

- Course Title:** Applied Categorical Data Analysis
- Course Number:** BIST 0615
- Course Pre- and Co-requisite(s):** PHCO0504 / BIST 0512 and BIST0551 / BIST 0610 and BIST 0535
- Course Location:** Piscataway, SPH Room 3A/3B
- Course Date & Time:** Wednesday 6:00-8:00pm
- Course Instructor:** Pamela Ohman Strickland, PhD, Associate Professor
- Contact Information:** For course purposes, ONLY use the CANVAS email system. For other purposes use pam.strickland@rutgers.edu. (I will not guarantee to respond to class emails sent to my regular Rutgers email account.)
- Office Hours:** With Professor: Via zoom on Mondays, 12-1pm
With Course Assistant: Variable. For first three weeks of course, she is available before 11am or at 8pm/after on Wednesday. Please message to confirm an exact meeting time.
- Course Assistant:** Weiyi Xia, Biostatistics PhD Student
- Course Website:** canvas.rutgers.edu Please contact professor and Course Assistant via CANVAS email.
- Required Course Text:** Agresti, A. (2007) *An Introduction to Categorical Data Analysis, 2nd edition*. John Wiley & Sons. ISBN-13: 978-0-471-22618-5.

The textbook above covers most of the class material. Some lectures will be more in depth, covering material not in the textbook. Agresti's big "Categorical Data Analysis" book (ISBN-13: 978-0470463635) is the standard for statistics PhD (and some mathematically minded) students but can be a bit difficult to read at a number of points. I would encourage to get one or the other of these books, although the Introduction textbook is the official textbook for the class.

Supplemental Resource: Stokes, M.E., Davis, C.S. and Koch, G.G. *Categorical Data Analysis Using the SAS System, 2nd Edition*. SAS Publishing

Course Description: Public health studies, especially those involving questionnaires, contain large amounts of categorical data. This class provides an introduction to descriptive and inferential statistics for univariate and multivariate categorical data with applications to epidemiological and clinical studies. For 2 and 3-way contingency tables, measures of association and tests for homogeneity between populations and independence of variables are presented. Related tests of trend for ordinal data are studied. Loglinear and logistic regression analyses are investigated for data sets with both nominal and ordinal variables.

Computing Language: SAS

Selected Concentration Competencies Addressed: Each Concentration identifies competencies for each degree offered. The competencies addressed in this course for the MPH in Biostatistics include:

1. Integrate relevant scientific background to design experimental and observational studies in biomedical, clinical and public health research;
2. Use statistical computer packages to organize, analyze and report collected data;
3. Apply basic probability theory and standard statistical methods to biomedical, clinical and public health research;
4. Review and critique statistical methods and interpretations presented in published research studies, presentations or reports; and
5. Communicate the results of statistical studies both in writing and orally to investigators and lay community members.

Competencies for the MS Program include:

6. Apply probability and statistical methods to design experimental and observational studies in biomedical, clinical, and public health research
7. Use probability and statistical theory to evaluate and identify appropriate methods of analysis
8. Conduct appropriate statistical analysis of data to solve medical and public health problems
9. Use a variety of statistical computer packages
10. Communicate the results of statistical studies both in writing and orally to investigators and lay community members

Please visit the Concentration webpages on the School of Public Health's website at sph.rutgers.edu for additional competencies addressed by this course for other degrees and concentrations.

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

- a. Formulate appropriate statistical hypotheses for examining cross-classified data from public health and clinical studies
- b. Justify the basic theoretical models for categorical data
- c. Create and/or actively participate in the design and analysis plan for a study involving categorical data, whether nominal or ordinal in nature
- d. Conduct and/or actively participate in the analysis of categorical data
- e. Interpret results from contingency tables or generalized linear models that evaluate relationships between categorical variables
- f. Communicate results with non-statisticians, both verbally and in writing

Writing & Communication

This class includes a heavy emphasis on interpreting and communicating results, verbally and in writing, to scientists and lay-people.

Course Requirements and Grading:

Your grade will be determined according to the following assignments:

1. Assessments*	12%
2. Class Survey	1%
3. Honor Code	1%
4. SAS Write-up	1%
5. Discussion Boards (x4)	12%
6. Project Proposal (graded, no late submissions)	3%
7. Project Methods & Measures Write-up	1%
8. Final Project	14%
9. Midterm	25%
10. Final	30%

* Two lowest grades on weekly assessments will be dropped.

Grading scale:

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

At a minimum, you are guaranteed the grading scheme above. Occasionally, I do scale the grades up (e.g., from 89.2 to an A-, although not guaranteed), but I never scale down (if you get a 90.0, you will not be scaled down to a B+). If everyone in the class earns an A, I am more than happy to give everyone an A!





Course Objectives, competencies, objectives, modules, and assessments are related as follows:

Competency	Course Objectives(s)	Lessons	Assessment(s)
1, 8	a, c, f	1, 3, 6	Write-ups, Project
2, 9	c, d	1-6, 8-14	Discussion Boards, Project
3, 6, 7	a, b, c	3, 4, 8	Assessments, Midterm, Final, Journal Articles, Write-ups
4	b, e	1-6, 8-14	Assessments, Journal Articles
5, 10	a, e, f	3, 4, 8	Project, Write-ups

Course Schedule: Subject to Change based on the needs of the class. All assignments due by 6pm of next class.

Module	Date	Topic	Readings/ Multimedia	Online 30	Weekly Assessments
1	Sept 1	Introduction, Distributions & Sampling	<ul style="list-style-type: none"> • Read handout on one vs. two sided tests • Review MLE of Binomial • Agresti, Chapter 1 	<ul style="list-style-type: none"> • Self-guided tour of basics, including review lecture • Fill out class survey <u>by Thurs, 11:59pm!</u> (Data available by Friday, 6pm) 	<ul style="list-style-type: none"> • Assessment: Module 1 + Review Material • *Gain access to SAS & experiment with class data and/or NHIS data
2	Sept 8	Chi-square Tests – general & Pearson	<ul style="list-style-type: none"> • Journal Article #1, paying attention to structure of paper • Agresti, 2.1,4,6 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 2 + Article #1 • *Review Documentation for NHIS data; identify variables of interest & research question
3	Sept 15	Two-way Contingency Tables	<ul style="list-style-type: none"> • Agresti, 2.2,3 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 3 • Project Proposal (using provided form, graded) • Written summary of Study Methods & Measures for Project
4	Sept 22	Two-way Contingency Tables for Ordinal Data Discussion of Methods & Measures using student submissions	<ul style="list-style-type: none"> • Agresti 2.5 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 4 • DB: Association between two ordinal variables (one created from a continuous variable), first using Pearson chi-square & then an appropriate test for ordinal association (class data) – compare results

5	Sept 29	Analysis for Matched Pairs – binary outcomes	<ul style="list-style-type: none"> • Agresti 8.1 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 5 • *Work on Project Tables 1 & 2
6	Oct 6	Three-way tables	<ul style="list-style-type: none"> • Agresti 2.7 	<ul style="list-style-type: none"> • Handout 	<ul style="list-style-type: none"> • Assessment: Module 6 • *Study • DB: Association involving binary outcome x binary predictor with a binary or categorical or ordinal modifier (due Oct 21)
7	Oct 13	MIDTERM			<ul style="list-style-type: none"> • *Work on Project Tables 1 & 2 and results summary • Finish DB, if not done already
8	Oct 21 ASYNC HRONO US ONLINE	Generalized Linear Models	<ul style="list-style-type: none"> • Agresti, Chapter 4 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 8 • Write up results based on SAS Output (provided)
9	Oct 27	Logistic Regression Discuss Write-ups	<ul style="list-style-type: none"> • Journal Article #2, paying particular attention to structure of tables and description of results • Agresti, 5.2 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment: Module 9 + Article #2 • DB: Logistic regression with an interaction, using class data
10	Nov 3	Multi-category Logit Models	<ul style="list-style-type: none"> • Agresti, Chapter 6, especially 6.2 	<ul style="list-style-type: none"> • Recorded Lecture 	<ul style="list-style-type: none"> • Assessment Module 10

11	Nov 10	Loglinear Modeling for Contingency Tables	Chapter 7	<ul style="list-style-type: none"> Recorded Lecture 	<ul style="list-style-type: none"> Assessment: Module 11 DB: Loglinear or proportional odds modeling – calculate and interpret Odds Ratios
12	Nov 17	Model Building	<ul style="list-style-type: none"> Agresti, 6.1 	<ul style="list-style-type: none"> Recorded Lecture 	<ul style="list-style-type: none"> Assessment: Module 12 *Work on project
	Nov 24	THANKSGIVING BREAK			
13	Dec 1	Conditional Logistic Regression	<ul style="list-style-type: none"> Agresti, 5.4, 8.2 	<ul style="list-style-type: none"> Recorded Lecture 	<ul style="list-style-type: none"> Assessment: Module 13 *Prepare for Review Session
14	Dec 7	Review		<ul style="list-style-type: none"> Review Sample Final Solutions 	<ul style="list-style-type: none"> Finish Project & Submit *Study
15	Dec 15	FINAL	<ul style="list-style-type: none"> A good book or movie! 		

* These items under “Assessments” are listed here to encourage you to prepare for the following class and/or encourage sound time management. There is nothing to “hand in” the following Wednesday for these items.

ASSIGNMENT STANDARDS

Administration of Exams. Exams will be administered during class time on the date indicated on the syllabus. You are required to bring your laptop and a calculator with you to class in order to take the exams. Please see the SPH webpage regarding the SPH requirements for computing accessibility (<https://sph.rutgers.edu/student-life/computer-requirements.html>).

Lateness. Assignments turned in after the official collection period are considered late. Assignments are to be posted to Canvas by the due date. Late assignments will assign a grade of zero.

Extra Credit. NO extra credit opportunities will be offered.

SCHOOL POLICIES

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