

# Difference of proportions

Let  $p_1$  and  $p_2$  represent the proportions of binary outcomes of two independent groups. The difference

is:  $\hat{p}_1 - \hat{p}_2$  with  $\hat{p}_1 = X_1/n_1$  and  $\hat{p}_2 = X_2/n_2$

standard error:

$$se(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

test of significance:

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{se(\hat{p}_1 - \hat{p}_2)} \sim N(0, 1)$$

$$H_0: p_1 = p_2$$

Large sample  $100(1-\alpha)\%$  confidence interval:

$$\hat{p}_1 - \hat{p}_2 \pm Z_{\alpha/2} se(\hat{p}_1 - \hat{p}_2)$$

For more details and going further, see  
for ex Agresti; An Introduction to  
Contingency Tables