



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF COMMUNITY HEALTH
MASTER OF PUBLIC HEALTH
END OF SEMESTER EXAMINATION AUGUST 2026

UNIT CODE: MAP 717: STATISTICAL METHODS IN EPIDEMIOLOGY
DATE: 10TH August, 2026
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. A study was conducted to determine the association between oral contraceptive use and ovarian cancer. During the first 10 months of the study, 179 women with ovarian cancer were enrolled as cases and 1,642 women as controls. Of these 86 cases and 683 controls had never used oral contraceptives.
 - a) Calculate the appropriate measure of association between oral contraceptive use and ovarian cancer and provide a brief interpretation of your results. (5 Marks)
 - b) Define effect modification and differentiate it from confounding. (5 Marks)
 - c) The authors evaluated parity as an effect modifier. The cases and controls were stratified by parity as shown in the table below. Calculate the measure of association for each stratum. (6 Marks)

Parity	Contraceptives	Cases	Controls
0	Ever use	20	67
	Never use	25	80
1-2	Ever use	42	376
	Never use	26	199
≥3	Ever use	30	520

	Never use	35	400
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- d) Is parity an effect modifier? Explain your answer. (4 Marks)
- e) Provide a brief interpretation of the strata specific measures of association and explain the public health significance of effect modification using this example. (5 Marks)

SECTION B

ANSWER ANY THREE (3) QUESTIONS (75 Marks)

Long Answer Questions

2. Investigators in a study examined age as a potential confounder of the association between obesity and cardiovascular disease. They stratified their analysis into two categories: those with age <50 and those who were ≥50 as shown in the table below:

	Age < 50				Age ≥ 50		
	CVD	No CVD	Total		CVD	No CVD	Total
Obese	10	90	100	Obese	36	164	200
Not Obese	35	465	500	Not Obese	25	175	200
Total	45	555	600	Total	61	339	400

- a) Calculate the crude odds ratio and the strata-specific odds ratios. (7 Marks)
- b) Is the association between obesity and cardiovascular disease confounded by age? Explain your answer. (3 Marks)
- c) Assuming that confounding is present, calculate a single measure of association using the Cochran-Mantel-Haenszel approach. (8 Marks)
- d) Explain the principles behind the Cochran-Mantel-Haenszel approach to adjusting for confounding. (7 Marks)
3. The association between smoking and coronary heart disease was studied in a cohort. A total of 7986 participants were followed up for one year. Of these participants, 3126 were smokers. During follow up, 171 cases of coronary heart disease were diagnosed, 84 of these were smokers. The total follow-up time was 2968.4 person-years for smokers and 4561.2 person-years for non-smokers.
- a) What was the prevalence of smoking at the beginning of the follow-up period (2 Marks)
- b) Calculate the appropriate measures of disease occurrence (frequency) among smokers and non-smokers (8 Marks)
- c) Calculate relative and attributable risk for the association between smoking and coronary heart disease. (8 Marks)
- d) Calculate attributable risk percent and population attributable risk percent for the association between smoking and coronary heart disease. (7 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).
- a) 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 test this hypothesis. (10 Marks)

- b) Calculate the appropriate statistic and state your conclusions based on the statistical significance test above. (15 Marks)
5. Researches wanted to know whether infection with HPV can be predicted by other sexually transmitted diseases. HPV is a virus that can cause cervical cancer. In this study 291 sexually active, adolescent and young women participated. These women were not HPV vaccinated and were not infected with HIV.
- From each participant, the following variables are also available:
- age
 - vaginal pH
 - bacterial vaginosis (0 = no, 2 = intermediate vaginal flora, 1 = bacterial vaginosis)
 - a number of sexually transmitted diseases:
 - infection with Herpes simplex virus (0 = no, 1 = yes)
 - infection with Chlamydia trachomatis (0 = no, 1 = yes)
 - infection with Neisseria gonorrhoeae (0 = no, 1 = yes)
 - infection with Trichomonas vaginalis (0 = no, 1 = yes)
 - infection with Mycoplasma genitalium (0 = no, 1 = yes)
- a) Briefly explain how you would use logistic regression to determine independent predictors of HPV infection, stating the reason why logistic regression is appropriate for this research question. (10 Marks)
- b) identify the key parameters/outputs of the model, and how you would select the best model with predictors that explain the association best. (15 Marks)
6. Researchers conducted a case-control study examining paint exposure (latex/oil-based) and pulmonary fibrosis (30 HRCT-confirmed cases; 90 asymptomatic controls). In-person interviews assessed prior exposures.
- a) Identify and define three potential sources of bias specific to this case-control design. (9 marks)
- b) For each bias identified in (a), explain its mechanism in this study using the paint exposure context. (8 marks)
- c) Propose two specific measures to minimize each bias, including implementation details. (8 marks)