Confidence Intervals and Hypothesis Tests: Two Samples

9.9 Hypothesis Test to Compare Two Population Proportions

1. According to a report, conducted by the State Epidemiological Outreach Workgroup (SEOW) for South Carolina's Alcohol and Drug Abuse Commission, fraternity and sorority members in South Carolina use illegal drugs at higher rates than their peers outside of the Greek system. A survey was given to 390 students at an anonymous college in Spartanburg County, SC. Of those 390 students, 140 were a part of Greek life on campus; while 250 were not involved in Greek life (273 were ages 17 to 20). The study found that 63 of the Greeks used marijuana in the past year, compared with 62 of the other students. Use a 5% significance level to test the claim that the rate of marijuana use by students involved with Greek life is higher than the rate for all other students.

2. Pregnancy and Infidelity: A study looked at the possible causes of infidelity committed by married men over the previous year. Of the 4,085 marriages studied 1,032 of them experienced a pregnancy during the previous year. The study revealed that among the marriages experiencing a pregnancy the rate of infidelity committed by the husband during the previous year was 5.4% while for the rest of the marriages it was only 2.3%. Using a 1% significance level test the claim that men in marriages experiencing a pregnancy cheat at higher rates than men in marriages without pregnancy.

3. A study conducted in 2010 looked at the side effects of the seasonal flu vaccine in children under 5 years old. The researchers gave flu vaccine to 2,155 children and placebo to 1,210 children. The number of children in the vaccinated group who experienced fever after injection was 416; while 146 of the placebo group experienced fever after injection. At the 2% significance level, test the claim that the rate of fever among the two groups is the same.

Answers:

1. It seems that students participating in Greek life on campus in South Carolina use marijuana at higher rates than the general population of students.

   $Claim: \rho_{Greek} > \rho_{other}$

   $H_0: \rho_{Greek} \leq \rho_{other}$

   $H_a: \rho_{Greek} > \rho_{other}$

   $\hat{p} = \frac{63+62}{390} \approx 0.3205$

   $Test\ Stat: 4.10$

   $Critical\ Value(s): 1.645$

   $Initial\ Conclusion:$ Reject the null, support the alternative

   $Final\ Conclusion:$ The sample data supports the claim...

2. It appears that men in marriages experiencing a pregnancy are more likely to commit adultery than men in marriages not experiencing a pregnancy.

   $Claim: \rho_{preg} > \rho_{other}$

   $H_0: \rho_{preg} \leq \rho_{other}$

   $H_a: \rho_{preg} > \rho_{other}$

   $x_{preg} = n_{preg}(\hat{p}_{preg}) = 1032(0.054) = 55.728 \approx 56$

   $x_{other} = n_{other}(\hat{p}_{other}) = 3053(0.023) = 70.219 \approx 70$

   $\hat{p} = \frac{56+70}{1032+3053} \approx 0.03084$

   $Test\ Stat: 4.98$

   $Critical\ Value(s): 2.326$

   $Initial\ Conclusion:$ Reject the null, support the alternative

   $Final\ Conclusion:$ The sample data supports the claim...

3. It appears that the placebo group had a significantly lower rate of fever.

   $Claim: \rho_{vacc} = \rho_{plac}$

   $H_0: \rho_{vacc} = \rho_{plac}$

   $H_a: \rho_{vacc} \neq \rho_{plac}$

   $\hat{p} = \frac{416+146}{2155+1210} \approx 0.1670$

   $Test\ Stat: 5.40$

   $Critical\ Value(s): \pm 2.326$

   $Initial\ Conclusion:$ Reject the null, support the alternative

   $Final\ Conclusion:$ The sample data rejects the claim...