AMS 7: Discussion Section 1

(a) See handout for questions & additional info. Census.gov has population info.

<table>
<thead>
<tr>
<th>Year</th>
<th># Cancer deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>331,000</td>
</tr>
<tr>
<td>1985</td>
<td>462,000</td>
</tr>
</tbody>
</table>

1. Absolute comparison: new - old

\[ \frac{\text{new} - \text{old}}{\text{old}} = \frac{131,000}{331,000} = \frac{1}{3} = 0.33 = 33\% \]

There were 131K more cancer deaths in 1985 in the U.S. than in 1970. (True)

2. Relative comparison: how much larger in percentage terms

\[ \frac{\text{new}}{\text{old}} = \frac{131,000}{331,000} \approx 0.396 = 39.6\% = 40\% \]

This cannot be attributed to population growth alone.

Intuition: U.S. population rise in same period was smaller than 40%.

(b) Variable: things you measure (your height is a variable of you)

Cost/Benefit tradeoff: i.e., PSA is a cheap but inaccurate way to detect prostate cancer

Circumference \to radius \to diameter (cheapest method)

Height

Volume: \( v = \pi r^2 h \)

Geometry models:

(c) Seattle: Cost of living (gas price)

Omaha: Quality of mass transit

Atlanta: Weather

Crime rate

Entertainment

(d) Weight: yes

Height: no

(e) 20 beats \( \frac{4 \text{ sec}}{1 \text{ min}} = 80 \text{ b/min} \)

80 beats \( \frac{60 \text{ sec}}{65 \text{ sec}} = 73.85 \text{ b/min} \)

39 beats \( \frac{60 \text{ sec}}{30 \text{ sec}} = 78 \text{ b/min} \)

65 sec \( \frac{60 \text{ sec}}{1 \text{ min}} = 73.85 \text{ b/min} \)
Section 2c: \[
\begin{bmatrix}
1 \\
2 \\
q \\
\end{bmatrix}
\]

<table>
<thead>
<tr>
<th>( n = 3 )</th>
<th>Subtract ( \bar{y} = 4 )</th>
<th>( n = 3 )</th>
<th>Subtract ( \bar{y} = 0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \bar{y} )</td>
<td>( \bar{y} )</td>
<td>( \bar{y} )</td>
<td>( \bar{y} )</td>
</tr>
</tbody>
</table>

old mean \( \bar{y} \)

\[
\begin{bmatrix}
y_1 \\
y_2 \\
y_3 \\
\end{bmatrix}
\]

new mean \( \bar{y} \)

\[
\frac{(y_1 - \bar{y}) + (y_2 - \bar{y}) + \ldots + (y_n - \bar{y})}{n} = \frac{1}{n} \sum_{i=1}^{n} (y_i - \bar{y})
\]

\[
= \frac{1}{n} \left[ (y_1 - \bar{y}) + (y_2 - \bar{y}) + \ldots + (y_n - \bar{y}) \right] = \frac{1}{n} \left[ n \bar{y} + \sum_{i=1}^{n} y_i + \bar{y} \right] = 0
\]

mean \( \bar{y} \)

so \( n \bar{y} = (y_1 + y_2 + \ldots + y_n) \)

Discussion

<table>
<thead>
<tr>
<th>new grouping</th>
<th>value</th>
<th>(raw) freq.</th>
<th>count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3.8</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.9</td>
<td>1</td>
<td></td>
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<td>4.0</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4.1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
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<td>4.3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Sum = \( n = 29 \)

stem & leaf plot by Tukey
\[ ^\circ F = \frac{9}{5} ^\circ C + 32 \]

\[ y = mx + b \]

![Graph showing temperature conversion]

- Add 10 to the original graph.
- Multiply the result by 2.
- The center of the graph is changed and multiplied by 2.
- The shape remains the same.

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Compass degrees are...

- Continuous
- No "twice as south"

Quantitative:

- Interval scale