§11.1: Comparing Counts (Chi-Square)

Skills

- Conduct a hypothesis test using the Chi Square procedures (Goodness of Fit)
Qualitative Data

Focus on one value and you get proportions
What if you want to focus on all of the values?
We need a way to measure how unusual the whole distribution is…
Acme Toy Company prints baseball cards. The company claims that 30% of the cards are rookies, 60% veterans, and 10% are All-Stars. The cards are sold in packages of 100.
<table>
<thead>
<tr>
<th>Type</th>
<th>Rookie</th>
<th>Veteran</th>
<th>All-Star</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>30</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>Type</td>
<td>Rookie</td>
<td>Veteran</td>
<td>All-Star</td>
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</table>
The Chi Square Distribution’s Shape

This shape is not constant – it depends on some things.
This is handled by the **degrees of freedom**
For the GOF test, DF is the number of categories minus 1
The higher the DF, the closer the Chi Square gets to being normal
The Chi Square Distribution

Mean: the same as the degrees of freedom!

Standard Deviation: the square root of twice the degrees of freedom

Shape: varies…mostly skew right
The Chi Square Goodness of Fit Hypothesis Test

\[ H_0: \text{the actual distribution is the same as some given distribution} \]
\[ H_a: \text{the actual distribution is not the same as some given distribution} \]

Requirements:
- Random Sample*
- All expected counts \( \geq 5 \)

An ABC News Poll asked adults whether they felt that genetically modified food was safe to eat. 35% said it was safe; 52% said that it was not safe; and 13% had no opinion.
The same question was given to a random sample of 120 adults at the State Fair.
Example

At the fair, 40 people said that it was safe; 60 said that it was not safe; and 20 had no opinion. Is there evidence that State Fair attendees have a different opinion on the safety of genetically modified food?