UWEC Fall 2025
PSYC 366/566: Statistical Reasoning and Analysis
M/W 2:00-3:15, CENT 3502

Course Information

Instructor: Dr. April Bleske-Rechek
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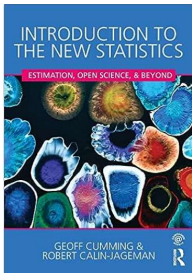
Student drop-in hours (HHH 255): MWF 10-10:45, T 11-12, and by appointment

Course Textbook



Cumming, G., & Calin-Jageman, R. (2017). *Introduction to the new statistics: Estimation, open science, & beyond*. Routledge.

Course Goals

This course is designed to develop our *statistical reasoning and analysis* skills.

"Statistical Reasoning and Analysis" refers to our ability to think logically about, and make sense of, statistical information:

- Understanding how and why statistical investigations are conducted;
- Understanding the role of chance, comparison, sampling, sample size, base rates, etc., when considering statistical information;
- Being able to explain when and why to use different statistical procedures;
- Recognizing data as qualitative or quantitative, discrete or continuous; and knowing why each type of data leads to a particular type of table, graph, or statistical measure;
- Understanding how graphs may be created and modified to better represent a data set, and understanding how to use graphs to recognize shape and spread of a distribution of scores;
- Understanding why large samples and unbiased samples will provide more accurate predictions than will small samples and biased samples;
- Being able to fully and correctly interpret 95% CIs, effect sizes, and *p* values, including what they do mean and what they do *not* mean;
- Being able to use statistics, such as confidence intervals, to make predictions about replication outcomes, while being able to explain why those statistical predictions are uncertain (probabilistic);
- Knowing how to judge and interpret a relationship between two variables, depending on the type of data the variables represent and the question of interest;
- Recognizing and being able to explain *why* a correlation between two variables does not mean that one causes the other;
- Being able to explain the type of research method needed to document (a) association between two variables versus (b) causal influence of one variable on another.

In this course, we will take a multi-pronged approach to working on these skills.

- First, in class I will provide explicit instruction on statistical concepts, using our textbook by Cumming and Calin-Jageman as a guide. Thus, I will use class time to introduce new ideas and facilitate review of important ideas from the textbook material. Please attend to the course schedule and read the relevant textbook pages prior to class.

- Second, in class I will provide worksheets and datasets to help us practice with statistical concepts and data analysis. This is the part of the course that is probably most similar to what you think of when you think of a traditional statistics course. Our textbook might seem very basic, and in a way, it is, because it does not delve into factor analysis or structural equation modeling or anything like that. But, in another way, the textbook is very atypical: it is devoted to a deep understanding of the fundamental ideas underlying any statistical analysis of a sample of data, and frankly – as you will learn – most academic psychologists don't have that understanding. Most people in psychology (and other disciplines, as well) can use computer programs to run a lot of statistical analyses, but that doesn't mean they understand what they are doing. With that in mind, please trust that you and I will be learning *together*.
  - You will earn 10 points each day for being in class to engage with statistical concepts and data analysis. I have never had a problem with students missing this class, and I am hoping that this semester will be like the past. Our daily work is directly tied to the content of the midterm exam and final exam/review packet.
  - If you miss class due to an unexcused absence, you will not earn the 10 points for that day. You should reach out to friends in the course to find out what you missed, and you should work through anything we did in class on your own time. Remember that many of our class materials will be available on Canvas. And, whenever I distribute something on paper, I leave extras in the bins outside my office door (HHH 255).
  - If you miss class due to a university excused absence, you will be expected to work through the class activities once you return.

- Third, outside of class, I will be asking you to read articles that support what we are learning about or that describe studies that apply the statistical analyses we are learning about. I never did anything like this in any of my undergraduate or graduate-level statistics courses, but I wish I had, and I hope that by the end of the semester you will see why. When it comes down to it, in your eventual jobs you are far more likely to be reading claims about human behavior (in the news and in journal articles) than you are to be running *t*-tests or constructing confidence intervals, and you need to thoughtfully and critically evaluate the validity of the claims you read. In fact, even as a psychology professor actively engaged in research, I spend far more time considering the validity of others' claims than running statistical analyses on my own (and others') data. The claims you will read about in your jobs/careers will (hopefully) be based on empirical studies and statistics, so you need to be able to find those studies and reports, read them and decipher the statistics (and tables and graphs) that are presented in those studies, and evaluate for yourself whether their data support their claims.
  - This portion of our learning will happen via structured article analyses. I will post all the reading materials for those assignments on Canvas, so that you can always read articles in advance. I will distribute one analysis for the week on Monday (to be turned in upon entry to class on Wednesday), and I will distribute the other on Wednesday (to be turned in the following Monday). In the article analyses, I will ask questions that attempt to carry you through the key ideas. As appropriate, I will ask you to identify variables and statistical analyses, interpret findings from tables and graphs, and so on.
  - I am happy to answer questions during class pertaining to these article analyses, and I am on campus every day so you can stop by my office with questions as well. I also am not opposed to you working in pairs on some of these analyses if I know the work is truly shared. If you work with a partner at any time, you should provide a written testament to shared work via a hand-written statement at the top of your assignment.
  - Because this course is mostly populated with school psychology graduate students and highly motivated undergraduate psychology students, some of our articles are quite difficult. For application articles, I have chosen a few topics in psychology that require a bit of mental stamina. This is a statistics course, after all, and I aim for you to consider issues that we often fail to think about objectively and statistically because they tend to elicit emotional (rather than analytical) reactions.
  - As a general rule, make-ups for these article analyses and our two exams will be provided only when due to an authorized absence or documented emergency. It is your responsibility to inform me of such situations and to provide appropriate documentation if needed. Late article analyses due to an unauthorized absence will be penalized 50% per day. Please consult with me regarding the nature of the make-up work and due dates.

Attendance

I have experimented with many different absence policies over the years. **This semester, I am implementing a policy that provides specificity about excused and unexcused absences. NOTE! If you are late to class more than three times, your next late arrival and every late arrival thereafter will count as unexcused absences.** Below is a table to show you reasons for missing class that are considered unexcused and those that are considered excused by the university. If you anticipate needing to miss more than one week (more than two days) of class due to illness, I encourage you to reach out to the Dean of Students Office so that they can formally help you get the support that you need. Excess absences can make passing classes difficult, so one of the roles of the Dean of Students is to work with you to develop an appropriate plan that can be applied across all your courses.

Reason for missing class	**Plan to use a free pass**	**This is university-excused (no free pass required)**
Email from April telling you class is optional or cancelled		**X**
Class field trip with written notice from instructor (e.g., Marching Band trip, Crim J trip to Stanley Prison)		**X**
Varsity or Club sporting event with written notice from coach or athletic director		**X**
Conference attendance or presentation, with written notice from faculty lead (this includes CERCA, NCUR, etc.)		**X**
UWEC organization event (such as Forensics competition, mock trial, etc.) with written notice from leader		**X**
University event with explicit or implicit attendance required (e.g., meeting with the chancellor, RA duty)		**X**
Court-required attendance (e.g., jury duty)		**X**
Graduate school interview or job interview		**X**
Going to the ER/urgent care – note from attending doctor in Eau Claire required (this may also serve as first absence in next row)		**X**
Having an illness requiring a doctor visit – limit to TWO absences in a row. Note from attending doctor in Eau Claire required		**X**
Being sick with a virus (flu, cold, virus, pink eye etc.) – THIRD absence and beyond if there was a doctor's note; any illness absence if no doctor's note	**X**	
Sleeping through your alarm clock	**X**	
Going to a scheduled medical/therapy appointment	**X**	
Taking a friend/partner to the ER, doctor, airport, etc.	**X**	
Taking your pet to the vet	**X**	
Family event (funeral, parent or sibling care, wedding, send-off, sibling's graduation, etc.)	**X**	
Getting stuck at home because of bad weather	**X**	
Car malfunction, car accident, etc.	**X**	
Got scheduled at work despite asking for the time off	**X**	
Vacation, planned or unplanned	**X**	
Taking a mental health day	**X**	
Can't find parking	**X**	

Other policies

(1) The last day to drop a course with no record is September 16. The last day to withdraw with a grade of W is November 11.

(2) UWEC policy combined with provisions of the Family Educational Rights and Privacy Act (FERPA) indicates that you have a right to see your records and that I cannot release any information about you to a third party without written permission from you that clearly spells out what type of information may be released. For more information, please see: https://www.uwec.edu/tuition-financial-aid/parent-family-information/ferpa-privacy-policy/.

(3) If you have a documented disability and are in need of special accommodations, please notify the Office for Services for Students with Disabilities as soon as possible so that we can meet your needs: https://www.uwec.edu/equity-diversity-inclusion/edi-services-programs/services-for-students-with-disabilities/.

(4) I expect academic honesty. Sample violations of integrity include (a) using student homework, papers, or ideas from previous semesters, unless approved by me; (b) asking for or giving information about the content of my quizzes (e.g., studying from an unauthorized file); (c) representing work done by someone else*, including AI,* as your own (i.e., plagiarism). If you are concerned that an activity you or someone else is considering might fall into the dishonest category, ask me about it. I consider academic misconduct in this course as a serious offense, and I will pursue the strongest possible academic penalties for such behavior. The disciplinary procedures and penalties for academic misconduct are described on the UW-Eau Claire Dean of Students web site: https://www.uwec.edu/kb/article/blugold-student-conduct-code/.

Relatedly, I do not consent to having notes – or any materials - from my class uploaded to the internet, including commercial note-selling websites such as StudySoup. Some companies target students and solicit course material acting as if they are working in coordination with colleges and universities, but that is not true for this class. This means that you do not have the right to provide your notes to anyone else or to make any commercial use of them without express prior permission from me. Unless you are a qualified disabled student, you do not have the right to record or pass along my lectures or materials in any form. Inappropriate use of notes may be in violation of the Blugold Conduct Code and sanctions will be pursued accordingly.

Warnings

- First, you should complete everything ON TIME. There is no room to get behind, so let's hope COVID and other illnesses don't get in our way. Again, late assignments that are not pre-authorized will be penalized 50% per day.
- Second, please do not ask for time extensions or exceptions to the unexcused absence policy. I have to keep up with you and the other courses I am teaching, and I can't go back to score things after the fact, when I need to be scoring the incoming assignments. Your daily class activity work is intentionally low stakes so that if you miss class and it's not excused, then that's that and you only lose a few points. Everyone is likely to miss one at some point along the way.

Graduate Students

If you are a graduate student, as appropriate I will give you additional questions on the assignments and final assessments that require deeper analysis of the material. We can discuss these requirements in one-on-one meetings as the semester progresses.

Grading

Final grades will be based on points earned. I will post your scores online, on our course website. Please keep track of your scores so that you always have an estimate of how you are performing in the course, and so that you can inquire about any apparent discrepancies between your records and those on the course website. If you think I made an entry error, please write me a note with an explanation of the problem; I will check it out and get back to you ASAP. I also encourage you to maintain an electronic or paper copy of all work you turn into me for your personal records.

		B+	88.00-90.99%	C+	79.00-81.99%	D+	71.00-73.99%	
A	94.00-100%	B	85.00-87.99%	C	76.00-78.99%	D	68.00-70.99%	
A-	91.00-93.99%	B-	82.00-84.99%	C-	74.00-75.99%	D-	65.00-67.99%	F <65.00

Please do not fret about this grading scheme. I know it seems more strict than usual. It is designed to adjust for grade inflation as well as my awareness that you earn points each day just by being in class to learn and engage with the concepts and data. You should do just fine in this course if come to class, participate during class, and keep up with the article analyses.

Approximate Breakdown of Points:

Daily Class Activities: 10 points x 23 days = 230 (about 30%)
Article Analyses: ≈ 15 points x 21 ≈ 315 (about 40%)
Midterm and Final Exam: ≈ 250 (about 30%)

Weekly Course Plan for Psyc 366/566 Statistical Reasoning and Analysis
M/W 2:00-3:15 pm, CENT 3502

Note: The papers we will read for each article analysis topic will not generally utilize the statistical focus of that specific week (left column). The empirical articles are selected for their content, not their choice of statistical analysis. Our job is to practice working with the numbers that each paper offers, no matter what specific statistical analyses the researchers happened to use.

	In Class	**Topic of Analysis Assigned**	**Articles (on Canvas)**
Week 1			
Sept. 3	Introductions, course plan		
Week 2			
Sept. 8	C&C Chapter 1: Asking and answering research questions, pp. 1-15	Numeracy	Lipkus et al., 2001
Sept. 10	C&C Chapter 2: Research fundamentals, pp. 17-39	Experimental vs Non-Experimental Studies	Bleske-Rechek et al., 2018
Week 3			
Sept. 15	C&C Chapter 3: Picturing and describing data, pp. 43-67	Probabilistic Reasoning	Tversky & Kahneman, 1974
Sept. 17	Ch. 1-3 Conceptual Application and Practice with Data	Motivated Reasoning	McPhetres & Zuckerman, 2017
Week 4			
Sept. 22	C&C Chapter 4: The normal distribution and sampling, pp. 72-93	Selective Reporting	DeVries et al., 2018
Sept. 24	Ch. 4 continued C&C Chapter 5: CIs and effect sizes, pp. 97-122	Insensitivity to Sample Bias	Hamill et al., 1980
Week 5			
Sept. 29	Continue with Ch. 5, then Practice	Retrieval Practice for Learning	Karpicke & Blunt, 2011
Oct. 1	Practice	Effect Sizes	Funder & Ozer, 2019
Week 6			
Oct. 6	C&C Chapter 6: *p* values, NHST, and confidence intervals, pp. 128-156	Evaluating Effect Sizes	Michal & Shah, 2024
Oct. 8	Practice	The Replication Crisis	Open Science Collaboration, 2015
Week 7			
Oct. 13	C&C Chapter 7: The independent groups design, pp. 160-189	Dichotomizing Statistical Significance	Gelman & Stern, 2006
Oct. 15	Practice	False Positive Psychology	Simmons et al., 2011
Week 8			
Oct. 20	C&C Chapter 8: The paired design, pp. 195-217 (Practice: Independent vs Paired Groups Designs)	Interpreting "Non-Significance"	Gates & Ealing, 2019
Oct. 22	(Class is optional: Review for Midterm)		

	In Class	Topic of Article Analysis	Article (on Canvas)
Week 9			
Oct. 27	Midterm Exam		
Oct. 29	ANOVA	(Break)	
Week 10			
Nov. 3	Practice - ANOVA	Application of ANOVA: Hindsight Bias	Bleske-Rechek et al., 2023
Nov. 5	Practice - ANOVA	Quality Control!	Coakley & Duffy, 2010
Week 11			
Nov. 10	C&C Chapter 9: Meta-analysis, pp. 222-243	Meta-Analysis Application: Social Media	Ferguson, 2024
Nov. 12	No Class – April at Spelman College		
Week 12			
Nov. 17	C&C Chapter 11: Correlation, pp. 293-326	(Break)	
Nov. 19	Practice with correlation	Paired Groups and Correlations in the Same Data	Bleske-Rechek & Kelley, 2014
Week 13			
Nov. 24	Practice with correlations: Reliability and Validity	Reliability Application: General Cognitive Ability	Deary, 2014
Nov. 26	No Class: Thanksgiving Holiday		
Week 14			
Dec. 1	C&C Chapter 12: Regression, pp. 331-363	Quality Control!	Qu et al., 2023
Dec. 3	Practice: Simple regression	Relational Aggression I	Crick & Grotpeter, 1995
Week 15			
Dec. 8	Practice: Multiple regression	Regression Application: Relational Aggression II	Cillessen & Mayeux, 2004
Dec. 10	Final Exam/Review Packet		
Finals Week			

Complete References for Article Analyses

Lipkus, I. M., Samsa, G., & Rimer, B. K. (2001). General performance eon a numeracy scale among highly educated samples. *Medical Decision Making, 21*, 37-44.

Bleske-Rechek, A., Gunseor, M. M., & Maly, J. R. (2018). Does the language fit the evidence? Unwarranted causal language in psychological scientists' scholarly work. *the Behavior Therapist, 41,* 341-352.

Tversky, A., Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185*(4157), 1124-1131.

McPhetres, J., & Zuckerman, M. (2017). Religious people endorse different standards of evidence when evaluating religious versus scientific claims. *Social Psychological and Personality Science,* 1-7. https://doi.org/10.1177/1948550617691098

DeVries et al. (2018). The cumulative effect of reporting and citation biases on the apparent efficacy of treatments: The case of depression. *Psychological Medicine, 48*, 2453-2455.

Hamill, R., Wilson, T. D., & Nisbett, R. E. (1980). Insensitivity to sample bias: Generalizing from atypical cases. *Journal of Personality and Social Psychology, 39*(4), 578-589.

Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying concept mapping. *Science*, *331*, 772-775.

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science, 2*, 156–168.

Michal, A. L., & Shah, P. (2024). A practical significance bias in laypeople's evaluation of scientific findings. *Psychological Science, 35*(4), 315-327.

Open Science Collaboration (2015). Estimating the reproducibility of psychological science. *Science, 340*(6251), aac7416.

Gelman, A., & Stern, H. (2006). The difference between "significant" and "not significant" is not itself statistically significant. *The American Statistician, 60*(4), 328-331.

Simmons, J. P.., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*(11), 1359-1366.

Gates, S., & Ealing, E. (2019). Reporting and interpretation of results from clinical trials that did not claim a treatment difference: Survey of four medical journals. *BMJ Open,* 9:e024785. https://doi.org/10.1136/bmjopen-2018-024785

Bleske-Rechek, A., Gunseor, M., & Nguyen, K. (2023). I "knew" they wouldn't last: Hindsight bias in judgments of a dating couple. *Social Psychological Bulletin*, *18*, e9967. https://doi.org/10.32872/spb.9967

*Coakley, A. B., & Duffy, M. E. (2010). The effect of therapeutic touch on postoperative patients. *Journal of Holistic Nursing*, *28*(3), 193-200.

Ferguson, C. J. (2024). Do social media experiments prove a link with mental health: A methodological and meta-analytic review. *Psychology of Popular Media*. Advance online publication. https://doi.org/10.1037/ppm0000541

Bleske-Rechek, A., & Kelley, J. A. (2014). Birth order and personality: A within-family test using independent self-reports from both firstborn and laterborn siblings. *Personality and Individual Differences, 56,* 15-18. https://doi.org/10.1016/j.paid.2013.08.011

Deary, I. J. (2014). The stability of intelligence from childhood to old age. *Current Directions in Psychological Science, 23*(4), 239-245.

*Qu, D., Zhang, X., Wang, J., Liu, B., Wen, X., Feng, Y., & Chen, R. (2023). New form of addiction: An emerging addiction problem of milk tea among youths. *Journal of Affective Disorders, 341*, 26-34.

Crick, N. R., & Grotpeter, J. K. (1995). Relational aggression, gender, and social-psychological adjustment. *Child Development, 66*, 710-722.

Cillessen, A. H. N., & Mayeux, L. (2004). From censure to reinforcement: Developmental changes in the association between aggression and social status. *Child Development, 75*(1), 147-163.

***** *Articles used for "quality control" exercises.*