SAINT LOUIS UNIVERSITY

COLLEGE FOR PUBLIC HEALTH AND SOCIAL JUSTICE

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## BST 5420 Section 001

# Sampling Theory and Survey Design in Public Health

## Spring 2019

## Syllabus

Tuesdays/Thursdays 4:30 – 5:45 pm
Salus 1503


### Instructor:

Steven E. Rigdon
Professor of Biostatistics
481 Salus
314-977-8127
steve.rigdon@slu.edu


### Office Hours:

Tuesday/Thursday 10:00 – 10:50 (Tegler Hall)
Thursday 3:30 – 4:20
or by appointment

# Course Overview

## Course Description in Banner:

This course will provide a survey of the fundamental types of probability sampling designs that are used for data collection, including: systematic random sampling, simple and stratified random sampling, cluster sampling and multistage sampling. The course will briefly discuss the applications of current survey research methods including web-based surveys and the use cell phones within the context of surveillance systems and registry-based samples. The role of survey design choices in reducing total survey error as well as the role of questionnaire design in reducing non-sampling biases will be discussed briefly. The main topics to be covered in detail include: design-based parameter and variance estimation methods, construction and use of survey weights and statistical models incorporating sample designs as well as the used of survey sampling for registry based samples and matched case/control studies. Methods for evaluating, reducing and adjusting for survey nonresponse will also be covered.

## Prerequisite: BST 5000 or PUBH 5040 or BST 5020

## Purpose:

Students should gain important skills needed to design surveys and analyze the results by studying

1. the typical survey designs that are used in practice (simple, stratified, cluster, etc.)
2. the science of web surveys
3. the use of weighting in complex survey design

## Course Learning Objectives:

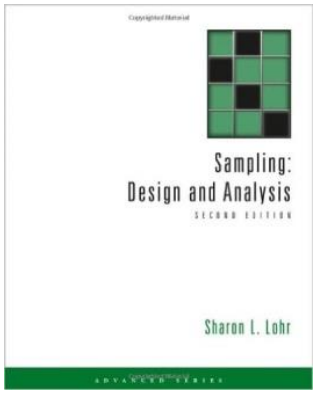
| Course Learning Objective | Program Learning Outcomes | Teaching Methodology | Student Assessment |
|---|---|---|---|
| 1. Design surveys to learn about public health. | **PhD2:** Conduct research studies, and interpret the results using inferential statistical methods and methods of qualitative data analysis.<br>**BST1:** Analyze data with complex statistical models. | Lecture, Discussion | Homework and exams |
| 2. Estimate population parameters given sample data. | **BST1:** Analyze data with complex statistical models. | Lecture, Discussion | Homework and exams |
| 3. Use SAS or R to obtain point and interval estimates of parameters and to test hypotheses. | **BST1:** Analyze data with complex statistical models.<br>**BST2:** Evaluate evidence using statistical reasoning. | Lecture, Discussion | Homework and exams |
| 4. Compare efficiency of various survey designs. | **BST3:** Create statistical reports and presentations using appropriate graphical and numerical summaries and narrative explanation. | Lecture, Discussion | Homework and exams |
| 5. Present the results of data analysis from primary or secondary data. | **BST3:** Create statistical reports and presentations using appropriate graphical and numerical summaries and narrative explanation. | Lecture, Discussion, Project | Homework, Exams, Presentations |

# Course Description

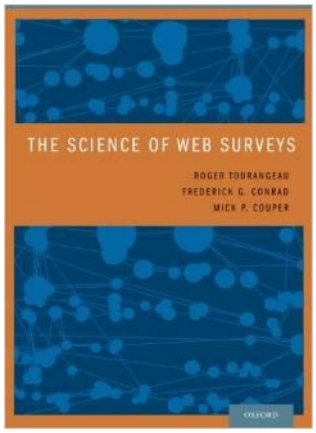
## Course Format:

Course meets twice per week for 75 minutes. Each class will consist of some combination of lecture, class discussions, student presentations, or exam.

## Textbooks:

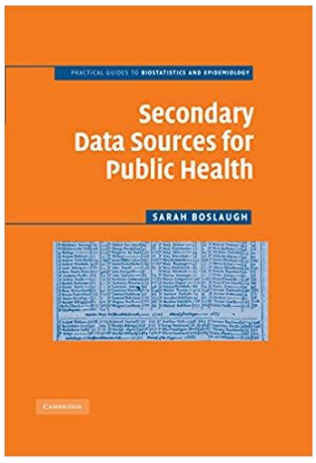



*Sampling: Design and Analysis, 2nd Edition*
By Sharon L. Lohr
Brooks/Cole Cengage Learning
ISBN-13: 978-0-495-10527-5




OPTIONAL

*The Science of Web Surveys*
by Roger Tourangeau , Frederick G. Conrad , Mick P. Couper (2013)
ISBN-13: 978-0199747047
Oxford University Press




OPTIONAL

*Secondary Data Sources for Public Health*, 2e
by Sarah Boslaugh (2007)
ISBN-13: 978-0521870016

## Readings:

Readings will come directly from the textbook. In order to be prepared for class, you should read the section to be covered before class. See the last page of the syllabus for a course outline. Additional material may be posted on Blackboard. You should check this frequently. Also, you should check your SLU e-mail account for course information.

## Course Expectations:

Come to class regularly. Come to class prepared by reading the section(s) to be covered. Turn in homework assignments on time. Participate in class discussion.

## Course Requirements:

There will be one in-class exam, plus three homework assignments. Some of the homework will involve use of the software package R. The breakdown in terms of contribution to the final grade is given in the table below.

| Item | Points | Percent of Grade |
|---|---|---|
| Homework | 30 (3 @ 10) | 20% |
| Midterm | 50 | 33% |
| Qualtrics Survey | 30 | 20% |
| Complex Survey | 40 | 27% |
| TOTAL | 150 | 100% |

- Midterm Exam – April 2 covers most of Lohr's book
- Homework – 3 Assignments to be turned in. See Course Outline below for due dates.
- Qualtrics Survey – Groups of 2-3. Develop and write questionnaire. Graded on (1) 10 minute presentation and (2) writeup (2-4 pages)
- Complex Survey – Groups of 2-3. Use data from an existing survey, e.g. BRFSS, NHANES, etc. that uses survey weights. Presentation 20 minutes, writeup 3-6 pages.

## Grading Scale and Policy:

According to the University, final grades allowed are listed below. The grading scale applies to all CPHSJ undergraduate BST, EPI, HMP, PUBH, EMGT, and HCE courses:

| Grade | Range | GPA | Grade | Range | GPA |
|---|---|---|---|---|---|
| A | 92-100 | 4.0 | C+ | 77-79 | 2.3 |
| A- | 90-91 | 3.7 | C | 72-76 | 2.0 |
| B+ | 87-89 | 3.3 | C- | 70-71 | 1.7 |
| B | 82-86 | 3.0 | D | 60-69 | 1.0 |
| B- | 80-81 | 2.7 | F | <60 | 0.0 |

In addition, Biostatistics, Emergency Management, Health Management, and Public Health students are required to earn the following:

- Minimum grade of "C" in all BS in Biostatistics/Emergency Management/Health Management/Public Health Major Courses
- Minimum grade of "C-" in all core classes for the BS in Biostatistics/Emergency Management/Health Management/Public Health
- Minimum grade of "D" in all general elective courses counting toward the 120 credits for graduation

## Late Policy:

Homework should be turned in at the end of the class on the due date. After that it is considered late. One point (out of ten) will be deducted for each day the assignment is late, including the first day. If you are unable to attend class, you can scan and send the assignment via email by the due date. The same policy applies to homework submitted by email. Exceptions can be made if there are extenuating circumstances. Contact me as soon as possible in these cases.

## Assignment/Exam Conflicts:

If you know you must miss a scheduled exam, let me know as soon as possible so we can reschedule. This applies to the two in-term exams and the final exam.

## Feedback on Assignments:

Timely feedback on assignments is needed in order to assure that students are aware of their progress. Exams will ordinarily be returned on the class day following the exam. Homework assignments will be returned within three classes. If these deadlines cannot be met, students will be informed of the delay and the extra time needed.

## Attendance:

Regular class attendance is an important part of undergraduate education. Students are expected to attend all class sessions. When students miss a class, they are responsible for reading the text book to learn the material covered that day.

## Additional Course policies:

A laptop that can run R will be helpful. If this is a problem, see me early in the term.

## Academic Integrity Expectations and Policy:

*Academic integrity is honest, truthful and responsible conduct in all academic endeavors.* The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care, and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern. The governing University-

level Academic Integrity Policy was adopted in Spring 2015 and can be accessed on the Provost's Office website: www.slu.edu/provost/policies/academic-and-course/policy_academic-integrity_6-26-2015.pdf

Additionally, each SLU College, School, and Center has adopted its own academic integrity policies, available on their respective websites. All SLU students are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions, and appeals. Please direct questions about any facet of academic integrity to your faculty, the chair of the department of your academic program, or the Dean/Director of the College, School or Center in which your program is housed.

All BSPH, BSHM, BSEM, BSBS majors must complete the CPHSJ academic integrity module. Violation of Academic Integrity expectations and/or the Honor Code Pledge may result in severe consequences, including expulsion.

## Policy on Style for Citation and Plagiarism:

Plagiarism is a serious violation of CPHSJ's Academic Integrity Policy. If a student plagiarizes others' material or ideas, s/he may receive an "F" in the course. The instructor will file a report with the Associate Dean for Academic Affairs, who may investigate further. Refer to the University's Policy on Academic Integrity and Ethics for more information.

## Student Success Center:

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center assists students with academic-related services and is located in the Busch Student Center (Suite, 331). Visit www.slu.edu/life-at-slu/student-success-center/ to learn more about tutoring/university writing/ disability services and academic coaching.

## Disability Services Academic Accommodations:

Students with a documented disability who wish to request academic accommodations must contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also **must** notify the course instructor that they wish to access accommodations in the course. Please contact Disability Services, located within the Student Success Center, at Disability_services@slu.edu or 314.977.3484 to schedule an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services and viewed within Banner via the instructor's course roster. *Note: Students who do not have a documented disability but who think they may have one are encouraged to contact to Disability Services.*

## University Writing Services:

Students are encouraged to take advantage of university writing services in the Student Success Center; getting feedback benefits writers at all skill levels. Trained writing consultants can help with writing projects, multimedia projects, and oral presentations. University Writing Services offers one-on-one consultations that address everything from brainstorming and developing ideas to crafting strong sentences and documenting sources. For more information, visit www.slu.edu/life-at-slu/student-success-center/ or call the Student Success Center at 314-977-3484.

## Title IX:

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX coordinator, Anna R. Kratky (DuBourg Hall, room 36; anna.kratky@slu.edu; 314-977-3886) and share the basic facts of your experience with her. The Title IX coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus. If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK. To view SLU's sexual misconduct policy and for resources, please visit the following web addresses: www.slu.edu/here4you and https://www.slu.edu/general-counsel

# Course Outline

| Week/ Date | Learning Objectives | Topics | Readings | Assign-ments Due |
|---|---|---|---|---|
| 1<br>1/15 – 1/17 | LO1; LO2 | Introduction; Chapter 2: Probability Samples and Simple Random Sampling air hostess | [L] Chapters 1 and 2 | |
| 2<br>1/22 – 1/24 | LO1; LO2 | Simple Random Samples: Sample size determination<br>Stratified Sampling | [L] Chapters 2 and 3 | |
| 3<br>1/29 – 1/31 | LO1; LO2 | Stratified Sampling: Sampling weights, optimal allocation and sample size determination. | [L] Chapter 3 | |
| 4<br>2/5 – 2/7 | LO1; LO2 | Ratio and Regression Estimation: using SRS, poststratification, using stratified sample | [L] Chapter 4 | HW#1 (R) |
| 5<br>2/12 – 2/14 | LO1; LO2 | Cluster Sampling with Equal Probabilities: one-stage, two-stage, systematic sampling | [L] Chapter 5 | |
| 6<br>2/19 – 2/21 | LO1; LO2 | Cluster Sampling with Unequal Probabilities: one-stage, two-stage | [L] Chapter 6 | HW#2 R) |
| 7<br>2/26 – 2/28 | LO1; LO2 | Complex Surveys: sampling weights, estimating the distribution function, plots, design effects | [L] Chapter 7 | |
| 8<br>3/5 – 3/7 | LO1; LO2 | Nonresponse: effects of ignoring, designing to avoid, 2-phase sampling, weighting for nonresponse, imputation | [L] Chapter 8 | HW#3 (R) |
| 3/12<br>3/14 | | **Spring Break** | | |
| 9<br>3/19 – 3/21 | LO1; LO2; LO3 | Regression with Complex Survey Data: Weigting, mixed models, logistic regression. Using SAS and R. | [L] Chapter 11 | |
| 10<br>3/26 – 3/28 | LO1; LO2; LO3; LO4 | More on regression with complex survey data. Comparing designs. Review. | [L] Chapter 11 | |
| 11<br>4/2 – 4/4 | LO1 | Midterm Exam<br>Science of Web Surveys: Introduction, Coverage | [TCC] Chapters 1 and 2 | |
| 12<br>4/9 – 4/11 | LO1 | Science of Web Surveys: Nonresponse, Measurement error, Visual aspects | [TCC] Chapters 3 – 5 | |
| 13<br>4/16 – 4/18 | LO1 | Science of Web Surveys: Interactive Features<br>Designing surveys with Qualitics | [TCC] Chapter 6 | |
| 14<br>4/23 – 4/25 | LO5 | Presentations on Qualtrics Surveys<br>Secondary Data Sources: Introduction | [B] Chapter 1 | Qualtrics Survey Presentations |
| 15<br>4/30 – 5/2 | LO1 | More Examples of Secondary Data | [B] Chapters 2 – 4 | |
| 5/7 | LO5 | **Final Exam Time (Presentations)**<br>Tuesday May 7. 4:00 - 5:50 pm | | Complex Survey Presentations |

**Readings Codes:** [L] *Sampling Design and Analysis, 2e,* Lohr; [TCC] *The Science of Web Surveys*, Tourangeau, Conrad, Couper [B] *Secondary Data Sources for Public* Health, Boslaugh