Lab 3 — Statistics for Laboratory Scientists II

Due: 19 May 2006, in class

1. The data for this lab is available at:

   `http://www.biostat.jhsph.edu/~kbroman/teaching/labstat/fourth/lab3.csv`

   The data concern an analysis of copper using flame atomic absorption spectroscopy. There are two columns: the concentration of copper (in ppm) in a set of standards, and corresponding measurements of percent transmittance (via the spectroscopy procedure).

   Let x = the concentration of copper and y = the **log$_{10}$** of the percent transmittance.

   Fit the model

   $$y_i = \beta_0 + \beta_1 x_i + \epsilon_i, \quad \epsilon_i \sim \text{ iid Normal}(0, \sigma^2)$$

   (a) **Provide estimates of β_0, β_1, and σ.**

   (b) **Provide 95% confidence intervals for β_0 and β_1.**

   (c) **Assess the appropriateness of the model.**

2. The percent transmittance for a sample with unknown copper concentration was measured to be **35.6%**.

   (a) **Use your fitted calibration line to estimate the copper concentration in this sample.**

   (b) **Calculate a 95% confidence interval for the copper concentration in this sample.**

   Note: There's a function, `calibrate()`, available on the web which will make this last bit super-simple for you. Download the R code at the following:

   `http://www.biostat.jhsph.edu/~kbroman/teaching/labstat/fourth/calibrate.R`

   Then type (within R) something like the following to make the function available to you.

   ```
   source("calibrate.R")
   ```