



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER
OF SCIENCE IN PUBLIC HEALTH**

HPH 700: MEDICAL STATISTICS

DATE: MONDAY 2ND APRIL 2012

TIME: 9.00 A.M. - 12.00 P.M.

INSTRUCTIONS

SECTION 1 : Answer ALL questions (50 marks)

Question 1

- a) Define the following terms as used in Biostatistics (5 marks)
- i. Data
 - ii. Variable
 - iii. Experimental unit
 - iv. A population
 - v. A sample
- b) Illustrate diagrammatically the type of variables that one that obtain data about. Give example of each types of variable (5 marks)
- c) Describe the various methods of presenting data. (5 marks)
- d) The length of time (in monthly) between the onset of a particular illness and its recurrence was recorded for n= 50 patients. The following is its grouped data (5 marks)

Grouped time	Frequency
0.2-4.1	20
4.2-8.1	9
8.2-12.1	8
12.2-16.1	4
16.2-20.1	5
20.2-24.1	2
24.2-28.1	1
28.2-32.1	0
32.2-36.1	1

- i. Construct a relative frequency histogram
 - ii. Calculate mean, mode, median and mode
 - iii. Is the histogram roughly symmetrical, skewed to the right or skewed to the left?

- e) A large number of cancer patients at a particular site are found to have a mean survival time from diagnosis of 38.3 months with a standard deviation of 43.3 months. One hundred patients are treated with a new technique and their mean survival time is 46.9 months. Is this apparent in mean survival statistically significant? (5 marks)

- f) The mean prothrombin in the normal population is known to be approximately 20 mg/dl plasma and the standard deviation of 4 mg/dl. A sample of 40 patients showing Vit K deficiency has a mean prothrombin level of 18.5 mg/dl. How reasonable is it to assume that the mean for patients with Vit K deficiency is the same as that of normal population. (5 marks)

- g) In a malaria control program, 100 houses were sampled for spraying. The mean surface area was 24.2 m^2 and a standard deviation of 5.9 m^2 . What is the 95% Confidence limit of the surface area of houses from which the houses were sampled?
If one liter of insecticide sprayed 50 m^2 of surface. How much insecticide would be required for 10,000 houses? (10 marks)

- h) An experiment was conducted to test the effect of a new drug on viral infection. The infection was induced in 100 mice and the mice were randomly split into two groups of 50. The first group 'control group' received no treatment for the infection. The second group 'treatment group' received the drug. After a 30 day period, proportions of survivors in the two groups were found to be .36 and .60 respectively. (10 marks)
 - i. Is there sufficient evidence to indicate that the drug is effective in treating the viral infection? Use $\alpha = 0.05$.
 - ii. Use 95% confidence interval to estimate the actual difference in the cure rates for the treated versus the control groups.

Section 2: Choose any Three Questions. Each question carries (20 marks)

Question 2

The birth weights of children born to 14 heavy smokers (group 1) and 15 non-smokers (group 0) were recorded from a sample of live births at a large teaching hospital.

Calculate

(20 marks)

1. Difference between the means
2. Equal variance standard deviation
3. Degrees of freedom
4. 95% confidence interval for the differences between the means. $t' = 2.05$
5. T – test
6. Interpret your results $t_{27} d.f$ at $0.05 = 2.05$

	Heavy Smokers	Non-smokers
	3.18	3.99
	2.74	3.89
	2.9	3.6
	3.27	3.73
	3.65	3.31
	3.42	3.7
	3.23	4.08
	2.86	3.61
	3.6	3.83
	3.65	3.41
	3.69	3.13
	3.53	3.36
	2.38	3.54
	2.34	3.51
		3.71
	44.44	54.4
x-bar	3.1743	3.6267
S	0.4631	0.3584
N	14	15

Question 3

(20 marks)

- a) Explain the three common uses of a chi- square test. What type of data is the technique applied to?
- b) Describe the steps used in calculation of Chi square test.
- c) During studies of two drugs (SP and Coartem) on malaria patients, the following was the effects on patients.

Outcome	SP	COARTEM	Total
Cured	20	35	55
No change	35	25	60
Worse	40	30	70
Total	95	90	185

Use Chi square test to test the hypothesis that there is no difference between the effect of SP and Coartem on malaria patients. χ^2 of 2 df at 95% confidence interval is 5.99. (20 marks)

Question 4

The following is data for randomized block experiment for three treatment plans. (20 marks)

Treatment A	48	49	50	49
Treatment B	47	49	48	48
Treatment C	49	51	50	50

Perform ANOVA to test the null hypothesis of no difference in the means between the three treatment plans. The critical value for $F_{2,9}=4.26$

Question 5

(20 marks)

- a) Discuss the basic assumptions under which non-parametric statistics are used and their advantages.

- b) The following data illustrates the relationship between age of randomly selected lung disease patients in a clinical trial and forced vital capacity.

Age (x) - 15, 20, 28, 12, 40, 60, 20, 80

FCV (y) – 40, 30, 50, 30, 20 10, 30, 60

Calculate the spearman's rank correlation coefficient and test the hypothesis that there is rank correlation between Age(x) and forced vital capacity (FVC) (y).

$$\text{Note } r_s = 1 - 6 \sum \frac{d^2}{n^3 - n}$$

$$r_s = 0.738 \text{ for } p=0.05 \text{ for } n = 8$$