EPSY 8310
Midterm Examination – Due Tuesday, October 23rd at 11:59:59 PM

This midterm consists of two data sets:

1. Educational Spending Data
2. Auto Pollution Data

Each data set is the result of a study conducted by various investigators that are described on the following pages. Along with a description of each study you will find a set of questions posed by each of the investigators prior to collecting the data. These questions are not directly statistical in nature, in that they do not ask for specific analyses to be run. They are, however, the questions that drove the research, and resulted in the data that were collected. Each question can be answered using statistical tools taught in this course up to this point (Chapter 7 in the textbook). *Note that there is not necessarily a single best way to answer each question.* Furthermore, note that this midterm is the statistical equivalent to an essay test, with answers evaluated not only for technical correctness, but also for the motivating reasons for using the statistical methodology – so describe the motivation for your choice of analysis fully. Your job, for each part of the midterm, is to present an answer to each question in the form of an argument that is supported with evidence culled from the statistical analyses. In your mind, consider me as either a journal editor evaluating a manuscript or as a reviewer of a technical report.

Directions:
Your job is to answer the questions given for each data set using statistical techniques you have learned in this class. For **each part of each** question:

- Describe the analysis you have selected to perform (for example, explain why you are using the variables you are using).
- Describe the assumptions of the analysis.
- Report any diagnostic tests of assumptions you may have run.
- Perform the analysis and report the results. Supplying graphs can be helpful to describe your findings.
- Interpret the results.
- Provide an answer to the question using the statistical evidence you have gained via the analysis.
- Describe any limitations of the analysis you performed.
- Remember: direct tabular output from SPSS or any other stat package is not allowed (and will lead to zero points on that section of the analysis); however graphs and figures are encouraged.
- NOTE: Because of logistics, please post your questions to WebCT's discussion board rather than email them to me – this will help others and will allow for communication to flow easier while I am away.

Scoring:
Each data set will represent 1/2 of the total score for the final. For question in the midterm, your score will depend upon these factors:

- Did you choose an analysis that will provide an accurate answer to the question? (10 points)
- Did you explicitly state all assumptions? (10 points)
- Did you perform the appropriate analysis correctly? (20 points)
- Did you check the assumptions? (20 points)
- Were your interpretations consistent with the information the analysis provides? (30 points)
- Were your conclusions well explained (how well did you use the statistical evidence to create an answer to the question)? (10 points)
- BONUS: One percentage point per WebCT discussion post: either a question or an answer (up to 5% of your total grade).

Problem #1
Educational Spending Data

Average salary paid to teachers and expenditures per pupil are two commonly used measures of the amount of money spent on education. Data on these two measures are provided by state, and states are classified by region of the country.

Variable Name	Description
State	State
Region	Region
Pay	Amount of pay in thousands
Spend	Average amount spent per student in thousands

Researchers want to know:

- Are there regional differences in teachers' pay?
    - If so, describe these differences.

- Are there regional differences in educational spending?
    - If so, describe these differences.

Problem #2
Auto Pollution Data

The data are from a statement by Texaco, Inc. to the Air and Water Pollution Subcommittee of the Senate Public Works Committee on June 26, 1973. Mr. John McKinley, President of Texaco, cited the Octel filter, developed by Associated Octel Company as effective in reducing pollution. However, questions had been raised about the effects of pollution filters on aspects of vehicle performance, including noise levels. He referred to data presented in the data file associated with this story as evidence that the Octel filter was was at least as good as a standard silencer in controlling vehicle noise levels.

Variable Name	**Description**
Noise	Noise level reading (decibels)
SIZE	Vehicle size: 1=small; 2=medium; 3=large
TYPE	Filter Type = 1=standard silencer; 2=Octel filter
SIDE	Side of car:1=right side; 2=left side

There are three questions of the study:

- Do vehicle size and type of filter interact to have an effect on noise levels?
    - If so, describe the nature of the interaction.

- Is there a main effect of vehicle size on noise levels?
    - If so, describe the nature of the main effect.

- Is there a main effect of filter type on noise levels?
    - If so, describe the nature of the main effect.