



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF COMMUNITY HEALTH
MASTER OF PUBLIC HEALTH
END-OF-SEMESTER EXAMINATION APRIL 2025

MAP 716: Biostatistics II and Computing

DATE: APRIL 2025

TIME: Three Hours

Start:

Finish

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. Answer any THREE questions in Section B
4. This online exam shall take 3 Hours
5. Late submissions 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 the nullification of your exam
11. In case you have any questions, call the invigilator for this exam on Tel. and or the Head of Department on Tel.
12. For adverse incidences, please write an email to: amiu.examinations@amref.ac.ke

SECTION A: COMPULSORY

Question 1

- a) Describe in detail the logistic regression model (8 marks)
- b) A research interviewed university students and asked if they have ever driven after drinking. They were also asked, “How many days per month do you drink at least two beers?” In the following discussion, π = the probability a student says “yes” they have driven after drinking. This is modeled using X = the number of days per month of drinking two beers. The results were as follows.

- Drink drive yes 122, no -127 (days beer)
- Gender 1-male, 0-female

Using the logistic regression model, the output from analysis is as shown below. Study the output and answer the following questions.

Predictor	Coef	SE Coef	Z	P	Odds	95% CI	
					Ratio	Lower	Upper
Constant	-1.7736	0.2945	-6.02	0.000			
DaysBeer	0.18693	0.03004	6.22	0.000	1.21	1.14	1.28
Gender							
male	0.6172	0.2954	2.09	0.037	1.85	1.04	3.31

Log-Likelihood = -139.981

Test that all slopes are zero: G = 65.125, DF = 2, P-Value = 0.000

- a) Write the regression equation (4 marks)
- b) Interpret the results from the analysis (5 marks)

c) Write a detail summary of findings (8 marks)

SECTION B: SELECT ANY THREE (3) QUESTIONS -75 MARKS

Question 2

In a class of eighteen (18) MPH students, a biostatistics lecturer instructor compared male and females on the duration of time it take them to tackle a biostatistics problem on binomial distribution. The results are recorded in the table below. We would like to determine if there is a difference in time it takes male and female students to tackle a binomial distribution problem:

<i>Gender</i>	<i>01</i>	<i>02</i>	<i>03</i>	<i>04</i>	<i>05</i>	<i>06</i>	<i>07</i>	<i>08</i>	<i>09</i>	<i>10</i>
<i>Male</i>	<i>18.5</i>	<i>16.0</i>	<i>22.7</i>	<i>17.6</i>	<i>18.9</i>	<i>25.5</i>	<i>16.5</i>	<i>24.2</i>		
<i>Female</i>	<i>12.6</i>	<i>14.5</i>	<i>20.5</i>	<i>10.7</i>	<i>15.9</i>	<i>19.6</i>	<i>12.0</i>	<i>15.5</i>	<i>11.9</i>	<i>14.9</i>

- a) Develop a null and alternative hypotheses for this data (4 marks)
- b) Use the Mann-Whitney U test to test your hypotheses (12 marks)
- c) What conclusions do make from your analysis? (5 marks) :
- d) Why was the Mann-Whitney U-test preferred for this data (4 marks)

Question 3

A public health research student is interested in the effects of sex and dietary group on systolic blood pressure (SBP) The "dietary group" factor includes three groups: Intervention A, intervention B and normal diet. Sex and dietary group may be independent or they may interact

with each other. The results from the Two-way ANOVA model predicting mean SBP levels are tabulated in the tables below. Use the information provided to answer this question.

Table 1 Descriptive statistics

Variable 1	Variable 2	N	Mean	SD
Male	Intervention A	30	117.25	10.63
Male	Intervention B	25	119.01	8.49
Male	Normal diet	45	120.78	8.82
Female	Intervention A	25	110.93	10.37
Female	Intervention B	30	110.85	9.57
Female	Normal diet	45	117.78	9.35

Table 2: Two Way ANOVA

	DF	Sum of squares	Mean square	F statistics	P value
Sex	1	1594.39725	1594.39725	17.64529	Blank ?
Diet category	2	1137.86004	?? blank ?	6.29634	Blank ?
Interaction	2	245.48621	Blank ?	1.3584	0.2595
Model	5	2794.86329	Blank ?	6.19	Blank
Error	194	17529.50212	90.35826		
Total	199	20324.36541			

- Make a summary of the descriptive statistics (Table 1) **(2 marks)**
- What are the assumptions of Two Way ANOVA technique **(3 marks)**
- Complete the blanks (?) in the Two Way ANOVA table (3marks)
- State the hypotheses associated with the Two way ANOVA in this study (6 marks)
- Interpret the results from the ANOVA table in line with your stated hypotheses in (d) above (6 marks)
- Write a summary of the findings (5 marks)

Question 4

Explain with appropriate examples the application of the following statistical techniques

- a) Simple linear regression (4 marks)
- b) Multiple linear regression (5 marks)
- c) One way ANOVA (6 marks)
- d) Independent samples T-test (5 marks)
- e) One Sample T-test (5 marks)

Question 5

- a) Using an appropriate public health example, explain the application of the principal components approach. (10 marks)
- b) For most parametric tests, there is a corresponding non-parametric alternative. Explain at least five parametric tests and their respective non-parametric alternatives. (15 marks)

Question 6

- a) Explain the advantages and disadvantages of non-parametric methods (10 marks)
- b) A Mann-Whitney U-test was used to compare median DMFT of the deciduous dentition of male and female children. The outputs below were derived from the SPSS program. Study the output and answer the following questions;

- i. What is the possible null and alternative hypothesis for this study? (4 marks)
- ii. Interpret the findings at $\alpha=0.05$ (4 marks)
- iii. Write a summary of the results (7 marks)

Ranks

	sex of the child	N	Mean Rank	Sum of Ranks
dmft decidouse	male	95	91.39	8682.50
	female	100	104.28	10427.50
	Total	195		

Test Statistics^a

	dmft decidouse
Mann-Whitney U	4122.500
Wilcoxon W	8682.500
Z	-1.598
Asymp. Sig. (2-tailed)	.110

a. Grouping Variable: sex of the child

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