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Statistical Analysis of Sample Data: Comparing Men and Women's Blood Pressure

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Comparing Men and Women's Blood Pressure

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Rappahannock Community College

MTH 245 – Statistics I

The purpose of this project was to compare the age, systolic blood pressure, and diastolic blood pressure of a sample group and use descriptive statistics to determine if gender has a statistically significant impact on a person's blood pressure. As a nursing student, the ways in which gender and age effect health are very interesting to me. The more knowledgeable I become on topics such as this one, the better nurse I will be. Since I am so new to the world of nursing, I only have my personal experiences to inform my opinion on this topic. In my family it is usually the men who are diagnosed with high blood pressure. Several of the older men in my family have passed away from heart attacks. Given my family history, I will make the prediction that men will have a much higher average blood pressure than women, regardless of age. Analyzing the sample data in a sequence will be crucial to an accurate assessment of the findings. I will balance the number of values per gender. Then I will compare the ages of the participants. Next, I will compare the systolic blood pressure of the sample, then the diastolic blood pressures. I will also include research to compare this small sample of data to a larger global sample. This comparison will show if this small sample accurately represents men and women's blood pressures.

The sample group consisted of 147 women and 153 men, making for a total of 300 participants. However, accurate statistical analysis is more likely when each subset of the sample has an equal number of values to compare. For that reason, six of the male participants' data was removed from the sample data. To avoid unconscious bias when determining which participants' data should be excluded, effort was made to ensure randomization. The numbers 1 to 153 were each written individually on small identical squares of paper. Each of the 153 pieces of paper was rolled into a ball and placed in a bowl. The balled paper pieces were then mixed around to promote randomization, and then 6 were picked from the bowl. The number on each of the 6 papers corresponded to a row of data that was be deleted from the data set. The removal of that data allowed for an even number of data values on both sides, 147 women and 147 men, totaling 294 sample subjects. The sample data set used for the analysis was retrieved from the textbook *Elementary Statistics* (Triola & Iossi, 2018).

Age can contribute to a person's probability of having high blood pressure. To ensure that the data analysis would not be skewed due to an imbalance in the ages of the men and women in the sample group, a comparison of descriptive statistical data was performed. The

mean age of the women was 47.15. For the men, it was 47.26. This shows that the difference between the average ages of the women and men will not impact the results of the project. The median for the women's age was 45 and it was 46 for the men. The range of the ages spanned from 18 to 80 for both the men and the women. The 3rd quartile for the women was 63 and for men it was 61. Analyzing the statistical data for the ages of the men and women in the sample shows that their ages are well matched and will not skew the comparison.

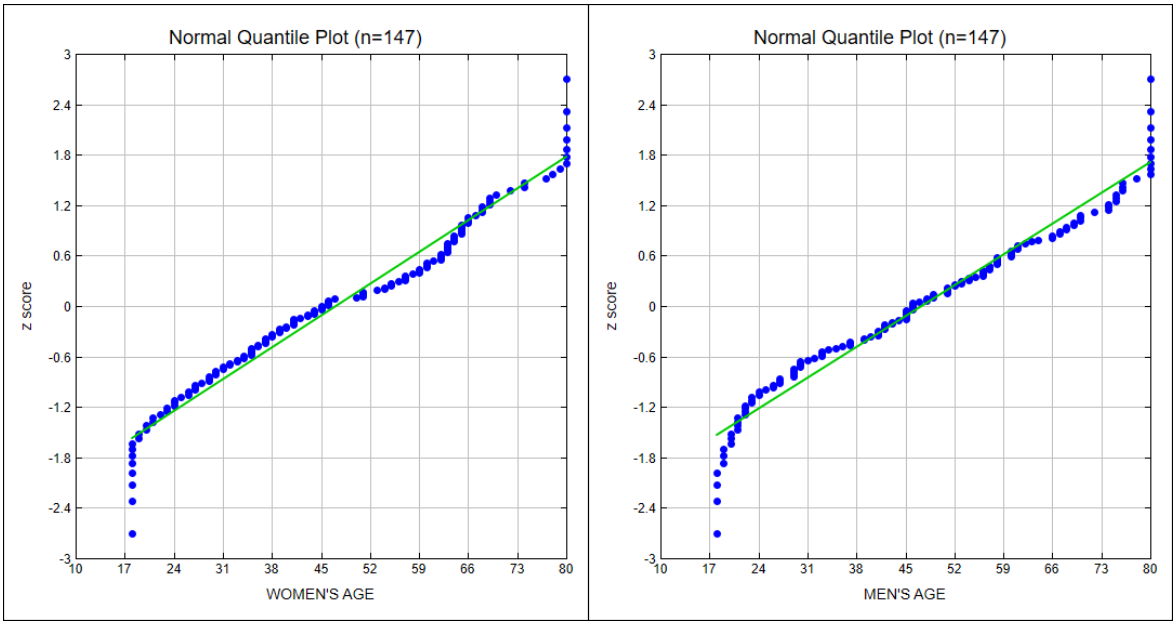


Figure 1. These graphs show the ages of the men and women in the sample are quite similar.

Next, the men and women's systolic blood pressure was compared. Each beat of the heart indicates a contraction in the left ventricle that pushes the blood out of the heart and through the rest of the body. Systolic blood pressure measures the pressure that is put on the arteries with each contraction of the heart. For medical accuracy, the descriptive statistics of the blood pressures will be rounded to the nearest whole number that is even, since there are no decimals or odd numbers in blood pressure readings. The proper unit of measure for blood pressure is millimeters of mercury, most often seen as mmHg. The mean reading for the women was 124 mmHg, followed closely by the men's 122 mmHg. The women's systolic blood pressure had a median of 122 mmHg. A median of 120 mmHg was calculated for the men. The

3rd quartile measurements were 134 mmHg for the women and 132 mmHg for the men. The systolic pressure for the women showed a wide range of 98 mmHg, while the men had a smaller range of 72 mmHg. This difference in ranges is due to a high outlier within the women's systolic readings (186 mmHg). Except for the outlier, the men and women's systolic blood pressures show only minimal differences.

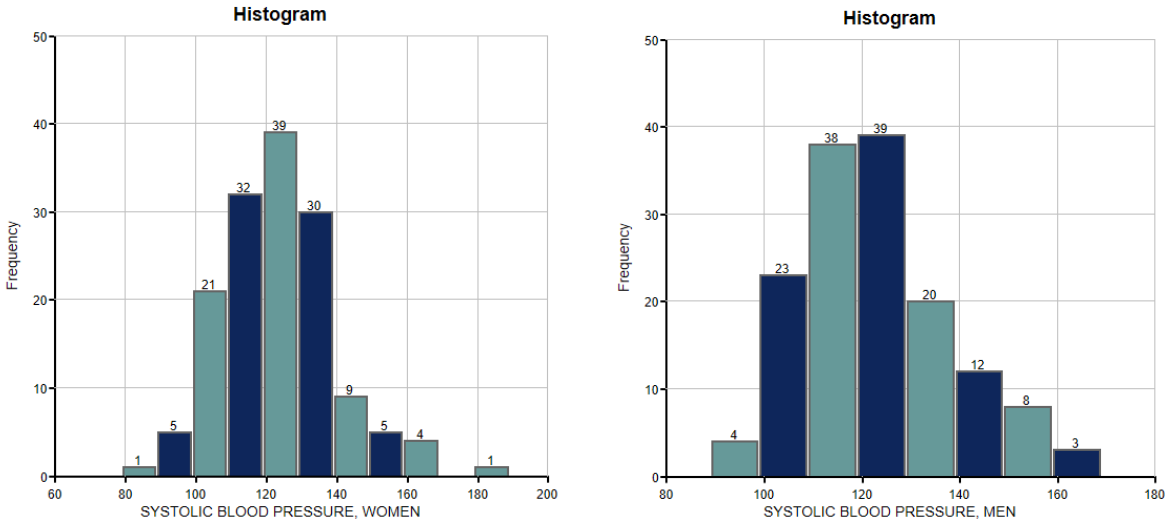


Figure 2. The above histograms illustrate the frequencies of the women and men's systolic blood pressure readings using 10-point class widths.

The last analysis for this data set was to compare the diastolic pressures of the men and women. After the heart has contracted and pushed out the oxygenated blood, it must then relax and refill. Diastolic blood pressure measures the pressure on the arteries during the refill process. The mean diastolic pressure for the women was 72 mmHg, and for the men it was 70 mmHg. Both women and men showed a median of 70 mmHg. The minimum diastolic blood pressure was 40 mmHg, for the men and the women. The maximum was 102 mmHg for the women and 98 mmHg for the men. Comparing the 3rd quartile, shows the men and women matching up with 78 mmHg. The range for the women's pressure was 62 mmHg. The men's range was 58 mmHg. Assessing the data for the diastolic blood pressures of the sample showed almost no variation between the men and women's readings.

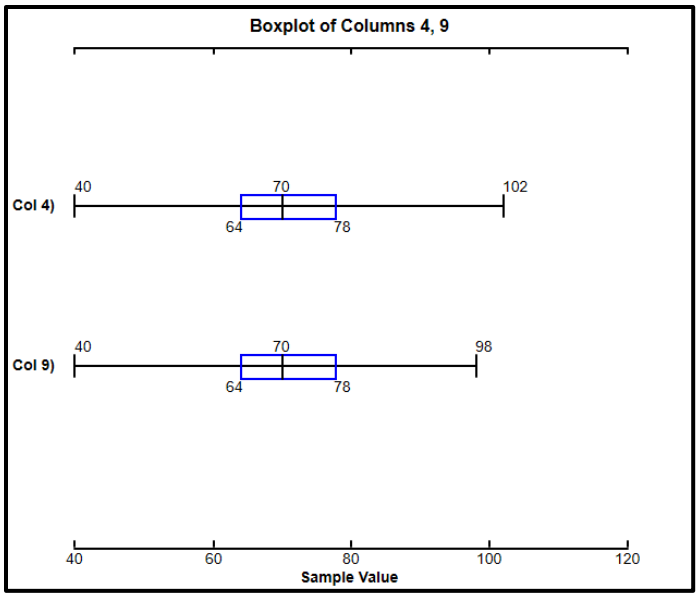


Figure 3. These boxplots represent the data for the sample's diastolic blood pressure: women (Col 4) and men (Col 9).

The following three graphs compare the mean, range, and sum of each category of data (ages, systolic blood pressures, and diastolic blood pressures). The format of these graphs allows for a side-by-side visual comparison of the sample data. The data speaks for itself and clearly demonstrates no significant differences between the blood pressures of men and women.

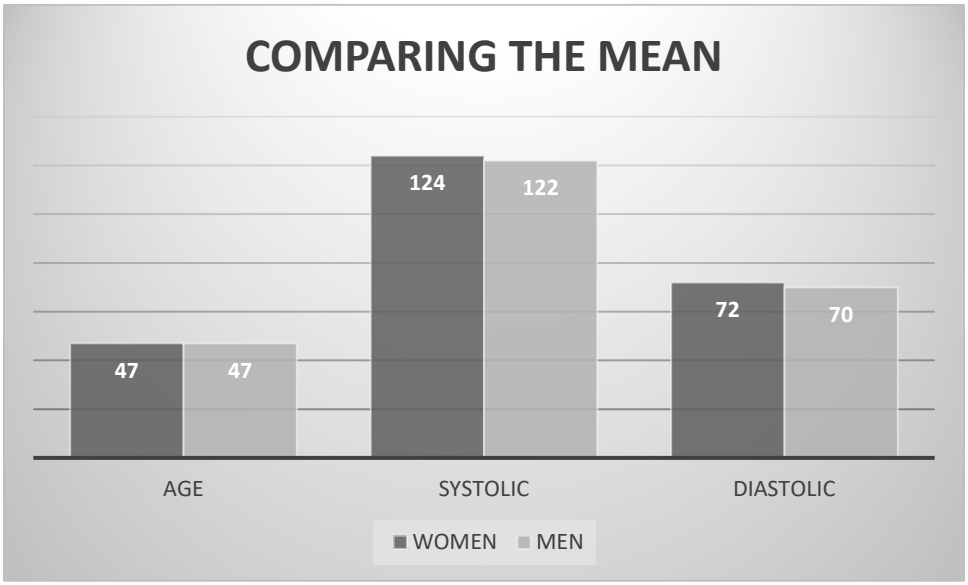


Figure 4. The chart above compares the mean of each gender's age, systolic blood pressure, and diastolic blood pressure.

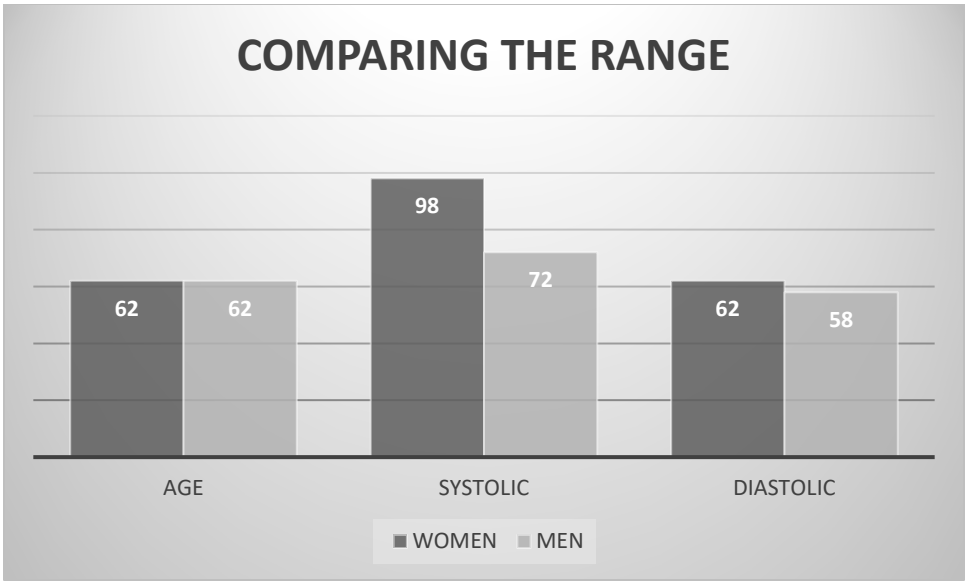


Figure 5. The above chart compares the range of each gender's age, systolic blood pressure, and diastolic blood pressure.

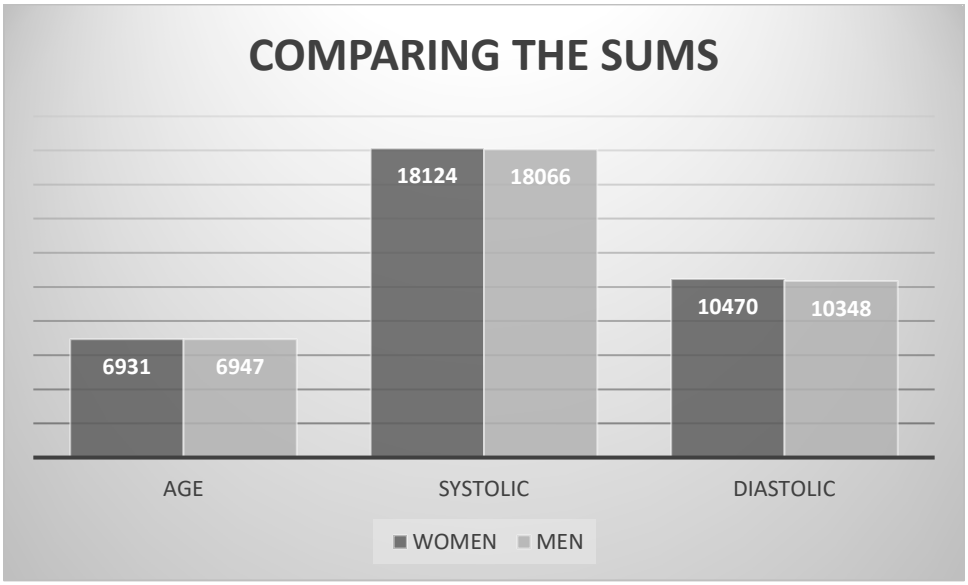


Figure 6. The above chart compares the sum of each gender's age, systolic blood pressure, and diastolic blood pressure.

Blood pressure is a medical measurement that can be taken on every living human. Therefore, a sample of less than 300 people is not of large enough size to adequately make a statistical judgement on whether gender influences blood pressure. I performed more research to find a larger sample that could more accurately represent the global averages of blood pressure. I found a study that combined the data from 1492 studies around the world, making a sample containing the data of 19.1 million people. In this study, they found the following values: mean for men's systolic blood pressure – 127.0, mean for men's diastolic blood pressure – 78.7, mean for women's systolic blood pressure – 122.3, and the mean for women's diastolic blood pressure – 76.7 (Zhou & Bentham, et al., 2017). When graphing these results, I rounded to the nearest whole number that was even, since that is what I had done with the results of the project data set. The graph below shows that the project data set, while comparatively small, is an accurate representation of global averages.

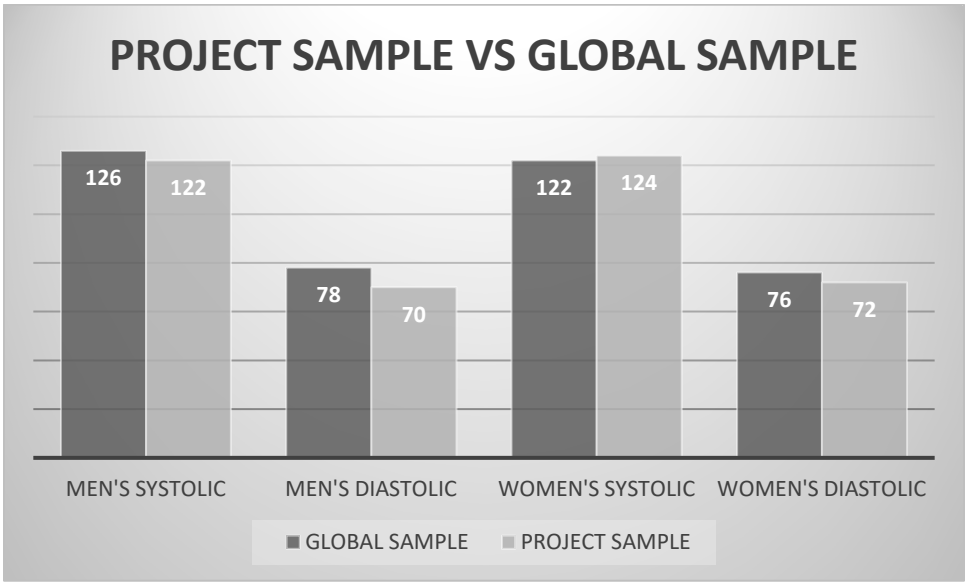


Figure 7. The above graph compares the data of the project sample to the data of the global sample.

I began this project with the preconceived notion that men's blood pressures would be significantly higher than women's blood pressures. This was based on my experiences with men I knew having heart attacks and hypertension (chronic high blood pressure). After this project showed me that there is no real difference between men and women's pressures, I was curious as

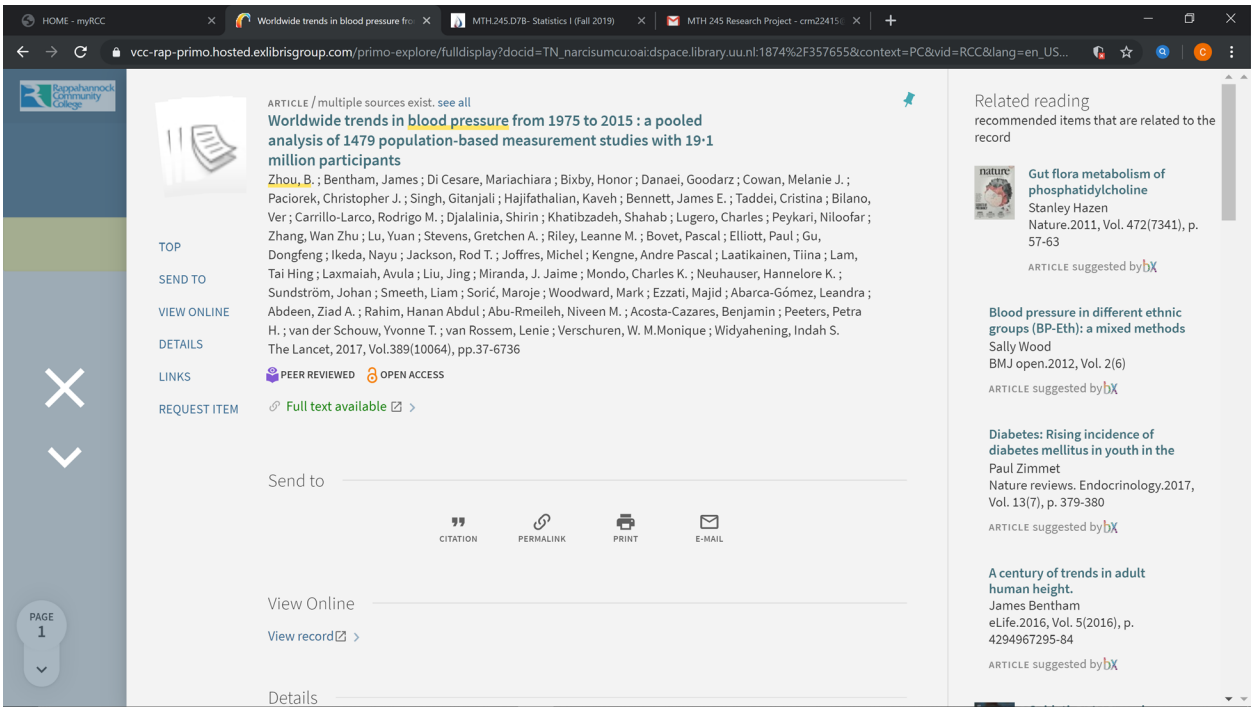
to why my experiences did not align with the data. To assuage my need to know, I performed more research. Apparently, while gender has little to no effect on blood pressure, it does have an effect how the body reacts to that pressure (Tian & Xiaohong, et al., 2016). It seems that higher blood pressures have a more measurable effect on men than on women. I would speculate that it could be related to the fact that men are more likely to internalize stress. While my hypothesis on the results of this project did not turn out to be correct, I am glad for the opportunity to expand my medical knowledge and apply this information to my future patients.

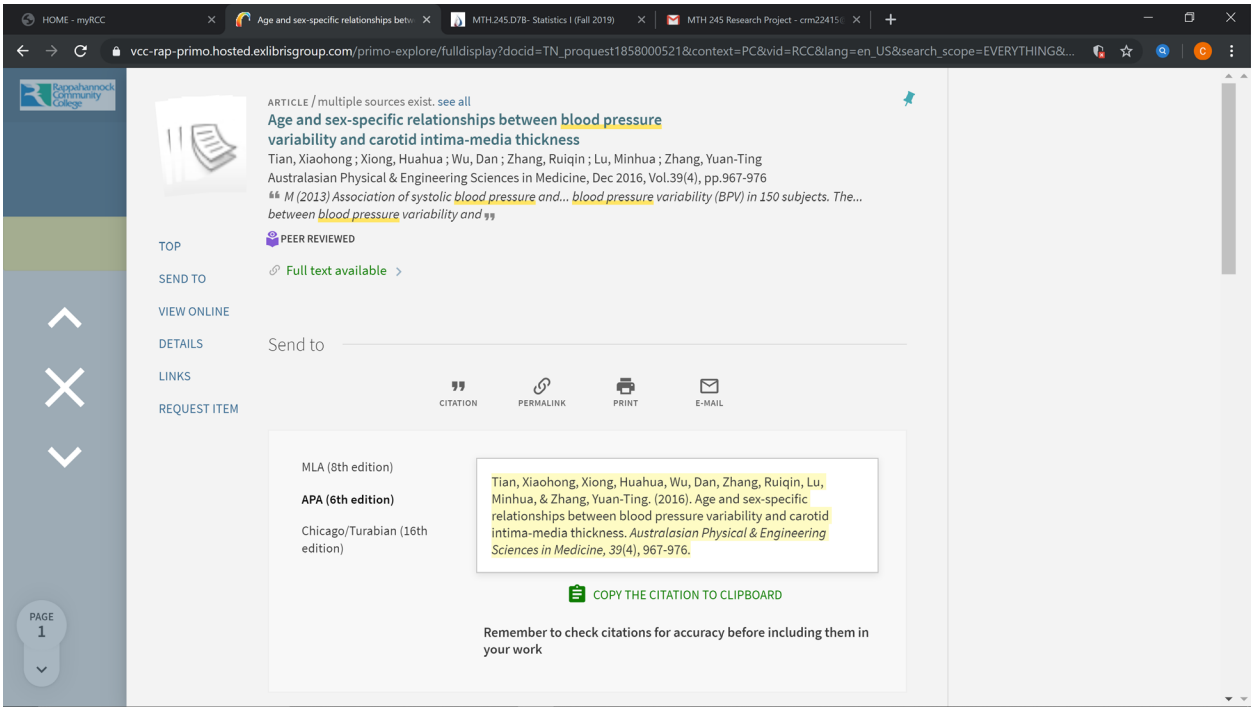
Literature Cited

Tian, Xiaohong, Xiong, Huahua, Wu, Dan, Zhang, Ruiqin, Lu, Minhua, & Zhang, Yuan-Ting. (2016). Age and sex-specific relationships between blood pressure variability and carotid intima-media thickness. Australasian Physical & Engineering Sciences in Medicine, 39(4), 967-976.

Triola, M. F., & Iossi, L. (2018). *Elementary statistics*. Pearson.

Zhou, B., Bentham, James, Di Cesare, Mariachiara, Bixby, Honor, Danaei, Goodarz, Cowan, Melanie J, ... (2017). Worldwide trends in blood pressure from 1975 to 2015: A pooled analysis of 1479 population-based measurement studies with 19·1 million participants. Lancet (London, England), 389(10064), 37-55.





Figures 8 & 9. These are the required screen shots of the articles that I found through the RCC online research library.