STAT3004: Basic Methods in Biomedical Statistics
Assignment 3
Due date: 16 November 2020, 5pm

The following problems are based on questions that can be found in *Fundamentals of Biostatistics, 8th Ed.* by Bernard Rosner, unless stated otherwise.

1. **Problems 11.13-11.18 in Rosner**
   The Update to the Task Force Report on Blood Pressure Control in Children reported the observed 90th percentile of SBP in single years of age from age 1 to 17 based on prior studies. The data for boys of average height are given in Table 1. Suppose we seek a more efficient way to display the data and choose linear regression to accomplish this task.

Age (x)	SBP (y)	Age (x)	SBP (y)
1	99	10	115
2	102	11	117
3	105	12	120
4	107	13	122
5	108	14	125
6	110	15	127
7	111	16	130
8	112	17	132
9	114		

Table 1: 90th percentile of SBP of boys aged 1 to 17 study

   (a) Fit a regression line relating age to SBP, using the data in Table 1.
   (b) Provide a 95% confidence interval for the slope of the regression line.
   (c) What is the predicted blood pressure for an average 13-year-old boy as estimated from the regression line?
   (d) What is the standard error of the estimate in (c)?

2. **Problems 11.31-11.33 in Rosner**
   A study of cardiovascular reactivity is conducted by measuring the change in blood pressure before and after a stimulating experience (like playing a video game). Blood-pressure measurements were made using an automated monitor (a machine) and using manual method. One way to relate measures of reactivity for the automated and manual blood pressures is the correlation coefficient. Suppose the correlation coefficient relating these to measures of reactivity is 0.19, based on 79 people having reactivity measured by each type of blood-pressure monitor.

   (a) What is the appropriate procedure to test if there is a relationship between reactivity as measured by the automated and manual monitors?

(b) Conduct the test procedure in (a) and report a p-value. What do the results mean, in words?

(c) Provide a 95% CI for the correlation coefficient between these two measures of reactivity.

3. **Problems 12.6-12.8 in Rosner**
Twenty-two young asthmatic volunteers were studied to assess the short-term effects of sulfur dioxide (SO_2) exposure under various conditions. The baseline data in Table 2 were presented regarding bronchial reactivity to SO_2 stratified by lung function (as defined by forced expiratory volume / forced vital capacity [FEV_1/FVC]) at screening.

	Lung-function group	
Group A	Group B	Group C
$FEV_1/FVC \leq 74\%$	FEV_1/FVC 75-84%	$FEV_1/FVC \geq 85\%$
20.8	7.5	9.2
4.1	7.5	2.0
30.0	11.9	2.5
24.7	4.5	6.1
13.8	3.1	7.5
	8.0	
	4.7	
	28.1	
	10.3	
	10.0	
	5.1	
	2.2	

Table 2: Relationship of bronchial reactivity to SO_2 (cm H_2O/s) grouped by lung function

(a) Test the hypothesis that there is an overall mean difference in bronchial reactivity among the three lung-function groups.

(b) Compare the means of each pair of groups using the pairwise comparison method.

(c) Compare the means of each pair of groups using the Bonferroni method.

4. **Problems 12.44 in Rosner**
Refer to data set `LEAD.csv`. Use nonparametric methods to compare `MAXFWT` among the three exposure groups defined by the variable `LEAD_GRP`.