

0. Read Chapter 3 in SDA book by yourself.
1. (Exercise 3.8 on page 104 of SDA book) A public opinion researcher has a budget of \$20,000 for taking a survey. She knows that 90% of all households have telephones. Telephone interviews cost \$10 per household; in-person interviews cost \$30 each if all interviews are conducted in person, and \$40 each if only nonphone households are interviewed in person (because there will be extra travel costs). Assume that the variances in the phone and nonphone groups are similar, and that the fixed costs are  $c_0 = \$5000$ . How many households should be interviewed in each group if
  - (a) all households are interviewed in person
  - (b) households with a phone are contacted by telephone and households without a phone are contacted in person.
2. (Exercise 5.11 on page 210 of SDA book) An accounting firm is interested in estimating the error rate in a compliance audit it is conducting. The population contains 828 claims, and the firm audits an SRS of 85 of those claims. In each of the 85 sampled claims, 215 fields are checked for errors. One claim has errors in 4 of the 215 fields, 1 claim has 3 errors, 4 claims have 2 errors, 22 claims have 1 error, and the remaining 57 claims have no errors. (Data courtesy of Fritz Scheuren.)
  - (a) Treating the claims as psus and the observations for each field as ssus, estimate the error rate, defined to be the average number of errors per field, along with the standard error for your estimate.
  - (b) Estimate (with standard error) the total number of errors in the 828 claims.
  - (c) Suppose that instead of taking a cluster sample, the firm had taken an SRS of  $85 \times 215 = 18,275$  fields from the 178,020 fields in the population. If the estimated error rate from the SRS had been the same as in (a), what would the estimated variance  $\hat{V}(\hat{p}_{\text{SRS}})$  be? How does this compare with the estimated variance from (a)?