Stats for Clinical Trials, Math 150

Homework # 2

Due: Thursday 9/18/14

1. Eisenhofer et al. (1999) investigated the use of plasma normetanephrine and metanephrine for detecting pheochromocytoma in patients with von Hippel-Lindau disease and multiple endocrine neoplasia type 2. The data set (vonHippelLindau.csv) contains data from this study on 26 patients with von Hippel-Lindau disease and nine patients with multiple endocrineneoplasia. The variables in the data set are (*{problem from Dupont, chp 2.22, PubMed article at http://www.ncbi.nlm.nih.gov/pubmed/10369850}*):

disease = 0: patient has von Hippel-Lindau disease 1: patient has multiple endocrine neoplasia type 2

p_ne = plasma norepinephrine (pg/ml)

tumorvol = tumor volume (ml)

   (a) Regress plasma norepinephrine against tumor volume. Draw a scatter plot of norepinephrine against tumor volume together with the estimated linear regression curve. What is the slope estimate for this regression? What proportion of the total variation in norepinephrine levels is explained by the regression?

   (b) Experiment with different transformations of norepinephrine and tumor volume. Find transformations that provide a good fit to a linear model. Report your new linear model. What is your new R^2? Does the R^2 matter in choosing your transformation? Explain.

   (c) Using the transformed model, what is the predicted average plasma norepinephrine concentration for a patient with a tumor volume of 100 ml? What is the 95% confidence interval for your prediction? Interpret. What is the 95% prediction interval for a new patient with a 100 ml tumor?

2. Which of the following assumptions are required to test hypotheses using simple linear regression. If you think it isn't valid, explain why not.

   (a) The random variable Y is normally distributed.
   (b) The variance of Y depends only upon X.
   (c) The random variable Y is normally distributed for each value of X.
   (d) The mean of Y is a linear function of X.
   (e) The random variable X is randomly distributed.

3. Chp 6, E1 Cancer and Smoking: Fisher's Exact Test and Simulations Studies

4. Chp 6, E5 Donner Party