17% of youth have asthma
Claim: 83% of youth don’t have asthma.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Asthma</th>
<th>No asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed (O)</td>
<td>88</td>
<td>312</td>
</tr>
<tr>
<td>Cases (sample data)</td>
<td>( n = 400 )</td>
<td></td>
</tr>
<tr>
<td>Expected (E)</td>
<td>( E = 0.17(400) = 68 )</td>
<td>( E = 0.83(400) = 332 )</td>
</tr>
<tr>
<td>(based on ( H_0 ))</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Statistic

\[
\chi^2 = \sum \frac{(O - E)^2}{E}
\]

\[
\chi^2 = \sum \frac{(O - E)^2}{E} = \frac{(88 - 68)^2}{68} + \frac{(312 - 332)^2}{332}
\]

Test Stat: \( \chi^2 = 7.0872 \)

\[
(\frac{\hat{p} - p}{\sqrt{\hat{p}(1 - \hat{p})}} = 2.66217)
\]

\[
(z = 2.66217^2 = 7.0871)
\]

→ When there are 2 outcomes \( \chi^2 = z^2 \).

→ Advantage of this test → it allows 2 or more outcomes.

→ We need a critical value. Use the \( \chi^2 \) distribution.

This is always a right tailed test since the T.S. is large when \( H_0 \) is false.

Degrees of freedom: \( \# \) of random observations (O)

One degree of freedom

We have \( O = 88 \), \( \# O = 312 \). Only one is random since \( 312 = 400 - 88 \).