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

UNIT CODE: HMD 131BIOSTATISTICS
DATE: April 2024
TIME: Two Hours   **Start:**   **Finish**

INSTRUCTIONS
1. This exam is marked out of 70 marks
2. This Examination comprises TWO Sections
   Section A: Compulsory Question (30 marks)
   Section B: Long Answer Questions (70 marks)

QUESTION ONE (COMPULSORY 30 Marks)

a) Distinguish by giving examples in Health systems.
  - i) Variable and Data   (3mks)
  - ii) Null and Alternative Hypothesis   (3mks)
  - iii) Continuous and Discrete variables   (3mks)
  - iv) Descriptive and inferential statistics   (3mks)

b) The period starting from initial exposure to the diagnosis of the corona virus is referred to as the incubation period. Below are the incubation periods, measured in days, for a random sample of 8 individuals infected with Corona. Calculate the following and interpret the result.

10	9.5	7.2	10	6.3	10.5	7.8	10

  - i. sample mean   (3mks)

  - ii. sample variance and standard deviation and CoV   (8mks)

  - iii. Median and the mode   (2mks)

c) A nurse provided you with an SPSS output for sample data for patients on smoking status. The Nurse wanted to know whether gender (male/female) is associated with the smoking status. Below is the output:

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Do you smoke cigarettes? * Gender	402	92.4%	33	7.6%	435	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.171[a]	2	.205
Likelihood Ratio	3.217	2	.200
Linear-by-Linear Association	1.106	1	.293
N of Valid Cases	402		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.76.

  - i. Was there a statistical difference between gender and smoking status, Justify?

    (5mks)

SECTION B: ANSWER ANY TWO QUESTIONS (40 Marks)

QUESTION TWO (20 Marks)

Hepatitis B is caused by the hepatitis B virus (HBV) and it affects livers. It has been established that the disease is a serious medical condition caused by an overpowering immune response to infection. To this effect, there is a need for cross examination of records of patients on this disease to ascertain the factors that could be responsible for the survival or dying from this disease. Chi squared statistic was used to test for independence between age and gender of those who tested positive to disease between 2020 and 2023 in Kisumu, Kenya. An SPSS output is provided below.

Table 5: Cross Tabulation of Outcome and Gender

Age Interval	Gender		Total
	F	M	
<20	54_a	27_a	81
21-30	1064_a	644_a	1708
31-40	4545_a	2826_a	7371
41-50	3461_a	1692_a	5153
51-60	1583_a	418_a	2001
61-70	105_a	370_a	475
>70	35_a	63_a	98
Total	11113	5747	16887

Table 6: Pearson Chi-Square and Likelihood Ratio Estimates for Table 5

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	$.001^a$	6	0.027		
Continuity Correction[b]	0.008	6	0.028		
Likelihood Ratio	0.002	6	0.026		
Fisher's Exact Test				0.008	0.046
N of Valid Cases	16887				

i)	State the hypothesis	(4mks)
ii)	What was the sample size?	(2mks)
iii)	Which age bracket is greatly affected by the HBV?	(2mks)
iv)	Which gender category is least affected by HBV?	(2mks)
v)	Why was the Chi square test appropriate in this case?	(4mks)
vi)	Was there a statistical difference between gender and Age bracket, Justify?	
		(6mks)

QUESTION THREE (20 Marks)

a) A statistician provides a SPSS output in for a sample dataset that had test scores (out of 100) on four placement tests: English, Reading, Math, and Writing. Below is the output

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
English	431	59.83	101.95	82.7265	6.82982
Reading	435	55.11	103.62	82.0394	7.63745
Math	435	35.32	93.78	65.4512	8.29165
Writing	435	64.06	93.01	79.5392	5.50151
Valid N (listwise)	431				

Required

i. What is the sample size? (2mks)
ii. Calculate the range of English and Writing test? (3mks)
iii. which was the most passed placement test? Justify (2mks)
iv. Which was the worst performed placement test? Justify. (2mks)
v. Comment on the std deviation of the placement tests? (2mks)
vi. Calculate the coefficient of variance of the Math and reading test? (4mks)

b) Outline steps to conduct hypothesis testing illustrating using a Health system example or case
(5mks)

QUESTION FOUR (20 MKS)

A specific tumour has three stages in its lifecycle, Stage 1 , Stage 2 and Stage 3. The probability that a randomly selected patient will be in a particular stage is shown in the table below.

Tumour Stage	Probability
Stage 1	0.15
Stage 2	0.65
Stage 3	0.20

a) Find the probability that of two randomly patients seen by the doctor

i) Both will be in stage 3 (3mks)
ii) Exactly one will be in stage 2 (3mks)
iii) None will be in stage 1 (4mks)

b) Find the probability that of three randomly patients seen by the doctor

i. All will be in stage 2 (3mks)
ii. Exactly two will be in stage 3 (3mks)
iii. One will be in stage 1, one will be in stage 3 and one will be in stage 1 (4mks)