

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES

SUPPLEMENTARY EXAMINATION PAPER – JULY 2010

TITLE OF PAPER : HEALTH STATISTICS
COURSE CODE : HSC 307
TIME : 2 HOURS
MARKS : 100

INSTRUCTIONS

- : ANSWER **ALL** QUESTIONS FROM SECTION A
- : ANSWER **ANY TWO** QUESTIONS FROM SECTION B
- : NO FORM OF PAPER SHOULD BE BROUGHT INTO NOR TAKEN OUT OF THE EXAMINATION ROOM
- : BEGIN THE ANSWER TO EACH QUESTION ON A SEPARATE SHEET OF PAPER
- : ALL CALCULATIONS/WORKOUT DETAILS SHOULD BE SUBMITTED WITH YOUR ANSWER SHEET
- : CALCULATORS MAY BE USED BUT THEY MUST BE THE SILENT TYPES
- : A FORMULA SHEET, z AND t DISTRIBUTION TABLES, AND GRAPH PAPER ARE PROVIDED

SECTION A ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION 1

- a. Write down whether the following statistical measurements are continuous or discrete.
- i. the length of each fluke recovered from bovine liver inspections (1)
 - ii. the data obtain by an environmental health specialist for coliform counts at a water source (1)
 - iii. Under-arm temperature of one-day old infants born in a hospital (1)
- b. Define the following :
- i. sample (2)
 - ii. type I error (2)
- c. For each of the following variables, indicate whether it is quantitative or qualitative.
- i. Ages of 189 subjects who participated in a study on smoking cessation (1)
 - ii. Type of violent victimisation recorded by 679 women who had been victimised (1)
 - iii. Duration of each bovine carcass inspection by a qualified Public Health Inspector (1)

[10 marks]

QUESTION 2

Compute the following probabilities:

- a. If the probability of left-handedness in a certain group of people is 0.05, what is the probability of right-handedness (assuming no ambidexterity)? (2)
- b. A health inspector performs a bovine carcass inspection. From previous data, the probability that he finds a liver fluke is 0.5 and the probability that he finds an intestinal fluke is 0.7. What is the probability that the health Inspector finds both a liver fluke and an intestinal fluke? (2)
- c. The probability is 0.6 that a patient selected at random from the current residence of a certain hospital will be a male. The probability that the patient will be a male who is in for surgery is 0.2. A patient randomly selected from current residents is found to be a male; what is the probability that the patient is in the hospital for surgery? (3)
- d. In a certain population of hospital patients the probability is 0.35 that a randomly selected patient will have heart disease. The probability is 0.86 that a patient randomly selected from the population will be a smoker and have heart disease? (3)

[10 marks]

Question 3

Porcellini et al., (2003), studied 13 HIV-positive patients who were treated with highly active antiretroviral therapy (HAART) for at least 6 months. The CD4 T cell counts ($\times 10^6$ /L) at baseline for the 13 subjects are listed below:

230 205 313 207 227 245 173 58 103 181 105 301 169

- a. Calculate the :
 - i. Range (2)
 - ii. mean (2)
 - iii. median (2)
 - iv. standard deviation, of the CD4 cell counts for the 13 subjects (2)
- b. Write down a plausible interpretation of the mean. (2)

[10 marks]

Question 4

- a. A research team is interested in the difference between serum uric acid levels in patients with and without Down's syndrome. In a large hospital for the treatment of the mentally retarded, a sample of 12 individuals with Down's syndrome yielded a mean of 4.5 mg/100 ml. In a general hospital a sample of 15 normal individuals of the same age and sex were found to have a mean value of 3.4.
 - i. If it is reasonable to assume that the two populations of values are normally distributed with variances equal to 1 and 1.5, find the 95% confidence interval for $\mu_1 - \mu_2$. (3)
 - ii. Can it be concluded that the two population means are not equal? State the reason(s). (3)
- b. If the probability that an environmental health officer working at a community will find a client at home is 0.7, what is the probability (assuming independence) that on two home visits made in a day both clients will be home? (4)

[10 marks]

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION

Question 5

The following are ages of 30 patients seen in the emergency room of a hospital on a Friday night.

| | | | | | |
|----|----|----|----|----|----|
| 35 | 32 | 21 | 43 | 39 | 60 |
| 36 | 12 | 54 | 45 | 37 | 53 |
| 45 | 23 | 64 | 10 | 34 | 22 |
| 36 | 45 | 55 | 44 | 55 | 46 |
| 22 | 38 | 35 | 56 | 45 | 57 |

- a. From this data, construct a:
- i. Frequency distribution (4)
 - ii. Relative frequency distribution (2)
 - iii. Frequency polygon (4)
- b. Also, use the data to compute the:
- i. Mean (2)
 - ii. Median (2)
 - iii. Mode, and (2)
 - iv. Variance (2)
 - v. Standard deviation (2)

[20 marks]

Question 6

Researchers are interested in the mean age of a certain population. Let us say that they are asking the following question: Can we conclude, at the 95% confidence level, that the mean age of this population is different from 30 years. The population variance is known and is 20. The sample size is 10 and its mean age is 27. (20)

[20 marks]

Question 7

The purpose of a study by Brown and Persley was to characterise acute hepatitis A in patients more than 40 years old. They performed a retrospective chart review of 20 subjects who were diagnosed with acute hepatitis A, but were not hospitalised. Of interest was the use of age (years) to predict bilirubin levels (mg/dL). The following data were collected:

Enrollment in local colleges, 2005

| Age (years) | Bilirubin (mg/dL) | Age (years) | Bilirubin (mg/dL) |
|-------------|-------------------|-------------|-------------------|
| 78 | 7.5 | 44 | 7.0 |
| 72 | 12.9 | 42 | 1.8 |
| 81 | 14.3 | 45 | 0.8 |
| 59 | 8.0 | 78 | 3.8 |
| 64 | 14.1 | 47 | 3.5 |
| 48 | 10.9 | 50 | 5.1 |
| 46 | 12.3 | 57 | 16.5 |
| 42 | 1.0 | 52 | 3.5 |
| 58 | 5.2 | 58 | 5.6 |
| 52 | 5.1 | 45 | 1.9 |

Source: Fictitious data, for illustration purposes only

- Construct a scatter diagram of the data. (4)
- Describe the correlation of the age with the bilirubin levels using the scatter. (3)
- Determine the equation of the least squares regression line and plot it through the scatter diagram (7)
- Compute the correlation coefficient (4)
- Interpret the correlation coefficient (2)

[20 marks]