Statistics 104
Sample problems for Chapter 10

Reading: December 8 – December 10 Sections 10.2

Problem:

1. A major medical center in the Northeastern U.S. conducted a study looking at blood cholesterol levels and incidence of heart attack. Below are data from 16 people who had a heart attack and 20 people who did not have a heart attack.

<table>
<thead>
<tr>
<th>(1) Heart Attack</th>
<th>(2) No Heart Attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>242 186 266 206</td>
<td>182 222 198 192 238</td>
</tr>
<tr>
<td>318 294 282 234</td>
<td>198 188 166 204 182</td>
</tr>
<tr>
<td>224 276 262 360</td>
<td>178 202 164 230 186</td>
</tr>
<tr>
<td>310 280 248 258</td>
<td>162 182 218 170 200</td>
</tr>
</tbody>
</table>

a) Is this an experiment or an observational study? Explain briefly.
b) Compute 5-number summaries for each group.
c) Construct side-by-side box plots. Compare the two groups in terms of center and spread.
d) Describe how the individuals in the study need to be selected in order for the randomization condition to be met.

Below are summary statistics for the two groups.

<table>
<thead>
<tr>
<th>(1) Heart Attack</th>
<th>(2) No Heart Attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \bar{y}_1 = 265.375 )</td>
<td>( \bar{y}_2 = 193.1 )</td>
</tr>
<tr>
<td>( s_1 = 43.645 )</td>
<td>( s_2 = 21.623 )</td>
</tr>
<tr>
<td>( n_1 = 16 )</td>
<td>( n_2 = 20 )</td>
</tr>
</tbody>
</table>

e) Is there sufficient evidence to indicate that the mean cholesterol for people who have had a heart attack is greater than that for people who have not had a heart attack? Perform the appropriate test of hypothesis. Use \( df = 20 \) and \( \alpha = 0.05 \). Note: the normal distribution condition is satisfied.
f) Construct a 95% confidence interval for the difference between the population mean cholesterol levels. Give and interpretation of this interval.
g) Do the results of the hypothesis test in e) and those of the confidence interval in f) agree? Explain briefly.

2. An article in the Journal of the American Medical Association examined whether the true body temperature is 98.6 degrees Fahrenheit and if there are differences between men and women in terms of body temperature. JMP was used to analyze the data on separate random samples of 65 men and 65 women. The output is on the next page.

a) Give the sample means and sample standard deviations for the two groups, men (M) and women (F).
b) Compare the two samples in terms of center and spread.
c) Report the values of the 95% confidence interval for the difference between the population mean body temperatures for men and women. According to this interval could the difference in population mean body temperatures be zero? Explain briefly.
d) Test the hypothesis that the difference in population mean body temperatures is zero against and alternative that the difference is not zero. Be sure to include all the steps for a test of hypothesis.

e) Are the results of the test of hypothesis consistent with those for the confidence interval in c)? Explain briefly.

### Women (F)

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<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Body Temperature °F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>97</td>
<td>98</td>
<td>99</td>
<td>100</td>
</tr>
<tr>
<td>Count</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>20</td>
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</table>

### Men (M)

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#### Descriptive Statistics

**Women (F)**
- Minimum: 96.4
- 0.0% quartile: 98
- Median: 98.4
- 25.0% quartile: 98
- 50.0% quartile: 98.8
- 75.0% quartile: 99.7
- Maximum: 100.8

**Men (M)**
- Minimum: 96.3
- 0.0% quartile: 97.6
- Median: 98.1
- 25.0% quartile: 98.6
- 50.0% quartile: 99.5
- Maximum: 100

**Histograms**

#### Inferential Statistics

**Women (F)**
- Mean: 98.393846
- Std Dev: 0.7434878
- N: 65

**Men (M)**
- Mean: 98.104615
- Std Dev: 0.6987558
- N: 65

**Difference**
- 0.28923
- t Ratio: 2.28543
- Std Err Dif: 0.12655
- DF: 127.5103
- Upper CL Dif: 0.53965
- Prob > |t|: 0.0239*
- Lower CL Dif: 0.03881
- Prob > t: 0.0120*
- Confidence: 0.95
- Prob < t: 0.9880