**Stat 500** **Lab 5**

Objectives of Lab 5:

(1) Use SAS to conduct inference for the difference in two population means using the two-sample procedure.
(2) Model diagnostics.
(3) Wilcoxon rank-sum test.

1. We have analyzed the SMSSPEED data.

For a school statistics poster competition in 2006, students timed 15 randomly selected teenagers from the school and 15 randomly selected staff from the school over the age of 30 on how long it took each person to text the following sentence on their phone: "the quick brown fox jumps over the lazy dog." Each subject had the sentence in front of them while they were typing. The text message had to be typed with no errors, no abbreviations, and no use of the phone directory. Time was measured using a stop watch to within 0.01 seconds. Participants were timed using two phones – their own phone and a "control" phone, which was the same for all participants. The data are located in the file **smsspeed.csv** and the SAS code for the analyses below can be found in the file **smsspeed_diag.sas**.

We conducted two-sample inference using to determine if teenagers were faster "texters" for this school, on average, than adults. Now, we look at the model assumptions.

a. Describe the independence assumption for the two-sample inference procedure. Explain why this assumption is valid for these data.

b. Describe the homogeneous variance assumption for the two-sample inference procedure. Check whether this assumption is appropriate or not for these data. Explain why violating this assumption has little impact on our results.

c. Describe the normal distribution assumption for the two-sample inference procedure. Check whether this assumption is appropriate or not for these data.

2. Sodium Intake and Blood Pressure – This data set comes from a small experiment on the effect of sodium intake on systolic blood pressure for men with Stage 1 hypertension. Blood pressure is composed of two measurements – systolic and diastolic. Systolic blood pressure measures the amount of pressure in the arteries when the heart beats and diastolic blood pressure is the pressure when the heart is at rest. A normal blood pressure is written as 120/80 mmHg, where 120 is the systolic number and 80 is the diastolic number and the units are millimeters of mercury. Hypertension is a medical condition characterized by higher than normal blood pressure readings. In the first stage of hypertension, systolic pressures range from 140 to 159 mmHg or diastolic pressures range from 90 to 99 mmHg. The research question is this study is:

   Does sodium intake affect systolic blood pressure in men with Stage 1 hypertension?

   Twenty men with Stage 1 hypertension agree to participate in the study. Men are randomly assigned to one of two treatments: either a low sodium diet (50 mmol/day) or a high sodium diet (200 mmol/day). After three months, the systolic blood pressure of the 20 men is measured.

Here are the data:

| Low Sodium Group | High Sodium Group |
|---|---|
| 143 | 161 |
| 136 | 161 |
| 126 | 179 |
| 165 | 176 |
| 145 | 162 |
| 135 | 155 |
| 143 | 172 |
| 157 | 156 |
| 132 | 146 |
| 149 | 162 |

Perform a Wilcoxon rank-sum test to determine if the distributions of systolic blood pressures are the same for the two groups. Calculate the test statistic $W$ and find a corresponding p-value using the low sodium group. The SAS code can be found in the file **bloodpressure.sas**.