



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SMA 577: STATISTICAL METHODS OF EPIDEMIOLOGY

DATE: Monday 26th March 2012

TIME: 2.00p.m – 5.00p.m

INSTRUCTIONS

Answer Question One and any other TWO.

Question One – Compulsory (30 Marks)

- a) Classify the different epidemiologic study designs (5 marks)
- b) Outline the advantages and the disadvantages of (5 marks)
 - i) Cohort study designs
 - ii) Case control studies
 - iii) Cross-section studies
 - iv) Nested case-control studies
 - v) Ecological studies
- c) In a cohort study on 2,000 farmers, a researcher established the following (10 marks)

Total number of people exposed to pesticides	= 940
Total number of people not exposed to pesticides	= 1,060
Total number of people with chronic disease	= 400
Total number of people with disease but not exposed to pesticides	= 160
Total number of people with disease and exposed to pesticides	= 240

- i) Draw a contingency table to represent this data
- ii) Calculate the Relative Risk (R.R) of chronic disease in this population
- iii) Calculate the Attributable Risk (A.R) of the exposure to pesticides on chronic disease
- iv) Interpret your R.R and A.R

- d) An experiment to assess the effects of cigarette smoking on causation of lung cancer was conducted between cases and controls. Among 200 cases of lung cancer, 30 were non-smokers, 75 smoked between 1-20 cigarettes daily and 95 smoked 21-50 cigarette daily. Among 150 controls assessed, 40 were non-smokers, 65 smoked 1-20 cigarettes daily and 45 smoked 21-50 cigarettes daily.

(10 marks)

- Construct a 2 X 3 table showing the cases and controls by cigarette smoking
- Calculate the ODDS ratio of smokers of 21-50 cigarettes getting cancer
- Calculate the ODDS ratio of smokers of 1- 20 cigarettes getting cancer
- Calculate the ODDS ratio of a smoker getting cancer
- Use Chi square to test the hypothesis that cigarette smoking has effect of causing lung cancer
- Explain all your results

(Note that the critical value of χ^2 for 2 d.f. at $p=0.05$ equals 5.99)

Question 2 – (20 Marks)

- Define rates standardization or adjustment. Compare and contrast direct and indirect methods of rates standardization.
- The following is data of deaths for England and Wales while compared to immigrant population.

Age	England and Wales			Immigrants		
	Incidence			Incidence		
	No males	cases	rate	No males	cases	rate
0-4	1,900,000	1,406		26,000	21	
5-14	3,100,000	186		30,000	2	
15-44	9,400,000	1,786		127,000	27	
45-64	4,900,000	7,350		25,000	42	
65+	2,000,000	17,400		5,000	49	
Total						

- Calculate the Age specific death rates
 - Calculate the crude death rates of England and Wales: Immigrants
 - Using population of England and Wales as standard population, calculate direct age standardized rate for population of immigrants (study population)
- c) In population of KLN males the number of deaths recorded due to penile cancer over one year in January 1902 to December 1902 were 175. Some of the DATA regarding the KLN are given below

Age	KLN male population	Penile cancer death rates/1000 in all Kenyan males	Expected deaths in KLN population
35-39	6684	0.26	<i>a</i>
40-44	6516	<i>B</i>	4.17
54-49	<i>c</i>	1.78	9.58
50-54	4257	4.14	<i>d</i>
55-59	2985	<i>e</i>	23.55
60-64	2055	12.67	26.04

- Calculate a, b, c, d, e in the table above
- Calculate the **SMR** for this population of KLN above
- Interpret your results appropriately

Question 3

- a) You are provided with the following data. (10 marks)

$$n_1 = 20$$

$$\bar{x} = 7.5 \text{ years}$$

$$S_1 = 1.87$$

$$n_2 = 25$$

$$\bar{x} = 8.2 \text{ years}$$

$$S_2 = 1.93$$

- State the hypothesis
 - Test whether the mean difference in age is merely due to sampling error
 - Give the 95% C.I for the difference between ages
- b) 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 as given below. (10 marks)

	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

Calculate

- Difference between the means
- Equal variance standard deviation
- Degrees of freedom
- 95% confidence interval for the differences between the means.
- T – test
- Interpret your results

Question 4

- Explain the three common uses of a chi-square test. What type of data is the technique applied to? (2 marks)
- Describe the steps used in calculation of Chi square test. (3 marks)
- During studies of two drugs (SP and Coartem) on malaria patients, the following was the effects on patients. (5 marks)

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. X^2 of 2 df at 95% confidence interval is 5.99. (10 marks)

d) The following is data for randomized block experiment for three treatment plans. (10 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 $F_{2,9} = 4.26$