Course Syllabus

HEOR DS 510: Principles of Data Science and Healthcare Data

Autumn Quarter
Course 1 of 3 in the *Certificate in Data Science Methods for Real-World Evidence in Health*
Instructor: Professor Beth Devine, PhD, PharmD, MBA, bdevine@uw.edu

Course Description

(2025-2026 curriculum; subject to slight changes for 2026-2027)

This course provides an overview of the field of data science, laying a solid foundation for the material covered in quarters 2 and 3. The course includes an introduction to the broad field of data science; types of real-world evidence data sources; the details of data management; fundamental concepts of the scientific process, biostatistics and epidemiology; introduction to causal inference methods, which are covered in quarter 2; evidence synthesis; brief introduction to artificial intelligence and machine learning and their application to healthcare, the material that will be covered in quarter 3.

Course Learning Outcomes

By the end of the course, students will be able to:

- Compare and contrast sources of health data
- List the steps involved in data management
- Understand and explain fundamental scientific, statistical and epidemiologic concepts
- Interpret a network meta-analysis
- Appreciate the many potential applications of artificial intelligence and machine learning to the field of health economics and outcomes research

Course Lessons

- Module 1 – Introduction to Data Science
    - Lesson 1, Part 1: Introduction to Data Science
    - Lesson 1, Part 2: Introduction to Data Science (continued)
- Module 2 – Data Sources
    - Lesson 2: Claims Data
    - Lesson 3, Part 1: Real-World Evidence
    - Lesson 3, Part 2: Real-World Evidence (continued)
    - Lesson 4: Electronic Health Record Data
- Module 3 – Data Management

    - Lesson 5, Part 1: Data Management
    - Lesson 5, Part 2: Data Management (continued)
- Module 4 – Fundamentals of the Scientific Process
    - Lesson 6: Fundamentals of the Scientific Process
    - Lesson 7: Introduction to Biostatistics
- Module 5 – Principles of Probability and Epidemiology
    - Lesson 8: Probability and Distributions
    - Lesson 9, Part 1: Principles of Epidemiology – Study Designs
    - Lesson 9, Part 2: Principles of Epidemiology – Bias, Confounding, Effect Modification
- Module 6 – Data Analysis
    - Lesson 10: Regression Methods
    - Lesson 11: Advanced Analytic Methods
    - Lesson 12: An Organized Approach to Analyzing a Dataset
- Module 7 – Evidence Synthesis
    - Lesson 13: Systematic Reviews and Meta-Analysis
    - Lesson 14, Part 1: Network Meta-Analysis
    - Lesson 14, Part 2: Example of a Published Network Meta-Analysis
- Module 8 – Potential Uses of AI and ML in HEOR
    - Lesson 15: Potential Uses of AI in HEOR
    - Lesson 16: Clinical Prediction Models
    - Lesson 17: AI-Driven Advancements in Evidence Synthesis: Transforming Systematic Reviews and Meta-Analyses