PBIO 504 Fall 2019 Name\_\_\_\_\_\_\_\_\_\_\_\_\_

# t-tests

**Reading Assignment** Chapters 9.3 and 11 from the textbook

**Homework Instructions**

**Data Set A: Zinc Concentration (see worksheet)**

**Data Set B: Oat bran cereal**

A crossover study was conducted to investigate whether oat bran cereal helps to lower serum cholesterol levels in hypercholesterolemic males. Fourteen such individuals were randomly placed on a diet that included either oat bran or com flakes; after two weeks, their low-density lipoprotein (LDL) cholesterol levels were recorded. Everyone was then switched to the alternative diet. After a second two-week period, the LDL cholesterol level of each individual was again recorded. The data from this study are shown below.

|  |  |  |
| --- | --- | --- |
|  | LDL(mmol/l) | |
| subject | Corn flakes | Oat Bran |
| 1 | 4.79 | 3.18 |
| 2 | 5.09 | 3.59 |
| 3 | 5.72 | 4.19 |
| 4 | 4.35 | 3.38 |
| 5 | 4.63 | 6.21 |
| 6 | 6.85 | 3.79 |
| 7 | 4.86 | 2.79 |
| 8 | 4.62 | 3.93 |
| 9 | 3.14 | 3.01 |
| 10 | 4.44 | 4.25 |
| 11 | 4.23 | 4.33 |
| 12 | 4.43 | 4.46 |
| 13 | 3.88 | 2.36 |
| 14 | 3.77 | 4.31 |
| 15 | 3.74 | 4.41 |
| 16 | 4.23 | 2.57 |
| 17 | 5.77 | 5.09 |
| 18 | 5.46 | 4.91 |
| 19 | 4.09 | 6.52 |
| 20 | 2.8 | 4.25 |

**Data Set C: Low birth weight**

The data set *lowbwt* contains information for a sample of 100 low birth weight infants

born in two teaching hospitals in Boston, Massachusetts. Measurements of systolic blood pressure are saved under the variable name sbp and indicators of gender-with 1 representing a male and 0 a female. Import the Excel File containing the data. Construct the histogram of systolic blood pressure to check the assumption. You will use the function ttest in STATA. **Answer the questions on the worksheet**.

**HOMEWORK WORKSHEET: T-Tests**

NOTE: Always include information about null hypothesis, alternative hypothesis, testing result as well as your interpretation. Show your work.

**PART A – Zinc Concentration**

Trace metals in drinking water affect the flavor and an unusually high concentration can pose a health hazard. Ten pairs of samples were taken measuring zinc concentration in bottom water and surface water. The data are shown below. Import the Excel File (water) into Stata.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Location | | | | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Zinc concentration in bottom water | .430 | .266 | .567 | .531 | .707 | .716 | .651 | .589 | .469 | .723 |
| Zinc concentration in surface water | .415 | .238 | .390 | .410 | .605 | .609 | .632 | .523 | .411 | .612 |

(1) State the hypotheses.

(2) Perform the paired t-test and interpret the results.

**PART B - Oat bran cereal**

(3) Are the two samples of data paired or independent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(4) What are the appropriate null and alternative hypotheses for a two-sided t-test?

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(5) Conduct the test at the 0.05 level of significance. What is the t statistic and p-value?

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(6) What do you conclude based on the results?

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**PART C - Low birth weight**

(7) Construct a histogram of systolic blood pressure measurements by gender.

Based on the graphs, do you believe that blood pressure is approximately normally distributed in each group?

(8) Construct boxplots of systolic blood pressure measurements separated by gender, describe your observations on the systolic blood pressure distributions in these two gender groups based on the boxplots.

(9) State the null hypothesis that among low birth weight infants, the mean systolic blood pressure for boys and girls is the same. Use a two-sided test at the 0.05 level of significance. What do you conclude?

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**LESSONS LEARNED**

(10) What is the major difference between the two sample T-test and the paired T-test? When should we use one versus the other? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_