AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

MASTER OF PUBLIC HEALTH

END OF SEMESTER EXAMINATION APRIL 2023

MAP 717 Statistical Methods in Epidemiology

DATE: **26th April 2023**

TIME: Three Hours **Start:** 1600 Hours **Finish** 1900 Hours

INSTRUCTIONS

1. This exam is marked out of 100 marks
2. This Examination comprises TWO Sections
   Section A: Compulsory Question (25 Marks)
   Section B: Long Answer Questions (75 Marks)
3. The question on Section A is compulsory and Answer any THREE questions in Section B
4. This online exam shall take 3 Hours
5. Late submission of the answers will not be accepted
6. Ensure your web-camera is on at all times during the examination period
7. No movement is allowed during the examination
8. Idling of your machine for 5 min or more will lead to lock out from the exam
9. The Learning Management System (LMS) has inbuilt integrity checks to detect cheating
10. Any aspect of cheating detected during and or after the exam administration will lead to nullification of your exam
11. In case you have any questions call the invigilator on +254721440462 or Head of Department on Tel +254720573449

12. For adverse incidences please write an email to: amiu.examinations@amref.ac.ke

SECTION A: COMPULSORY QUESTION (25 MARKS)

1. A study from the University of Texas examined whether the risk of Hepatitis C (Hep C) was related to whether people had tattoos. A sample of 600 individuals was randomly selected from the student population. In this sample 113 had a tattoo. For individuals with a tattoo, 22 were found to have Hepatitis C and for individuals without a tattoo, 25 were found to have Hepatitis C. Researchers want to know if there is evidence from this study of an increased prevalence of Hep C for individuals with a tattoo amongst the population from which they were sampled.

   a. Find out the study design is being used in this example? Explain your answer [3 marks]

   b. Give formal statements of the Null and Alternative hypotheses. [4 marks]

   c. Construct an appropriately labelled 2x2 table to display these data. [4 marks]

	Hepatitis C	No Hepatitis C	
Tattoo			
No Tattoo			

   d. Calculate the sample prevalence (risk) ratio for Hep C among individuals with a tattoo compared to individuals without a tattoo. Interpret it. [6 marks]

   e. Calculate the 95% confidence for the risk ratio. Interpret it. (8marks)

SECTION B: ANSWER ANY THREE (3) QUESTIONS(75 MARKS)

2. A study is conducted concerning the blood pressure of 60-year-old women with glaucoma. In the study 200 60-year-old women with glaucoma are randomly selected and the sample mean systolic blood pressure is 140 mm Hg and the sample standard deviation is 25 mm Hg.

a. Calculate a 95% confidence interval for the true mean systolic blood pressure among the population of 60-year-old women with glaucoma. Interpret. (10 marks)

b. Suppose the study above was based on 100 women instead of 200 but the sample mean (140) and standard deviation (25) are the same. Recalculate the 95% confidence interval. Does the interval get wider or narrower? Why? Explain. (15 marks)

3. a) Write short notes on incidence density and explain their relevance in measuring disease frequency in epidemiology (5mks)

   b) Investigators enrolled 2,100 men in a study and followed them over 4 years to determine the rate of heart disease. The follow-up data are summarized as follows (20marks)

   a. After 1 year-2,000 disease-free,100 lost to follow up with disease

   b. After 2 years-1900 disease-free, 1 with the disease,99 lost to follow up

   c. After 3 years-1,100 disease-free,7 with disease,793 lost to follow up

   d. After 4 years-700 disease-free,8 with disease,392 lost to follow up

   Calculate the incidence density

4. a. Epidemiology is the branch of medicine that deals with the incidence, distribution, and possible control of diseases and other factors relating to health. Give a critical review of the scope of epidemiology (20mks)

   a. A researcher randomizes 500 coronary artery disease (CAD) patients to either Medicine A or Medicine B. The outcome of interest is myocardial infarction (MI). In the statistical section of the published paper, the researcher writes that alpha was set at 0.05 and 500 patients were required to achieve 80% power to detect a difference of 10% or more between the two study arms. The researcher reports that 20% of the patients on Medicine A had an MI while 5% of patients on Medicine B had an MI with p = 0.03.

Is the study result statistically significant? Explain your answer and interpret (5mks)

5. Aden undertook a study to examine a belief held by a section of community regarding taking refined sugar and weight gain. He classified the respondents into two main groups; one was aged 30 or more years and the other group is less than 30 years. His screening questions were "do you currently take refined sugar?" He compared their answers with their body weights and tabulated their results as follows

Less than 30 yrs

	YES	NO	TOTAL
Overweight	37		
Normal weight		142	
TOTAL	123		402

30 years and above

	YES	NO	TOTAL
Overweight		209	
Normal weight	83		139
TOTAL	185		

(a) Complete the above tables 5 marks

(b) Use an appropriate statistical test to show if the age is a confounding factor in the above situation 20 marks

6. a) Review the techniques for controlling for confounders at design stage and analysis stage in an epidemiological study design (10mks)

   b) Table 2 shows the distribution of deaths from Diabetes in Juba and Lilongwe.

Table 2: Deaths from Diabetes in Juba and Lilongwe in 2020

	Community X		**Community Y**	
Age	Number of People	Number of Deaths from Diabetes	Number of People	Number of Deaths from Diabetes
Young	8,000	69	5,000	48
Old	11,000	115	3,000	60

Calculate the age-adjusted death rate for Diabetes in Juba and Lilongwe by the direct method, using the total of both communities as the standard population (15mks)