The Ohio State University College of Public Health

PUBHBIO 6211
Applied Biostatistics II
Online Section
3 credit hours – Fall 2025

Instructor: Grzegorz (Greg) A. Rempala, Ph.D. / rempala.3@osu.edu / Office: 380E Cunz Hall
field of study: Mathematical Statistics / alma mater: BGSU / graduation year: 1996

TA: Pin Hsun Mao (mao.575@buckeyemail.osu.edu¿)

Office Hours/ Help Sessions: Online using Zoom
Help sessions: Wednesday, 8:30-9:30am
Fridays, 9-10:00am (**or by appointment**)
In these optional sessions, help will be available to assist with the computer lab (Stata) assignments, or to answer any other questions about course materials.

TA Responsibilities: The TA assigned to the course will assist in moderating the discussion boards and will hold office hours. The TA may assist with scoring assignments and exams; however, final grades will be assigned by the professors. **Any questions regarding grading must be directed to the professors and not the TA.**

Course Description: A second course in applied biostatistical methods with an emphasis on regression methods commonly used in the health sciences. The focus is on linear regression and ANOVA. Integrated with use of computer statistical packages.

Prerequisites: A grade of B- or above in 6210 (701), or permission of instructor.

Class Format: This course meets **100% at a distance**.

The course material is organized in **one week blocks**. Each block starts at 12:00am on a Monday and ends at 11:59pm on a Sunday (see calendar for specific dates). Each block contains (a) recorded lectures to be watched asynchronously, (b) computer labs, (c) online quizzes, (d) textbook readings. Additionally, approximately every other block will contain a homework assignment. All asynchronous activities will be accessible via Carmen. Periodically during the semester we may ask you for feedback on your learning experience, in order to improve the course.

Weekly materials will be released early, so students who wish to may "work ahead". This may help in cases of travel and other schedule conflicts. However, no adjustments will be made to due dates, so please plan accordingly.

Time Management:

This course is designed to have a large active learning component, which may differ substantially from previous biostatistics courses you have taken. University rules stipulate that a student can expect to spend a minimum of 3 hours per week on a course for each credit hour, thus for this 3 credit hour course you should expect to devote roughly **9 hours per week**. In a typical week, you can expect your time to be spent as follows:

1 hour – watching recorded lectures
2 hours – completing computer lab exercises
1 hour – completing short online quizzes
5 hours – completing assigned reading, reviewing material, interacting on discussion boards, completing homework assignments

Of course, workload will vary from week to week, with some weeks having more lecture time and others having more active learning time. **This is intended as a rough guide to help you plan your time accordingly.**

Carmen:

There is a Carmen site for this course: `http://carmen.osu.edu`
All course materials are available via Carmen.

Required Text:

Regression Methods in Biostatistics, 2nd Edition, by Vittinghoff (2012)
Available **free for OSU students** online at:
`http://link.springer.com/book/10.1007/978-1-4614-1353-0`
You must access the book online using a university computer or be logged in through the library website if accessing from off campus (you can download a PDF for offline use).

Required Software:

Stata (`http://www.stata.com/`)

For the purpose of illustration and to get the best computing support, **students are required to use Stata for all activities in this course**.

Note that a large proportion of class activities will involve using Stata (a much larger proportion than in PUBHBIO 6210). Therefore, **owning a copy on your personal computer will likely be the most convenient option for most students**. Since the textbook is free to use, you may consider the cost of a copy of Stata as your "book costs" for this course. Details on how to purchase Stata (and the associated costs) are available on the course website.

Course Learning Objectives:
Upon successful completion of this course, students will be able to:

1. Interpret the results of a linear regression analysis
2. Perform hypothesis tests in the context of linear regression
3. Assess the fit of a linear regression model and make appropriate modifications if necessary
4. Explain the concept of confounding in the context of linear regression
5. Use statistical software to fit a linear regression model
6. Interpret the results of one- and two-way ANOVA analyses
7. Explain the problem of multiple comparisons and perform appropriate adjustments in the context of an ANOVA model
8. Describe the use of nonparametric tests as an alternative analysis approach

9. Interpret the results of a basic logistic regression analysis
10. Interpret the results of a basic survival analysis

Foundational MPH Competencies:

- Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate (3)
- Interpret results of data analysis for public health research, policy or practice (4)

MPH-BIO Specialization Competencies:

- Address problems arising in public health and medicine through appropriate statements of hypotheses, study design, data collection, data management, statistical analysis, and interpretation of results (1)
- Describe basic concepts of probability, random variation and commonly used statistical probability distributions (4)
- Use computational methods to effectively analyze complex public health and medical data (5)

MS-BIO Specialization Competencies:

- Address problems arising in public health and medicine through appropriate statements of hypotheses, study design, data collection, data management, statistical analysis, and interpretation of results (7)
- Explain core concepts of probability, random variation and commonly used statistical probability distributions and how they relate to statistical inference (9)
- Use computational methods to effectively analyze complex public health and medical data (10)

A complete list of College of Public Health Graduate Competencies are located in Appendix C of the CPH Graduate Student Handbook that can be found at: `http://go.osu.edu/cphgradcompetencies`

Course Technology:

Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)

Required equipment

- Computer: current Mac (Mac OSX) or PC (Windows 10+) with high-speed internet connection
- Calculator: Students should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation.
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Optional equipment (for participation in optional live office hours and/or review sessions)

- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone

Calculator:

Students should have access to a scientific calculator that can perform basic arithmetic, square roots, logarithms, and exponentiation. For this online class, a program such as Microsoft Excel may suffice.

Computer Labs: Each recorded lecture has an associated computer lab. These provide an opportunity for you to implement the concepts covered in each lecture using Stata, and completion of these exercises is a key component of this course.

All materials for a block will be simultaneously available for the entire block so that students can complete assignments at times that best fit their schedules. Any computer lab not completed by the end of the block will be given a 0. **There are no exceptions to this rule.**

Quizzes: Each recorded lecture has an associated short online multiple-choice quiz (taken via Carmen) to help reinforce understanding of the covered concepts. Some questions will require students to perform calculations and will require the use of a calculator. Students will not have to use Stata during the quizzes (but will be expected to interpret Stata output).

Students may take up to two attempts at each quiz; if two attempts are taken then the quiz score will be the average of the two. Please note that quiz questions may be slightly different on the second attempt. A student cannot stop the quiz, logout/login and resume at a later time. **Quizzes must be completed without the help of other individuals, but books and notes are okay.**

All materials for a block will be simultaneously available for the entire block so that students can complete assignments at times that best fit their schedules. Any quiz not completed by the end of the block will be given a 0. **There are no exceptions to this rule.**

Exams: There will be two online exams in this course (see calendar for dates). The exams will have multiple-choice and short-answer questions. Some questions will require students to perform calculations and will require the use of a calculator. Students will not have to use Stata during the exam (but will be expected to interpret Stata output).

Exams will be done online (via Carmen) and will be available for a 3 day period at the dates shown on the course calendar. Students may choose any time in the window to take the exam and will have 80 minutes to complete it once started. A student cannot stop the test, logout/login and resume at a later time.

Exams **must** be taken within the scheduled windows. Students who miss taking any exam will be penalized fully in the absence of a documented excuse. **Exams must be completed without the help of other individuals, but books and notes are okay.**

Data Analysis Projects: There will be two data analysis projects in this course. These projects will involve students analyzing data using Stata and writing a brief report summarizing the results. Projects will be due on the dates shown on the course calendar.

Late projects will not be accepted. Students who fail to submit a project will be penalized fully in the absence of a documented excuse. **Projects must be completed without the help of other individuals, but books and notes are okay.**

Homework:

A homework assignment will be due approximately every other block, and will cover material from the previous two blocks. There will be a total of 5 homework assignments. Students are encouraged to work together to complete these assignments, but must write up answers independently. **Note that homework assignments are due on Tuesdays, to give you a few extra days after the end of a block to complete them. However, this will create overlap with new assignments for the new block that starts Monday, so plan accordingly.**

Late homework will not be accepted, with one exception. Students will get a 2-day grace period on submission of one homework, if needed. Note that this grace period only applies to one homework; any late homework submissions beyond the one permissible will be given a 0. You do not need to notify the instructor that you will be using the grace period; simply submit the homework up to 2 days late via Carmen and (if it is your first time using the grace period) you will not be penalized, though the assignment will appear as "late" in Carmen.

Assignment Submission:

Students are required to submit all assignments **electronically** via the provided Carmen dropboxes by the dates/times listed on the course website for each assignment. **In order to facilitate grading, assignments must be submitted as either Microsoft Word documents or as PDF files.** Since the majority of assignments will require submitting Stata output, using Microsoft Word will usually be the optimal method. It is the student's responsibility to ensure that any hand-written problems that are scanned for submission as PDFs are clearly legible.

Assignment Scoring:

Clear and effective communication is crucial in statistical practice. This rule is applied to all assignments and exams. In any problem-solving question it is the student's responsibility to make sure that he/she justifies his/her answer and provides enough detail for the grader to understand. Points may be deducted for answers that are not well-justified, even if they are correct. Any exceptions to this rule will be clearly stated (e.g., on online exams). **Any questions regarding grading must be directed to the professors and not the TA.**

Grading: Final class grade will be determined as follows:

Quizzes	10%
Computer Labs	20%
Homework	15%
Data Analysis Project 1	15%
Online Exam 1	12.5%
Data Analysis Project 2	15%
Online Exam 2	12.5%

Any questions regarding grading must be addressed **within one week** of the return of the assignment. No request of regrading on previous assignments will be accepted after the second exam except for the second exam. As a general policy, when requested, the regrading will apply to the whole assignment, not just to the specific part in which the student thinks there might be a mistake. As a consequence, regrading may lead to a lower overall score. Any questions regarding grading must be **directed to the professor** and not the TA.

Grading Scale:*

94–100	A	87–89	B+	77–79	C+	60–69	D
90–93	A-	84–86	B	74–76	C	≤59	E
		80–83	B-	70–73	C-		

**The instructor reserves the right to adjust the grading scale if it appears necessary due to overall class performance. These adjustments will only raise a student's grade, not lower it.*

Grade Policy: The Division of Biostatistics has established a grade policy for progressing from PUBHBIO 6211 to PUBHBIO 6212. **A grade of B- or higher in PUBHBIO 6211 is required to enroll in PUBHBIO 6212.**

Faculty Feedback & Response Time: The following gives you an idea of the instructors' intended availability during the course:
Grading: You can generally expect feedback within 7 days.
E-mail: We will reply to e-mails sent through Carmen within 24 hours on school days.
Discussion board: We will check and reply to messages in the discussion boards at least every 24 hours on school days, but responses to posts will often be much quicker than 24 hours.

Technical Support:
`http://resourcecenter.odee.osu.edu/carmen`
`http://resourcecenter.odee.osu.edu/carmenconnect`
Contact 8-HELP by telephone at 614-688-4357 (TDD: 614-688-8743)
Contact 8-HELP by email at `8help@osu.edu`
Contact CPH Information Systems by telephone at 614-688-2999
Contact CPH Information Systems by email at `support@cph.osu.edu`

Disclaimer: This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates or the methods of assessment. Official announcements will **always** be those posted on the course website (Carmen).

Copyright Statement

This syllabus and all course materials (e.g., homework assignments, solution keys, course materials) are under copyright by the instructor and cannot be posted elsewhere without written permission.

Office of Student Life: Disability and Mental Health Services

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university?s request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Mental Health Services

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting `ccs.osu.edu` or calling 614-292-5766. You can reach an on-call counselor at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at `suicidepreventionlifeline.org`.

Academic Integrity

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the College of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University's *Code of Student Conduct* and the College's *Student Handbook*, and that all students will complete all academic and scholarly assignments with fairness and honesty. The *Code of Student Conduct* and other information on academic integrity and academic misconduct can be found at the COAM web pages (`http://oaa.osu.edu/coam.html`). Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct*, the *Student Handbook*, and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the *Code of Student Conduct* and the *Student Handbook* is never considered an "excuse" for academic misconduct, so I recommend that you review the *Code of Student Conduct* and the *Student Handbook*, specifically, the sections dealing with academic misconduct.

If I suspect a student of academic misconduct in this course, I am obligated by University Rules to report these suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

AI Usage

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite and others. These tools will help shape the future of work, research and technology — but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes.

To maintain a culture of integrity and respect, **the generative AI tools should not be used in the completion of course assignments unless an instructor specifically authorizes their use**.

Grievances and Solving Problems

A student who encounters a problem related to his/her educational program has a variety of avenues available to seek resolution. According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, you may take your case to the department chairperson. Specific procedures are outlined in Faculty Rule 3335-8-23, the CPH Graduate Student Handbook, and the CPH Undergraduate Student Handbook. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Course Calendar: *Subject to change*

Week	Dates	Lectures	Quizzes	Labs	HW	Learning Objective
1	8/26–8/31	0 – Review	1 Quiz	1 Lab		
2	9/1–9/7	1A – SLR: Interpretation 1B – SLR: Testing and R2 1C – SLR: Model Assumptions	3 Quizzes	1 Lab		1,2,3,5
3	9/8–9/14	2A – SLR: Interpret w/Bin. Predictor 2B – SLR: Testing w/Bin. Predictor	2 Quizzes	1 Lab		1,2,5
4	9/15–9/21	3A – MLR: Interpretation 3B – MLR: Testing and R2 3C – MLR: Model Assumptions	3 Quizzes	1 Lab	HW 1	1,2,3,5
5	9/22–9/28	4A – MLR: Interpret w/Cat. Predictor 4B – MLR: Testing w/Cat. Predictor	2 Quizzes	1 Lab		1,2,5
6	9/29–10/5	5A – MLR: Interactions, Cont. x Cat. 5B – MLR: Interactions, Cat. x Cat. 5C – MLR: Interactions, Cont. x Cont.	3 Quizzes	1 Lab	HW 2	1,2,3,5
7	10/6–10/12	6A – MLR: Confounding 6B – MLR: Model Selection	2 Quizzes	1 Lab		1,2,3,4,5
8	10/13–10/19	Self-Study week			HW 3	
9	10/20–10/26	**PROJECT 1** – available 10/21–10/23, due 10/23 **EXAM 1** – available 10/23–10/25				
10	10/27–11/2	7A – MLR: Outliers 7B – MLR: Transformations	2 Quizzes	1 Lab		1,3,5
11	11/3–11/9	8A – ANOVA: One-way 8B – ANOVA: Multiple Comparisons 8C – ANOVA: Two-way	3 Quizzes	1 Lab		6,7
12	11/10–11/16	9A – Logistic Regression: Interpretation 9B – Logistic Regression: Testing	2 Quizzes	1 Lab	HW 4	9
13	11/17–11/23	10A – Survival Analysis: Introduction 10B – Survival Analysis: Testing	2 Quizzes	1 Lab		10
14	11/24–11/30	11A – Nonparametric Tests: Two Groups 11B – Nonparametric Tests: 3+ Groups		1 Lab (short week)	HW 5	8
15	12/1–12/7	**PROJECT 2** – available 12/1–12/3, due 12/3 **EXAM 2** – available 12/3–12/6, due 12/6				

SLR=Simple Linear Regression; MLR=Multiple Linear Regression
Bin.=Binary; Cat.=Categorical; Cont.=Continuous

Readings corresponding to each lecture (from the Vittinghoff textbook) will be posted on the Carmen site.

Alignment of Course Assessments with Degree Program Competencies

	Quizzes	Computer Labs	Homeworks	Online Exam 1	Online Exam 2	Project 1	Project 2
Foundational MPH Competencies							
Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate (3)		x	x			x	x
Interpret results of data analysis for public health research, policy or practice (4)	x	x	x	x	x	x	x
MPH-Biostatistics Specialization Competencies							
Address problems arising in public health and medicine through appropriate statements of hypotheses, study design, data collection, data management, statistical analysis, and interpretation of results (1)	x	x	x	x	x	x	x
Describe basic concepts of probability, random variation and commonly used statistical probability distributions (4)	x	x	x	x	x	x	x
Use computational methods to effectively analyze complex public health and medical data (5)		x	x			x	x
MS-Biostatistics Specialization Competencies							
Address problems arising in public health and medicine through appropriate statements of hypotheses, study design, data collection, data management, statistical analysis, and interpretation of results (7)	x	x	x	x	x	x	x
Explain core concepts of probability, random variation and commonly used statistical probability distributions and how they relate to statistical inference (9)	x	x	x	x	x	x	x
Use computational methods to effectively analyze complex public health and medical data (10)		x	x			x	x