

Statistical Thinking for Informed Decision Making

Course Information

Term:	Spring 2017
Meeting times:	Tuesdays and Thursdays. 12:00-1:15.
Room:	Homewood Campus, Maryland 109
Office Hours:	Thursdays 10:30-11:40. First floor - Brody Learning Commons
Instructor:	Leslie Myint
Contact information:	lmyint1@jhu.edu
Office:	Welch Medical Library, Room 117
Course credits:	3
Prerequisites:	Undergraduate biostatistics course or equivalent. Moderate familiarity with the R statistical software package.

Course Description

We live in a highly connected world where the amount of information we are exposed to on a daily basis is staggering. Primary news reports, articles from content aggregators, and social media postings are constantly feeding us information, and we must somehow synthesize all of this information in order to arrive at sensible conclusions. This course is designed to introduce students to the considerations that researchers and analysts face when performing the studies that make up the core content of news reports. In particular, students will take a detailed look at the complex process of going from scientific question to data analysis to journal publication to mainstream media reports. Using readings from news sources and primary research, students will engage in discussions about the considerations and complications that arise at each stage. Additionally, students will gain exposure to the computational aspect of statistics through data analysis and simulation exercises in the R programming environment.

Prerequisites: Undergraduate biostatistics course or equivalent. Moderate familiarity with the R statistical software package.

Course Learning Objectives

Upon successfully completing this course, students will be able to:

1. Critically evaluate reporting on studies in major fields of statistics including association studies, surveys, survival analysis, longitudinal studies, and high-throughput biology
2. Understand the logistical and statistical considerations required for the design and analysis of such studies
3. Develop reasonable plans for the design and analysis of such studies
4. Analyze how such considerations are addressed in original research and how this information is conveyed in news reports
5. Compare the strengths and limitations of particular study designs and analysis approaches for answering a research question and for making statements about causality
6. Communicate more effectively about their evaluations of news, both orally and through writing
7. Apply field-specific terminology to convey ideas about such studies and their reporting in the news
8. Clearly communicate informed evaluations about a particular body of news

Resources

There are no required textbooks for this class, but some useful references for statistical material include:

- *Fundamentals of Biostatistics*. Bernard Rosner.
- *Advanced Data Analysis from an Elementary Point of View*. Cosma Shalizi.
<http://www.stat.cmu.edu/~cshalizi/ADAfaEPoV/>
This is a more advanced reference on considerations for applied data analysis that presumes knowledge at the level of 550.420 Introduction to Probability in the Applied Mathematics and Statistics department.
- Online class notes from the Department of Statistics at Penn State University
<https://onlinecourses.science.psu.edu/statprogram/>
These notes are more advanced, but many of the examples are high-level and good for illustrating concepts.

Useful resources for learning more about R programming and data analysis include:

- CodeSchool's Try R course:
<https://www.codeschool.com/courses/try-r>
- Coursera's R programming course:
<https://www.coursera.org/learn/r-programming>
- DataCamp's R programming course:
<https://www.datacamp.com/courses/free-introduction-to-r>
- Advanced R by Hadley Wickham
<http://adv-r.had.co.nz/>
- A Handbook of Statistical Analyses Using R
<https://cran.r-project.org/web/packages/HSAUR/>

Grading

Class participation - 10%

Students are expected to actively pay attention and to participate in class by asking questions, answering questions, and contributing to discussions. I will be making note of participation and post participation grades approximately every two weeks.

Weekly journal: Synthesis of class topics – 70%

Students will keep a journal of responses to the required readings, lectures, and discussion material. For each module, students will be given a document containing required pre-class readings and questions to answer before and/or after each class. These questions are intended to focus students' attention on the readings and to clearly express ideas discussed in class.

Responses will be graded weekly on content, clarity of writing, and appropriate use of statistics and terminology.

Final project: News topic synthesis – 20%

Students will choose a news subject that interests them (preferably related to public health topics but others may be suitable—see instructor) and perform a comprehensive review and evaluation of news reporting on this subject. Requirements for the project include the following:

1. Collection of at least ten news articles on the chosen subject and three primary research papers cited by or directly related to the content of those articles. Of the three research papers, at most one can be a systematic review/meta-analysis. If you choose to read more than three research papers, the additional ones can include any number of systematic reviews/meta-analyses.
2. Summary of content in the news articles and primary research papers
3. Critical evaluation of the news articles and primary research papers
4. Proposed data analysis: students should locate where data related to the topic can be found, summarize the features of the available data, formulate a research question, propose an analysis plan to answer that question, and defend this plan. Students do not actually have to perform the analysis.
5. In-class presentation (approximately 10 minutes) giving a brief overview of the subject area, news article coverage, primary research findings, and proposed data analysis (items 2-4).
6. Written report on items 2-4

Throughout the semester, you will be required to turn in a document showing how you have met certain milestones. These will form a small portion of the final project grade.

Milestone 1: Choose topic. Find 4 news articles and 1 primary research paper. Write a short summary of the news articles and research paper.

Milestone 2: Find at least 6 more news articles and 1 more primary research paper. Write a short summary of the new material. Find and briefly discuss a source of data on your topic.

Milestone 3: Find the last research paper and begin planning your proposed data analysis. Write a short summary of the paper and outline your data analysis plan.

Late assignments

For each day late that an assignment is submitted, 10% of the total points for that assignment will be deducted. Because a lot of class activity depends on doing the readings and thinking about them with your journal entries, it is important to get assignments in on time.

Attendance Policies

Because participation is tracked, excess absences will detract from your participation grade unless you provide documentation for illness or extenuating circumstances. A maximum of three free absences (unexcused absences for any reason) will be allowed for the semester. Beyond that point, points will be deducted from your participation grade.

Electronics

Laptops will be permitted during class in order to take notes, reference the articles being discussed, and to perform in-class exercises with R.

Exams

There will be no midterm or final examinations. The final project paper will be due at the end of our final exam slot: Wednesday, May 17 at 5PM.

Academic Integrity

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition.

Report any violations you witness to the instructor. You may consult the associate dean of student affairs and/or the chairman of the Ethics Board beforehand. See the guide on “Academic Ethics for Undergraduates” and the [Ethics Board Web site](#) for more information.