**INSTRUCTOR**

Elza Rechtman

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**COURSE DETAILS**

Course Blackboard: learn.mssm.edu

Tuesday 4:00 pm – 5:15 pm

**COURSE DESCRIPTION**

R is an open-source language widely used by epidemiologists to manage and clean data, carry out statistical analyses of epidemiologic data, and produce high-quality figures for research communications. This course will give students a solid foundation in the most important tools for performing epidemiology data analyses using R. Students will learn how to import data into R, merge datasets, clean and transform variables, visualize, and model population data. Emphasis will be given to modeling approaches for association estimates calculation such as beta coefficients, relative risks, and odds ratios using R. Students will be given hands-on training during class and work on an epidemiologic project using R. Prior programming experience is helpful but not necessary.

**COURSE LEARNING OBJECTIVES**

Students who complete this course will be able to:

* Import data into R; take data stored in a file (Excel, CSV), and load it into a data frame in R.
* Learn basic coding with R using epidemiology data.
* Transform data using R; create new variables or summaries, rename variables, reorder the observations.
* Tidy a dataset; learn a consistent way to organize data in R. Getting the data tidy using tools provided by packages in the tidyverse.
* Summarize and visualize epidemiology data using R; visualize data using ggplot2, one of the most elegant and versatile systems for making graphs. Understand how ggplot2 implements the grammar of graphics, a coherent system for describing and building graphs.
* Perform exploratory data analysis; use visualization and transformation tools to explore data systematically.
* Modeling basics for epidemiology datasets: use learned tools of data wrangling and programming, to fit basic models and understand how they work.

**COMPETENCIES**

This course meets the following two foundational competencies for the MS in Epidemiology program:

1. Develop and apply quantitative skills to analyze and/or synthesize epidemiological data.
2. Demonstrate practical experience in analyzing and summarizing in written and oral communications epidemiology research projects.

**PREREQUISITES**

Course #: MPH0300 Course Title: Intro to Biostatistics

**REQUIRED TEXTS/PURCHASES**

Required materials will be posted on Blackboard.

Levy Library Resources:

* Current Services & Remote Library Access: <https://libguides.mssm.edu/visit>. For questions about the Levy Library use the [Ask a Librarian Chat](https://askalibrarian.mssm.edu/index.php) service during work hours or email [refdesk@mssm.edu](mailto:refdesk@mssm.edu).

**ASSESSMENT AND GRADING POLICY**

Pass/Fail Grading System

To pass, students will be required to:

* Attend 80% of classes
* Submit 80% of the assignments
* Present a final project

**LEARNING MANAGEMENT SYSTEM: BLACKBOARD**

Blackboard will be used extensively throughout the term for course syllabus, assignments, announcements, communication and/or other course-related activities. Blackboard is accessible at [learn.mssm.edu](https://learn.mssm.edu). It is the student’s responsibility to familiarize themselves with Blackboard and check it regularly. To learn more about Blackboard, visit the [ISMMS Blackboard Guide](https://sites.google.com/a/mssm.edu/blackboard-echo360-guides/home/Guides-for-Students). If you have difficulties accessing Blackboard, please inform the instructor and the Instructional Technology Group (itg@mssm.edu).

**TECHNOLOGY REQUIREMENTS**

Accessing the online delivery components of this course requires students have access to a computer or laptop with a camera and microphone.

**ZOOM VIDEO COMMUNICATIONS**

Students can access their zoom account by signing into [mssm.zoom.us](https://mssm.zoom.us/) using your Mount Sinai log in credentials. Zoom is a powerful and versatile web conferencing tool that allows students and faculty to connect easily for live lectures and remote instruction. Classes may utilize features such as screen sharing, break out rooms, hand raising, polling, and other features to create an interactive online environment. To learn more about Zoom, visit the [Zoom Help Center](https://support.zoom.us/hc/en-us/categories/200101697). If you have difficulties accessing Zoom, please inform the instructor.

**SCHOOL-WIDE RESOURCES & EXPECTATIONS**

**Disability Services**

The Icahn School of Medicine is committed to providing equal access to learning opportunities for students with documented disabilities. To ensure access to this class, and your program, please contact the Disability Officer, Christine Low, to engage in a confidential conversation about the process for requesting accommodations. More information can be found online at: <https://icahn.mssm.edu/education/students/disability> or by contacting the Disability Officer at [christine.low@mssm.edu](mailto:christine.low@mssm.edu). Students seeking accommodations and services are required to submit documentation of their disability. Students should expect a minimum of one month to process accommodation requests and plan accordingly.

**Academic Integrity**

The Graduate Program in Public Health expects all students to adhere to the Icahn School of Medicine at Mount Sinai’s standards for Academic Integrity and Responsible Conduct of Research as stated in the Student Handbook. It should be clearly understood that any form of academic misconduct will be treated as serious offenses inconsistent with the goals and activities of the academic environment. If it is determined that the student has been involved academic misconduct, the student will receive an F for the assignment or course. Additional consequences, including dismissal from the Program, are at the discretion of the Program Director and the Dean of the Graduate School. Some basic types of behavior that are unacceptable include, but are not limited to:

Cheating: using unauthorized notes, study aids, or information on an examination; altering a graded work after it has been returned, then submitting the work for re-grading; allowing another person to do one’s work and submitting that work under one’s own name; submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

Plagiarism: submitting material that in part or whole is not entirely one’s own work without attributing those same portions to their correct source.

Please refer to the Student Handbook for the complete policies on Academic Integrity and Responsible Conduct of Research.

**Mistreatment and Unprofessional Behaviors Directed at Students**

The Icahn School of Medicine at Mount Sinai and the Graduate School of Biomedical Sciences are dedicated to providing students, postdocs, residents, faculty, staff members, and patients with an environment of respect, dignity, inclusion, trust, support, and protection of civil and professional discourse, free of mistreatment, abuse, or coercion, and without fear of retaliation. Please refer to the [School’s statement and procedures regarding mistreatment](https://icahn.mssm.edu/education/students/handbook-policies/misconduct-policy).

## COURSE SCHEDULE\*\*

**Date Topic Learning Objectives**

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| --- | --- | --- | --- |
| Week 1 |  | Get up and running with R and RStudio | * The basic data analysis cycle * Download and install R * Download and install RStudio * Install a set of R packages called the Tidyverse * Understand the environment interface * Where and how to get help * Building scripts |
| Week 2 |  | Introduction to coding with R (I) | * Create and name a vector * Create and name matrices * Create and name factors |
| Week 3 |  | Introduction to coding with R (II) | * Create, name, and subset lists * Create and name a data frame |
| Week 4 |  | Data transformation (I) | * dplyr basics * Tibbles * Filter rows * Arrange rows * Select columns * Add new variables |
| Week 5 |  | Data transformation (II) | * Combining multiple operations with the pipe * Missing values * Counts * Summary functions * Grouping and ungrouping |
| Week 6 |  | Data Wrangling using the Tidyverse (I) - | * Tidy data   + Pivoting   + Separating and uniting   + Missing values |
| Week 7 |  | Data Wrangling using the Tidyverse (II) | * Mutating joins * Filtering joins * Factors: modifying order and levels |
| Week 8 |  | Data Visualization (I) | * Understand what geometries and mappings are. * The layered grammar of graphics * Create visualizations using the x, y, color, size, alpha, and shape properties. * Facets * Geometric objects |
| Week 9 |  | Data Visualization (II) | * Statistical transformations * Position adjustments * Coordinate systems * Themes |
| Week 10 |  | Exploratory Data Analysis | * Introduction * Variation and covariation * Patterns * Build simple linear regression models |
| Week 11 |  | Modeling basics for Epidemiology research studies | * Formulas * Model families * Adjust for confounders * Model interactions |
| Week 12 |  | Final Project  Presentations and Course Wrap-up | * Present and discuss the final student epidemiology project using R |

*\*\** This Syllabus is Subject to Change.