

## 2-PROPORTION Z TEST

*This test is used to compare proportions from 2 independent samples.*

In a study done in Michigan, it was determined 38 (out of 62) poor children who attended preschool needed social services later in life compared to 49 (out of 61) poor children who did not attend preschool.

**Does this study provide significant evidence that preschool reduces the need for social services later in life?**

### P) IDENTIFY POPULATION PARAMETERS:

$p_1$  = proportion of preschooled children requiring social services

$p_2$  = proportion of children not preschooled requiring social services

### H) STATE HYPOTHESES:

$H_0 : p_1 = p_2$

$H_a : p_1 < p_2$

### A) VERIFY CONDITIONS REQUIRED FOR TEST:

a) SRS

*This is not known so we must be cautious with our conclusions.*

b) Normal Sampling Distribution:

$$n_1 \hat{p}_1 \geq 5$$

$$n_1 (1 - \hat{p}_1) \geq 5$$

$$n_2 \hat{p}_2 \geq 5$$

$$n_2 (1 - \hat{p}_2) \geq 5$$

$$(62)(.63) \geq 5?$$

$$(62)(.37) \geq 5?$$

$$(61)(.80) \geq 5?$$

$$(61)(.20) \geq 5?$$

$$38 \geq 5 \checkmark$$

$$23 \geq 5 \checkmark$$

$$49 \geq 5 \checkmark$$

$$12 \geq 5 \checkmark$$

c)  $N > 10n$

$N_1 > 10n_1 > 10(62) > 620$ ... probably?

$N_2 > 10n_2 > 10(61) > 610$ ... probably?

**T) PERFORM TEST USING**

a) **TABLE C**

Calculate z-statistic and compare to critical value from Table C:

$$\hat{p}_1 = 38/62 = .6129 \qquad \hat{p}_2 = 49/61 = .8033$$

$$\hat{p} = \frac{\text{total number of success in both samples}}{\text{total number of observations in both samples}} = \frac{87}{123} = .7073$$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{.6129 - .8033}{\sqrt{.7073(.2927)\left(\frac{1}{62} + \frac{1}{61}\right)}} = -2.32$$

P-value < .02

b) **CALCULATOR:**

STAT ---> TESTS ---> 6: 2-Prop Z Test ---> P-value = .0102

**S) STATE CONCLUSION:**

There is strong (but not overwhelming evidence) that preschool reduces the future need for social services. We can reject  $H_0$  at  $\alpha = .05$  but not at  $\alpha = .01$ .

**CONFIDENCE INTERVAL (Use PAIS):**

Construct a 95% confidence interval for the difference in proportions of people needing social services after attending preschool:

STAT ---> TESTS ---> B: 2-Prop Z Int = (-.35, -.03)

*We are 95% confident that the percentage of people needing social service after attending preschool was between 3% and 35% less than those who did not attend preschool. (The interval is wide because the samples are quite small.)*