

MATH 115 STATISTICS GROUP PROJECTS

Overview: During the last two weeks of classes, you and two partners will turn in a statistics project. The project will consist of a short (4 or 5 pages, including figures and tables) paper and an 8-minute in-class presentation. The paper is due at the beginning of class on Monday, Dec. 5; the presentations will be on Wednesday, Nov. 30 and Friday, Dec. 2. The exact time of your presentation will be determined later, so you should be prepared to present as early as Nov. 30. You will also complete a peer evaluation of the work of the members of your group.

Content: You will pick a question of interest to you, and use statistical methods to try to answer it. You can either conduct an original study or analyze an existing dataset. You must use some of the techniques that we learn in class, and you may not do a survey. **At least one of your variables must be quantitative.**

Your report should include the following.

- (1) *Statement of the question.* What problems did you set out to investigate? What were the key issues?
- (2) *Background.* Is there anything we need to know before thinking about your project?
- (3) *Method of collection.* What did you do? How? Give enough information about the collection of your data (whether you collected it yourself or not) to allow readers/listeners to assess its strengths and weaknesses. For an experiment, how did you assign subject to treatments? Was there blinding? For an observational study, how did you control for lurking variables?
- (4) *Method of analysis.* How did you analyze the data and derive your conclusions? Did you specify an analysis plan before you collected your data? What statistical techniques did you use?
- (5) *Results and conclusions.* What did you find out? Did you answer your questions? Construct graphics, if you can, to make the evidence clear.
- (6) *Discussion and critique.* How sure are you of your results? How sure should we be? If there are alternative explanations or grounds for doubt, describe them fairly.

Techniques: By the time the project is due, we'll have learned statistical techniques to answer the following kinds of questions:

- *1-sample t-test, confidence interval.* Estimate the mean of a single numerical variable. (For example, what is the average height of Agnes Scott students?)
- *1-sample t-test, hypothesis test.* Answer a yes/no question about the mean of a single numerical variable. (For example, is the average Agnes Scott student taller than 5'6"?)
- *2-sample t-test, confidence interval.* Estimate the difference between the means of two numerical variables. (For example, how much taller are sophomores than juniors?)
- *2-sample t-test, hypothesis test.* Compare two numerical variables. (For example, are sophomores taller than juniors?)
- *1-sample Z-test, confidence interval.* Estimate a single proportion. (For example, what proportion of Agnes Scott students are from Texas?)
- *1-sample Z-test, hypothesis test.* Answer a yes/no question about a single proportion. (For example, is the proportion of Agnes Scott students from Texas under 20%?)
- *2-sample Z-test, confidence interval.* Estimate the difference between two proportions. (For example, what is the difference in the president's approval ratings in Georgia and Florida?)
- *2-sample Z-test, hypothesis test.* Compare two proportions. (For example, are Texans more likely to graduate than non-Texans?)

(We will also learn how to do comparisons among three or more numerical variables (ANOVA) or proportions (chi-square), but not in time for the project.)

Topics: The most important thing is to pick a topic that you find interesting, but if you need help getting started thinking about it, here are some sample topics. (You should have no trouble coming up with something less lame than these.) **Be aware that if your proposed study involves your collecting data from human subjects, you will need to get permission from the Agnes Scott Institutional Review Board (IRB). This can be a pain, so think carefully before deciding to try such a study.**

Experiments: 1. Compare two brands of stain removers. 2. Determine how many licks it takes to get to the center of a Tootsie Pop. 3. Conduct a taste test between bottled water and Brita-filtered water. 4. Test whether people can distinguish between the quality of CD's and MP3's. 5. Compare heart rates before and after consumption of Count Chocula. 6. Test different measures to keep squirrels off a bird feeder. 7. Compare the time it takes to travel two different routes.

Observational Studies: 1. Compare time spent on athletics at Agnes Scott for different sports. 2. Evaluate the weather forecasts for high and low temperature predictions. 3. Compare the fraction of front-page space devoted to local and national stories by the Atlanta Journal-Constitution and New York Times. 4. Compare gas prices for different locations. 5. Compare the length of commercial breaks for sporting events and for other programs. 6. Try to estimate the number of squirrels that live on campus. 7. Compare the widths of parking spaces and/or vehicles in different parking lots.

Paper: It should be 4-5 pages typed, including figures and tables. For many of you the write-up will include more information than you will be able to present (those 8 minutes will fly by!). The paper should be written in complete sentences, with correct grammar and punctuation. It should read like a research paper, not like a homework assignment. Lastly, it is very important to cite any outside sources and to include a bibliography. If you use existing datasets, be sure to cite them. Be aware of Agnes Scott's strict policy on plagiarism!

Your paper will be graded on the following criteria:

- (1) *Content:* Do you address all of the issues in the assignment?
- (2) *Can the paper stand on its own?* Can the paper be understood by someone who didn't see the presentation?
- (3) *Style:* Is the paper well written (including punctuation and grammar)?
- (4) *Citations:* Are all outside sources cited appropriately? Is there a bibliography?
- (5) *Graphics:* Are your tables and figures clearly labeled? Are they easily understandable? Do they add to the paper?

Presentation: Each presentation should last 8 minutes. All three group members are responsible for presenting. Your presentation can be as high- or low-tech as you'd like. Feel free to use the chalkboard, the computer projector, the document camera, the internet, Powerpoint, physical demonstrations, etc. You have a lot of freedom. Be sure to practice before you give your talk; you may find it more difficult than you expect, especially the timing.

Your presentation will be graded on the following criteria:

- (1) *Overview:* Do you make clear at the beginning what questions you're addressing and how you'll address them?
- (2) *Content:* Do you address all the issues in the assignment?
- (3) *Clarity:* Is all new terminology and notation defined? Are your tables and graphs clear? Do you have a good balance between oral and visual information?
- (4) *Style and organization:* Is the talk polished? Does it look like you have practiced it? Is the talk well organized and well planned? Did all three members participate in the presentation?

Hint: One of the most common mistakes that students make in presentations is rushing through the introduction. Make sure to spend plenty of time setting up the problem. Remember, the audience won't care about the answers you're giving if they don't understand the questions.

Proposal: Proposals should be emailed to me by 3:30 pm on Monday, Oct. 3.

Your proposal should include:

- The names of the three people in your group.
- The question(s) that you're trying to answer (include any necessary background information).
- What data you'll use – where you'll find them or how you'll collect them.
- How you'll answer your questions (methods of analysis). (Since we're learning new techniques, you can leave some gaps in this part to be filled in as we go along.)

Peer evaluation: Along with the final paper, you will turn in a peer evaluation of the work of the members of your group. The evaluation form is available on the assignments webpage.

Timeline:

- **Monday, Oct. 3.** Email me project proposals by 3:30 pm
- **Monday, Nov. 21.** Draft of paper due.
- **Wednesday, Nov. 30 and Friday, Dec. 2.** In-class presentations.
- **Monday, Dec. 5.** Papers and peer evaluations due at the beginning of class.