

# HSCI 5150 Methods for Observational Research 1

## Course Description

This course provides a foundational understanding of techniques and tools vital for observational health research using real-world data. We begin with a conceptual understanding of evidence generation and the principles of reproducible research and progress to conducting of characterization studies. Utilizing the R programming language, students will gain hands-on experience with OHDSI analytic tools, equipping them with the practical skills needed to navigate and analyze real-world observational data effectively. This course serves as a springboard for those seeking expertise in observational research methodologies and their applications in the modern healthcare landscape.

**Class Time:**

Fall 2023: Online

**Credit hours:** 3 semester hours

**Instructors:** Profs. Asieh Golozar and Justin Manjourides

**Office location:** 312 Robinson Hall **Office hours:** Weekly Zoom Office Hours (TBD)

**Emails:** a.golozar & | j.manjourides at northeastern dot edu

**NOTE:** We are here to help you learn this material. If you are struggling, we encourage you to reach out via office hours or to make an appointment. Office hours are scheduled for your benefit, and it is not a burden on us to meet with you during those times.

**Communication policy:** Please allow 24-48 hours for email responses and 1 week for grading feedback. Please keep this in mind when emailing assignment/project specific questions close to the due dates.

**Prerequisites:** None

**Course Goals:** Students participating in this course should acquire the ability read and think critically about observational health research published in leading journals, as well as :

- Generate a study question and determine an appropriate method for analysis
- Interpret and critique observational studies reported in the scientific literature.
- Illustrate how different forms of observational health data are collected, organized, and standardized to generate accurate, reproducible, and well-calibrated evidence.

**Course Outcomes:** By the end of this course you will be able to:

- Interpret observational health data using both numeric and graphic techniques
- List and describe assumptions and biases specific to study designs.
- Use state-of-the-art statistical software and methods to combine and analyze large-scale federated health data from diverse sources (e.g. EHRs) while preserving privacy.
- Evaluate strengths and weaknesses of an observational health analysis.

## General Course Topics:

- 1. Generating clinical evidence:
  - 1. Experimental study designs
  - 2. Observational study designs
  - 3. Hierarchy of evidence
- 2. Reproducible research:
  - 1. Version control
  - 2. Data wrangling with dplyr
- 3. Statistical analyses
  - 1. Effect estimates
  - 2. Confidence Intervals
  - 3. Hypothesis Testing
- 4. OHDSI analytic tools
  - 1. ATLAS
  - 2. HADES
  - 3. P-values
  - 4. Bootstrapping
- 5. Characterization studies
  - 1. Cohort building
  - 2. Phenotyping
- 6. Use of the R statistical software package
  - 1. RStudio
  - 2. The Tidyverse

## Classroom Behavior

Yes, this is an online course, but class participation is expected. Everyone is expected to be respectful of fellow classmates.

**Discussion Board:** There will be occasional discussion board topics: Optional and Required. The “optional” board topics are not graded, but are available for you to post questions on lecture materials or labs. If you have the answer to a classmates’ question, feel free to respond. We will also be monitoring these discussions as well and will answer any outstanding questions. The “Required” board topics are discussed below under Assignments and Assessment.

**Course Format & Methodology:** This course runs for a total of 15 weeks beginning September 7th, 2023, and is delivered online via the NU Online Canvas system. Each module contains one or more lessons. Lessons are organized around specific course topics, and may contain readings, lectures, discussions, and quizzes that you complete. Please note that all due dates and times are specified according to the Eastern Standard Time zone (EST); plan to complete and submit all assignments accordingly.

If you have questions about using Canvas, please go here first: <https://digitalresilience.northeastern.edu/student-resources/>

**Academic Honesty:** “Northeastern University is committed to the principles of intellectual honesty and integrity. All members of the Northeastern community are expected to maintain complete honesty in all academic work, presenting only that which is their own work on tests and assignments. If you have questions regarding the definitions of cheating or plagiarism, consult the Northeastern University Student Handbook and/or contact the professor prior to submitting work for evaluation.”

Any student who has witnessed an act of academic dishonesty should report it to the course faculty member.

## Assignments and Assessment

Because this course is online, your presence in peer-to-peer activities, and your performance on assignments, serve as indicators of your level of engagement and effort throughout the course. Frequent and varied (e.g., synchronous/ asynchronous/face-to-face) opportunities to receive feedback, help, and/or clarification on course material from the instructors are provided throughout the term. Those students who struggle with the material, but take advantage of self-checks and opportunities provided for instructor help and/or peer-to-peer mentoring, can still be successful in this course.

**Weekly(ish) assignments:** There are assignments associated with several of the course modules. These may be Canvas quizzes, problem sets, or other activities such as article critiques. When assigned, these activities are to be completed prior to the end of each module, generally Sunday night.

**Final Project:** This class will have a final project. Many of the weekly module assignments will be steps along the way to completing this project. More details around this culminating project will be presented throughout the course.

**Grading Scale** 93-100% = A

90-92% = A-

87-89% = B+

83-86% = B

80-82% = B-

77-79% = C+

73-76% = C

70-72% = C-

67-69% = D+

63-66% = D

60-62% = D-

59% and below = F

## Special Accommodations

If you have specific physical, psychiatric or learning disabilities that may require accommodations for this course, please contact Northeastern’s Disabilities Resource Center (DRC) at (617) 373-2675. The DRC can provide you with information and assistance to help manage any challenges that could affect your performance in the course. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

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## **Title IX**

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's Title IX Policy prohibits Prohibited Offenses, which are defined as sexual harassment, sexual assault, relationship or domestic violence, and stalking. The Title IX Policy applies to the entire community, including male, female, transgender students, faculty and staff.

If you or someone you know has been a survivor of a Prohibited Offense, confidential support and guidance can be found through University Health and Counseling Services staff and the Center for Spiritual Dialogue and Service clergy members. By law, those employees are not required to report allegations of sex or gender-based discrimination to the University.

Alleged violations can be reported non-confidentially to the Title IX Coordinator within The Office for Gender Equity and Compliance at: [titleix@northeastern.edu](mailto:titleix@northeastern.edu) and/or through NUPD (Emergency 617.373.3333; Non-Emergency 617.373.2121). Reporting Prohibited Offenses to NUPD does not commit the victim/affected party to future legal action.

Faculty members are considered "responsible employees" at Northeastern University, meaning they are required to report all allegations of sex or gender-based discrimination to the Title IX Coordinator.

In case of an emergency, please call 911.

Please visit <http://www.northeastern.edu/titleix> for a complete list of reporting options and resources both on- and off-campus.