



AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF COMMUNITY HEALTH
MASTERS IN PUBLIC HEALTH
END OF SEPTEMBER-DECEMBER TRIMESTER 2022 EXAMINATIONS

MPH 712: BIostatistics

DATE: 13th December 2022

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)
3. All questions in Section A are compulsory and Answer any THREE questions in Section B
4. This online exam shall take 3 Hours
5. Late submission 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 nullification of your exam
11. In case you have any questions call the invigilator for this exam on Tel. 0722840012 and or the Head of Department on Tel +254720573449
12. For adverse incidences please write an email to: amiu.examinations@amref.ac.ke and jarim.omogi@Amref.ac.ke

SECTION A: COMPULSORY

Question 1

The county public health department took samples of grain to assess the aflatoxin level. Data was analyzed from 32 samples. The output below presents the results. Study the output and answer the following questions

- a) Write a brief summary of the descriptive findings (3 marks)
- b) State the null hypothesis that the research fellow is testing using the one sample t-test (3marks)
- c) State the appropriate alternative hypothesis for this test (3 marks)
- d) Interpret the results of the t-test using at 5% level of significance (6 marks)
- e) Write a brief summary of the results (6 marks)
- f) Highlight the appropriate application of one sample T-test (4 marks)

Table 1 Descriptive

		Statistic	Std. Error
	Mean	11.5625	.75126
	95% Confidence Interval for Mean	Lower Bound Upper Bound	
		10.0303 13.0947	
	5% Trimmed Mean	11.5694	
	Median	12.0000	
	Variance	18.060	
Aflatoxin PPB	Std. Deviation	4.24976	
	Minimum	4.00	
	Maximum	19.00	
	Range	15.00	
	Interquartile Range	7.50	
	Skewness	-.060	.414
	Kurtosis	-.999	.809

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Aflatoxin PPB	32	11.5625	4.24976	.75126

One-Sample Test

	Test Value = 8.5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Aflatoxin PPB	4.076	31	.000	3.06250	1.5303	4.5947

SECTION B: SELECT ANY THREE QUESTIONS OF YOUR CHOICE

Question 2

- a) Explain the assumptions of binomial distribution (5 marks)
- b) The proportion of male students with ear-piercing is estimated to be 23%. In a sample of six students selected from this population, determine the probability that;
 - i. None has ear-piercing (3 marks)
 - ii. At least three have ear piercing (6 marks)
 - iii. Less than five have ear piercing (4 marks)
 - iv. Two have ear piercing (3 marks)
 - v. Less than 50% have ear piercing (4 marks)

Question 3

A certain drug is claimed to be effective in curing flu. In an experiment of 160 persons, half of them were given the drug and a half 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 18 showed no change. Of the patients who were on sugar pills, 44 were cured, 10 got worse and 26 showed no change.

- a) Construct a 2x 3 table of the results for the patient on different treatments. (2 marks)
- b) Develop the null and alternative hypotheses for this study (4 marks)
- c) Use the chi-square test of independence to test your hypothesis (14 marks)
- d) What conclusion can you make concerning the drug (5 marks)

Question 4

- a) One of the pitfall in statistical data analysis is failure to identify the type of data and variables Explain in detail, how the type of data and variable influence the types of statistical tests, use appropriate examples of public health importance (10marks)
- b) Distinguish between describe and inferential statistics, use clear examples (10 marks)
- c) Distinguish between categorical data and numerical data (5 marks)

Question 5

A research student wants to compare the average intelligence level of students of from a certain primary school in Nairobi county using standardized IQ test which has a population mean (μ) of 100 and a standard deviation (σ) of 16. A sample of 50 students scored an average of 105 in the IQ test. Does this value differ from 100? Use $\alpha=0.01$ for this test

- a) What is the appropriate test? Explain (3 marks)
- b) Develop the null and alternative hypotheses, paying attention to whether this is a one tailed or two tailed test (4 marks)
- c) Find the significance levels and corresponding critical values (3 marks)
- d) Compute the appropriate test (6 marks)
- e) Make a decision based on your results in (d) above and write a brief summary of the results (5 marks)
- f) Determine a 95% and 99% confidence interval for the mean IQ level in these population of students (4 marks)

Question 6

An MPH student collected data for his thesis and carried out univariate and bivariate analysis. Study the output and answer the following questions

- Interpret descriptive and bivariate results based on variable age group (3 marks)
- Interpret descriptive and bivariate results based on variable marital status (4marks)
- Interpret descriptive and bivariate results based on variable educational level (4 marks)
- Interpret descriptive and bivariate results based on variable CD4 cell count at enrollment (4 marks)
- Interpret descriptive and bivariate results based on variable WHO stage at enrollment (4 marks)
- Interpret descriptive and bivariate results based on disclosure of HIV status at enrollment (3 marks)
- Provide a summary of the variables associated with retention to care (4 marks)

Table 1: Patient characteristics stratified by retention to care for HIV status at 24 months

Characteristics		Status at 24 months of follow-up			P value	
		Active (%)	n	Inactive (LTFU, Dead, TO) n (%)		Total
Sex	Male	77(58.3)	55	41.7	132	0.970
	Female	144(58.5)	102	41.5	246	
Age	<21	12(60)	8	40	20	0.553
	21-30	109(57.7)	80	42.3	189	
	31-40	59(54.1)	50	45.9	109	
	41-50	34(68)	16	32	50	
	>50	6(66.7)	3	33.3	9	
Marital status	Single	20(38.5)	32	61.5	52	0.024
	Married	144(63.4)	83	36.6	227	
	Separated	7(63.6)	4	36.4	11	
	Divorced	6(37.5)	10	62.5	16	
	Widowed	36(61.0)	23	39	59	
	Cohabiting	3(75)	1	25	4	
	Not indicated	5(55.6)	4	44.4	9	
Education level	None	12(63.2)	7	36.8	19	0.587
	Primary	131(58.2)	94	41.8	225	

	Secondary	41(52.6)	37(47.4)	78	
	University/College	14(70)	6(30)	20	
	Not indicated	23(63.9)	13(36.1)	36	
CD4 cell count at enrollment	<200	82(47.7)	90(52.3)	172	0.000
	201-400	103(63.6)	59(36.4)	162	
	401-600	21(87.5)	3(12.5)	24	
	>600	15(75)	5(25)	20	
WHO stage at enrollment	1	49(72.1)	19(27.9)	68	0.031
	2	72(61)	46(39)	118	
	3	92(53.2)	81(46.8)	173	
	4	5(41.7)	7(58.3)	12	
Disclosure of HIV status	Disclosed	176(59.5)	120(40.5)	296	0.448
	Not disclosed	35(52.2)	32(47.8)	67	
	Not indicated	10(66.7)	5(33.3)	15	