Survey Sampling
Statistics 4234/5234 — Fall 2018

Assignment 4

Reading:

By Thursday, October 11, you should have read Appendix A and Chapters 1–4 of *Sampling: Design and Analysis, second edition*; by Sharon L. Lohr.

For Tuesday, October 16, study for the first midterm exam! The exam will cover Sections 1.1–1.6, 2.1–2.6 and 3.1–3.5; homework assignments 1–3; and lecture through Thursday, September 27.

For Thursday, October 18, read Chapter 5 (pages 165–207).

Homework 4:

The following problems are due in class on Tuesday, October 23. Homework can also be submitted to the course mailbox in Room 904 SSW by 5:00pm on Monday, October 29.

1. Stratified random sampling was used to estimate the total number of bushels of hard shell clams in Narragansett Bay, Rhode Island. The area of interest was divided into four strata based on preliminary surveys that identified areas in which clams were abundant. Then n_h dredge tows were made in stratum h for $h = 1, 2, 3, 4$. The acreage for each stratum was known, and the area fished during a standard dredge tow was calculated to be 0.04 acres; thus we may use $N_h = 25 \times \text{Area}_h$.

   (a) Here are the results from a survey taken before the commercial season.

Stratum	Area (acres)	Number of tows made	Average number of bushels per tow	Sample variance for stratum
1	222.81	4	0.44	0.068
2	49.61	6	1.17	0.042
3	50.25	3	3.92	2.146
4	197.81	5	1.80	0.794

   Estimate the total number of bushels of claims in the area, and give the standard error of your estimate.

   (b) Another survey was performed at the end of the commercial season. In this survey, strata 1, 2, and 3 were collapsed into a single stratum, called stratum 1 below.

Stratum	Area (acres)	Number of tows made	Average number of bushels per tow	Sample variance for stratum
1	322.67	8	0.63	0.083
4	197.81	5	0.40	0.046

   Estimate the total number of bushels of clams (with standard error) at the end of the season.

2. The data file `agsrs` contains information on the number of farms and acres devoted to farms, for an SRS of $n = 300$ counties from the population of $N = 3078$ in the United States. In 1987, the United States had a total of 2,087,759 farms.

   (a) Use ratio estimation to estimate the total number of acres devoted to farming in 1992, using the number of farms in 1987 as the auxiliary variable. Give a 95% confidence interval.

   (b) Repeat part (a), using regression estimation.

3. Use the data in `agsrs` to estimate the total number of acres devoted to farming in 1992 for each of two domains: (a) counties with fewer than 600 farms, and (b) counties with 600 or more farms. Give standard errors for your estimates.