

## BIOS 664: Sample Survey Methodology

Spring 2018

### Location and Time:

M/W 11:15 a.m.-1:00 p.m.

Room 228, Rosenau Hall

**Course Website:** [https://sakai.unc.edu/portal/site/bios664\\_sp18](https://sakai.unc.edu/portal/site/bios664_sp18)

**Instructor:** Ms. Bonnie Shook-Sa

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**Office:** McGavran-Greenberg Hall 3104B-04

**Office Hours:** M 1:00 p.m. - 2:00 p.m. (Room 228, Rosenau Hall) or by appointment

**Prerequisites:** BIOS 550 or permission from instructor. Familiarity with SAS.

### Course Material

- **Required:**

- Lohr, Sharon L. *Sampling: Design and Analysis, Second Edition*. Cengage Learning, United States, 2010.
- Lecture Slides: Presentations for each lecture will be available on Sakai (in “Lecture Slides” folder under “Resources”) 1-2 days prior to that lecture.
- Lecture Notes: Supplements to lecture notes and textbook that are available for download on Sakai (PDF in “Additional Resources” folder under “Resources”).

- **Recommended (for new SAS users):**

- Singh, Subhashree. “Learn SAS in 50 Minutes.” (PDF in “Additional Resources” folder under “Resources” in Sakai)
- Delwiche, Lora & Slaughter, Susan. *The Little SAS Book: A Primer, 5th Edition*. SAS Institute Inc., Cary, 2012.

- **Additional (Optional) Resources:**

- Kish, Leslie. *Survey Sampling*. Wiley-Interscience, New York, 1995.
- Valliant, Dever, and Kreuter. *Practical Tools for Designing and Weighting Survey Samples*. Springer, 2013.

### Software

- Access to SAS and SUDAAN (SAS-callable) is required. Please install both programs as early as possible in the term (SAS in particular, as it will be introduced during the third week of the course).
- SAS and SUDAAN (SAS-callable) can be ordered for installation from ITS Software Acquisition (<http://software.sites.unc.edu/>). SAS can also be accessed through the UNC Virtual Computing Lab (<https://vcl.unc.edu/>).
  - ITS SAS Version 9.4 Web Page: <http://software.sites.unc.edu/software/sas-9-4/>
  - ITS SUDAAN Web Page: <http://software.sites.unc.edu/software/sudaan/> (When ordering SUDAAN, indicate that you are using SUDAAN for BIOS 664: Sample Survey Methodology in their “Comments” section.)

**Course Objectives:**

1. To offer students practical exposure to survey design, data collection, and data analysis for surveys of human populations.
2. To present the theory related to basic concepts and strategies of randomized sampling of populations.
3. To teach students how to derive and compute estimates and their variances for common sampling designs.
4. To discuss issues related to the economic design of surveys.
5. To identify sources of and some remedies for nonsampling error in survey estimates.

**General Nature of the Course:**

As is evident from the list of objectives, the major goal of BIOS 664 is to gain an understanding of both the theory and application of fundamental concepts in survey statistics. Therefore, we will derive and also apply estimation formulas used in common sampling designs. Without a clear understanding of both the theory and application of these concepts, the statistician cannot make informed decisions regarding survey design and analysis. Because this course focuses on “survey statistics,” we will discuss not only the statistical aspects of designing and analyzing sample data, but will also delve into broader issues surrounding survey design, data collection, interdisciplinary collaboration, and controlling total survey error.

**Specific Topics to be Covered:**

- Introduction and Overview
- Probability Refresher with Applications to Survey Sampling
- Simple Random Sampling
- Stratification
- One- and Two-Stage Cluster Sampling
- Ratio Estimation
- Sampling with Unequal Probabilities of Selection
- Systematic Sampling
- Developing a Sample Design
- Sample Size Determination
- Sources of Survey Error
- Weights and Weighted Estimates
- Analysis and Reporting
- SUDAAN Programming
- Special Topics

### Final Course Grade Distribution:

The percentage weights for determining each student's overall course grade are given below:

Homework Assignments	25%
Sampling Project	15%
Midterm Exam	30%
Final Exam	30%

### Letter Grade Distribution:

The grading scale is given below. The instructor reserves the right to curve grades using more generous cut-points depending on the overall difficulty of the assessments. The brackets indicate the letter grade that is provided to a specific range of grade scores. For instance, a grade score must be at least 90.0 to get a letter grade of A-; any grade score  $\geq 87.5$  but less than 90.0 corresponds to a letter grade of B+.

Undergraduate Students	Graduate Students
$\geq 92.5$ A	$\geq 92.5$ H
[90.0, 92.5) A-	[70.0, 92.5) P
[87.5, 90.0) B+	[60.0, 70.0) L
[82.5, 87.5) B	$< 60.0$ F
[80.0, 82.5) B-	
[77.5, 80.0) C+	
[72.5, 77.5) C	
[70.0, 72.5) C-	
[65.0, 70.0) D+	
[60.0, 65.0) D	
$< 60.0$ F	

### Course Policies:

- **Class Participation**

- Attendance to lectures is **highly recommended** and participation during lectures is encouraged. Questions during lecture are welcome anytime. Classroom exercises will be assigned and discussed during most lectures.

- **Homework Assignments**

- There will be 8-10 homework assignments over the course of the semester, covering broad understanding of lecture content, theoretical derivations, and applications using SAS and/or SUDAAN software.
- Discussion is allowed and encouraged. However, each student has to turn in their own work. **Any evidence of copying another student's work or sharing code will be considered a violation of the Honor Code and will result in severe penalties.** (Refer to UNC Honor Code websites: <http://honor.unc.edu>; <http://instrument.unc.edu>)

- To ensure the receipt of partial/full credit, show your work, i.e., explain answers in enough detail so that 1) the grader can understand the means by which the answer was obtained and 2) the result can be easily understood later as you study for exams or the problem arises in practice.
- Starting assignments early is highly recommended to allow you time to seek help as needed. For each assignment, please contact instructor for assistance during office hours or by email.
- Completed assignments must be turned in **on the due date at the start of class. Late assignments will not be accepted.**
- The lowest homework score will be dropped and the remainder of scores averaged in the calculation of your overall homework grade.

- **Sampling Project**

- All students taking the course for credit will complete a graded sampling project. Each project, done by a small team of 4-5 students, will address a different estimation problem where sampling is the logical tool to use. Details of the sampling project will be discussed in class in late January.
- To avoid difficulties in past years with getting studies approved by the school's Institutional Review Board, studies requiring the collection of data from human subjects are not allowed. Look at the following NIH website to determine what qualifies as human subjects data (<https://humansubjects.nih.gov/walkthrough-investigator#tabpanel11>).

- **Midterm and Final Exams**

- No collaboration of any kind will be permitted on either exam – i.e., no talking about the exams, no use of other students' notes. **Any evidence of collaboration will be considered a violation of the University's Honor Code and will result in severe penalties.** To this end, each student must sign his or her name to the following statement on the exam: "I have neither given nor received any aid in completing this examination."
- Make-up exams will be given only for documented reasons such as serious illness or family emergency.
- The in-class, closed-book midterm will be given during the last class session before spring break (**Wednesday, March 7<sup>th</sup>**).
- The in-class final exam will be on **Tuesday, May 8<sup>th</sup>** at 12:00 PM in Rosenau 228. It will cover material from the entire semester, but will emphasize topics not covered on the midterm. The final exam will include both an in-class, closed-book portion as well as a take-home portion. The take-home portion will be assigned and by the last class session. The take-home portion of the exam will be due during the day/time announced in class. **No late submissions will be accepted.** Technical reasons (computer hard drive failure, printing issues) are not valid excuses for late submission of take-home portions of the final.
- If special accommodations are required, registration with the Accessibility Resources and & Service (ARS) Office (<https://accessibility.unc.edu/>) is required, after which the instructor will be provided with an official letter. Please contact ARS as early in the term as possible.

**Class Etiquette:**

- During lecture,
  - Please arrive on time.
  - Please bring calculators for classroom exercises.
  - The use of laptops is permitted, but should be limited to course-related activities (viewing lecture slides/taking notes, running code for class examples and exercises, sampling project-related work/research).
  - Please silence all cell phones and do not text during class.
- During exams, the use of a calculator is permitted and will be sufficient. The use of other electronic devices (phones, tablets, laptops) is not permitted and phones must be silenced.

**Course Evaluations:**

- Students are expected to complete the online course evaluation at the end of the semester. Please provide comments to aid in the improvement of structuring the course. Details will be provided in a later session.

**NOTE:** The instructor reserves the right to modify the syllabus as needed throughout the course.