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University Examinations 2024/2025

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN EPIDEMIOLOGY AND PUBLIC HEALTH

HPE/HPP 8112: BIOSTATISTICS

DATE: DECEMBER 2024 **TIME: 2 HOURS**

INSTRUCTIONS:

1. **SECTION A: A**nswer all Question
2. **SECTION B:** Answer any 3 Questions

SDECTION A: (30 MARKS)

QUESTION ONE

a) The proportion of person in a population with hypertension =0.2, the proportion of persons in a population with diabetes =0.10, and the proportion of diabetes with hypertension = 0.50. If you select a person from this population. (5 Marks)

i. What is the probability the person will have hypertension or diabetes?

ii. What is the probability the person will have both hypertension and diabetes?

b) In a sample of 300 Kenyans, 27 have type B blood. Based on this information, what is the 95% confidence interval for the proportion (p) of Kenyans who have type B blood? (5Marks)

c) A researcher wants to select 250 individuals for a study about the relationship between vitamin supplements and dental caries. She has decided to use probability sampling to select the participants.

i. Explain what probability sampling means.

ii. Why would the researcher want to use this method?

iii. Will the use of probability sampling guarantee that a representative sample of the population is selected for a study? Explain (20 Marks)

d) Two randomized-controlled trials of routine ultrasonography screening during pregnancy were carried out, to see whether routine ultrasound imaging influenced outcomes of pregnancy such as birth weight and mode of delivery. No significant differences were found. At ages 8 to 9 years', 2011 singleton children of the women who had taken part in these trials were followed up. Ultrasonography had actually been carried out on 92% of the 'screened' group and 5% of the control group. Analysis was by intention to treat. No significant differences were found in scores for reading, spelling, arithmetic and overall school performance. A sub-group of children underwent specific tests for dyslexia. The test results classified as dyslexic 21 of the 309 children in the screened group (7% [95% confidence interval 310 ^{0}/01) and 26 of the 294 controls (9% [95% confidence interval 412%]).

i) Explain what is meant by "significant" and "no significant differences were found"? Can we conclude that screening does not harm the fetus in terms of future educational attainment?

ii) What do the confidence intervals tell us? How should a more appropriate confidence interval be calculated? (10 Marks)

SECTION B: (30 MARKS)

QUESTION TWO

A hospital in Nairobi has 8 wards each containing 20 beds. A monthly census report reveals that the bed occupancy for the month of January 2021 is as follows; (20 Marks)

Ward No.	Number of Patients
1	12
2	15
3	18
4	20
5	6
6	14
7	9
8	10

Using the information in this table, Calculate

a) The mean patient per ward

b) The standard deviation across the patients in the wards

[Formulae $\sqrt{((\Sigma(x-x_i)^2)/n-1)}$]

c) The standard error of mean [Formulae SEM= $s/\sqrt{n}$] (10 Marks)

QUESTION THREE:

A study was conducted to determine whether maternal cigarette smoking is a risk factor for low birth weight and the following results were obtained

	Births under 2500 grams	Total births	Risk of low birth weight
Smokers	1556	16,530	9.4%
Non-smokers	694	15226	4.6%

a) Calculate the risk difference and interpret it

b) Calculate the attributable risk percent and interpret it

c) Given that the prevalence of maternal cigarette smoking is 52.1%, calculate the population attributable risk percent and interpret it (10 Marks)

QUESTION FOUR:

State and Describe the appropriate test that can be used in each of the scenarios below. (10 Marks)

i. Comparing two independent populations, both normally distributed.

ii. Comparing two independent populations, one normally distributed and on is not normally distributed.

iii. Comparing three populations, all normally distributed.

iv. Describe the assumptions under which non-parametric statistics are used and what are their advantages?

QUESTION FIVE

Discuss the steps of conducting a hypothesis testing. (10 Marks)