Today: Significance Testing

Wednesday: Comparing 2 samples

HW Due Wed May 24: Disc. Sec. D (Tue May 23 8:30-9:40 am) &
E (Tue May 23 10-11:10 am) Rescheduled this week only (see
web page for details)

Case Study 13

<table>
<thead>
<tr>
<th>Pop</th>
<th>Null True</th>
<th>Sample</th>
<th>Imag. Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>All UCSD students</td>
<td></td>
<td>The observed student</td>
<td></td>
</tr>
<tr>
<td>in Fall 1977</td>
<td></td>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>N=</td>
<td></td>
<td>Like SRS</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Like IID</td>
<td></td>
</tr>
<tr>
<td>$1's$</td>
<td></td>
<td>$\frac{1}{2}$</td>
<td></td>
</tr>
<tr>
<td>$0's$</td>
<td></td>
<td>$\frac{1}{2}$</td>
<td></td>
</tr>
</tbody>
</table>

Mean $p = 33\%$

TID

$\hat{p} = \frac{n_1}{n} = \frac{1}{100}$

Long Run Mean: EV of $\hat{p}$

$E_{\text{TID}} = p = 33\%$

Long Run SD: SE of $\hat{p}$

$SE_{\hat{p}}(\hat{p}) = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(.33)(.67)}{100}} = 0.0477$

$Z$ Test: 2-tailed

test ($p = 0.5\%$) This is the critical value of $p$ if null is true

Mr. FA preferred to ask women

Null Hypothesis (His Sampling Method is like SRS)

Alternative Hyp (Not)
Case Study 13.12 (FPP Section 20.6)

The Machinery: A small-sample refinement

Population

All possible measurements in this day

Sample

The observed

Imag. Doh

Possible y's

\[ N = \begin{bmatrix} 78 \cr 68 \cr 72 \cr 98 \end{bmatrix} \]

Like IID

\[ \begin{bmatrix} \bar{y} \cr \bar{y} \cr \bar{y} \cr \bar{y} \end{bmatrix} \]

\[ \text{Co Concentration} \]

\[ \text{Mean } \bar{y} = 77.8 \]

\[ \text{SD } \bar{y} = ? \]

\[ s \]

\[ \text{Pop Hist} \]

\[ \mu \]

\[ \text{Inferential Summary} \]

Quantity of interest

\[ \mu : \text{True reading of span gas today} \]

Estimate

\[ \bar{y} = 77.8 \text{ ppm} \]

Give or take

\[ SE(\bar{y}) = \frac{s}{\sqrt{n}} = 3.6 \text{ ppm} \]

95% CI for

\[ \bar{y} \pm 2 \times SE(\bar{y}) \]

Not 2 but 2.78 (4 degrees of freedom)

Convert to SU in Long Run Hist

\[ z = \frac{\bar{y} - \mu}{SE} \]

Normal Curve

Long Run Hist of \( z \)

Small \( n \)

One + curve for each value of \( n \): The right + curve w/n obs.

\( n-1 \) degrees of freedom
0.05% CI \( \bar{y} \pm 2.78 \frac{SE(y)}{\sqrt{n}} \) w/ 2.5% Area in right tail

7.78 ppm \pm 2.78 (3.6 ppm)

77.8 \pm 10

\[ \begin{array}{ccc}
77.8 & 77.8 & 87.8 \\
\end{array} \]

Some evidence machine near 67.8 \( \oplus \) 70 needing recalibration.