## Midterm Project Assignment

**Due: Course Week 7**

While I generally encourage collaboration in this class, the purpose of the midterm is for you to synthesize what you’ve learned from the class so far and apply it to the analysis of a real study. For that reason, **you will work alone on this project**; you cannot discuss the studies with anyone, in the class or out of the class (with one exception listed in part 3 below). You may consult your notes and use other resources as much as you like, with appropriate citation (see the note further down about appropriate citation and the use of ChatGPT and other AI resources).

## The midterm assignment consists of three parts:

1. Choose **one** of five studies and read it carefully (probably at least twice!).
2. **Write** a scientific/statistical critique of the study.
3. **Create** a public-facing summary of the study, its results, and its strengths, weaknesses, and limitations.

You will turn in both your critique and public-facing summary.

## 1. Choose one of the following five studies and read it carefully (PDFs of the articles are also posted on Moodle):

1. **COVID-19:** In the early COVID-19 pandemic, there was a lot of uncertainty about what existing drugs might be effective in treating symptoms and preventing severe outcomes. One drug commonly proposed was ivermectin. [Reis et al. (2022)](https://doi.org/10.1056/NEJMoa2115869) try to assess its efficacy in this study.
2. **Nutrition Nudges:** The field of behavioral economics has risen as a major academic field, and has led to the implementation of a number of policies based on the theory of “nudges”: small changes that have a large effect on people’s behavior. Recently, some major studies from the field have also been criticized for overstating results or, in some extreme cases, fabricating data. In this study, [Bianchi et al. (2023)](https://doi.org/10.1186/s12966-023-01456-8) use behavioral econ insights in nutrition policy research.
3. **A/B Testing:** A/B testing (also referred to as online controlled experiments) has become a key feature of the development of technology companies and their products. Companies routinely run studies on their users, testing tweaks of every aspect of the platform and assessing engagement. [Jung et al. (2022)](https://doi.org/10.1287/isre.2021.1028) describe one such study that was run by a South Korean online dating platform.
4. **Gambling Marketing:** As various forms of gambling online and in apps have taken off, many studies have examined their prevalence and effects, especially on children. [Wardle and Zendle (2021)](https://doi.org/10.1089/cyber.2020.0299) describe a British survey on gambling on “loot boxes” within video games and their role in problem gambling.

**2. Write a scientific/statistical critique of the study:**

In this brief essay, you should provide a fair critique of the chosen study, its design, and its results and presentation. Your critique should primarily assess the study design choices, considering the principles, goals, and trade-offs of design that we have discussed in the class. You should discuss both positive aspects of the study design that you notice and identify some limitations or flaws in the study design. You do not need to propose solutions to these limitations/flaws, but if you have ideas, please include them! Throughout, consider the scientific goals of the study as well as any ethical and/or practical limitations that may have arisen. Finally, you should conclude with a paragraph that addresses whether you think the goals of the study are worthwhile and whether the design and implementation of the study are an effective approach to answering those goals. Don’t be afraid to take a strong stance in the conclusion.

While you can assess any study design principles that you think are most relevant, you might consider focusing on ~2–3 of the following (although many of them overlap with each other):

* Relationship between the big-picture scientific question of interest and the statistical estimand, including the definition of the outcomes and interventions/predictors studied.
* Possible sources of bias and efforts to reduce bias, possibly including the role of sampling, randomization, measurement error, blinding, nonresponse bias, etc.
* Sources of variation, sample size selection, and other aspects related to power and precision.
* Limits to the study design due to ethics, feasibility, or availability of data. Were any compromises on other statistical principles made to accommodate these issues? Are there any ethical concerns you still have about the study?
* Generalizability, external validity, and interpretability: what is the target population and is the sample representative of it? Will the interventions transfer to the real world in a similar way to their conditions in the study? Are the results communicated clearly and fairly?

There’s no strict word minimum or maximum, but I would expect a solid critique to be approximately 3–4 pages, double-spaced, in a standard type size. For the main study you’re discussing, you should cite it the first time you use it (in any format you want: I would suggest either [Chicago style](https://www.chicagomanualofstyle.org/tools_citationguide.html) or [Vancouver style](https://guides.lib.monash.edu/citing-referencing/vancouver) or however the paper cites its sources), and then don’t need to explicitly cite it again.

**Other sources:** You are not required or expected to use any sources beyond the study itself. If you choose to use any other sources besides information from class lectures (which need not be cited), cite those sources in the same format as you cited the original study (but, again, you do not need to use any other sources). Be sure that you are using reliable sources. **Remember, any use of ChatGPT or other AI tools cannot be properly credited,** and so should not form the basis for any text or images you submit. The same goes for message boards or any site where you submit or post information and receive an anonymous or pseudonymous response.

## 3. Create a public-facing summary of the study and its design strengths and/or weaknesses:

The goal of this component is for you to explain the study’s goals, results, and key design elements to an audience that has little statistics background (think of pre-AP high school statistics: they know mean, median, range, but not expectation, variance, standard deviation, bias, etc.). This should interpret the main results of the study (if you think the study has any value at all, or explain why the results are not meaningful at all), and place them into the context of the strengths and limitations of the study design. What are the implications of these results for society at large or for the discipline? What further research might be necessary to answer the larger scientific question of interest?

This component can be in any form that you want! Some possibilities are:

* A newspaper op-ed. This is [a nice example](https://www.nytimes.com/2021/02/23/health/elderly-prediabetes-selvin.html) from the *New York Times* (although obviously you won’t have quotations from researchers and patients). This should be about 500–1,000 words and include an attention-grabbing (but accurate) title. No formal citations needed, but be sure to mention the authors of the study and include hyperlinks as appropriate.
* A blog post. Many scientists and statisticians now have blogs where they discuss study results or methodology. See [this post](https://statsepi.substack.com/p/out-of-balance) (and the rest of Darren Dahly’s posts) that covers the role of randomization, or statistician [Andrew Gelman’s blog](https://statmodeling.stat.columbia.edu/). Again, I would expect about 500–1,000 words, but you might cut down on words and use memes, cartoons, drawings, etc. to get the point across instead, and definitely a clickbait title. No formal citations needed, but be sure to mention the authors of the study and include hyperlinks as appropriate.
* An annotated infographic. You can describe the study design graphically and add annotations that discuss the advantages and drawbacks of each part of the design. Any combination of words and graphics would work!
* A short podcast, radio piece, or video. You can record yourself discussing the article instead of writing. Use whatever style you want: a reporter talking about it, get a friend (from outside the class) to ask you questions about it (but you should write their script), a TikTok-style explainer video, or a Vox/*New York Times*-style video explainer. No specific time requirements, but I would guess around 3–6 minutes would be the right window. Think of a NPR, Vox, or *New York Times*-style podcast.
* Any other format you think would be able to get the point across is fine too! If you have an idea for a format but want to make sure it would work, it’s probably fine! But feel free to ask to confirm.

For any of these, **make sure they’re targeted to a non-scientific audience** and **sufficiently different in tone from your critique** in part 2. Although it might seem easier, conveying this information in an accessible way is difficult in its own right! Make sure you spend enough time on this part of the project; it has equal weight in the grade as your scientific critique.