Lesson 17: Inference for One Proportion

Homework

Instructions: You are encouraged to collaborate with other students on the homework, but it is important that you do your own work. Before working with someone else on the assignment, you should attempt each problem on your own.

Suppose there is a large can of mixed nuts available for purchase at the store. The label states that 20% of the nuts are peanuts. You purchase the can and pull out a sample of $n = 100$ nuts and count $x = 12$ peanuts. Use this information to answer questions 1 through 11.

1. Are the requirements met to construct a 95% confidence interval for the true proportion of peanuts in the can?

2. Find $\hat{p}$, the point estimate of the proportion of peanuts in the can.

3. Construct and interpret a 90% confidence interval for the true proportion of peanuts in the can.

You suspect that the true proportion of peanuts in the can is less than 20%. Conduct a hypothesis test to test your theory. Use a level of significance of $\alpha = 0.05$.

4. Are the requirements met to conduct a hypothesis test?

5. Find $\hat{p}$, the point estimate of the proportion of peanuts in the can.

6. State the correct null and alternative hypotheses.

7. Give the test statistic and its value.

8. Calculate the P-value based on the test statistic.

9. Label the test statistic and shade the P-value on a sampling distribution curve. **Note: You can either sketch the distribution curve and scan in your document or use the snipping tool to paste a picture of the distribution curve here. Click here for instructions on how to use the snipping tool.**

10. What decision do you make based on the P-value and the level of significance (α)?

11. State your conclusion in an English sentence.

As of 1 Nov 2009, there have been 185,067 confirmed cases of the Swine Flu (H1N1) in the Americas. Out of these patients, a total of 4399 have died from the disease.

12. Construct and interpret a 95% confidence interval for the true proportion of people who contract this disease that will die.

Avian Influenza A (H5N1), commonly called the bird flu, is a very deadly strain related to the H1N1 virus. As of 22 September 2009, there have been 442 laboratory-confirmed cases of this virus in humans world-wide. Of these, 262 have resulted in death.

13. Construct and interpret a 95% confidence interval for the true proportion of people who would die if infected with this disease.

14. Compare the results from questions 12 and 13. Which of these viruses is more deadly? Justify your answer.

The BYU-Idaho Health Center is planning a study to determine the proportion of BYU-Idaho students who cover their mouth and nose when they sneeze or cough. Use this information to answer questions 15 and 16.

15. Assume that no prior information is known. How many people would you have to survey to obtain a margin of error of 4% with 90% confidence?

16. Suppose for the same question that there had been a prior study done. That study found that 73% of those surveyed did cover their mouth and nose. Use the estimate $p^* = 0.73$ to determine the number of people would you have to survey to obtain a margin of error of 4% with 90% confidence?

First Data Corp. records indicate that in 2005 43% of adult email users received a "phishing" email. A phishing email replicates an authentic site for the purpose of stealing personal information such as account numbers and passwords. Suppose a random sample of 800 adults is surveyed on whether they received any phishing emails in 2012 and 324 respond that they did. Conduct a hypothesis test to see if this indicates that the true proportion of adults who received phishing emails in 2012 was different than 43%. Use a level of significance of $\alpha = 0.05$. Use this information to answer questions 17 through 24.

17. Illustrate the phishing email data using a pie chart and a bar chart. For a refresher on how to do this, see Bro. Cromar's video for SPSS or this document for Excel.

18. Are the requirements met to conduct a hypothesis test?

19. Find $\hat{p}$, the traditional estimator of the true proportion of adults who received phishing emails.

20. State the correct null and alternative hypotheses.

21. Give the test statistic and its value.

22. Calculate the P-value based on the test statistic.

23. What decision do you make based on the P-value and the level of significance (α)?

24. State your conclusion in an English sentence.