



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH SYSTEMS MANAGEMENT AND DEVELOPMENT
MASTER OF SCIENCE IN HEALTH SYSTEMS MANAGEMENT
END OF SEMESTER EXAMINATION DECEMBER 2024

HSM 712: BIOSTATISTICS

DATE: December 2024

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
3. Section A: Compulsory Question (25 marks)
4. Section B: Long Answer Questions (75 marks)
5. All questions in Section A are compulsory and Answer any THREE questions in Section B
6. This online exam shall take 3 Hours
7. Late submission of the answers will not be accepted
8. Ensure your web-camera is on at all times during the examination period
9. No movement is allowed during the examination
10. Idling of your machine for 5 min or more will lead to lock out from the exam
11. The Learning Management System (LMS) has inbuilt integrity checks to detect cheating
12. Any aspect of cheating detected during and or after the exam administration will lead to nullification of your exam
13. In case you have any questions call the invigilator for this exam on Tel. +254725984499 and write an email to michel.mutabazi@mcampus.amref.ac.ke
14. For adverse incidences please write an email to: amiu.examinations@amref.ac.ke

SECTION A: ANSWER ALL QUESTIONS

1. Consider the data given in the table below.

Heights in cm	Number of patients
100 -104	24
105 - 109	30
110 -114	6
115 - 119	22
120 - 124	18
Total	100

Determine the coefficient of variation and interpret the result (5 marks)

2. The mortality rate for a certain disease is 5 persons per 1000 population. Determine the probability for just 3 deaths due to this disease in a group of 600 persons using the Poisson distribution. (5 marks)

3. If 20% of the patients who are exposed to Hepatitis C become infected, suppose we select 5 patients from this population. Estimate the probability that;

- i. None will become infected (1 mark)
- ii. One patient will become infected (1 mark)
- iii. More than 4 patients will become infected (1 mark)
- iv. At least three patients will be infected (1 mark)
- v. At most one patient will be infected (1 mark)

4. The following table gives the heights and weights of 12 patients chosen at random from a certain health facility.

Height X in cm.	168	150	174	144	158	168	177	156	150	161	156	163
Weight Y in Kg.	77	75	90	67	78	84	89	80	66	73	69	76

Calculate and interpret:

- i) The rank correlation coefficient (3 marks)
- ii) The determination coefficient (2 marks)

5. Consider a drug trial. The drug under the test is found to be effective in 75% cases. If a sample of 60 cases was used, determine the 95% confidence interval for this proportion. (5 marks)

SECTION B: ANSWER ANY THREE (3) QUESTIONS

6. A certain drug is claimed to be effective in curing flu. In an experiment of 164 persons, a half of them were given the drug and a half were given sugar pills. The patient reaction to the treatment is as follows. Of the patients on test drug, 52 were cured, 10 got worse and 20 showed no change. Of the patients who were on sugar pills, 44 were cured, 12 got worse and 26 showed no change.

Test the hypothesis that the test drug is no better than the sugar pill for curing flu. (25 marks)

7. Ten medical students got the following percentage of marks in Anatomy and Physiology.

% mark (X) in Anatomy	% mark (Y) in Physiology
78	84
45	55
36	50
78	60
62	82
90	86
65	58
75	60
39	47
41	51

Use the linear regression model $Y = a + b X$ to estimate the marks of a student who scored 80% in Anatomy (25 marks).

8. A study on retinol levels in well-nourished and undernourished children was conducted to examine if a difference exists. Realizing the importance of conducting such a study on a large sample of subjects so that the impact of uncertainties is minimized, 100 well-nourished and 70

undernourished children were included in this study. For well-nourished, mean = 30.1 and Standard deviation = 2.9 and for undernourished, mean = 29.7 and standard deviation = 3.1 Assuming the equality of variances from which these samples were taken, test the null hypothesis that the mean samples are equal (there is no difference between the means of the two samples) at 95% level of significance. (25 marks)

9. a) Describe three types and applications of the t-tests of hypotheses (15 marks)

b) Explain two ways in which you can apply the theory of estimation in research giving relevant examples (10 marks)

10. Two samples were drawn from two normal populations and their values are given in the table below:

Sample A	66	67	75	76	82	84	88	90	92		
Sample B	64	66	74	78	82	85	87	92	93	95	97

Test whether the two populations have the same variance at 5% level of significance. (25 marks)
