

Project 8 - Hypothesis Testing using two samples

Statistics 401: Fall 2006

Due Monday, November 13

Turn in your answers in a type-written report. For each hypothesis test performed, show all SIX steps of the test and give all relevant output in the body of your report.

1. In a study of middle aged Finnish men (see the abstract for *Coffee Drinking Is Dose-Dependently Related to the Risk of Acute Coronary Events in Middle-Aged Men* from the September 2004 Journal of Nutritional Epidemiology, available at the STAT401 web page), the smoking activity of $n_1 = 77$ non-coffee drinkers was compared to the smoking activity of $n_2 = 351$ heavy coffee drinkers (those who drink on average 950 ml of coffee each day). The study reported that $\bar{x}_1 = 2.84$, $s_1 = 4.58$, $\bar{x}_2 = 15.21$, and $s_2 = 7.87$. Smoking activity is measured in *pack years*. A pack year is calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. For example, 1 pack year is equal to smoking 1 pack per day for 1 year, or 2 packs per day for half a year, and so on.
 - (a) How many 8oz cups of coffee does 950ml correspond to? Does this make you a heavy coffee drinker?
 - (b) Find a 99% confidence interval for the mean difference between non-coffee drinker and heavy drinker smoking activity BY HAND. Use an un-pooled procedure and the exact degrees of freedom.
 - (c) Be sure to check your assumptions!
 - (d) Give a conclusion in terms of the problem.
 - (e) Can we conclude that drinking coffee causes middle aged men to smoke more often? Why or why not?
 - (f) The study was really interested in determining the effects of coffee consumption on coronary heart disease. In light of your answer to the previous question, comment on the assertion in the abstract that “heavy coffee consumption increases the short-term risk of acute myocardial infarction or coronary death.”
2. Do problem 11.4 on page 471 of your textbook.
 - (a) Why is a pooled test appropriate instead of an un-pooled test?
 - (b) Perform a pooled test BY HAND.
3. Do problem 11.24 on page 475-6 of your textbook.
 - (a) Perform an un-pooled test BY HAND. Use a significance level of $\alpha = .05$.
 - (b) Use R's `t.test` function to verify the results of your test. Include the R-code and R-output in the Appendix of your report.

4. Do problem 11.32 on pages 485-6 of your textbook.
 - (a) Perform the test BY HAND at a significance level of $\alpha = .05$.
 - (b) Use R's `t.test` function to verify the results of your test. Include the R-code and R-output in the Appendix of your report.

5. Consider the AP article at *Search-and-rescue dogs not sickened by post-9/11 work, scientists say*, available through the STAT401 web site. In a study of $n_1 = 97$ search-and-rescue dogs who worked at Ground Zero in the days and weeks after 9/11/2001, 29 have died. From a control group of $n_2 = 55$ search-and-rescue dogs who did not work at Ground Zero, 12 have died. In the article, Joaquin Guerrero, a police officer in Saginaw, MI, is quoted as saying "If people are getting [sick from being at Ground Zero], you know dogs are showing signs of it."
 - (a) Give the hypotheses whose alternative hypothesis reflects Guerrero's belief.
 - (b) Perform the rest of the hypothesis test BY HAND, being sure to check assumptions.
 - (c) What is your conclusion in terms of the problem?
 - (d) Does the conclusion of your test agree with the conclusion given in the article? Why or why not?
 - (e) Check your answers by using R's `prop.test` function, and include the R-code and R-output in an Appendix.

6. Regarding the AP article *Bad News For Male Mountain Bikers* available through the STAT401 web site, answer the following:
 - (a) Calculate a 99% CI for the difference of proportions BY HAND.
 - (b) Be sure to check your assumptions!
 - (c) Do you agree with the conclusion given in the article? Why or why not?
 - (d) Use R's `prop.test` function with `conf.level=.99` and `alternative="two.sided"` to verify the CI. Include the R-code and R-output in the Appendix of your report.