BROWN SCHOOL

**WASHINGTON UNIVERSITY IN ST. LOUIS**

**MASTER OF PUBLIC HEALTH PROGRAM**

**Fall 2020**

**Advanced data analysis**

**S55 MPH 5245.01 and .02**

**CREDIT HOURS:** 3 **INSTRUCTORS:** Kimberly J. Johnson, MPH, PhD and Xiaoyan Wang

**GRADE:** L/G **OFFICE:** Goldfarb 237 (Instructor)

**ROOM:**  **OFFICE HOURS:**  Kim Johnson: by appointment, Xiaoyan Wang: by appointment

**DAY/TIME: W 9-12, 2-5**

\*Due to the asynchronous/synchronous online learning format,

any synchronous meeting lengths will normally be less than 3 hours

**PHONE (Instructor):** 314-935-9154 (office)

**E-MAILS:** [kijohnson@wustl.edu](mailto:kijohnson@wustl.edu)

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1. **COURSE DOMAIN AND BOUNDARIES**

Students will be provided with an introduction to theory and analytical techniques commonly employed in the practice of public health through mini-lectures and a hands-on experiential learning approach. Students will work as individuals or teams to develop and conduct a project, choosing from different real-world public health datasets that are amenable to some of the most common types of analyses that students will encounter in their public health careers. Mini-lectures will address theory as well as practical tools and exercises will be focused on application of the theories and tools. Homework will be assigned that provides students with further opportunity to gain competency in strategies that can be employed to analyze each type of dataset. The course will also provide students with the opportunity to gain skills in data visualization strategies, conducting reproducible research, presenting projects, and effectively responding to constructive critiques.

Prerequisites:

- Foundations of Public Health: Epidemiology

- Foundations of Public Health: Biostatistics

- Applied Linear Modeling

- Basic competency in R or motivation to learn R in those with competency in SAS, SPSS, or STATA

1. **MPH FOUNDATIONAL KNOWLEDGE AND COMPETENCIES ADDRESSED IN THIS COURSE:**

1. **Foundational Knowledge**
2. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population’s health.

**B. Foundational Competencies (and or Specialization Competencies as applicable)**

1. Describe preferred methodological alternatives to commonly used statistical methods when assumptions are not met.
2. Apply and interpret common statistical methods for inference (e.g., ANOVA, linear and logistic regression, survival analysis) found in public health studies.
3. Explain the principles of study design for identifying risk factors for outcomes (e.g, sampling strategies, data collection, study design trade-offs).
4. Describe principles and the application of key concepts from probability and inference (e.g., random variation, measurement error, confounding bias, effect modification) to colleagues without extensive statistical training.
5. Demonstrate an understanding of systematic biases (selection and information biases) that affect observational, quasi-experimental, and experimental studies.
6. Demonstrate an understanding of the components of reproducibile research.
7. **Other Competencies**
   * 1. Communicate audience-appropriate public health content, both in writing and through oral presentation.

**III. BROWN SCHOOL ACADEMIC POLICIES**

Academic Integrity: If a faculty member or student suspects that academic or professional integrity has been violated, they are required to submit an Academic Integrity or Professional Integrity Violation form found on Inside Brown for review by the Assistant Dean of the program. The Assistant Dean or designated representative will aid in the investigation of the violation, which includes but is not limited to gathering relevant evidence; conversations with the instructor, student(s) involved, witnesses, and others as necessary. Depending on the seriousness of the case, the Assistant Dean may choose to refer the matter directly to the University Student Conduct Board. This referral procedure will generally be followed if it is believed that the penalty is likely to involve suspension or expulsion from the University. The Assistant Dean for the program or designated representative will offer to meet privately with the student(s) against whom the complaint has been made. It is the student’s responsibility to familiarize themselves with the behaviors that constitute an academic integrity violation requiring referral. More information about Academic and Professional Integrity policies, violations, guidelines and procedures can be found here: <https://insidebrown.wustl.edu/People/students/studenthandbook/Academic-and-Professional-Integrity/Pages/default.aspx>

[Student Handbook 2020](https://insidebrown.wustl.edu/People/students/studenthandbook/Pages/default.aspx)

Accommodations:  If you have a learning, sensory, or physical disability or any other diagnosis that requires accommodations and/or assistance in lectures, reading, written assignments, and/or exam taking, please work with the [Disability Resource Center](https://students.wustl.edu/disability-resources/), a University-wide resource that provides academic accommodations support and referrals.  After [requesting academic accommodations](https://students.wustl.edu/requesting-academic-accommodations/) by providing [appropriate documentation](https://students.wustl.edu/documentation-guidelines-disability-resources/), students approved for accommodations will provide an Accommodation Letter to the instructor and are encouraged to work directly with the instructor to discuss specific course needs. The student’s Academic Advisor and/or the Assistant Dean for Student Affairs can support a student through this process.

Pronouns: The Brown School embraces and promotes gender expansiveness as reflective of the lived experiences of many students, staff, faculty and members of our expanded community. The correct use of an individual’s pronouns is a critical part of an individual's identity and of building an inclusive community. Students, faculty and staff are encouraged to use pronouns during introductions, are expected to use expressed pronouns of all Brown School community members, and are encouraged to apologize when mistakes are made. Educational resources are available at: <https://campuslife.wustl.edu/lgbtqia/lgbt-resources/gender-pronouns/>

English Language Proficiency: If your English language proficiency is such that you may need special assistance in lectures, reading, written assignments, and/or exam taking, please communicate these needs to your instructor who may refer you to the [Brown Communication Lab](https://brown.mywconline.com/).  If you would like help seeking additional English language resources, please contact Amy Roither at amyroither@wustl.edu. You may also find the Academic Assistance resources available through the [Office for International Students and Scholars](http://oisshome.wustl.edu/students/) to be helpful.

Professional Use of Electronic Devices in the Classroom: Computers or other electronic devices, including “smart pens” (devices with an embedded computer and digital audio recorder that records the classroom lecture/discussion and links that recording to the notes taken by the student), may be used by students at the discretion of the faculty member to support the learning activities in the classroom. These activities include taking notes and accessing course readings under discussion. If a student wishes to use a smart-pen or other electronic device to audio record lectures or class discussions, they must notify the instructor in advance of doing so. Permission to use recording devices is at the discretion of the instructor, unless this use is an accommodation approved by Disability Resources.

Nonacademic use of laptops and other devices and use of laptops or other devices for other coursework is distracting and seriously disrupts the learning process for other people in the classroom. Neither computers nor other electronic devices are to be used in the classroom during class for nonacademic reasons or for work on other coursework. Nonacademic use includes emailing, texting, social networking, playing games, instant messaging, and use of the Internet. Work on other coursework may include, but is not limited to, use of the Internet, writing papers, using statistical software, analyzing data, and working on quizzes or exams. The nonacademic use of cell phones during class time is prohibited, and they should be set on silent before class begins. In the case of an emergency, please step out of the room to take the call. The instructor has the right to hold students accountable for meeting these expectations, and failure to do so may result in a loss of participation or attendance points, a loss of the privilege of device use in the classroom, or being asked to leave the classroom.

Religious Holidays: The Brown School recognizes the individual student’s choice in observing religious holidays that occur during periods when classes are scheduled. Students are encouraged to arrange with their instructors to make up work missed as a result of religious observance, and instructors are asked to make every reasonable effort to accommodate such requests.

**IV. WASHINGTON UNIVERSITY ACADEMIC SUPPORT POLICIES**

Accommodations based upon relationship or sexual violence, including sexual harassment and stalking: The University is committed to offering reasonable accommodations to students who are victims of relationship or sexual violence.  Students are eligible for accommodations regardless of whether they seek criminal or disciplinary action.  Depending on the specific nature of the allegation, such accommodations may include but are not limited to implementation of a no-contact order, emergency housing, course/classroom assignment changes, assignment extensions and other academic support services.  If you need to request such accommodations, please direct your requests to [rsvpcenter@wustl.edu](mailto:rsvpcenter@wustl.edu) or call directly to 314-935-3445.

There are licensed RSVP counselors who serve as confidential resources. However, to implement requests for accommodations, limited information will be shared with the appropriate university administrator and/or faculty.  The University will maintain as confidential any accommodations or protective measures provided to an individual student so long as it does not impair the ability to provide such measures.

If a student comes to me to discuss or disclose an instance of sexual assault, sex discrimination, sexual harassment, dating violence, domestic violence or stalking, or if I otherwise observe or become aware of such an allegation, I will keep the information as private as I can, but as a faculty member of Washington University, I am required to immediately report it to my Associate, Assistant or School Dean or directly to Ms. Jessica Kennedy, the University’s Title IX Director.  If you would like to speak with directly Ms. Kennedy directly, she can be reached at [(314) 935-3118](tel:(314)%20935-3118), or via email at [jwkennedy@wustl.edu](mailto:jwkennedy@wustl.edu),.  Additionally, you can report incidents or complaints to the Office of Student Conduct and Community Standards or by contacting WUPD at [(314) 935-5555](tel:(314)%20935-5555) or your local law enforcement agency. See: [Title IX](https://mailingsresponse.wustl.edu/trk/click?ref=z1030up2e7_2-bdafx37b35x0194&)

You can also speak confidentially and learn more about available resources at the Relationship and Sexual Violence Prevention Center by calling (314) 935-3445 for an appointment  See: [RSVP Center](https://mailingsresponse.wustl.edu/trk/click?ref=z1030up2e7_2-bdafx3ab80x0194&)

Bias Reporting: The University has a process through which students, faculty, staff and community members who have experienced or witnessed incidents of bias, prejudice or discrimination against a student can report their experiences to the University’s Bias Report and Support System (BRSS) team.  See:  [brss.wustl.edu](https://mailingsresponse.wustl.edu/trk/click?ref=z1030up2e7_2-bdafx3ab81x0194&).

Mental Health: Mental Health Services’ professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression.  See [Mental Health Resources](https://insidebrown.wustl.edu/People/students/Pages/Mental-Health-Resources.aspx) to be connected with a provider at Habif Health & Wellness, or in the Community

Center for Diversity and Inclusion (CDI):The Center of Diversity and Inclusion (CDI) supports and advocates for undergraduate, graduate, and professional school students from underrepresented and/or marginalized populations, creates collaborative partnerships with campus and community partners, and promotes dialogue and social change.  One of the CDI's strategic priorities is to cultivate and foster a supportive campus climate for students of all backgrounds, cultures and identities. See: [diversityinclusion.wustl.edu/](https://mailingsresponse.wustl.edu/trk/click?ref=z1030up2e7_2-bdafx3a66dx0194&)

Additional Issues or Concerns:  If you feel that you need additional supports in order to be successful in your time at Brown, beyond the mentioned accommodations, please contact your Academic Advisor or [Miriam Joelson](mailto:miriamjoelson@wustl.edu), Academic and Student Affairs Coordinator. They can assist you in navigating a myriad of concerns.

**V. COVID-19 HEATH AND SAFETY PROTOCOLS**

**Exceptions to course policies, expectations, and requirements (including attendance and assignment deadlines) because of COVID-19 diagnosis, symptoms consistent with COVID-19 or exposure to a person with a confirmed or suspected COVID-19 diagnosis will be made in collaboration between the student and instructor. In these cases, please notify your instructor as soon as possible to discuss appropriate accommodations.**

We take your health and the health of our community seriously. Any Danforth Campus student who is **currently diagnosed with COVID-19**, **is** **experiencing symptoms consistent with COVID-19**, **or** **has had direct contact with a person with a confirmed or suspected COVID-19 diagnosis must remain home and isolate yourself from others.**Students who have symptoms and/or do not pass the screening protocol described below must call theHabif Health and Wellness Center at 314-935-6666 for additional instructions.

All students on the Danforth Campus are required to complete the self-screening and reporting before each time that they come to campus. To complete the screening questionnaire, visit [COVID-19 restrictions and screening for campus access](https://emergency.wustl.edu/coronavirus-disease-covid-19/covid-19-travel-restricted-locations/) and log in with your WUSTL Key.

While on campus, it is imperative that students follow all public health guidelines established to reduce the risk of COVID-19 transmission within our community. The full set of University protocols can be found <https://covid19.wustl.edu/health-safety/>. This includes…

* **Complying with physical distancing requirements at all times and adhere to signage and environmental cues.** This includes not congregating before or after class as well as during breaks or class activities.
* **Complying with universal masking. All individuals on campus must wear disposable masks or cloth face coverings while occupying indoor public settings**, including: multi-person offices; hallways; stairwells; elevators; meeting rooms; classrooms; restrooms; and when in campus outdoor spaces unless you can maintain six feet of physical distance from others. *In the event that a student cannot wear a mask due to a medical condition or other concerns, they should consult with their academic advisors.*
* **Practicing healthy personal hygiene**, including frequent handwashing with soap and warm water for at least 20 seconds and/or using hand sanitizer with at least 60% alcohol.
* **Complying with cleaning and sanitation protocols.** Students may be responsible for wiping down common surfaces after use, particularly those that might be shared with others (e.g. classroom desks). Instructions for sanitizing technology equipment [can be found here](https://sites.wustl.edu/itss/sanitizing-technology-equipment/).

1. **READINGS AND SOFTWARE REQUIREMENTS**

**Readings:** The reading assignments for the course will include links to journal articles and other material provided on the syllabus and uploaded on Canvas.

**Software:** Students are required to use R software for this course for analyses.

1. **ORGANIZATION OF THE COURSE**

This course will be delivered as an online course. The majority of the class time will be asynchronous, meaning students will be expected to engage with pre-recorded lectures and resources. Each week, the Canvas module will open up by the end of Tuesday. There may be some synchronous sessions, meaning students should be present via Zoom video conference and be prepared to actively engage in course lectures, discussions and activities during those scheduled times. Additional details about the structure of the course will be provided via Canvas Announcement (which also sends an email) or other form of communication in advance of the start of the course.

1. **ROLE OF STUDENT AND INSTRUCTORS**

STUDENT ROLE:

Online learning expectations: In order to foster a collaborative and engaging online learning experience for both students and instructors, please follow the below guidelines:

* Follow instructor guidelines and parameters for online engagement, such as having your web camera on during lectures, discussions, or other class activities.
* Take yourself off mute to engage in discussions or other interactive class activities.
* Remember to keep yourself on mute when not speaking.
* Remain focused on the class and avoid unrelated conversations in the chat box.
* Maximize your opportunity for learning by being present for class – when possible, attend class in a quiet space that lets you avoid distractions.
* Avoid engaging in non-class activities, such as checking email, texting, other Internet use, working on other assignments, or any other home activities.

Failure to adhere to course parameters and instructor expectations for online learning may lead to a reduction in participation or attendance points as determined by the instructor.

Additionally, here are a few other tips for good online etiquette (or ‘netiquette’) during online class discussions or while participating in course discussion boards.

* Please read before you type. Read other posts, comments, or questions thoroughly to avoid posting or asking the same question.
* Please think about the impact of your contribution before you type. We all know communication online can easily go awry. Please demonstrate mutual respect in communications. Generally speaking, if you would not say it in person, it probably does not belong in an online discussion either. Try to avoid using all caps to avoid the perception that you are yelling your comments. Sarcasm, humor, and tone are often difficult to interpret and can easily lead to miscommunications and lead to potential harm to your colleagues.
* Public vs. Private. Any communication shared privately may become public, so be mindful of what you share in discussion boards or chat features.
* Formal vs. Informal. Make every effort to avoid using colloquialisms or text shortcuts during class discussions- many of our students may not be able to understand or engage in discussions. Think about online communication during class as an opportunity to practice communication with future employers, colleagues, and/or clients.

Instructor Expectations and Requirements:

* We will come to class prepared, organized, and enthusiastic.
* We can be reached by phone, email, or during office hours/scheduled appointments.
* We retain the right to change the content and order of the lectures and exercises to meet the needs of students who are enrolled in the course.

1. **ASSIGNMENTS AND GRADING CRITERIA**

**Homework (60% of final grade).** There will be 11 homework assignments. Students may drop 2 of the 11 assignments. Depending on the HW grading may be based on 2-3 problems chosen at random.

**Final project (30% of final grade):** Students will develop a data analysis project from conception to dissemination of results through a presentation or report using a real-world dataset. Students will find their own datasets. Examples of real-world datasets that could be used for this project include Surveillance, Epidemiology, and End Results (SEER: <https://seer.cancer.gov/>), Behavioral Risk Factor Surveillance System (BRFSS: <https://www.cdc.gov/brfss/index.html>), and National Health and Nutrition Examination Survey (NHANES: <https://www.cdc.gov/nchs/nhanes/index.htm>). Another source of datasets is the Inter-university Consortium for Political and Social Research (<https://www.icpsr.umich.edu/icpsrweb/ICPSR/search/studies>). Students are expected to apply the concepts used in class to their final project. The final project can be conducted by an individual or a team of no more than 3 members. For students choosing to work in teams, each team member will receive the same grade. It is therefore advised that you choose your team members with careful consideration as we will not take off points for individual team members who may cause other team members frustration! ☺ Components of the project include:

1. **Concept proposal (5 points)**
2. **Abstract (5 points)**
3. **Code for project on github site (5 points)**
4. **Final project presentation (10 points)**
5. **Responses to reviewers (5 points).** Reviewers will be composed of students who attend the presentation and the instructors. Instructors will assemble 2-3 written comments for the student/team to respond to within one week of the final presentation.

**Participation (10% of final grade).** This will be taken into account on a case-by-case basis.

**Grading Scale:**

95-100: A\* 90-94: A- 88-89: B+ 82-87: B

80-81: B- 77-79: C+ 74-76, C 70-73: C-

69 & below, F

**\*What constitutes A work:** As indicated in “Course Administration and Grading” (<https://insidebrown.gwb.wustl.edu/students/MPH/Pages/AcademicResources.aspx> ), A’s are given for outstanding work defined as “**exceeds expected level of performance for graduate study”.** Not all students will receive A’s in this course and extra credit assignments are not given to assist students in recovering lost points. Students who perform at the outstanding level in this class are typically those that come to class prepared, start their homework well before the due date, and ask questions to clarify gaps in their understanding. If you are not performing at an A level of work, please know that we do not use grades to judge the overall quality of the person. There are many factors besides grades that contribute to success and we do realize that students have varying priorities and demands on their time. We view each student holistically and grades are just one part of the overall view.

1. **Getting help with R and course content in general.**

If you need help with understanding the course materials, there are several options including:

* Making an appointment with one or both of the instructors.
* Making an appointment with the StatLab that provides excellent tutoring with software and programming. Please visit the StatLab website for more information at <https://insidebrown.gwb.wustl.edu/People/students/StudentSupportResources/Pages/StatLab.aspx>
* Good websites for R issues:
  + Quick-R: <https://www.statmethods.net/> .
  + UCLA Institute for Digital Research and Education (idre): <https://stats.idre.ucla.edu/r/>
  + Stackoverflow: <https://stackoverflow.com/> (please see: <https://stackoverflow.com/tour> before posting a question on this site. Users of this site get very crabby when questions are not well-written (clearly telling what problem you are trying to solve and showing what you already tried), so make sure you read about what not to ask about at the tour link.
  + Google your error message or your “how do you…” question and often you will find a solution on the web. This is a completely normal part of coding, so embrace it!

1. **COURSE OUTLINE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Class Date** | **To Do list** | **Topic (s)** | **Lecture** | **Exercises** | **What is due?** |
| **BLOCK ONE: Getting started and reproducible research**  **1. Getting started and writing code to ensure reproducibility (KJ)**  **2. Sharing using Github (KJ)** | | | | | |
| **1:** 8/26  Meet on zoom for introduction and R demo | * Complete class 1 survey * Watch class 1 videos * **Module 2:** [Coding2share module](https://coding2share.github.io/ReproducibilityToolkit/Mod3Code.html) * **Reading:** Peng RD. Reproducible Research in Computational Science. *Science* 2011, Vol 334. Pg. 1226-1227 | Course overview and Reproducible research I | Reproducible research I (Kim Johnson) | Importing data into R and simple statistics (Zoom demo) | **HW1:** response to survey |
| **2:** 9/2  Meet on zoom for Github demo | * Watch class 2 videos * **Reading:** Goodman A et al. Ten simple rules for the care and feeding of scientific data. *PLOS Computational Biology*. 2014, Vol 10, Issue <https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003542> | Reproducible research II | Version control for reproducible research (Kim Johnson) | Online demo of version control | **HW2:** Survey analysis questions and answers in R Markdown |
| **BLOCK TWO: Tools**  **1. Data visualization (XW)**  **2. Missing data imputation (KJ)**  **3. Building a conceptual model using DAGS (KJ)** | | | | | |
| **3:** 9/9 | * **Reading:** R for data science chapter 3: <https://r4ds.had.co.nz/data-visualisation.html> | Data Visualization | Data visualization in R for scientific presentations  (Xiaoyan Wang) | Data visualization using ggplot | **HW3:** Upload HW2 code to your Github acccount |
| **4:** 9/16  Meet on zoom for R missing data demo | * **Reading:** Mice in R: <https://www.jstatsoft.org/article/view/v045i03>   Pgs 1-7   * **Reading:** Azur et al. Multiple imputation by chained equations: what is it and how does it work? 2011 *Int. J. Methods Psychiatr Res*. 20(1): 40-49 | Missing data | Missing data (Kim Johnson) | Missing data exercise using the MICE package | **HW4:** Data visualization assignment |
| **5:** 9/23  Meet on zoom for Daggity demo | * **Reading:** Suttorp MM et al. Graphical presentation of confounding in directed acyclic graphs. Nephrol Dial Transplant. 2015 Sep;30(9):1418-23. doi: 10.1093/ndt/gfu325. Epub 2014 Oct 16. * **Video:** <https://www.youtube.com/watch?v=lRyG7zL9du8> * **Tutorial:** <http://www.dagitty.net/learn/graphs/index.html> | Covariate selection (DAGs) | DAGs (Kim Johnson) | DAG exercise using Daggity | **HW5:** Missing data assignment |
| **BLOCK THREE**  **Modeling: GLM**  **1. GLM (XW)**  **2. Poisson and Negbin (KJ)**  **3. Multinomial and Ordinal (XW)** | | | | | |
| **6:** 9/30 | * **Reading:** Quick-R Generalized Linear Models <https://www.statmethods.net/advstats/glm.html> | Generalized linear modeling I | Overview of generalized linear models and logistic regression  (Xiaoyan Wang) | Generalized linear models in R exercise | **HW6:** DAG assignment |
| **7:** 10/7 | * **Reading:** Long, J.S. (1997). Regression Models for Categorical Dependent Variables. Thousand Oaks, CA: Sage Publications, Chapter 8 (Optional) * **Video:** Introduction to Poisson <https://www.youtube.com/watch?v=8px7xuk_7OU> | Generalized linear modeling II | Poisson and negative binomial regression (Kim Johnson) | Poisson and negative binomial regression exercise | **HW7:** Logistic regression assignment |
| **8:** 10/14 | * **Reading:** <https://stats.idre.ucla.edu/r/dae/multinomial-logistic-regression/> * **Reading:** <https://stats.idre.ucla.edu/r/dae/ordinal-logistic-regression/> | Generalized linear modeling III | Multinomial and ordinal logistic regression (Xiaoyan Wang) | Multinomial and ordinal logistic regression excercise | **HW8:** Poisson and negative binomial regression assignment |
| **BLOCK FOUR**  **Modeling: survival analysis**  **1. KM curves (KJ)**  **2. Cox Proportional Hazards Regression (XW)**  **3. Cox PH assumption (XW)**  **4. Retricted Mean Survival Time (RMST) (XW)** | | | | | |
| **9:** 10/21 | * **Reading:** A Practical Guide to Understanding Kaplan-Meier Curves <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3932959/pdf/nihms549224.pdf> | Survival analysis I | Introduction to Survival Analysis (Kim Johnson) | Kaplan Meier Curves in R exercise | **HW9:** Multinomial and ordinal regression assignment |
| **10:** 10/28 | * **Reading:** <https://www.datacamp.com/community/tutorials/survival-analysis-R> (start with Cox Proportional Hazards Models) | Survival analysis II | Cox Proportional Hazards Regression (Xiaoyan Wang) | Cox PH in R exercise | **HW10:** KM curve assignment  **Concept proposal for project** |
| **11:** 11/4 | * TBD | Survival analysis II continued | PH assumption violation (Xiaoyan Wang) | PH assumption testing | Nothing |
| **12:** 11/11 | * **Reading:** survRM2 package: <https://cran.r-project.org/web/packages/survRM2/vignettes/survRM2-vignette3-2.html> * **Reading:** BMC paper:  <https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-13-152> * **Reading:** Statistics in Medicine paper:<https://onlinelibrary.wiley.com/doi/full/10.1002/sim.4274?casa_token=O0ax8kPwo28AAAAA%3ApdwvU0Qaf2eKymby_N20iJinOdMmYQHfpqggN1CfDThgBwY6kXhKn3fUxaom12zTlIufHJ2DIj8VYDI> | Survival analsysis III | Restricted Mean Survival time (Xiaoyan Wang) | RMST exercise | **HW11:** Cox PH assignment |
| **ODDS AND ENDS** | | | | | |
| **13:** 11/18 |  | TBD |  |  | **Abstract due** |
| **FINAL PROJECT PRESENTATIONS** | | | | | |
| **14:** 11/25 |  | Final project presentations |  |  |  |
| **15:** 12/2 |  | Final project presentations |  |  | **Final projects** are due including code posted on Github, and powerpoint |
| 12/7 |  | No class—just a deliverable due |  |  | **Final project response** |

**Resource list**

**Reproducible Research**

* Knuth DE. Literate Programming. http://www.literateprogramming.com/knuthweb.pdf (read pg 1 part A)
* Analysis and Reporting Modules [3c](https://www.youtube.com/watch?v=-_oNryFHh8c&list=PLkfBg8ML-gIm4PsDBIplBONOyMon2p9k-&index=7) and [3d](https://www.youtube.com/watch?v=qaRW2-Dy-F0&list=PLkfBg8ML-gIm4PsDBIplBONOyMon2p9k-&index=8)

Peng 1: <https://www.youtube.com/watch?v=4rBX6r5emgQ>

Peng 2: <https://www.youtube.com/watch?v=VOaN33aAcEw>

* Peng 3: <https://www.youtube.com/watch?v=SppP5TXnmwc&t=7s>
* Ram K. Git can facilitate greater reproducibility and increased transparency in science. Ram Source Code for Biology and Medicine 2013, 8:7 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3639880/>
* Blischak JD, Davenport ER, Wilson G. A Quick Introduction to Version Control with Git and GitHub. PLoS Computational Biol. 2016 Jan 19;12(1):e1004668. <https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1004668>

**Directed Acyclic Graphs**

* Westreich D and Greenland S. The table 2 fallacy: presenting and interpreting confounder and modifier coefficients. Am J. Epidemiol 2013 Feb 15;177(4):292-8. PMID: 23371353
* VanderWeele TJ and Robinson W. On causal interpretation of race in regressions adjusting for confounding and mediating variables. Epidemiology. 2014 July; 25(4): 473-484
* Shrier I and Platt RW. Reducing bias through directed acyclic graphs. BMC Medical Research Methodology. 2008, 8:70