# Keck School of Medicine of USC

**PM 516b: Statistical Problem Solving (Biostatistical Consulting)**

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| Units: | 1 |
| Term: | Summer 2025 |
| Location: | TBD |
| Instructor: | Trevor A. Pickering (tpickeri@usc.edu) |

Office hour times and locations will be posted on Brightspace.

## Course Overview

### Course Description

This course will reinforce concepts in biostatistical consulting and will expose students to the applied practice of biostatistical consulting. It will help statisticians and data analysts practice the necessary skills for successfully interacting with non-statistician collaborators. Under faculty supervision, the student will meet with an investigator and independently conduct statistical analysis throughout the semester.

### Learning Objectives

Through this course, students will gain additional experience in statistical consulting. Students will:
- Recall and apply the consulting principles learned in PM516a.
- Summarize research questions and implement appropriate biostatistical methods to address such questions, understanding how different methodologies affect conclusions.
- Apply statistical tools they have learned in their program to produce a meaningful analysis.
- Evaluate statistical interactions with non-statistician collaborators to improve the quality of such interactions.
- Understand how to work with individuals from diverse content domains.
- Create comprehensive, coherent consulting reports and interpret analyses for dissemination materials, such as the results sections of a manuscript.

### Course Preparation

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| Prerequisites | PM516a |
| Recommended Preparation | The course may be more useful for students who have training in generalized linear modeling (e.g., logistic, Poisson regression). However, accommodations will be made to match students with a project that meets their skill level. |

## Course Requirements

### Communication

Brightspace (slides, data sets, assignment submission), USC e-mail (formal communication), Slack (informal communication)

### Technological Proficiency and Hardware/Software Required

Students must have proficiency in at least one statistical program, but may choose which use for this course (e.g., R, SAS, Stata, SPSS).

### Required Textbook

Note: Textbook may be available through the USC Libraries (libraries.usc.edu)
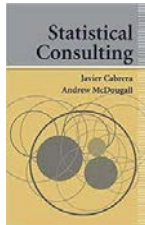
Cabrera J, McDougall A. Statistical consulting. Springer Science & Business Media; 2002 Jan 2.

## Assessments

Students will each be assigned a project and use the semester to perform statistical analyses and create an analysis report for the client/collaborator. As a 1-unit course, students are expected to spend approximately 40 hours analyzing data, writing results, and meeting with the client and instructor. All work should be completed before the last day of class.

Students will be assessed on the following:

### Required Trainings

Students will be working with real data from investigators at USC and must complete the appropriate required trainings. There are three trainings offered by CITI (https://about.citiprogram.org/) that must be completed. Students should have completed these in PM516a but, if not, they must complete them as soon as possible:

☐   CITI Biomedical Human Subjects
☐   CITI Responsible Conduct of Research
☐   CITI Research HIPAA
☐   Students may need to complete additional project-specific trainings

### Required Meetings with Deliverables

This is a practicum-type course and students will develop additional skills through their interactions with the instructor and collaborator. Students must proactively schedule at least 5 meetings over the semester:

☐   Initial Meeting. Once the project is assigned, the student will schedule a meeting with the collaborator (and instructor, if possible). After the meeting, the student must send the collaborator and instructor a *consultation follow-up e-mail* that discusses the scope of work and appropriate timelines for the project.
☐   Interim Meetings. At least one interim meeting should be scheduled with the instructor and client collaborator to discuss statistical or substantive issues with the analysis, with additional meetings on an as-needed basis.

☐ Final Meeting (Instructor). Before presenting the final analyses to the collaborator, the student should schedule a meeting with the instructor to review the accuracy and interpretation of results to be presented.

☐ Final Meeting (Collaborator). The final meeting will be focused on presenting the analyses to the collaborator (and instructor should be included, if possible).

**Analysis Report**

An analysis report should be delivered to the collaborator in advance of the final meeting. There are different ways to accomplish this. For example, the PM516a textbook offers one template, while I use the template at (https://uscbiostats.github.io/PM516/analysis-report/). Be sure to use all principles learned in PM516a when completing the analysis report.

**Debriefing**

By the end of the semester, students must submit documentation of the hours worked, much like a consultant would submit an invoice of their work performed. The template will be provided to the students.

After presenting the final analysis report, the collaborator will be sent an evaluation form for constructive feedback on the student's performance. Students should acknowledge the receipt of this feedback. This evaluation serves as feedback to the student but will not affect their final grade in the course.

The survey that will be distributed is given here:

Thank you for providing an opportunity for a PM516b student to become more involved in the research process this semester. I hope that the experience has been valuable for both you and the student. As a reminder, students were expected to spend approximately 30 hours on the project, and be involved in approximately 3-5 meetings over the course of the semester.
I am requesting your feedback on the experience you had with the student. This feedback will be shared with them in the spirit of constructive criticism.

1. Please type the name of the consultant with whom you worked.
2. Please rate your satisfaction with the following (Strongly Agree, Agree, Somewhat Agree, Disagree):
   a. The consultant asked probing, open-ended questions so they could fully understand the scope of the project
   b. The consultant followed up with an appropriate amount of communication through the span of the project
   c. The consultant was polite and professional in their interactions
   d. The consultant explained statistical concepts in a way that was understandable to a non-statistician collaborator
   e. The consultant successfully used graphs and/or figures to communicate complex results
   f. The summary report provided information that addressed the research question
   g. The summary report provided a thorough interpretation of the statistical results
   h. The content in the summary report was presented in a clear, professional manner
   i. The consultant met all required deadlines

3. Please provide any additional constructive feedback you have for the consultant.

## Grading Breakdown

The course is graded credit/no credit and there is no point breakdown. Instead, students must successfully complete all the following:

| Assignment | Criteria |
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| Required Trainings | Complete the required trainings before beginning work on the project. |
| Instructors Meetings | Schedule at least 2 meetings with the instructor, one of which will focus on reviewing your completed analysis report. |
| Investigator Meetings | Schedule at least 3 meetings with the investigator: an initial meeting, a check-in meeting, and a final presentation meeting. |
| Analysis Report | Successfully complete and submit your analysis report. |
| Debriefing | Successfully complete your mock invoice and receive collaborator feedback. |

# Course-Specific Policies

## Policy on Participation & In-Class Work

Participation is essential in a consulting environment - students are expected to be an active, engaged participant during scheduled meetings.

## Assignment Submission

Students complete meetings at their own pace during the semester and are responsible for meeting all deliverables by the last day of class.

## Classroom Norms

1. **Take Charge of Your Learning** – As a graduate-level course, this is an opportunity to deepen your expertise and develop new skills in your academic field. Your success depends on active engagement and responsibility in the learning process. Feel empowered to ask questions, seek clarification, and communicate barriers early with the instructor. Make use of all resources available to you, including office hours, peer support, and additional readings.
2. **Be Present** – This is a practice-based course, and active participation is key to your success as a consultant. "Being present" means not just physically attending meetings, but fully engaging in them through focus, contribution to discussions, and participation in activities. Your active involvement will deepen your understanding of the field and help you develop useful skills.
3. **Practice Professionalism** – In this course, you will engage with external collaborators who are professionals in the field. It is essential to conduct yourself with professionalism in all interactions. This includes being punctual, meeting deadlines, communicating clearly and respectfully, and representing you and your program with integrity. Come to sessions

prepared, showing respect for the time and expertise of others. The way you conduct yourself in these interactions will contribute to your growth and future success in the field.

## Zoom Etiquette

In this course we may meet with other faculty at USC, Keck School of Medicine, or Children's Hospital Los Angeles. This may include medical students, faculty researchers, or practicing doctors. Please come to consultations prepared, and on your best professional behavior.

## Content Distribution and Recording Policies

As befitting a consulting-type environment, synchronous sessions will not be recorded.

## Course Evaluation

End of semester surveys will gather student opinions about the course. Your opinion is valued and can make a difference in how this course is conducted in future semesters. Please give your honest and constructive recommendations for ways that the course can be improved. Additionally, there will be a mid-semester evaluation. The purpose of this evaluation is to identify any barriers to student success in the course.

## Policy on the Use of AI Generators

The use of AI (e.g., ChatGPT) can sometimes be helpful when conducting statistical analysis and interpreting results. However, in my experience the use of AI has led to incorrect, misleading, or otherwise false results in a surprising number of cases. As such, I discourage the use of AI as the "final arbiter" of conducting and interpreting data analyses. Keep in mind the following:

- You may use AI tools to help aggregate and/or explain ideas related to this course.
- Only use these tools if you have sufficient training and experience in the methods you are asking AI tools to help you with. The output of such tools must be examined through a critical lens, and using such tools blindly can be dangerous.
- Be mindful of when AI is most useful. Consider its appropriateness in each situation.
- Do not assume the information provided by AI tools is accurate or trustworthy. In fact, assume all information is incorrect unless you can verify its accuracy with another source. You will be responsible for any errors or omissions provided by the tool.
- If you use AI tools for any deliverable, you are expected to clearly attribute any material generated by the tool used.

## Alignment Grid

| Learning Objective By the end of this course, students are expected to be able to: | Learning Activities The learning objective will be facilitated by: | Assignment/Assessment This learning objective skill is measured by: |
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| Recall and apply the consulting principles learned in PM516a. | Instructor and Investigator Meetings | Debriefing |
| Apply statistical tools they have learned in their program to produce a meaningful analysis | Instructor Meetings, Analysis Report | Instructor Meetings, Debriefing |
| Summarize research questions and implement appropriate biostatistical methods to address such questions, understanding how different methodologies affect conclusions | Instructor Meetings, Analysis Report | Instructor Meetings, Debriefing |
| Create comprehensive, coherent consulting reports and interpret analyses for dissemination materials, such as the results sections of a manuscript. | Class Materials, Instructor Meetings and Feedback | Instructor Meetings and Debriefing |
| Evaluate statistical interactions with non-statistician collaborators to improve the quality of such interactions. | Investigator Meetings | Instructor Meetings |
| Understand how to work with individuals from diverse content domains | Investigator meetings | Debriefing |

# Course Schedule

| Deadline | Content |
| --- | --- |
| **M 5/26** | **Review of Statistical Consulting Best Practices, Trainings**<br>Read the SCS Brochure<br>Read the ASA article on What to Expect When You Consult A Statistician<br>Read the ASA article on How to Get and Keep Clients<br>Ensure you have completed the required CITI trainings:<br>    ▪ CITI Biomedical Human Subjects<br>    ▪ CITI Responsible Conduct of Research<br>    ▪ CITI Research HIPAA |
| **M 6/2** | **Project Assignment and Initial Meeting**<br>Schedule and complete a meeting with your collaborator (and instructor, if possible)<br>Send an follow-up e-mail to the collaborator (cc the instructor) that discusses:<br>    • A brief summary of the research question<br>    • The scope of work you will perform<br>    • Estimated timelines for your work |
| **M 6/9 – F 7/18** | **Analysis, Interim Meetings, and Feedback**<br>Work on analysis<br>Work on the analysis report<br>Work on the mock invoice<br>Schedule at least 1 meeting with the instructor and/or collaborator, additional as needed |
| **F 8/1** | **Final Check-In**<br>Schedule a meeting with the instructor to review your work |
| **F 8/8** | **Final Deliverable**<br>Schedule a meeting with the collaborator (and instructor, if possible) to present your analysis<br>Submit your analysis report<br>Submit your mock invoice |

# Statement on Academic Conduct and Support Systems

**Academic Conduct:**
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

**Support Systems:**
*Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call*
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

*National Suicide Prevention Lifeline - 1-800-273-8255*
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call*
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

*Sexual Assault Resource Center*
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

*Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086*
Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

*Bias Assessment Response and Support*
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

*The Office of Disability Services and Programs*
Provides certification for students with disabilities and helps arrange relevant accommodations. http://dsp.usc.edu

*Student Support and Advocacy – (213) 821-4710*
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

*Diversity at USC*
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. https://diversity.usc.edu/

*USC Emergency Information*
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, http://emergency.usc.edu

*USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime*
Provides overall safety to USC community. http://dps.usc.edu