Statistics for Behavioral Scientists
PSYC UN1610 (4 points)
Preliminary Syllabus for Spring 2019

Lecture: Tuesdays & Thursdays 2:40-3:55pm (Location TBD)
Lab (You must register for both UN1610 and one section of UN1611):

- Section 001: Thursdays 4:10-6:00pm (Location TBD)
- Section 002: Thursdays 6:10-8:00pm (Location TBD)
- Section 003: Thursdays 8:10-10:00pm (Location TBD)
    - Overflow section, will only open if sections 001 and 002 are full

Instructor: Christopher Baldassano, c.baldassano@columbia.edu

- Office hours: Wednesdays 3-4pm, 370 Schermerhorn Ext

TA information: Please check our CourseWorks homepage for the most updated list of TA office hours and their locations. You are welcome to attend any office hours (either TA's, and the instructor's), regardless of your section assignment. Please also request appointments with any of us outside of office hours if you cannot make the scheduled times.

- Yaniv Abir, yaniv.abir@columbia.edu (Office hours TBD)
- Ellen Tedeschi, eer2135@columbia.edu (Office hours TBD)

Course Description
This course provides an introductory overview to the basic statistical concepts and procedures used in experimental research. The focus is on becoming familiar with how to interpret and perform statistical tests, in order to design experiments and interpret their results. It is not a course on mathematical theory; no mathematical skills beyond basic algebra are required. The course is instead intended to provide a basic degree of scientific literacy, with an emphasis on the psychological sciences. In addition to the lectures, students will participate in a mandatory laboratory section that meets once a week. Lab activities will consist primarily of hands-on data analysis using R, applying the concepts introduced in lecture.

Role in the Psychology Curriculum
For the Psychology major, and for the Psychology Post-Bac certificate program, this course counts toward the statistics requirement. For the Neuroscience & Behavior major, this course counts toward the P3 (statistics/research methods) requirement. For the Psychology concentration, this course counts as an elective.

Course Requirements

Participation
Your presence at every lecture is expected, and because each lecture's concepts build on previous ones, active attendance is crucial to building an understanding of the material. You will earn your participation grade (5% of your overall grade) by actively attending class. Active attendance means not only showing up, but also remaining awake and paying attention. Each student will start out with the full 5% for participation, and will have two free absences to use for any reason. Beyond this, you may lose part of your participation grade for additional unexcused

absences or for regularly being present only physically (e.g., sleeping through class, browsing Facebook instead of paying attention, etc.). If you anticipate needing to miss more than two classes due to illness or other unavoidable obligations (e.g., traveling for athletic competitions, grad-school interviews), please contact Prof. Baldassano as soon as possible, but no later than a week before the lecture you will need to miss.

Lab Assignments

Active attendance to every lab meeting is essential for this course. During each lab meeting, students will complete an assignment with the help of the TA. If you anticipate needing to miss a lab meeting, you must contact Prof. Baldassano at least 2 weeks in advance in order for that absence to be excused. If illness or emergency causes you to need to miss lab unexpectedly, your absence may be excused with a doctor's or dean's note. For excused absences, you will be able to make up your lab assignment, for full credit, on a timeline as arranged with your TA and instructor. Any lab assignments missed due to an unexcused absence may be made up for partial credit within one week of the missed lab meeting.

Written assignments

Homework. Practicing new knowledge is important in any subject, all the more so for statistics. Your homework assignments provide you with a chance to test your knowledge, cement concepts before we build on them in further lectures, and make instructive mistakes.

- Homework assignments must represent your own—and only your own—work. You may not collaborate or share answers with other students.
- Show your work! You will receive more of your points for using a correct method, as opposed to coming to a correct answer. This means that making a silly math error early on needn't cause you to lose all points for a question, even if that error makes your final answer wrong. It also means that you will not receive many points for a correct answer if the TAs cannot see how you arrived at it. Similarly, TAs can only give you points for work that they can read, so write legibly.
- Homework is due at the beginning of class. Points will be deducted per half day past the due date of the assignment, which will always be at 10:10am (when our class starts). If you have not finished your homework before class, the late penalty will be the same if you hand it in during or directly after class as if you turn it in any time before 10:10pm that night. That means that if you haven't been able to finish a homework assignment before class starts, there's no benefit to working on it during class rather than paying attention to the new material—we would rather you gain the full benefit of class, and then finish your homework later in the day.
- Homework is due in hard copy, stapled, with your name on each page. It's your responsibility to make sure your entire assignment is stapled and can be traced back to you.

Projects. In place of in-class exams, you will instead demonstrate your understanding of course concepts by completing a series of data-analysis projects. Think of these projects as take-home exams. Some important notes about projects:

- Projects are due 48 hours after they are assigned. This is a short window, and late projects will lose points, so plan ahead to make sure that you can devote enough time to complete the project before it is due. Extensions will only be considered if requested well in

advance of the project being assigned, or in cases of unforeseen emergency, as documented by a doctor's or dean's note.

- You are expected to work alone. You may use any reference resources (lecture notes, your textbook, other readings), but you may not receive help from fellow students, TAs, friends, internet message boards, or any other outside source. Receiving help from anyone on your projects for this class is considered the same as cheating on an exam, and will result in a score of 0 for that project and be reported to Columbia as academic misconduct.
- At the time the project assignment goes live, you will receive a unique dataset that will serve as the basis for your individual analysis. Each student will have a different dataset, which means that each project will have a different set of correct answers. If you do not receive your dataset, let your TA and instructor know immediately.
- Note that the first couple of projects are weighted less strongly toward your final grade than the latter two. If you don't do as well as you would have liked on the first project, make sure to meet with your TA or the instructor to go over what you did wrong (but also what you're doing right!), so that you can improve your grade as the projects increase in value.

Grading

This class is not graded on a curve, so your grade will be determined only by your own work, not by how well you do relative to the other students. There is no pre-determined proportion of students who will receive As, Bs, Cs, etc.—if every student does A-level work, then everyone will receive an A in the course. Your grade will depend on the following:

Participation: 5%
Lab Assignments: 5%
Homework: 25%
Project 1: 10%
Project 2: 15%
Project 3: 20%
Project 4: 20%

The cutoffs for each letter grade are as follows:

97 – 100 % = A+
93 – 96.9 % = A
90 – 92.9 % = A
87 – 89.9 % = B+
83 – 86.9 % = B
80 – 82.9 % = B
77 – 79.9 % = C+
73 – 76.9 % = C
70 – 72.9 % = C
60 – 69.9 % = D
0 – 59.9 % = F

Academic Integrity

Academic honesty includes presenting only your own work in your assignments. Taking credit for work that is not your own is a serious violation within the academic community, and anyone found to be cheating in this class will be reported to the university, and will receive a score of zero on the assignment(s) in question. In this course, academic dishonesty includes receiving unauthorized help on your projects or homework assignments, copying another student's work, copying answers from online sources, or helping other students with their work. Detailed definitions and examples of academic dishonesty (and a rundown of the consequences) are available in Columbia's Guide to Academic Integrity (http://www.college.columbia.edu/academics/integrity). Ignorance of the rules is not a valid defense, so make sure you've read them. If you find yourself in a position where it feels like getting answers from another person is your only option, please reach out to your instructor and/or your TA before going elsewhere. It's always preferable to deal with any issues before they get so bad that they become overwhelming, so please do come to us if you're feeling stressed out about the class workload or if there's a concept you're just not understanding. Getting help before a homework assignment is due, and before a project is assigned, is always going to be the best option, but even if you're reaching out after that, we'd rather you come to us rather than resorting to cheating. If you have an issue that you'd rather not talk about with us, you may contact your academic advisor or dean; or a Psychology Program Advisor (DUS); or the counselors at Columbia's CPS (http://health.columbia.edu/services/cps).

Students with Disabilities

Students with special needs who may require classroom accommodations should make an appointment to see me as soon as possible. If you have not already done so, stop by the Office of Disability Services (ODS) on the 7th floor of Lerner Hall to register for support services. ODS often requires a few weeks to process an application, so please contact them as soon as you can. The procedures for registering with ODS can be found at http://health.columbia.edu/services/ods or by calling (212) 854-2388. Please note that students who ordinarily receive extra time to complete in-class exams are not generally eligible to receive more time to complete the projects in this course.

Readings

Required reading will consist mainly of chapters from our required text: Introductory Statistics for the Behavioral Sciences, 7th Edition, by Joan Welkowitz, Barry H. Cohen, and R. Brooke Lea (2012). ISBN: 978-0-470-90776-4. You are strongly encouraged to obtain your own copy, though one copy will be placed on reserve in the NWC Building Science Library. Note that chapters are sometimes listed as required reading more than once. This is not a mistake, but rather a cue to re-read those chapters prior to the class in question: either because they are particularly important, or because they are particularly challenging. Each lecture will also have an accompanying recommended reading, available electronically. These are strictly optional and (wherever possible) non-mathematical. You may find these supplementary readings to help make the problems of the course a bit less abstruse.

Tentative List of Topics & Readings

Chapters listed below are all from Welkowitz, unless otherwise noted.
Recommended readings are listed in parentheses.

Date	Topic	Readings	Due
1/22	Introduction	Course Syllabus	
1/24	Variables and Measurement	Chapter 1 (Blaslant Ch. 1)	
1/29	Data Visualization	Chapter 2 (Tufte Ch. 1)	HW 1
1/31	Central Tendency and Variability	Chapter 3 (Blastland Ch. 5, Gonick Ch. 2)	
2/5	Inference	Salsburg Chapter 11	HW 2
2/7	Testing for Differences	Ernst 2004	
2/12	Bootstrapping		HW 3
2/14	Correlation	Chapter 9 (Blastland Ch. 12)	Project 1
2/19	Linear Regression	Chapter 10 (Gonick Ch. 11)	HW 4
2/21	Linear Models	Chapter 10 (Dancey Ch. 12)	
2/26	Discrete Probability	Chapter 16 (Blastland Ch. 3)	HW 5
2/28	Probability Density	Chapter 4 (Salsburg Ch. 9)	
3/5	Distributions	Chapter 4 (Salsburg Ch. 2)	HW 6
3/7	Z-test	Chapter 5 (Salsburg Ch. 11)	Project 2
3/12	T-test (Part 1)	Chapter 6 (Gonick Ch. 8)	HW 7
3/14	T-test (Part 2)	Chapter 7 (Gonick Ch. 9)	
3/26	Rank tests	Chapter 8 (Salsburg Ch. 10)	HW 8
3/28	Chi-Square test	Chapter 17 (Salsburg Ch. 10)	
4/2	ANOVA	Chapter 12 (Salsburg Ch. 5)	HW 9
4/4	Factorial ANOVA	Chapter 14 (Dancey Ch. 11)	
4/9	Making sense of ANOVA	Chapter 14 (Dancey Ch. 11)	HW 10
4/11	P Hacking	Chapter 13 (Dancey Ch. 10)	Project 3
4/16	Effect Size	Ellis Ch. 1 (Wainer Ch. 1)	HW 11

4/18	Power Analysis	Chapter 11 (Ioannidis 2005)	
4/23	Bayes Rule (Part 1)	Stone Ch. 1 (Salsburg Ch. 13)	HW 12
4/25	Bayes Rule (Part 2)	Goodman 1999 (Kruschke Ch. 2)	
4/30	Analytic Strategy	McElreath Ch. 1 (O.S.C. 2015)	HW 13
5/2	Future Directions		
5/10			Project 4