AMREF INTERNATIONAL UNIVERSITY

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF COMMUNITY HEALTH

MASTER OF PUBLIC HEALTH

END OF SEMESTER EXAMINATION AUGUST 2023

UNIT CODE: MAP 717
UNIT NAME: STATISTICAL METHODS IN EPIDEMIOLOGY
DATE: **11**th August, 2023
TIME: Three Hours **Start:** 1630 Hours **Finish** 1930 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. 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 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 for this exam on Tel. 0722840012 and or the Head of Department on Tel +254 727239519
12. For adverse incidences please write an email to: amiu.examinations@amref.ac.ke and jarim.omogi@amref.ac.ke

SECTION A: COMPULSORY (25 Marks)

1. Researchers conduct a study to compare the risk of hypoglycemia (low blood sugar) among patients with diabetes who initiate long-acting versus short-acting insulin therapy. They recruit 15 patients who recently initiated insulin treatment and have no previous history of hypoglycemic episodes. Participants are followed for up to 2 years to assess occurrences of hypoglycemia. Results are shown below.

Participant number	Insulin type	Follow-up time (years)	Hypoglycemic episode
1	Long-acting	1.3	No
2	Long-acting	1.1	Yes
3	Long-acting	0.8	No
4	Long-acting	1.6	No
5	Long-acting	1.4	Yes
6	Long-acting	1.9	No
7	Long-acting	1.7	No
8	Short-acting	0.6	No
9	Short-acting	1.9	No
10	Short-acting	1.1	No
11	Short-acting	0.8	Yes
12	Short-acting	0.4	No
13	Short-acting	1.3	Yes
14	Short-acting	0.7	No
15	Short-acting	1.4	No

a) What is the study design? Give reasons for your answer. **(5 Marks)**

b) Calculate the cumulative incidence and incidence rate of hypoglycemia in this study. Provide a brief interpretation of the measures you have calculated above explaining how they differ. **(5 Marks)**

c) Calculate the relative risk and incidence rate ratio comparing hypoglycemic reaction among patients receiving long-acting insulin with those receiving short-acting insulin. Provide a brief interpretation of the measure you just calculated. **(10 Marks)**

d) How do measures of disease frequency such as incidence differ from measures of association? **(5 Marks)**

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

2. Explain the difference between type I and Type II errors, using appropriate examples discuss the potential impact of these errors in public health and the trade-offs between the two types of errors that should be considered in the design of an epidemiological study. **(25 Marks)**

3. Researchers conduct a case-control study to examine the association of paint exposure with pulmonary fibrosis, a serious disease that typically presents with shortness of breath and a nonproductive cough. The researchers identify 30 case individuals who have received a diagnosis of pulmonary fibrosis, confirmed by high-resolution computed tomography, and a comparison group of 90 healthy control individuals who are free of pulmonary symptoms. The researchers conduct in-person interviews with the case and control individuals to

inquire about previous exposures to latex and oil-based paint products. Discuss the potential sources of bias in this study and the measures that can be taken to minimize them. **(25 Marks)**

4. A medical researcher hypothesizes that smoking can result in wrinkled skin around the eyes. The researcher recruited 50 smokers and 50 nonsmokers, all of the same age, to take part in an observational study and found that 32 of the smokers and 20 of the nonsmokers were seen to have prominent wrinkles around the eyes (based on a standardized wrinkle score administered by a person who did not know if the subject smoked or not). What statistical test would you use to test if there is a significant difference in the frequency of wrinkles between smokers and non-smokers? Outline the steps you would follow to assess this association. In your explanation, state the null and alternative hypotheses for the test above, the decision rule that you use to determine statistically significance, calculate the appropriate statistic and state your conclusions based on the statistical significance test above. **(25 Marks)**

5. The following is a two-by-two table summarizing the results of a longitudinal cohort study that investigated the impact of diabetes on all-cause mortality. Calculate relevant measures of public health impact (attributable risk, attributable risk percent, and population attributable risk percent) and provide a brief interpretation of each measure and how they can be used to guide public health interventions. **(25 Marks)**

	Dead	**Alive**	**Total**
Diabetic	100	89	189
Non-diabetic	811	2340	3151
Total	911	2429	3340