

## Goodness of Fit

### *Null and alternative hypotheses*

- $H_0$ : The stated distribution is correct
- $H_a$ : The stated distribution is not correct

### *Calculating $\chi^2$*

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

$$\text{Degrees of freedom} = \# \text{categories} - 1$$

#### Validity requirements

$\chi^2$  tests are valid if:

- Random data
- 10% rule  
 $n \leq 0.1N$
- Large counts  
 Expected counts  $> 5$

## Two-Way Tables

### Test for Homogeneity

#### *Null and alternative hypotheses*

- $H_0$ : There is no difference in the distribution of the categories
- $H_a$ : There is a difference in the distribution of the categories

#### *Calculating Expected Counts & Degrees of Freedom*

$$\text{Expected Count} = \frac{(\text{Row total})(\text{Column total})}{\text{Table total}}$$

$$\text{Degrees of freedom} = (\# \text{rows} - 1)(\# \text{columns} - 1)$$

#### Calculator Note

- $\chi^2$  cdf P-value from  $\chi^2$
- $\chi^2$  GOF-Test G'ness Fit
- $\chi^2$ -Test Ind. & Homog.

### Test for Independence

Same as above, except:

#### *Null and alternative hypotheses*

- $H_0$ : There is no association among the categories (they are independent)
- $H_a$ : There is an association among the categories (they are not independent)