Practical 2
Inferential Statistics

Statistical Tests & Types of Variables

In general there are 2 types of variables; qualitative & quantitative. When you want to test the association between 2 variables, the type of test to be utilised depends on the type of variables. The tables below gave a general guide on the correct statistical test for the respective variable types.

Qualitative Data Analysis

Variable 1	Variable 2	Criteria	Type of Test
Qualitative	Qualitative	Sample size ≥ 20 dan no expected value < 5	Chi Square Test (X^2)
Qualitative Dichotomus	Qualitative Dichotomus	At least 10 successes & 10 failures	Proportionate Test
Qualitative Dichotomus	Qualitative Dichotomus	Sample size > 40 but with at least one expected value < 5	X^2 Test with Yates Correction
Qualitative Dichotomus	Qualitative Dichotomus	Sample size < 20 or (< 40 but with at least one expected value < 5)	Fisher Test

Parametric Analysis

Qualitative Dichotomus	Quantitative	Normally distributed data	Student's t Test
Qualitative Polinomial	Quantitative	Normally distributed data	ANOVA
Quantitative	Quantitative	Repeated measurement of the same individual & item (e.g. Hb level before & after treatment). Normally distributed data	Paired t Test
Quantitative - continous	Quantitative - continous	Normally distributed data	Pearson Correlation & Linear Regresssion

Non-Parametric Analysis

Variable 1	Variable 2	Criteria	Type of Test
Qualitative Dichotomus	Qualitative Dichotomus	Sample size < 20 or (< 40 but with at least one expected value < 5)	Fisher Test
Qualitative Dichotomus	Quantitative	Data not normally distributed	Wilcoxon Rank Sum Test or U Mann-Whitney Test
Qualitative Polinomial	Quantitative	Data not normally distributed	Kruskal-Wallis One Way ANOVA Test
Quantitative	Quantitative	Repeated measurement of the same individual & item	Wilcoxon Rank Sign Test
Quantitative - continous	Quantitative - continous	Data not normally distributed	Spearman/Kendall Rank Correlation

Practical 2

This is the second practical session for this module. In this session, we will be conducting exercises on Student's t-test, paired t-test and proportionate test.

Student's t-test

1a. Write down the formula for Student's t-test in the boxes below;

Basic Formula	Sample size > 30	Small sample size & equal variance

b. Based on results from the practical 1 Q5, complete the boxes below;

	Case	Control
Mean		
Standard deviation		
n	50	50

The hypothesis that we want to test out is that;

There is a difference of mothers' first trimester body mass index between the cases (mothers with SGA babies) and controls (mothers with non-SGA babies).

c. Write down the null hypothesis;

d. Calculate the t for Student's t-test for the above exercise;

e. Please refer to table A1 and A3, and try to estimate the p value from the t value calculated. Discuss which table is more appropriate for this exercise.

f. Based on the above p value, is the null hypothesis rejected?

g. Is there a significant difference of first trimester body mass index between the two groups? Explain your answer.

2. During the examination, we will not tell you what test to use. Instead the students are expected to choose the appropriate one based on the problem and the data given. For example, try to do the exercise below;

A case-control study to identify factors that can cause small for gestational age – SGA was conducted. Among the factors studied were the mothers' heights. It is believed that the shorter mothers were of higher risk to get SGA babies.

	Case	Control
Total of samples n	50	50
Total of height $\sum x$	7,540	7,675
Total of $(x\text{-mean})^2$	1388.0	1006.5
	Both groups	
Total of samples n	100	
Total of height $\sum x$	15,215	
Total of $(x\text{-mean})^2$	2013.0	

a. State the hypothesis and null hypothesis for the above problem.

b. What is the appropriate statistical test to prove this hypothesis?

c. Using the data given, conduct the statistical test.

d. What is your conclusion, based on your answers in Q2c?

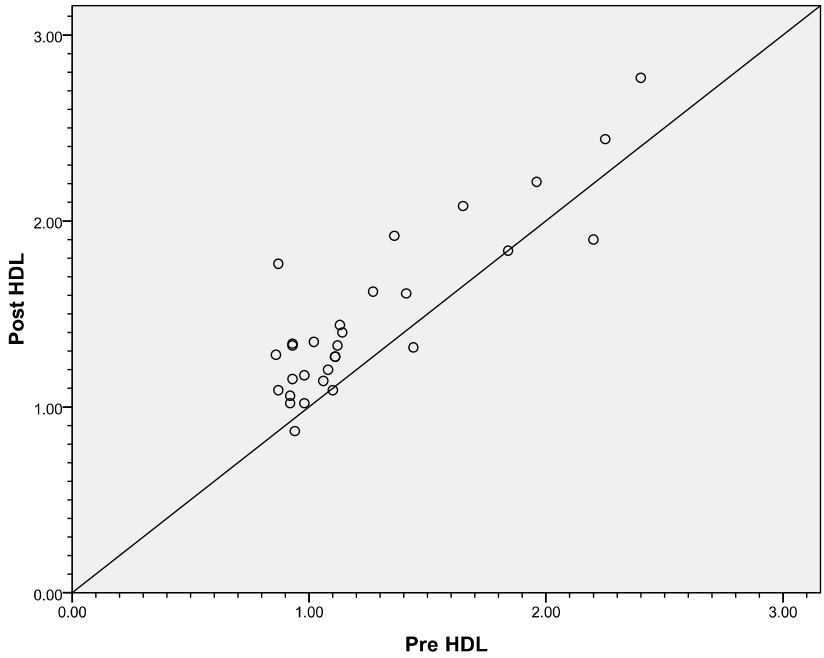
Paired t-test

3a. Write down the formula for paired t-test in the box below;

Basic Formula

b. Thirty medical personnel were noted to have abnormal fasting serum lipids (FSL). They were treated with fish oil supplement for 2 months and their FSL levels were measured again. To measure the effectiveness of the treatment, please complete the table below. High Density Lipoprotein (HDL) below 1.2 mmol/L is abnormal.

No.	HDL (before)	HDL (after)	D	D^2
1	2.2	1.9		
2	1.44	1.32		
3	0.94	0.87		
4	1.1	1.09		
5	1.84	1.84		
6	0.98	1.02		
7	1.06	1.14		
8	0.92	1.02		
9	1.08	1.2		
10	0.92	1.06		
11	1.11	1.27		
12	1.11	1.27		
13	2.25	2.44		
14	0.98	1.17		
15	1.41	1.61		
16	1.12	1.33		
17	0.93	1.15		
18	0.87	1.09		
19	1.96	2.21		
20	1.14	1.4		
21	1.13	1.44		
22	1.02	1.35		
23	1.27	1.62		
24	2.4	2.77		
25	0.93	1.33		
26	0.93	1.34		
27	0.86	1.28		
28	1.65	2.08		
29	1.36	1.92		
30	0.87	1.77		
SUM	**37.78**	**44.3**		



c. Is the intervention effective? Do a paired t-test analysis using the data above.

d. Discuss the result of your statistical test.

Proportionate Test

4a. Write down the formula for proportionate test in the box below;

Basic Formula

The rate of SGA for mothers exposed to cigarette smoke (passive smoker) was 89/156. The rate of SGA for mothers not exposed to cigarette smoke was 20/61.

b. State the appropriate null hypothesis.

c. Do the proportionate test and discuss its result using 0.05 as the level of significance (the z value in the normal distribution table for 0.05 as the level of significance is 1.96).

Research Project 2

Presentation of the complete research proposal. Upon acceptance of the proposal, as homework, the students are expected to distribute the questionnaires and collect the data for the study. All completed forms are to be brought to the third practical session.

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Amali2-2015.doc 1-9-15.