Homework 5 (Due on Feb 28)

February 21, 2013 STA 5172

Problem I

A medical practice wants to compare the prevalence of side effects in its patients who take a specific antihypertensive drug with published side-effect rates from the literature. The doctors feel that side-effect rates greater than 20% will not be acceptable to patients. As a test of whether a new drug should be adopted by their practice, they conduct a pilot study among 10 patients in their practice who get the drug. If at least 4 have side effects, then the doctors are reluctant to adopt the drug in their practice. Otherwise, they feel the side-effect prevalence is reasonable and they are willing to use the drug in their practice.

1. If the assessment of this pilot-study experience is represented in a one-sided hypothesis-testing framework where $H_0 : p = 0.2 \, vs. \, H_1 : p > 0.2$, then what is the type I error of the test? (Hint: Use exact binomial probabilities in R).

2. Suppose the actual true prevalence of side effects with the new drug is 50%. What is the power of the test procedure described? (Hint: Use exact binomial probabilities in R).

3. The use of 10 participants in the pilot study is arbitrary. How many participants should be enrolled to achieve a power of 99% in the previous problem? (Hint: Use the normal approximation to the binomial distribution.)

Problem II

Iron-deficiency anemia is an important nutritional health problem in the United States. A dietary assessment was performed on 51 boys 9 to 11 years of age whose families were below the poverty level. The mean daily iron intake among these boys was found to be 12.50 mg with standard deviation 4.75 mg. Suppose the mean daily iron intake among a large population of 9 to 11-year-old boys from all income strata is 14.44 mg. We want to test whether the mean iron intake among the low-income group is different from that of the general population.

1. State the hypotheses that we can use to consider this question.

2. Carry out the hypothesis test in part 1. using the critical-value method with an α level of .05, and summarize your findings.

3. What is the p-value for the test conducted in part 2?

4. The standard deviation of daily iron intake in the larger population of 9 to 11-year-old boys was 5.56 mg. We want to test whether the standard deviation from the low-income group is comparable to that of the general population. State the hypotheses that we can use to answer this question.

5. Carry out the test in part 4. with an α level of 0.05, and summarize your findings.

6. What is the p-value for the test conducted in part 5?

7. Compute a 95% CI for the underlying variance of daily iron intake in the low-income group. What can you infer from this CI?