

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF MEDICAL LABORATORY SCIENCES
ACADEMIC YEAR 2019/2020 – SEMESTER I



BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS
MLU1141 - HEALTH STATISTICS - LEVEL 3
FINAL EXAMINATION

DURATION: TWO HOURS

DATE: 16th SEPTEMBER 2020

TIME: 9.30 A.M. - 11.30 A.M

INDEX NO:

IMPORTANT INSTRUCTIONS/ INFORMATION TO CANDIDATES

- This question paper consists of **06 pages**.
- There are **06 Structured Essay Questions (SEQs)**. Answer only **FOUR (04)** questions on the provided papers.
- Each question is allocated twenty-five (25) marks.
- If the random number table is used to describe a design for data collection, you are advised to clearly describe how you use it.
- Statistical tables are provided.
- Write your Index Number in the space provided.
- Do **NOT** remove any page/part of this question paper from the examination hall.
- Do **NOT** keep unauthorized material, including mobile phones and other electronic equipment, with you during the examination. (non-programmable calculators are allowed.)

1. In a study on risk factors associated with diabetes, a researcher recorded the following variables on a sample of 500 persons randomly selected from the attendees to a wellness clinic in Colombo over the months of May and June in 2020.

V_1 : status of diabetes (recorded as 1: Type I diabetes mellitus; 2: Type II diabetes mellitus; 3: Gestational diabetes; 4: other type of diabetes; 5: no recognized diabetes condition)

V_2 : age of the patient at first diagnosed (recorded as less than 20years, 21 to 39; 40 to 50 years; above 50 years)

V_3 : gender of the person coded as 1: male; 2: female

V_4 : physical activity level recorded as 1: not active at all; 2: somewhat active; 3: very active

V_5 : body mass index, which is, the weight in kilograms divided by the square of the height in meters

- a) i) Classify the variables as qualitative or quantitative.
ii) Classify the quantitative variables as discrete or continuous.
iii) Name the scale of measurement of the variable used (nominal, ordinal, interval or ratio).
iv) State whether the study described here is an observational study or an experimental study. Give reasons for your answer.

(10 marks)

- b) Suppose the researcher intends to use the data collected in this study to estimate the proportion of Type I diabetes in the Colombo district. Define the terms sampling error and non-sampling error and briefly explain how each type of error can occur in this study using an example for each.

(15 marks)

2. In an urban residential area with a population of 1500 persons, 30 cases of Hepatitis *A* were identified within a period of two months. The source for Hepatitis *A* was suspected as eating at one of the two restaurants in the residential area. In order to identify which of the restaurants is the possible cause, a medical researcher has resources to take a sample of 50 persons and collect data on whether they had eaten food at each of the two restaurants over the last two-months period. A list of residents in the residential area was available to be used for sample selection, if needed. The researcher needs to have the results of the survey within a week.

a) A student proposed to select a simple random sample of 50 persons. State whether you agree with the sampling method proposed by the student. If you do, clearly describe how you select the sample. If you do not agree, clearly describe a weakness in the sampling method and propose an appropriate design for sampling.

(15 marks)

b) Explain the following terms in relation to this study.

- i. Population
- ii. Sampling unit
- iii. Random sample

(10 marks)

3. a) State whether you would expect large bias, large sampling variation or neither in each of the following studies. In each case, give reasons for your answer.

i) To explore associations between the behavioural patterns of child (recorded as aggressive/non-aggressive) and the employment status of the mother (recorded as employed/non-employed), a researcher collected a sample of 60 students with employed mothers from an urban school and a sample of 40 students with non-employed mothers from a school in a rural area.

ii) In a study to assess the effectiveness of a certain training programme on the time taken to accomplish a specific task, the selected participants had substantially differed with respect to the age and level of education.

iii) To examine the effect of a certain diet on the elevation of blood cholesterol levels in rats, the treatment group of 50 rats were fed with a specific diet and were kept in a small cage and the control group of 50 rats was selected from rats that move freely to find food.

(15 marks)

b) State whether each of the following statements is true or false, giving reasons for each answer.

i) Estimates derived from data collected in a census will always be more accurate compared to estimates calculated from sample surveys.

ii) Sampling error can be reduced by increasing the sample size.

(10 marks)

4. a) In a study to understand the association between gender and rheumatoid arthritis related knee pain in the age group of 60 to 65, a researcher collected data from a sample of 400 persons in this age group voluntarily participated for the study. Of the 400 participants 100 were male and 300 were female. Of the 400 participants, 80 reported of having knee pain and 10 among those reported with knee pain were male.

i) Construct a 2×2 contingency table for the data described in this problem.

ii) Calculate the odds of having arthritis related knee pain in the male group.

iii) Calculate the odds ratio for having arthritis related knee pain among males and females.

iv) Interpret the value obtained in part (iii) in relation to this study.

(15 marks)

b) State whether each of the following statements is true or false. In each case, give reasons for your answer.

i) Data collected in cross-sectional studies are generally subjected to more bias due to confounding compared to data collected in case-control studies.

- ii) Case-control study designs are not appropriate as cohort study designs, in studies conducted to identify risk factors related to a disease.

(10 marks)

5. a) Clearly describe one advantage of each of the following:

- i) Blocking in randomized experiments
- ii) Use of a placebo
- iii) Randomization

(10 marks)

b) State whether each of the following statements is true or false. In each case, give reasons for your answer.

- i) Experimental studies are not suitable when ethical grounds do not permit the researcher to control the factors of interest.
- ii) Cohort studies are useful for studying incidence of a rare disease with long periods to appear symptoms.
- iii) Case-control studies are useful for studying risk factors associated with a disease.
- iv) Cluster sampling is suitable for estimating prevalence of a disease in a population where the persons infected with the disease are clustered together.
- v) Non sampling errors can be reduced by increasing the sample size.

(15 marks)

6) A researcher is interested in comparing the effectiveness of a newly developed drug for asthma with a standard drug, under two methods of administering (giving as a pill or as an injection). Suppose the researcher can collect data only from 400 voluntary asthma patients consented to take any drug in any form they are requested to take. Of these 400 patients, 250 are adults and the rest are non-adults.

- a) If the researcher seeks your advice to design this study, clearly describe how you advise.
- b) Describe a weakness in selection of participants for this study.

(15 marks)

c) Explain the following terms in relation to this study:

- i) Replicate
- ii) Interaction
- iii) Active treatment control

(10 marks)

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