



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH SYSTEMS MANAGEMENT AND DEVELOPMENT
BSC. HEALTH SYSTEMS MANAGEMENT AND DEVELOPMENT
END OF SEMESTER EXAMINATION APRIL 2025

UNIT CODE: HMD 133 **UNIT NAME: BIostatISTICS**

DATE: 11th APRIL, 2025

TIME: Two Hours **Start:** 9:00 am **Finish:** 11:00 am

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 (40 marks)

INSTRUCTIONS: Answer Question **ONE** and any other **TWO** Questions.

SECTION A: COMPULSORY QUESTION (30 Marks)

Question one (30 Mks)

- 1) Distinguish by giving examples in Health systems.
 - i) Nominal and Ordinal Variables (2mks)
 - ii) Null and Alternative Hypothesis (2mks)
 - iii) Descriptive and inferential statistics (2mks)

- 2) The period starting from initial exposure to the diagnosis of the flu virus is called the incubation period. Below are the incubation periods, measured in days, for a random sample of 8 individuals infected with flu. Calculate the following and interpret the result.

10	9.5	7.2	10	6.3	10	7.8	10
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- i. sample variance and standard deviation and CoV (7mks)
 - ii. Median and the mode (3mks)
- 3) Mr Mwangi, a doctor in Nairobi Hospital provided you with a PSPP output for sample data for patients on smoking status. Dr Mwangi wanted to know whether gender (male/female) is associated with 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? (4mks)
- 4) Denzel and Cherie are patients who often go to physiotherapy treatment . on such a visit there is a probability of 0.4 that Denze will purchase medicine prescribed. The probability that Cherie will purchase medicine prescribed is 0.7 if denzel buys medicine and 0.35 if he does not.
 - a) Draw a probability tree diagram illustrating this case (6mks)
 - b) When Denzel and Cherie go for physiotherapy session together :
 - i. Find the probability that both will buy Medicine prescribed (4mks)

SECTION B: ANSWER ANY TWO (2) QUESTIONS (40 Marks)

Question Two (20 Mks)

- 1) The following table shows hemoglobin levels for miners, compute the probabilities described below.

Class Interval for Hemoglobin (g/cc)	Number of Miners
12.0–17.9	24
18.0–21.9	53
22.0–27.9	13
Total	90

Source: Adapted from Dunn, O. J. (1977). *Basic Statistics: A Primer for the Biomedical Sciences*, 2nd Edition. Wiley, New York, p. 17.

- a. Compute the probability that a miner selected at random from the population has:
- a hemoglobin level in the 12.0–17.9 range. (3mks)
 - a hemoglobin level in the 18.0–21.9 range. (3mks)
- 2) During a study, data on the following variables was collected for each patient in a hospital ward (see table). For each of the following variables, state whether it is qualitative or quantitative (**type**); hence further classify into either nominal, ordinal, discrete or continuous (**sub type**). (14mks)

Variable	Type	Sub type
Exact age of a patient (in years)		
Weight (in grams)		
Height (in meters)		
Systolic blood pressure		
Blood type		
Sickness description		
Smoking (Yes or No)		

Question Three (20 Mks)

1. 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 Math and English 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)
2. Outline steps to conduct hypothesis testing illustrating using a Clinical example or case (5mks)

Question Four (20 Mks)

i) You have been hired as a consultant in Kenyatta National Hospital, The Data Manager provided you with an PSPP output for Survey on Back pain for employees. The data manager wanted to know whether Job stressfulness is associated with the Lower Back pain (LBP). Below is the output.

		Is your job stressful?		Total
		stress free	stressful	
Lower Back pain	NoLBP	Count 96	44	140
		% within Lower Back pain 68.6	31.4	100.0%
	% within Is your job stressful? 73.8%	54.3%	66.4%	
LBP	Count	34	37	71
	% within Lower Back pain	47.9%	52.1%	100.0%
	% within Is your job stressful? 26.2%	45.7%	33.6%	
Total	Count	130	81	211
	% within Lower Back pain	61.6	38.4%	100.0%
	% within Is your job stressful? 100.0%	100.0%	100.0%	

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.521 ^a	1	.004		
Continuity Correction ^b	7.669	1	.006		
Likelihood Ratio	8.428	1	.004		
Fisher's Exact Test				.004	.003
Linear-by-Linear Association	8.481	1	.004		
N of Valid Cases	211				

	Cases				Total	
	Valid		Missing		N	Percent
	N	Percent	N	Percent		
Lower Back pain * Is your job stressful?	211	79.0%	56	21.0%	267	100.0%

- i) State the hypothesis (4mks)
- ii) Why was the Chi square test appropriate in this case? (4mks)
- iii) What was the sample size? (2mks)
- iv) Which stress category is greatly affected by the LBP? (2mks)
- v) Which stress category is least affected by LBP? (2mks)
- vi) Was there a statistical difference between stressful job status and Lower Back Pain, Justify? (6mks)