Psychology 770 - Statistical Graphics

Fall 2023 August 29 – December 5 Tuesdays 10-12:15 Location: **PAIS 361 (Computer lab)** Irwin D. Waldman Email: psyiw@emory.edu

<u>Virtual Office Hours</u>: By appointment Zoom link for Office Hours:

We live in a world that is becoming increasingly data-rich, thus demanding enhanced ability to analyze large and complex datasets and display those results. Despite advances in statistical methods and researchers' increasing familiarity with them, experience with advanced methods for effectively displaying data and statistical results remain rudimentary. In this class we will explore principles and practices for displaying data and statistical results and intelligently integrating such displays with data analyses to create narratives that are both comprehensible and meaningful to the viewer. We will begin with a short "art appreciation" tour of Infographics, then investigate: 1. ways of distinguishing between bad and good graphic displays (and the principles that underlie both), 2. when it is best to use figures versus tables (and vice versa), and 3. some perceptual aspects that underlie effective (versus ineffective or misleading) displays of information. We will learn how to use various packages (e.g., ggplot2 in R) for creating statistical graphic displays of increasing complexity and sophistication. We will explore the use of such graphical displays in the published literature as well as in our own research. Students will complete a series of relevant assignments, including the application of these statistical graphic methods to their own data and research questions, ever mindful of the integration of statistical graphic and data analytic methods to achieve coherent and meaningful narratives.

Goals / requirements: The primary goals for the course are for all of us to become better consumers and producers of statistical graphics - and their integration with statistical analyses - in our research domains and in science in general. Students will be responsible for all of the following:

- Attending all of the classes, Actively participate in class discussions, activities, and by asking questions in class, Completing all assignments (These are to be emailed to me by 11:59 PM Monday evenings.)
- 2. Presenting several times throughout the semester on your assignments, and on the use of statistical graphics and their integration with statistical analyses in your research area and in your own research

GRADING AND ASSIGNMENTS

There are several assignments in this class on which your grades will be based, as described below:

Class participation and demeanor: Note that attending each class and paying close attention is expected. You will get **no credit** for a class if you miss it, fall asleep, text, email, take a phone call, make a phone call, do not participate in the discussion or activity, or otherwise act in an unprofessional manner in that class. (worth 15% of grade)

Homework assignments (pre-Fall Break): These assignment will help you get a feel for good and bad statistical graphics displays, how to create them, and how to integrate them with statistical analyses and data: (each worth 15% of grade)

Presentations on statistical graphics (and integration with results and data) in your own research (post-Fall Break): (each worth 20% of grade)

Points Earned	Grade	Points Earned	Grade
93-100	А	70-72	C-
90-92	A-	67-69	D+
87-89	B+	60-66	D
83-86	В	Below 60	F
80-82	B-		
77-79	C+		
73-76	С		

Final Grades: Final grades will be based upon the following point system, with no curve.

Your Safety and Well-being:

Emory University cares greatly about the health and well-being of our students, staff, and faculty, and takes all sexual or gender-based violence and harassment very seriously. Emory University employees (including faculty and teaching assistants) are mandated reporters of any incidents of sexual or gender-based violence or harassment. Thus, any disclosures of sexual or gender-based violence or harassment to a faculty member or a TA must be forwarded to the Title IX

Coordinator. The Title IX Office will then contact you regarding your rights, your option to participate in the investigation, interim safety measures and/or academic accommodations, and the need to proceed with an investigation (even if none is requested). If you have experienced sexual assault, sexual harassment, intimate partner violence, and/or stalking and want a confidential place to obtain support and information, please contact The DeKalb County Day League (formerly DeKalb Rape Crisis Center): <u>404-377-1428</u> for 24-hour confidential crisis line | <u>404-377-1429</u> for free counseling service or Georgia's 24-hour Domestic Violence Hotline: <u>800-334-2836</u>.

Accommodations:

Some students may require accommodations. In such cases, students must coordinate any accommodations at the start of the semester by contacting Emory's Office of Accessibility Services at 404-727-9877, or by email at <u>accessibility@emory.edu</u>.

Honor Code: Refer to the College Honor Code (which can be located on the Emory website): <u>http://college.emory.edu/home/academic/policy/honor_code.html.</u> Suspected violations of the honor code are to be referred to the Honor Council by the instructor for formal investigation. All graded work is to be completed independently unless otherwise noted by the instructor.

Email & Canvas: Students must check their Emory University email regularly. Having not checked your email is not an excuse for failing to bring the appropriate materials to class or missing an assignment

Course Outline

<u>Textbook</u>: Kieran Healy (2019). *Data Visualization: A Practical Introduction.* Princeton University Press. (available from Amazon etc for purchase)

L: Lecture; A: Class activity; H: Homework assignment, to be presented & discussed in class

Tentative Dates:		
8/29	Week 1	Organizational meeting: Review course and syllabus, Introductions
9/5	Week 2	L: Infographics and the Display of Quantitative Data A: Starting out with R: Downloading R, RStudio, and the basics of the R language, learn to use R Markdown
9/12	Week 3	 L: Good versus bad graphs A: Start to learn how to effectively choose graphs and analyses that best and most efficiently describe the data H: Find several examples of good and bad graphical displays
9/19	Week 4	L: Basics of Data Visualization: Showing data on one variable for one or more groups A: Learn basics of data structures and visualization in R
9/26	Week 5	 L: Advanced Data Visualization: Showing data on multiple variables and/or for multiple groups A: Learn how to create graphs with multiple variables H: Create several examples of good and bad graphical displays
10/3	Week 6	L: Integrating Statistical Graphics with Data Analyses A: Begin discussion and practice of how to choose appropriate analyses for the questions you want to answer & to match graphic displays w/ stats H: <i>Modify</i> several examples of good graphical displays integrating them with statistical results and/or data
10/10	Week 7	Fall Break

10/17	Week 8	Show and Tell – Part I
		A: Everyone will take turns presenting on the topic of their research and
		the problem, data, and analyses they are working on. It will help to show
		and explain some figures from representative publications in your field.
		H: Prepare and give your presentation (more detailed guidelines to follow)

10/24	Week 9	 Show and Tell – Part I A: Everyone will take turns presenting on the topic of their research and the problem, data, and analyses they are working on. It will help to show and explain some figures from representative publications in your field. H: Prepare and give your presentation (more detailed guidelines to follow)
10/31	Week 10	 Show and Tell – Part I A: Everyone will take turns presenting on the topic of their research and the problem, data, and analyses they are working on. It will help to show and explain some figures from representative publications in your field. H: Prepare and give your presentation (more detailed guidelines to follow)
11/7	Week 11	No class: Conversation with Scott Vrieze on "Training future clinical scientists"
11/14	Week 12	 Show and Tell – Part II A: Everyone will take turns presenting on their research and the integration of statistical graphics and results of analyses they are working on. Contrast these with some figures from representative publications in your field. H: Prepare and give your presentation (more detailed guidelines to follow)
11/21	Week 13	Thanksgiving Break
11/28	Week 14	 Show and Tell – Part II A: Everyone will take turns presenting on their research and the integration of statistical graphics and results of analyses they are working on. Contrast these with some figures from representative publications in your field. H: Prepare and give your presentation (more detailed guidelines to follow)
12/5	Week 15	Show and Tell – Part II A: Everyone will take turns presenting on their research and the integration

A: Everyone will take turns presenting on their research and the integration of statistical graphics and results of analyses they are working on. Contrast these with some figures from representative publications in your field.
 H: Prepare and give your presentation (more detailed guidelines to follow)

<u>Readings</u>

<u>Text</u>: Kieran Healy (2019). *Data Visualization: A Practical Introduction.* Princeton University Press.

Required articles:

- 1. Wainer, H. (1984). How to display data badly. American Statistician, 38,137-147.
- 2. Wainer, H. & Velleman, P.F. (2001). Statistical Graphics: Mapping the pathways of science. *Annual Review of Psychology, 52*, 305-335.
- 3. Lane, D.M. & Sandor, A. (2009). Designing Better Graphs by Including Distributional Information and Integrating Words, Numbers, and Images. *Psychological Methods, 14*, 239-257.

Additional articles and/or chapters may be assigned.

Please be sure to complete all assigned readings.

Tentative Dates:

8/29	Week 1	Organizational meeting: Review course and syllabus, Introductions
9/5	Week 2	L: Infographics and the Display of Quantitative Data R: Preface (pp xi-xviii); Chapter 1 in the textbook
9/12	Week 3	L: Good versus bad graphs R: Chapter 2 in the textbook; Wainer, H. (1984). How to display data badly. <i>American Statistician</i> , <i>38</i> ,137-147.
9/19	Week 4	 L: Basics of Data Visualization: Showing data on one variable for one or more groups R: Chapter 3-4 in the textbook; Wainer, H. & Velleman, P.F. (2001). Statistical Graphics: Mapping the pathways of science. <i>Annual Review of Psychology</i>, <i>52</i>, 305-335.
9/26	Week 5	L: Advanced Data Visualization: Showing data on multiple variables and/or for multiple groups R: Chapters 5 in the textbook
10/3	Week 6	L: Integrating Statistical Graphics with Data Analyses: R: Chapter 6 in the textbook; Lane, D.M. & Sandor, A. (2009). Designing Better Graphs by Including Distributional Information and Integrating Words, Numbers, and Images. <i>Psychological Methods, 14</i> , 239-257.
10/10	Week 7	Fall Break R: Chapter 7 in the textbook;

10/17	Week 8	 Show and Tell – Part I H: Everyone will select a brief representative reading from their field for the class to read R: Chapter 8 in the textbook;
10/24	Week 9	Show and Tell – Part I H: Everyone will select a brief representative reading from their field for the class to read
10/31	Week 10	Show and Tell – Part I H: Everyone will select a brief representative reading from their field for the class to read
11/7	Week 11	No class
11/14	Week 12	Show and Tell – Part II H: Everyone will select a brief representative reading from their field for the class to read
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