



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF COMMUNITY HEALTH
MASTER OF PUBLIC HEALTH
END OF SEMESTER EXAMINATION APRIL 2024

UNIT CODE: MAP 717: STATISTICAL METHODS IN EPIDEMIOLOGY

DATE: April, 2025

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)

SECTION A: COMPULSORY (25 Marks)

Short Answer Questions

1. The side by side tables below examine the relationship between obesity and incident cardiovascular disease (CVD) in persons less than 50 years of age and in persons 50 years of age and older, separately.

	Less than 50 yrs			50 yrs and older		
	CVD	No CVD	Total	CVD	No CVD	Total
Obese	10	90	100	36	164	200
Not Obese	35	465	500	25	175	200
Total	45	555	600	61	339	400

- A) Construct a combined two by two table for both age groups and calculate the crude (5 Marks)
- B) Determine the Risk Ratio for each age group (5 Marks)
- C) Determine the crude Odds Ratio (3 Marks)

- D) Determine the Odds Ratio for each of the age groups (5 Marks)
- E) What is this statistical approach to evaluating confounding or effect modification called? (2 Marks)
- F) Calculate the Mantel-Haenszel adjusted odds ratio and compare it to the crude odds ratio. Based on this comparison, determine whether confounding is present and state your conclusion. (5 Marks)

SECTION B1.28

ANSWER ANY THREE (3) QUESTIONS (75 Marks)

Long Answer Questions

- 2. In a health district, a group of 80 school children who lacked antibody to measles were followed for a total of 125 person-months for infection with measles. At the end of follow-up, 10 children had acquired antibody to measles. Differentiate cumulative incidence from incidence rate, clearly stating the advantages and disadvantages of each measure. Calculate the cumulative incidence and the incidence rate (person-time incidence rate) for measles infection in this population of children and provide a brief interpretation for each measure? (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 Underground versus Above-ground. 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. The following description is adapted from a published abstract: (Incidence of injury among adolescent soccer players: a comparative study of artificial and natural grass turfs. Clin J Sport Med 2010; 20: 1-7.) The objective of this research was to investigate the incidence of acute injuries and soccer-related chronic pain from long-term training and during matches in adolescent players using natural grass turfs and artificial turfs. Study participants were youth soccer players (12-17 years of age) from 6 teams, with a predominant tendency to train on either natural turf or artificial turf. Of 332 players enrolled in this study, 301 remained to completion. Medically diagnosed acute injuries and chronic pain were recorded daily by team health care staff throughout 2005 and this information was provided to the researchers. Acute injuries per 1000 player hours on each surface and chronic complaints per 1000 player hours were evaluated according to frequency of surface used most of the time. There was no significant difference in the incidence of acute injuries between the two surfaces during training and competition. However, the artificial turf group showed a significantly higher incidence of low back pain

during training (RR = 1.63, 95% confidence interval = 1.06-2.48). Age (early rather than late adolescence) and prolonged training hours were factors associated with an increased incidence of chronic pain in the artificial turf group. **CONCLUSION:** Adolescent players routinely training on AT for prolonged periods should be carefully monitored, even on AT conforming to new standards.

Define and describe different types of bias that could have affected this study, providing specific examples relevant to the study. Discuss how these biases could influence the interpretation of the results. Suggest and justify strategies that could be used to minimize these biases in future research. **(25 Marks)**

5. 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. Give formal statements of the Null and Alternative hypotheses. Construct a contingency table to display these data. Calculate the sample prevalence (risk) ratio for Hep C among individuals with a tattoo compared to individuals without a tattoo and interpret it. Choose an appropriate statistical test, conduct the test to evaluate your hypotheses (assume the significance level is 0.05). Show how to use this knowledge to make a decision with respect to your opposing hypotheses and explain the reason for that decision. **(25 Marks)**

6. You conduct a 20-year study of incidence of dementia, enrolling 2500 70-year olds. You follow 1500 men and 1000 women for the entire study and detect 400 cases in the men and 350 cases in the women. Construct a contingency table to summarize this data. Calculate the risk ratio comparing the risk in men to the risk in women and the odds ratio comparing the odds in men to the odds in women. Compare the odds ratio and risk ratio: why are they different? Explain how you would evaluate if the association between sex and dementia is causal. **(25 Marks)**