1. (a) \[ 30.800 \pm 2.179 \times \frac{4.782}{\sqrt{5}} = 30.800 \pm 4.660 = (26.140, 35.460) \]

(b) \[ R^2 = \frac{70.0}{344.4} = .203 \]

(c) No, because all confidence intervals contain zero.

(d) No, because the null hypothesis for the global test cannot be rejected with any reasonable level of alpha (p-value = .256).

(e) Conduct Kruskal-Wallis test.

\[ H_0: \eta_1 = \eta_2 = \eta_3 \text{ vs. } H_1: \eta_i \neq \eta_j \text{ for some } i \neq j \]

\[ R_1 = 45, R_2 = 26.5, R_3 = 48.5 \]

\[ H^* = \frac{12}{15(15+1)} \left[ \frac{(45)^2}{5} + \frac{(26.5)^2}{5} + \frac{(48.5)^2}{5} \right] - 3(15+1) = 2.795 \]

RR: \(|H \geq \chi^2_{10,2} = 4.60517\}

Retain \(H_0\).

2. (a) \[ SS_{xx} = 9463 - \frac{(251)^2}{8} = 1587.875 \]

\[ SS_{xy} = 17612 - \frac{(251)(589)}{8} = -867.875 \]

\[ \hat{\beta}_1 = \frac{-867.875}{1587.875} = -0.5466 \]

\[ \hat{\beta}_0 = \frac{589}{8} - (-0.5466) \left( \frac{251}{8} \right) = 90.7746 \]

\[ \hat{y} = 90.775 - 0.547x \]

(b) \[ \hat{y} = 90.0 - 0.5(30) = 75.0 \]

\[ 75.0 \pm 1.943(26.2) \sqrt{1 + \frac{1}{8} + \frac{(30 - 31.375)^2}{1587.875}} = 75.0 \pm 54.023 = (20.977, 129.023) \]

(c) \[ H_0: \rho_s = 0 \text{ vs. } H_1: \rho_s \neq 0 \]

\[ \Sigma_j d_j^2 = 106 \]

\[ r_s^* = 1 - \frac{6(106)}{8(64 - 1)} = 1 - 1.262 = -.262 \]

RR: \{|r_s| \geq r_s(.05/2,8) = .738\}

Retain \(H_0\).

3. Conduct Wilcoxon rank-sum test for independent samples.

\[ H_0: \eta_1 - \eta_2 = 0 \text{ vs. } H_1: \eta_1 - \eta_2 < 0 \]

\[ T_1 = 36 \text{ with } n_1 = 7 \]

\[ T_2 = 42 \text{ with } n_2 = 5 \text{ (test statistic)} \]

RR: \(|T \leq 20 \cup T \geq 45\} \text{ (This is for one-sided } \alpha = .025) \]

With \(\alpha = .01\), still retain \(H_0\).
4. (a) \( H_0: \beta_1 = \beta_2 = \cdots = \beta_5 = 0 \) vs. \( H_1: \beta_i \neq 0 \) for some \( i \neq 0 \)
\[
F^* = \frac{98035498}{412277} = 237.790
\]
RR: \( \{F \geq F_{0.01,5,11} = 5.32\} \)
Reject \( H_0 \).

(b) \( R^2_a = 1 - \left[ \frac{17 - 1}{17 - (5 + 1)} \right] (1 - .991) = .987 \)

(c) \( \hat{\beta}_1 = -15.85 \). As the average daily patient load increases by 1, the monthly worker hours are expected to decrease by 15.85. This does not make intuitive sense.

(d) Multicollinearity exists among the predictor variables.

5. (a) See below.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>( F^* )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>1155.63</td>
<td>1155.63</td>
<td>10.63</td>
<td>.002</td>
</tr>
<tr>
<td>Smoke</td>
<td>1</td>
<td>51.12</td>
<td>51.12</td>
<td>0.47</td>
<td>.499</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>18.49</td>
<td>18.49</td>
<td>0.17</td>
<td>.685</td>
</tr>
<tr>
<td>Error</td>
<td>36</td>
<td>3915.30</td>
<td>108.76</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>5139.78</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

(b) Only the main effect of gender is significant (\( p \)-value = .002). Inspection of the marginal means indicate that women have significantly higher pulse rates (\( \bar{y}_F = 76.95 \)) than do men (\( \bar{y}_M = 66.20 \)).

6. Conduct Wilcoxon signed-rank test for paired samples.
\( H_0: \eta_D = 0 \) vs. \( H_1: \eta_D \neq 0 \)
\( T_+ = 19 \)
\( T_- = 2 \) (test statistic)
RR: \( \{T \leq 2\} \)
Reject \( H_0 \).

7. (a) F: \( \hat{y} = 57.1 + 1.51x_1 \)
    M: \( \hat{y} = 38.0 + 1.86x_1 \)
(b) F: \( \hat{y} = 57.1 + 1.51x_1 \)
    M: \( \hat{y} = 57.7 + 1.51x_1 - 19.7 + 0.35x_1 = 38.0 + 1.86x_1 \)
These prediction equations are the same as those in (a).
(c) Model 1: \( t_{.05/2,8} = 2.306 \)
    Model 2: \( t_{.05/2,16} = 2.120 \)
By combining the two groups, \( df_e \) become larger and, hence, the powers of inferential tests can be improved.