Hypothesis Test with Two Proportions Worksheet

MTH 112: Introduction to Statistics II
Hypothesis Test of Two Proportions Worksheet

In clinical trials of Nasonex, 750 randomly selected pediatric patients (ages 3 to 11 years old) were randomly divided into two groups. Group 1 (experimental group) received 100 mcg of Nasonex, while the patients in Group 2 (control group) received a placebo. Of the 374 patients in the experimental group, 64 reported headaches as a side effect. Of the 376 patients in the control group, 68 reported headaches as a side effect. The researcher is trying to determine if there is enough pervasive evidence to conclude at α = 0.05 that there is a difference in the proportion of headache sufferers taking Nasonex than those taking the placebo.

1. Find the proportion of headache sufferers in each group.

$\hat{p}_N = \frac{64}{374} = 0.171$ $\quad\quad$ $\hat{p}_P = \frac{68}{376} = 0.181$

2. How can you verify that the sample sizes are large enough?

$n_N\hat{p}_N \geq 10$	$n_N(1-\hat{p}_N) \geq 10$	$n_P\hat{p}_P \geq 10$	$n_P(1-\hat{p}_P) \geq 10$
$374(0.171) \geq 10$	$374(1-0.171) \geq 10$	$376(0.181) \geq 10$	$376(1-0.181) \geq 10$
$63 \geq 10$	$310 \geq 10$	$67 \geq 10$	$307 \geq 10$

All four criteria are true, therefore the sample size is large enough.

3. Construct a 90% confidence interval for the difference between the two population proportions.

$$CI = (\hat{p}_P - \hat{p}_N) \pm z^* \sqrt{\frac{\hat{p}_P(1-\hat{p}_P)}{n_P} + \frac{\hat{p}_N(1-\hat{p}_N)}{n_N}}$$

$$(0.181-0.171)-1.645\sqrt{\frac{0.181(1-0.181)}{376}+\frac{0.171(1-0.171)}{374}}$$

$= -0.0357442355693$

$$(0.181-0.171)+1.645\sqrt{\frac{0.181(1-0.181)}{376}+\frac{0.171(1-0.171)}{374}}$$

$= 0.0557442355693$

4. Interpret the confidence interval in terms of the two different groups.

We are 90% confident that the difference between the proportion of people suffering from headaches is between -0.03574 to 0.05574 (-3.6% to 5.6%). NOTE: This interval includes 0. Think about what this means in terms of patients suffering from headaches as a side effect.

5. State the null and alternative hypothesis to test if there is a difference in the proportions of headache sufferers in each group.

H_o: $\pi_N = \pi_P$ or $\pi_N - \pi_P = 0$

H_a: $\pi_N \neq \pi_P$ or $\pi_N - \pi_P \neq 0$

6. Should the test be one or two tailed?

because H_a: $\pi_N \neq \pi_P$ is not equal to, therefore two-tailed

7. Calculate $\hat{p}_{pooled}$.

$$\hat{p}_{pooled} = \frac{x_P + x_N}{n_P + n_N}$$

$$\frac{64+68}{374+376}$$

$= 0.176$

8. Calculate the test statistic.

$$z = \frac{\hat{p}_P - \hat{p}_N}{\sqrt{\hat{p}_{pooled}(1-\hat{p}_{pooled})(\frac{1}{n_P}+\frac{1}{n_N})}}$$

$$\frac{0.181-0.171}{\sqrt{0.176(1-0.176)\left(\frac{1}{374}+\frac{1}{376}\right)}}$$

$= 0.359566441551$

9. Determine the p-value.

when $z = 0.36$ the probability is 0.6406.

two-tailed, upper tail, therefore,

p-value = 2(1-prob) = 2(1-0.6406) = 2(0.3594) = 0.7188

p-value		significance level, α
0.7188	>	0.05

Fail to reject H_o.

10. Summarize your conclusions in terms of the two groups.

There is no significant difference between the proportion of headache suffers taking Nasonex than those taking the placebo.