BIOS 662, Fall 2018

Homework 7

Assigned: Tuesday, November 13

Due: Tuesday, November 20

1. A case-control study is being designed to detect an odds ratio of 3 for bladder cancer associated with a certain medication that is used in about one person out of 50 in the general population. Suppose $\alpha = 0.05$ and that 100 cases and 100 controls are to be sampled for the study. What is the power to detect OR = 3? Would you recommend conducting such a study? If not, how many cases and controls would you recommend?

2. A cross-sectional study is being designed to investigate the association between a continuous exposure X and a continuous outcome Y. The data will be analyzed using a linear regression model

$$Y = \alpha + \beta X + \epsilon.$$

   From a pilot study it seems reasonable to assume that $\epsilon \sim N(0, 10^2)$ and that $X \sim N(50, 8^2)$.

   (a) Using simulation, determine the sample size needed to detect $\beta = 0.20$ with power 0.90. Include a copy of the code you use for your simulation.

   (b) Confirm your answer using a sample size formula from the "Power and Sample Size, Part III" overheads.