**UNIVERSITY OF FLORIDA**

**Department of Health Outcomes and Biomedical Informatics**

**Health Outcomes and Biomedical Informatics Research Seminar**

**GMS 7887 / sections 016E (Summer A)**

**Summer 2022**

Instructor: Jessica Ray, Ph.D. and Bruce Vogel, Ph.D.

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Class Meetings: Tuesdays, 2nd period, 9:30am – 10:45am

Classroom: Communicore CG-041

Credits: 1 credit each, Summer A and B

Office Hours: By appointment

**Introduction** - This class will be cover current topics in health outcomes and biomedical informatics. All students will read the assigned papers on the topic and do the assigned activities prior to class. Discussion questions will be provided on each topic, and these questions will be explored during each class meeting. Please come to class prepared to contribute to the discussion and to raise any issues or questions of your own on the assigned topic.

**Grading –** Grades will be S/U (Satisfactory/Unsatisfactory) based on class attendance and participation in class discussions. Any absence from class must be approved by the instructor prior to the class meeting. For additional grading policy information, you may visit <http://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Objectives**

As a result of this course, students will be able to:

1. Review, evaluate, and comment upon the evolving literature in health outcomes and biomedical informatics.
2. Identify strengths and weaknesses of peer-reviewed journal publications based on the nature of the research topic and the appropriateness of the study design.
3. Contribute to critical discussions of the scientific literature in a meaningful manner.
4. Understand the evolution (past, present, and future) of important research themes in the areas of health outcomes and biomedical informatics.

**Course Requirements**

We will operate as an advanced graduate seminar, with students taking an active role in initiating and leading discussions. Attendance and active participation in all class discussions are required. You should give thoughtful attention to the discussion questions associated with each topic prior to class.

**Course Format**

We will conduct the course as a hybrid in-person seminar with a synchronous zoom option. Students choosing to participate via Zoom should be prepared to have their camera turned on and actively participate in discussion for the entirety of the class. Discussions will not be recorded or available for asynchronous viewing.

**Class Attendance**

Class attendance is required. Excused absences follow the criteria of the UF Graduate Catalogue (e.g., illness, serious family emergency, military obligations, religious holidays), and should be communicated to the instructor prior to the missed class day whenever possible. Regardless of attendance, students are responsible for all material presented in class. The use of cell phones, pagers, or laptop computers (except for class assignments) is not permitted in class.

**Accommodations for Students with Disabilities**

Students requiring accommodations must first register with the Dean of Students' Office. The Dean of Students' Office will provide documentation to the student who must then provide this documentation to the faculty member when requesting accommodation. The College is committed to providing reasonable accommodations to assist students in their coursework.

**University of Florida Academic Honesty Statements**

“I understand that the University of Florida expects its students to be honest in all their academic work. I agree and adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.”

“All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.”

“We, the members of the University of Florida, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.”

**Diversity and Inclusion**

We consider this classroom to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

**Class Meeting Schedule (tentative) – Summer A and B**

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| --- | --- | --- |
| **Week** | **Dates** | **Topic** |
| **Summer A** | | |
| **Wk 1** | 05/10 | **Outcomes Analysis and Political Controversy** |
| **Wk 2** | 05/17 | **Evolution of Evidence (Data) Based Medicine** |
| **Wk 3** | 05/24 | **Decision-Theoretic and Bayesian Reasoning vs. Classical Statistics** |
| **Wk 4** | 05/31 | **Breaking out of the Black Box** |
| **Wk 5** | 06/07 | **Bias in the Design of Clinical Trials and Efficacy vs. Effectiveness** |
| **Wk 6** | 06/14 | **Late-Breaking Topics** |
| Summer Break | | |

**SUMMER A**

**Tuesday, May 10**

**Class Introductions and Course Administrative Issues**

**Topic: Outcomes Analysis and Political Controversy**

No matter how much you wish to focus on theoretical and applied research, you inevitably will find yourself drawn into controversy that extends well beyond your academic expertise. The first two readings below concern two recent controversies concerning academic freedom here at UF and whistleblower protection for government employees here in Florida. The last two readings deal with evaluation research here at HOBI focused on Florida’s new Medicaid policy limiting retroactive enrollment in Florida Medicaid.

# New York Times, “In Florida, a Firestorm Over Silenced University Professors Grows, November 4, 2021, retrieved from <https://www.nytimes.com/2021/11/04/us/florida-professors-lawsuit.html> , accessed April 7, 2022.

1. Miami Herald, “Whistleblower: What Rebekah Jones Saw Behind the Scenes at the Florida Department of Health,” June 4, 2021, updated June 7, 2021, retrieved from <https://floridacovidaction.com/wp-content/uploads/2021/06/MiamiHerald_archived.pdf> , accessed April 7, 2022.
2. H. Meyer, “New Medicaid barrier: Waivers ending retrospective eligibility shift costs to providers, patients,” *Modern Healthcare,* February 9, 2019, retrieved from <https://www.modernhealthcare.com/article/20190209/NEWS/190209936/new-medicaid-barrier-waivers-ending-retrospective-eligibility-shift-costs-to-providers-patients> , accessed April 7, 2022.
3. J. Alker, “Retroactive Coverage Should Not Be Waived in Florida or Anywhere Else: Florida’s Own Evaluation Makes That Clear,” Center for Children and Families, Georgetown University Health Policy Institute, October 22, 2021, retrieved from <https://ccf.georgetown.edu/2021/10/22/retroactive-coverage-should-not-be-waived-in-florida-or-anywhere-else-floridas-own-evaluation-makes-that-clear/> , accessed April 7, 2022.

Possible Discussion Questions:

1. How relevant is academic freedom in the modern university? Is academic freedom still relevant given the increasing importance of the research priorities of funding agencies the regulatory oversight of the research process (e.g., Human Subjects Protection, HIPAA, funding priorities of research funders)?
2. What is the appropriate role of analysis in supporting the public policy process? How important is it to have rigorous answers to policy-relevant questions? Are standards of academic rigor relevant to the analysis of public policy?
3. What would you have done differently if you had been Rebekah Jones?
4. What do you think of Florida’s rationales for limiting Medicaid retroactive enrollment?

**Tuesday, May 17**

**Topic: Evolution of Evidence (Data) Based Medicine**

Similar to the industrial revolutions evolving from mechanization to computerization and now towards IoT, healthcare has undergone tremendous transformation across the last two centuries. In this group of readings, we reflect on how technology and the availability of data influence how we approach medicine both at a public health and personalized level. The first of these readings is meant to set the groundwork for understanding the evolution of medical training and evidence based medicine. The second article challenges the notion of the levels of evidence and presents a case for computational approaches. The final two articles offer examples of how data can be translated to offer assistance and guidance to providers trying to practice evidence based medicine at the bedside in the modern technological age.

1. Claridge JA, Fabian TC. History and development of evidence-based medicine. World J Surg. 2005 May;29(5):547-53. doi: 10.1007/s00268-005-7910-1. PMID: 15827845.
2. Bukowski R, Schulz K, Gaither K, Stephens KK, Semeraro D, Drake J, Smith G, Cordola C, Zariphopoulou T, Hughes TJR, Zarins C, Kusnezov D, Howard D, Oden T. Computational medicine, present and the future: obstetrics and gynecology perspective. Am J Obstet Gynecol. 2021 Jan;224(1):16-34. doi: 10.1016/j.ajog.2020.08.057. Epub 2020 Aug 22. PMID: 32841628.
3. King AJ, Cooper GF, Clermont G, Hochheiser H, Hauskrecht M, Sittig DF, Visweswaran S. Using machine learning to selectively highlight patient information. J Biomed Inform. 2019 Dec;100:103327. doi: 10.1016/j.jbi.2019.103327. Epub 2019 Oct 29. PMID: 31676461; PMCID: PMC6932869.
4. Tang PC, Miller S, Stavropoulos H, Kartoun U, Zambrano J, Ng K. Precision population analytics: population management at the point-of-care. J Am Med Inform Assoc. 2021 Mar 1;28(3):588-595. doi: 10.1093/jamia/ocaa247. PMID: 33180897; PMCID: PMC7936526.

Possible Discussion Questions:

1. The ideas behind Evidence Based Medicine have a long history even though the term is not so old. How has the meaning of evidence changed across time? How do you see the technologies of today and tomorrow changing the meaning of evidence going forward?
2. What are the challenges we face as new technologies continue to produce increasing amounts of data at the individual level? How do we translate the data produced by these technologies into evidence based medicine? How would you apply the Data, Information, Knowledge, Wisdom (DIKW) when thinking about this translation?
3. Technology has powered change in medicine much as it has in industry. Where do you think we are today in this evolution and where do you think we will go in the next 20 years? What do we need to get there?

**Tuesday, May 24**

**Topic: Decision-Theoretic and Bayesian Reasoning as Alternatives to Classical Statistics**

Most of us are trained in classical statistics where we pose a null hypotheses and test that null hypothesis against an alternative hypothesis using an appropriate statistical test with the probability of a type I error set at 0.05. Such testing is closely tied to our traditional notion of science as a body of facts that has withstood the test of time. Many times, however, we are conducting research to make decisions that may not represent generalizable scientific knowledge and where alternative frameworks, such as decision theory and Bayesian reasoning, are alternatives to classical statistics.

1. Manski CF. Treatment Choice With Trial Data: Statistical Decision Theory Should Supplant Hypothesis Testing. Am Stat [Internet]. 2019 [cited 2022 Mar 14];2019(S1):296–304. Available from: <https://www.tandfonline.com/action/journalInformation?journalCode=utas20>
2. Suzuki A. Policy Implications of Statistical Estimates: A General Bayesian Decision-Theoretic Model for Binary Outcomes. Stat Public Policy [Internet]. 2022 Dec 31 [cited 2022 May 2];9(1):1–26. Available from: <https://www.tandfonline.com/doi/abs/10.1080/2330443X.2022.2050328>

Possible Discussion Questions:

1. Classical statisticians often calculate 95% confidence intervals. Suppose we calculate a 95% confidence interval for the mean cost of a primary care visit from a random sample of office visits and obtain a 95% confidence interval lower bound of $85 and a higher bound of $145. In what, exactly, are we placing our confidence?
2. If we estimate a regression model of Y as a function of X and fail to reject the null hypothesis that the coefficient for X is zero, we often say that X has no effect on Y or that we are 95% confident that X has no effect on Y. Is this correct? Why or why not?
3. Manski asks, “Why did statistical decision theory lose momentum long ago? … Another reason may have been diminishing interest in decision making as the motivation for analysis of sample data. Modern statisticians tend to view their objectives as estimation and hypothesis testing rather than decision making.” Why do you think statisticians tend to concentrate on estimation and hypothesis testing rather than decision making?
4. People who study health outcomes often talk about making decisions that yield the best possible outcome given the situation under study. Decision theorists, by contrast, often talk about maximizing the *utility* of outcomes, where utility refers to the patient’s subjective valuation of the outcome where utility is an increasing function of outcomes. Economists, in turn, generally believe that most processes are subject to diminishing marginal utility, whereby each additional unit of outcome improvement leads to an ever-smaller increase in subjective value to the patient.

What are the implications of these three concepts (outcomes, the utility of outcomes, and diminishing marginal utility of outcomes) for all how you evaluate outcomes?

**Tuesday, May 31**

While advanced techniques from systems dynamics modeling to machine learning have advanced our ability to process large and complex data sets, building trust in the outcomes of these techniques should be considered as part of implementation. This has led some researchers toward explainable models. This week’s readings introduce the issue of explainable systems and trust in systems.

1. Asan O, Bayrak AE, Choudhury A Artificial Intelligence and Human Trust in Healthcare: Focus on Clinicians *J Med Internet Res* 2020;22(6):e15154 doi: [10.2196/15154](https://doi.org/10.2196/15154) PMID: [32558657](https://www.ncbi.nlm.nih.gov/pubmed/32558657)
2. Payrovnaziri SN, Chen Z, Rengifo-Moreno P, Miller T, Bian J, Chen JH, Liu X, He Z. Explainable artificial intelligence models using real-world electronic health record data: a systematic scoping review. J Am Med Inform Assoc. 2020 Jul 1;27(7):1173-1185. doi: 10.1093/jamia/ocaa053. PMID: 32417928; PMCID: PMC7647281.
3. Ploug T, Sundby A, Moeslund TB, Holm S. Population Preferences for Performance and Explainability of Artificial Intelligence in Health Care: Choice-Based Conjoint Survey. J Med Internet Res. 2021 Dec 13;23(12):e26611. doi: 10.2196/26611. PMID: 34898454; PMCID: PMC8713089.
4. Zhang Z, Genc Y, Wang D, Ahsen ME, Fan X. Effect of AI Explanations on Human Perceptions of Patient-Facing AI-Powered Healthcare Systems. J Med Syst. 2021 May 4;45(6):64. doi: 10.1007/s10916-021-01743-6. PMID: 33948743.

Possible Discussion Questions

1. As Figure 1 in Asan et al (2020) depicts, trust has an optimal level with problems arising from both over trust and under trust. How do you see this applying in your own work? When is it important to consider trust?
2. Zhang et al (2021) concluded that model performance influences trust. When is this potentially beneficial and when might this be harmful?
3. When would you consider using an explainable model vs a traditional model? What factors would influence your decision?
4. The introduction of AI in healthcare systems raises policy and regulatory questions. How do you see the topic of trust influencing the future trajectory of policy and regulations?
5. Multiple techniques have been suggested for explaining findings of different machine learning methods. If you were modeling hospital readmission for patients with congestive heart failure, when might you choose an explanatory approach vs a traditional approach to the model? What type of explanation might you consider?

**Tuesday, June 7**

**Topic: Bias in the Design of Clinical Trials and the Gulf between Efficacy and Effectiveness**

Randomized clinical trials (RCTs) are often considered the “gold standard” because they produce findings with the highest levels of evidence with maximum internal validity. Unfortunately, RCTs are far from a perfect guide to which interventions will yield the highest levels of real-world effectiveness. The readings below should cover familiar topics based on your health outcomes coursework, but the discussion questions will ask you to think about efficacy vs. effectiveness a little differently.

1. Alexander Krauss (2018) Why all randomized controlled trials produce biased results, Annals of Medicine, 50:4, 312-322, DOI: 10.1080/07853890.2018.1453233 <https://doi.org/10.1080/07853890.2018.1453233>
2. Drazen JM, Harrington DP, Mcmurray JJ V, Ware JH, Woodcock J, Ford I, et al. The Changing Face of Clinical Trials: Pragmatic Trials. N Engl J Med. 2016;375:454–63. <https://www.nejm.org/doi/full/10.1056/NEJMra1510059?query=featured_clinical-trials>
3. Nordon C, Karcher H, Groenwold RHH, Ankarfeldt MZ, Pichler F, Chevrou-Severac H, et al. The “efficacy-effectiveness gap”: Historical background and current conceptualization. Value Heal. 2016 Jan 1;19(1):75–81. Available from: <http://dx.doi.org/10.1016/j.jval.2015.09.2938>

Discussion Questions:

1. Why do the results seen in RCTs so often fail to translate into real-world clinical settings?
2. How would you construct a conceptual model of how the efficacy of an clinical trial intervention translates into real-world effectiveness? What modeling technique(s) would you choose to operationalize such a model?
3. Most researchers conduct research to learn about the world around them. Along the way, however, they know they must publish, obtain funding, and ultimately advance through the ranks of their chosen profession. How might their self-interest in career advancement influence their choice of research topics, the conduct of their research, and choice of publication outlets.
4. Economists have observed that not all human labor is devoted to acquiring saleable skills and producing goods and services. Workers who have superior productivity have a strong incentive to “signal” their superior productivity to potential employers so that current employers are forced to recognize their superior productivity in the form of higher wages. Do researchers have an incentive to engage in market signaling? If so, how? How might such market signaling affect the design and conduct of outcomes research?

**Tuesday, June 14**

**Late-Breaking Topic**

* TBD
* TBD
* TBD
* TBD

**Tuesday, June 21 -** Summer Break; No Class