories.
- i) We formulate the hypothesis that there is no association between the number of good friends and how often one goes to a bar or tavern.
 - ii) We find the F-statistic in Table 12.23: $F=3.03$.
 - iii) From Table 12.23, the p-value is 0.049.
 - iv) Since the p-value is just below the significance level of 0.05, we reject the hypothesis and conclude that there is an association between number of friends and how often one goes to a bar.
- (b) One of the assumptions of the one-way ANOVA model is that the standard deviation is the same in all three groups. Comparing the estimated sd's in Table 12.23, shows that this assumption may be violated. (Since number of friends is a count variable, there may also be problems with the normality assumption, but this is probably less important).
- (c) Taking “never” to be the reference group, we define

$$\begin{aligned}z_1 &= \begin{cases} 1 & \text{if very often,} \\ 0 & \text{otherwise.} \end{cases} \\z_2 &= \begin{cases} 1 & \text{if occasional,} \\ 0 & \text{otherwise.} \end{cases}\end{aligned}$$

Exercise 12.11

The response y is “hours a day watching TV”. The explanatory variables are sex and race. The observed means for each combination of sex and race are:

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##          female male
## white    2.66 2.62
## black    3.48 3.14
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The tests in Table 12.27 show a significant effect of race but not of sex. This is consistent with the table, which shows that there is a difference between the means for black and white within each gender group, but no difference between men and women within each race group.