AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

MASTER OF PUBLIC HEALTH

END OF SEMESTER EXAMINATION DECEMBER 2024

UNIT CODE: MAP 717: STATISTICAL METHODS IN EPIDEMIOLOGY

DATE: TUESDAY 10TH DECEMBER 2024

TIME: THREE HOURS **START:** 5.00PM HOURS **FINISH** 8.00PM

INSTRUCTIONS

1. This exam will be graded out of 100 marks
2. This Examination comprises TWO Sections
   Section A: Compulsory Question (25 marks)
   Section B: Long Answer Questions (75 marks)
3. All questions in Section A are 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 your machine for 5 minutes or more will lead to a lockout from the exam.
9. The Virtual Assessment System (VAS) has built-in integrity checks to detect cheating.
10. Any aspect of cheating detected during and or after the exam administration will lead to disciplinary measures.
11. In case you have any questions, call the invigilator for this exam Dr. Dickens Onyango or the Head of Department Dr. Faith Muhonja on Tel +254 723 742 370 or ICT related questions Mr. Patrick Njine on +254725835496
12. For adverse incidences, please write an email to amiu.examinations@amref.ac.ke

SECTION A: COMPULSORY (25 MARKS)

1. A study conducted by the University of Nairobi 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) What 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 (3 Marks)

D) Calculate the sample prevalence (risk) ratio for Hep C among individuals with a tattoo compared to individuals without a tattoo. Interpret it. (5 Marks)

E) The formula for a chi-square test statistic is: $\chi 2$ statistic $=\sum [(O-E)^2/E]$. Use the 2x2 to calculate the $\chi 2$ to test your hypotheses. Show how to use this knowledge to make a decision with respect to your opposing hypotheses and explain the reason for that decision. (10 Marks)

SECTION B: ANSWER <u>ANY THREE (3)</u> QUESTIONS (75 MARKS)

2. You want to determine if the risk of becoming ill with tuberculosis in a population is independent of location of residence among urban, suburban, and rural areas. The table below summarizes results of a study that you have conducted. Use the chi-square to test your hypothesis. Clearly show the steps of hypothesis testing. (Critical values for chi square are: 1 degree of freedom =3.84; 2 degrees of freedom=5.991; 3 degrees of freedom=7.815; 4 degrees of freedom=9.488) (25 Marks)

3. Researchers are interested in whether working underground in a mine increases risk of tuberculosis. Participants were classified as either working underground (Underground) or above ground (Above ground) and were followed for two years. The outcome was defined as any case of Tuberculosis (TB) vs. no cases Tuberculosis (No TB) within the two years of follow-up. All comparisons are <u>Underground</u> versus <u>Above-ground</u>. Calculate the absolute risks, the risk ratio comparing underground to above ground, the risk difference, odds ratio and population attributable

fraction. Provide a brief interpretation for each measure of association and measure of impact. (25 Marks)

	TB	No TB
Underground	240	1230
Above ground	96	937

4. A study has been conducted to determine if asbestos exposure is associated with lung cancer. You are worried that smoking might be a confounder of this association. The tables below summarize data collected from the study. Briefly explain what confounding is outlining how to address it during analysis of data. Use the tables to evaluate if smoking is a confounder or effect modifier. What is your conclusion? (25 Marks)

Non smokers	**Lung cancer**			Smokers	**Lung cancer**	
Asbestos	-	+		**Asbestos**	-	+
-	80	12		-	214	66
+	70	28		+	167	169

Overall

	Lung cancer	
Smoking	**-**	**+**
-	150	40
+	381	235

5. Compare and contrast measures of disease frequency, measures of association, and measures of public health impact. Provide specific examples for each type and discuss their respective roles in epidemiological research and public health decision-making. (25 Marks)

6. The following table summarizes the results of a study that was conducted to assess the association between alcohol use and liver cirrhosis. The study was first conducted with controls as patients admitted at the same hospital for trauma (Controls A). The investigators were not satisfied with the odds ratio that was obtained. They further enrolled controls who were patients admitted to the same hospital for non-trauma reasons (Control B). Briefly

outline the types of error that affect epidemiological studies. Calculate odds ratios using Control A and then using Control B. Discuss the cause of the difference in odds ratios when either control group is used and how this type of error can be minimized. (25 Marks)

Alcohol Use	Cases (Cirrhosis)	Controls A (Trauma)	Controls B Non-Trauma
Heavy	40	30	10
Light / none	10	20	40