RUTGERS
School of Public Health

Course Title: *Biostatistical Computing*

Course Number: *BIST 0535J030*

Course Prerequisite(s): Introduction to Biostatistics

Course Location: Room 2A

Course Date & Time: *Monday 6:00 PM – 8:00 PM*

Course Instructor: Nicole Jones, MPH

Department of Biostatistics
Email: jones.nicolek20@gmail.com **or** nkj20@sph.rutgers.edu

Office Hours: After class, Thursday 5:00 PM - 7:00 PM, or by appointment

Course Assistant: Perpetual Tamakloe

Email: pmt60@scarletmail.rutgers.edu

Office hours: Tuesday 5:00 PM – 6:00 PM

Course Website: *Canvas*

Course Text (not required):

The Little SAS Book, A Primer, Fifth Edition, Delwich and Slaughter, SAS Publishing.

Applied Statistics and the SAS Programming Language, Fifth Edition, Cody and Smith, Pearson Prentice Hall.

For R: SAS and R – Data Management, Statistical Analysis and Graphics second edition, Ken Kleinman and Nicholas J. Horton CRC Press

Additional/Supplemental Readings/Resources:

Naked Statistics, Stripping the Dread from Data, Charles Wheelan, 2009

SAS OnDemand/SAS Studio (free for academia) (© SAS Institute Inc., Cary, NC, USA) and Microsoft Office (© Microsoft Corporation). SAS OnDemand/SAS Studio is a program that runs in your web browser after you have created a free account on the SAS website. I will supply a walkthrough of steps necessary for using SAS Studio through SAS OnDemand.

https://www.sas.com/en_us/software/on-demand-for-academics.html

R version 3.6.1 or higher and RStudio Version 1.2.1335 – © 2009-2019 RStudio, Inc. R and R Studio are freeware that can be downloaded from the web.

R downloaded from: http://www.r-project.org
...and R Studio from
https://www.rstudio.com/products/rstudio/download/

Course Description: This course introduces the student to SAS software (© SAS Institute Inc., Cary, NC, USA) and its use in data management and analysis. We will cover topics frequently used in public health applications. This course will also introduce students to the R and RStudio computer packages for data analysis. We will also briefly review Microsoft Excel (© Microsoft Corporation).

Competencies Addressed: Each Department identifies competencies for each degree offered. The core competencies addressed in this course for the MPH for the Department of Quantitative Methods include:

- Demonstrate competency in the use of Statistical Analysis Software and R (if applicable)
- Create and work with high quality datasets related to research and public health Manipulate, analyze and interpret data using appropriate statistical tests
- Conceptualize public health or research questions using univariate, bivariate and basic multivariate analysis
- Understand basic design and methodologies of a research study
- Critically evaluate the epidemiological data by assessing the quality of data and their sources
- Communicate results by creating charts and graphs

Course Objectives: By the completion of this course, students will be able to:

- Give an introduction and develop a basic competency in using SAS Software (© SAS Institute Inc., Cary, NC, USA), and Microsoft Office (© Microsoft Corporation). For those in the 3 credit class, it will introduce R and R studio for analysis and graphs.
- Understand the concepts of data management and analysis with a specific application to public health

Course Requirements and Grading: *Your grade will be based on the following*

1.	*Class Participation*	*10%*
2.	*Classwork and homework*	*45%*
3.	*Project 1*	*20%*
4.	*Final project*	*25%*
	Total:	*100%*

Late Homework Policy: No late assignments will be accepted.

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Grading Policy: *94 – 100   A*
90 – <94   A-
87 – <90   B+
84 – <87   B
80 – <84   B-
77 – <80   C+
70 – <77   C
<70   F

Course Schedule:

Week	Date	Course Topic	Online 30	Assignments/ Assessments
1	Jan 23	Overview of course Introduction to SAS	Review ACTG1750OverallDescription and ACTGF15NEJM1996 files on Canvas page	
2	Jan 30	SAS Basics • Common PROC steps • Accessing SAS Data sets • Descriptive Statistics	Basic_sas_lib_data_ac.pptx	Homework 1: ACTG Table 1
3	Feb 6	Review Table 1 SAS Basics • Reading SAS Datasets • Formats	Excel Advanced	Homework 2: Run small program and answer questions
4	Feb 13	Review Homework 2 Handling Data • Reading Raw Data files • Manipulating data	Reading Raw Data Supplement	Homework 3: Reading Raw Data

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5	Feb 20	Review HW3 Oswego Project		Project 1: Oswego Project
6	Feb 27	Handling Data (cont.) • Combining Datasets		Homework 4: Combining Datasets
7	Mar 6	Review of SAS topics Advanced SAS • SAS Macro variables • SAS Macros • Proc SQL • Proc Transpose	Installation_of_R_2021	Homework 5: SAS Review
8	Mar 20	Introduction to R	Review R Studio IDE and Base R cheat sheet: • https://ucdavis-bioinformatics-training.github.io/Oct2017-ILRI-Workshop/Cheat_Sheets/rstudio-IDE-cheatsheet.pdf • https://github.com/rstudio/cheatsheets/blob/main/base-r.pdf Review readr, readxl and googlesheets4 cheat sheet https://leadousset.github.io/intro-to-R/cheatsheet_import.pdf	Homework 6: Introduction to R

9	Mar 27	R Basics • Programming Concepts and Functions • Reading Data into R	Review purr and stringr cheat sheets: • https://stringr.tidyverse.org • https://github.com/rstudio/cheatsheets/blob/main/data-transformation.pdf • https://github.com/rstudio/cheatsheets/blob/main/tidyr.pdf • http://www.flutterbys.com.au/stats/downloads/slides/figure/factors.pdf	
10	Apr 3	R Basics • Reading Data into R (cont.) Manipulating Data in R • Dplyr • Tidyr	Review cheat sheet • https://github.com/rstudio/cheatsheets/blob/main/data-transformation.pdf Watch this YouTube video on joins • https://www.youtube.com/watch?v=Yg-pNqzDuN4	Homework 7: Reading Data
11	Apr 10	Manipulating Data in R • Stringr • Purr Merging Datasets • merge( ) base R • dplyr joins	Review ggplot cheat sheet: • https://ggplot2.tidyverse.org	Homework 8: Data Manipulation in R + Merging Datasets homework
12	Apr 17	Descriptive Statistics • Summarise() Data Visualization • Ggplot2 Advanced R • R Shiny • Shiny Dashboards	Review Cheat Sheet • https://shiny.rstudio.com/images/shiny-cheatsheet.pdf	Homework 9: Data Visualization

13	Apr 24	Advanced R • RMarkdown • Reticulate	Review RMarkdown, and reticulate cheat sheets • https://www.rstudio.com/wp-content/uploads/2015/02/rmarkdown-cheatsheet.pdf • https://ugoproto.github.io/ugo_r_doc/pdf/reticulate.pdf	
14	May 1	Final Project R		Final Project
15	May 8	Final Project R		Final Project

Minimum Grade Requirement for Select Prerequisite Courses

BIST 0535 Biostatistical Computing serves as a prerequisite course for many upper-level research and quantitative courses. Some of these upper-level courses require not only completion of BIST 0535 but also require a minimum grade requirement (i.e., a grade of "B" or better) in BIST 0535. Students who have completed the prerequisite course with the required minimum grade will be allowed to register for upper-level courses that require a minimum grade. Students who have completed the prerequisite course with a grade less than the required minimum grade should review the Minimum Grade Requirement for Select Prerequisite Courses Policy for more information. Students may review the Curriculum Worksheet for their concentration to learn which upper-level courses have a minimum grade requirement.S

Learning Management System: Canvas will be used extensively throughout the semester for course syllabus, assignments, announcements, communication and/or other course-related activities. It is the student's responsibility to familiarize themselves with Canvas and check it regularly. If you have difficulties accessing Canvas, please inform the instructor and Canvas Support (help@canvas.rutgers.edu). Canvas is accessible at canvas.rutgers.edu.

School of Public Health Honor Code: The School of Public Health Honor Code is found in the School Catalog (sph.rutgers.edu/academics/catalog.html). Each student bears a fundamental responsibility for maintaining academic integrity and intellectual honesty in his or her graduate work. For example, all students are expected to observe the generally accepted principles of scholarly work, to submit their own rather than another's work, to refrain from falsifying data, and to refrain from receiving and/or giving aid on examinations or other assigned work requiring independent effort. In submitting written material, the writer takes full responsibility for the work as a whole and implies that, except as properly noted by use of

quotation marks, footnotes, etc., both the ideas and the works used are his or her own. In addition to maintaining personal academic integrity, each student is expected to contribute to the academic integrity of the School community by not facilitating inappropriate use of her/his own work by others and by reporting acts of academic dishonesty by others to an appropriate school authority. It should be clearly understood that plagiarism, cheating, or other forms of academic dishonesty will not be tolerated and can lead to sanctions up to and including separation from the Rutgers School of Public Health.

Students with Disabilities: Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student must apply for Services by first completing a Registration Form with the Rutgers Office of Disability Services (ODS) at ods.rutgers.edu. The student will also be required to participate in an ODS intake interview and provide documentation. If reasonable accommodations are granted, ODS will provide you with a Letter of Accommodations which should be shared with your instructors as early in your courses as possible.

Commitment to Safe Learning Environment: The Rutgers School of Public Health is committed to helping create a safe learning environment for all students and for the School as a whole. Free expression in an academic community is essential to the mission of providing the highest caliber of education possible. The School encourages civil discourse, reasoned thought, sustained discussion, and constructive engagement. Provocative ideas respectfully presented are an expected result. An enlightened academic community, however, connects freedom with responsibility. The School encourages all students to disclose any situations where you may feel unsafe, discriminated against, or harassed. Harassment or discrimination of any kind will be not tolerated and violations may lead to disciplinary actions.

Reporting Discrimination or Harassment: If you experience any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, know that help and support are available. You may report such incidents to the RBHS Title IX Office or to the School of Public Health's Office of Student Affairs. Rutgers University has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. If you experience any other form of discrimination or harassment, including racial, ethnic, religious, political, or academic, please report any such incidents to the School's Office of Student Affairs. The School strongly encourages all students to report any incidents of discrimination or harassment to the School. Please be aware that all Rutgers employees (other than those designated as confidential resources such as advocates, counselors, clergy and healthcare providers as listed in Appendix A to Policy 10.3.12) are required to report information about such discrimination and harassment to the School and potentially the University. For example, if you tell a faculty or staff member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty or staff member must share that information with the RBHS Title IX Coordinator. If you wish to speak to a confidential employee who does not have this reporting responsibility, you can find a list of resources in Appendix A to University Policy 10.3.12. For more information about your options at Rutgers, please visit Rutgers Violence Prevention and Victim Assistance.

Graduate Student Computer Policy: Students are required to possess a personal laptop, no older than approximately two years, that must meet minimum requirements which may be found online at: sph.rutgers.edu/student-life/computer-support.html

Policy Concerning Use of Recording Devices and Other Electronic Communications Systems: When personally owned communication/recording devices are used by students to record lectures and/or classroom lessons, such use must be authorized by the faculty member or instructor who must give either oral or written permission prior to the start of the semester and identify restrictions, if any, on the use of mobile communications or recording devices.

Policy Concerning Use of Turnitin: Students agree that by taking this course all required papers may be subject to submission for textual similarity review to Turnitin.com (directly or via learning management system, i.e. Canvas) for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

Withdrawal/Refund Schedule: Students who stop attending their course(s) without submitting a completed Add/Drop Course form will receive a failing grade. Furthermore, students dropping to zero credits for the semester are considered withdrawn and must submit a completed Leave of Absence form from the School of Public Health's Office of Student Affairs. The School of Public Health refunds tuition only. Administrative and technology fees are non-refundable. You may find the Withdrawal/Refund Schedule on the School of Public Health website at:
sph.rutgers.edu/academics/academic-calendar.html

Student Well-Being: The School of Public Health recognizes that students may experience stressors or challenges that can impact both their academic experience and their personal well-being. If the source of your stressors or challenges is academic, students are encouraged to discuss these challenges and circumstances with their instructor, if they feel they may need additional support or temporary accommodations at the beginning or during this course. The course instructor may consider making reasonable temporary adjustments depending on the student's situation. For personal concerns or if additional support is needed, students may reach out to the Office of Student Affairs (studentaffairs@sph.rutgers.edu) or any of the appropriate referral resources listed on the SPH Student Connect Canvas page.

Overview of School Policies: Academic and non-academic policies and procedures, such Auditing a Course, Retaking Courses, Grade Grievance and others that cover registration, courses and grading, academic standing and progress, student rights and responsibilities, graduation and more may be found under Policies on the School of Public Health website. Below are select specific policies; however, students are responsible for keeping informed about academic and non-academic policies and procedures beyond those noted on this syllabus.