## Final Project Assignment Instructions and Template

**Presentations: In-Class, Course Weeks 13/14**

**Final Paper Due: Finals Period**

## The final project is to design your own study on a topic of your choosing and write a paper explaining the goals and design of the study.

## Overall Task

Your goal is to:

1. Identify a topic of interest to your group and survey some recent scientific literature on the topic.
2. Determine a scientific question of interest related to this topic that can be answered using a scientific research study with a statistical component.
3. Identify the best study design, accounting for the statistical, feasibility, and ethical principles we have discussed in the course.
4. Present this topic and study design to the class.
5. Prepare a final paper describing the study.

*Note: You will not be conducting the study.*

## Groups

You may choose your own groups. Groups should be 3–4 people. You will inform me of your groups **by course week 8.** If you do not have a group or have a partial group but are looking for more members, please let me know at that time and I will match you with others.

**Topics**

Your group will pick the general topic for your study design. You should phrase this as a scientific question of interest. You will choose this and submit it **by course week 10**. We will have some time in class on April 3 for you to talk with your group and/or me about your topic.

## Presentation

You will present your study to the class. All members of your group should participate in some way in the presentation. Your presentation should focus on the rationale for the study, highlighting the following key points:

* Why is this an important topic to study?
* Why is your specific question of interest (and statistical estimand) an interesting way to study that topic?
* Why is this study design well-suited to answer the question of interest?
* How will results from this study be interpretable, generalizable, and useful?

You can think of the presentation almost like a pitch to funders (think Shark Tank for science): why should someone invest resources in your study? For that reason, you should frame it as positively as possible. However, there should still be some acknowledgement of the limitations of your study and design; be careful not to over-promise!

You will have 12–15 minutes for the presentation, followed by about 3 minutes of questions from myself and your classmates. When you are listening to other group’s presentations, pay close attention to potential sources of bias and variability that they have not considered. This peer review-type process will help strengthen their final papers.

## Final Paper

Your final paper will cover the rationale for the study as well as the design of the study. It will also discuss the strengths and limitations of your chosen study design. It should be written as a scientific paper, like those we have discussed in class. References are required, but can be in any standard form you prefer. I would suggest either Chicago-style or Vancouver-style citations. No extensions or late submissions can be accepted.

A template, with details on the expected sections for the paper, is available on the last two pages of this document. You are also free to write up the paper in another format, as long as it covers the key topics clearly.

## Evaluation

You will be evaluated on the content, style, and clarity of your presentation (1/3 of total grade) and final paper (2/3 of total grade). You will also be evaluated on how well your study design addresses your topic of interest, the statistical justification for your approach, and your acknowledgement of potential limitations. In particular, **any limitations raised by me or your classmates during your presentation should be addressed in the final paper**. You will also be evaluated on the thoroughness of your introduction. While you do not need to cite every potentially relevant study, you should identify several relevant research papers and describe and cite them appropriately in your final paper.

**Descriptive Title**

Group Members

Date

Course Title and Instructor

**Abstract**

Summarize, in 250 words or less, the motivation, goals, design, and justification for the study. The abstract often includes approximately one sentence that summarizes each of the other sections.

**Introduction**

Introduce the topic of your study and provide background information for readers about the subject. This should provide and motivate the scientific question of interest. The introduction will include most (if not all) of the references to articles, books, etc. about the topic you’re studying. This may be articles from the relevant discipline that describe the question, intervention, or outcome, or it may be studies that have already been conducted on related topics, what they found, and what their limitations are. You should consider both studies with similar designs to yours and studies seeking to answer similar questions with different designs, if they exist. The introduction section may also include references to papers about the study design that you are using, whether it falls in your topic area or not. You can ask me for help identifying those papers. The final paragraph of the introduction should clearly state the need for further research and how your study fills that need.

For help on identifying relevant papers, please schedule an appointment either with me or with the librarian.

**Methods**

*Study Design*

Describe in general terms the design of the study. What type of study is it, and what details or techniques are used?

*Participants/Study Units*

Include some details on the population of interest, inclusion/exclusion criteria, how the study units will be selected, and how they will be randomized (if applicable). If any covariates are needed (to adjust for confounding, to stratify, or to identify clusters, for example), state how they will be collected as well.

*Interventions/Exposures*

Describe in detail the intervention(s), including the placebo or control, for a randomized trial. For an observational study, describe the exposure and how it will be measured or ascertained for each study unit.

*Outcomes*

Describe in detail the outcome(s) of interest. You should specify one primary outcome, but you may add additional secondary outcomes as well. Describe how the outcome(s) will be measured or ascertained for each study unit, including the time frame.

*Statistical Estimand and Estimator*

Describe, in words or clearly-defined random variables and equations, what quantity your study is attempting to measure. You should relate this clearly to the question of interest. You should also generally define your estimator. Since we have not covered analysis methods in detail, this can be a broad statement of your approach (difference in means, risk ratio, regression estimate, etc.) and why you chose it.

*Sample Size/Power Calculation*

You can either determine a sample size from feasibility/logistical constraints and then determine how much power it has to detect a certain effect size. Or you can choose the power and effect size you would like and then calculate the sample size. You will need to use your judgement to determine a reasonable minimum detectable effect size, but should support this with references where possible. Explain why the sample size is reasonable. You can assume a large budget for your study, but should consider practical or financial limitations that might occur. I’m happy to discuss sample size calculations in detail in advance of the presentation date.

**Results**

This will be an abbreviated section for this study, since you won’t actually have results! You can describe here what results you expect to get from this study and how you would interpret them. You are free to skip this as a section and incorporate those ideas into the discussion.

**Discussion**

This section can either be written in paragraphs, or divided into sub-sections. Either way, you should address *both* the strengths and weaknesses of your chosen study design, any potential sources of bias, how well your estimand matches the scientific question of interest, how variance is quantified and why this is adequate. You should also consider the generalizability and external validity of the study. You should candidly acknowledge weaknesses and limitations of the study, but justify why you were unable to address them in the design. You should also describe how your study results should be interpreted and used by the target audience. This should include a consideration of both how to interpret if a significant result is found and if a significant result is not found. The discussion section should answer the questions: why is this study useful to perform and why should people care about the results? Finally, you should propose future work that would build on the results of your study.

**References**

Include a reference list with full citations (as well as citing with superscripts or parenthetical citations throughout the text). Any citation style is fine as long as you are consistent.