

**UNIVERSITY OF SWAZILAND**  
FACULTY OF HEALTH SCIENCES

**FINAL EXAMINATION PAPER – DECEMBER, 2010**

TITLE OF PAPER : INTRODUCTION TO EPIDEMIOLOGY  
COURSE CODE : HSC 310  
TIME : 2 HOURS  
MARKS : 100

INSTRUCTIONS : ANSWER **QUESTION 1** AND **FOUR** OTHERS  
: **QUESTION 1** IS COMPULSORY  
: EACH QUESTION IS 20 MARKS  
: 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/WORK OUT DETAILS  
SHOULD BE SUBMITTED WITH YOUR  
ANSWER SHEET

**ANSWER QUESTION 1 AND ANY FOUR QUESTIONS FROM THIS SECTION.**

**QUESTION 1 [COMPULSORY]**

- i. The single most important information on a case report form from the standpoint of determining what, if anything, is to be done about the case, is the cases's:
  - A. name
  - B. address
  - C. diagnosis
  - D. age
  - E. None of the above
  
- ii. Disease surveillance is a systematic process of:
  - A. disease reporting, data analysis, distribution of surveillance reports, and implementation of control measures
  - B. morbidity reporting, preparation of tables, graphs, and charts, data analysis, and distribution of surveillance reports
  - C. case investigations, calculation of incidence and prevalence rates, data analysis, and distribution of information regarding disease occurrence
  - D. collection of data, consolidation of data, data analysis, and distribution of information regarding disease occurrence
  - E. None of the above
  
- iii. Which one of the following does not belong in any of the basic classes of agents that cause disease?
  - A. Bacteria and viruses
  - B. Pesticides and other chemicals
  - C. Vibration and heat
  - D. Parasites
  - E. Psychological factors

- iv. The distribution of cases by age group and sex obtained from a report of an epidemic of salmonellosis which occurred in a mental hospital over a period of one week is given below:

| Age Group | Male | Female | Total |
|-----------|------|--------|-------|
| 60 – 64   | 5    | 8      | 13    |
| 65 – 69   | 13   | 19     | 32    |
| 70 – 74   | 15   | 23     | 38    |
| 75 – 79   | 4    | 6      | 10    |
| 80 – 84   | 2    | 4      | 6     |
| 85 – 89   | 2    | 3      | 5     |
| Total     | 41   | 63     | 104   |

After reviewing the distribution of cases, which of the following statements concerning the risk of disease acquisition is true?

- A. Females have a higher risk than males
  - B. The 65 – 69 and 70 – 74 age groups have higher risk compared with other age groups
  - C. The 70 – 74 age group has the highest risk
  - D. All of the above statements are correct
  - E. No statement of risk can be made
- v. In a cohort study, the advantage of starting by selecting a defined population for study before any of its members become exposed, rather than starting by selecting exposed and nonexposed individuals, is that:
- A. the study can be completed more rapidly
  - B. a number of outcomes can be studied simultaneously
  - C. a number of exposures can be studied simultaneously
  - D. the study will cost less to carry out
  - E. Both A and D
- vi. Retrospective cohort studies are characterised by all of the following except:
- A. The study groups are exposed and nonexposed
  - B. Incidence rates may be computed
  - C. The required sample size is smaller than that needed for a prospective cohort study
  - D. The required sample size is similar to that needed for a prospective cohort study
  - E. They are useful for rare exposures

Questions (vii) and (viii) are based on the information given below:

Table 1 below shows the total number of persons who ate each of two specified food items that were possibly infective with group A streptococci. Table 2 shows the number of sick persons (with acute sore throat) who ate each of the various specified combinations of the food items.

**TABLE 1:** TOTAL NUMBER OF PERSONS WHO ATE EACH SPECIFIED COMBINATION OF FOOD ITEMS

|                       | Ate Tuna | Did Not Eat Tuna |
|-----------------------|----------|------------------|
| Ate egg salad         | 75       | 100              |
| Did not eat egg salad | 200      | 50               |

**TABLE 2:** TOTAL NUMBER OF PERSONS WHO ATE EACH SPECIFIED COMBINATION OF FOOD ITEMS AND WHO LATER BECAME SICK (WITH ACUTE SORE THROATS)

|                       | Ate Tuna | Did Not Eat Tuna |
|-----------------------|----------|------------------|
| Ate egg salad         | 60       | 75               |
| Did not eat egg salad | 70       | 15               |

- vii. What is the sore throat attack rate in persons who ate both egg salad and tuna?
- A.  $60/75$
  - B.  $70/200$
  - C.  $60/135$
  - D.  $60/275$
  - E. None of the above
- viii. According to the results shown in the preceding tables, which of the following food items (or combination of food items) is most likely to be infective?
- A. Tuna only
  - B. Egg salad only
  - C. Neither tuna nor egg salad
  - D. Both tuna and egg salad
  - E. Cannot be calculated from the data given

- ix. Age-adjusted death rates are used to:
- A. Correct death rates for errors in the statement of age
  - B. Determine the actual number of deaths that occurred in specific age groups in a population
  - C. Correct death rates for missing age information
  - D. Compare deaths in persons of the same age group
  - E. Eliminate the effects of differences in the age distributions of populations in comparing death rates
- x. Disease frequency within a population varies most with which one of the following "person" variables?
- A. Sex
  - B. Age
  - C. Ethnic group
  - D. Blood type
  - E. Occupation

[20 marks]

## QUESTION 2

a. Define the following:

- i. Incidence rate (2)
- ii. Attack rate (2)
- iii. Proportional distribution (2)
- iv. Mortality rate (2)

b. During 1977, a total of 412 cases of a particular disease were reported in a city having a population of 212 000.

i. What was the incidence rate per 100 000 population in that city during 1977? (2)

ii. It was also known that 19 of these cases were females under 10 years of age. At that time the female population under 10 years age was 19 080. What was the age-specific incidence rate during 1977 in that city? (2)

c. In an outbreak involving 26 cases of disease "x", 7 of the cases were found to be females and 19 male. In the group in which the outbreak occurred there were a total of 9 females and 87 males.

i. What is the attack rate among members of each sex? (2)

- ii. What is the attack rate among the group as a whole? (2)
- d. In an outbreak involving 26 cases of disease x, 7 were female and 19 were male. The total number of persons of each sex that were in the affected group is unknown. What is the proportional distribution of the cases by sex?

(4)

[20 marks]

### QUESTION 3

The incidence of tuberculosis and the mid-year population of different ethnic groups in a European country, country Z, in 2004 are given in Table 3.

**Table 3: Incidence of tuberculosis and mid-year population by ethnic group in country Z, 2004.**

| Ethnic group | Number of new tuberculosis cases, 2004 | Mid-year population, 2004 |
|--------------|--|---------------------------|
| European     | 2890                                   | 69 900 000                |
| Indian       | 1 900                                  | 1 790 000                 |
| Other        | 400                                    | 1 650 000                 |
| Total        | 5 190                                  | 73 340 000                |

- a. Define incidence rate. (2)
- b. Calculate the incidence rate and the rate ratio for each group. (7)
- c. Which ethnic group is strongly associated with tuberculosis? Give reasons. (3)
- d. The incidence rate for the entire population is 7.1 per 100 000 person-years. Assume that a targeted intervention has reduced the incidence rate in the Indian and the other ethnic groups to the level of that in the European group (4.1 per 100 000 person-years).
- i. What percentage of tuberculosis cases in the Indian group would be prevented? (3)
- ii. What percentage of tuberculosis cases in the whole population would be prevented? (3)
- iii. Explain why a mid-year population is used in the calculation. (2)

[20 marks]

### QUESTION 4

In an Asian country with a population of 6 million people, 60 000 deaths occurred during the year ending December 31, 1995. These included 30 000 deaths from cholera in 100 000 people who were sick with cholera.

- a. What was the cause-specific mortality rate from cholera in 1995? (3)
- b. What was the case-fatality rate from cholera in 1995? (3)

c. From the statistics of cholera in (a), the clinic nurse believes the country is experiencing an epidemic of cholera. Outline the steps you would take in the process of investigation of the cholera epidemic including any possible further investigations and analyses you would need to do. (14)

[20 marks]

**QUESTION 5**

Between 1951 and 1971, a total of 10 000 deaths were recorded among 34 440 male British doctors (Doll and Peto, 1976). Of these deaths, 441 were from lung cancer and 3 191 were from ischaemic heart disease (IHD). Doctors who smoked at least one cigarette per day during the follow up period were classified as smokers and the rest as non-smokers. The age-adjusted annual death rates per 100 000 male doctors for lung cancer and IHD among smokers and non-smokers are given in Table 4 below:

**Table 4: Cause of death and specific death rates by smoking habits of British male doctors, 1951 – 1971.**

| <i>Cause of death</i>   | <i>Annual death rate per 100 000 doctors</i> |                |
|-------------------------|--|----------------|
|                         | <i>Non-smokers</i>                           | <i>Smokers</i> |
| Lung cancer             | 10   | 140            |
| Ischaemic heart disease | 413  | 669            |

Source: based on Doll and Peto (1976)

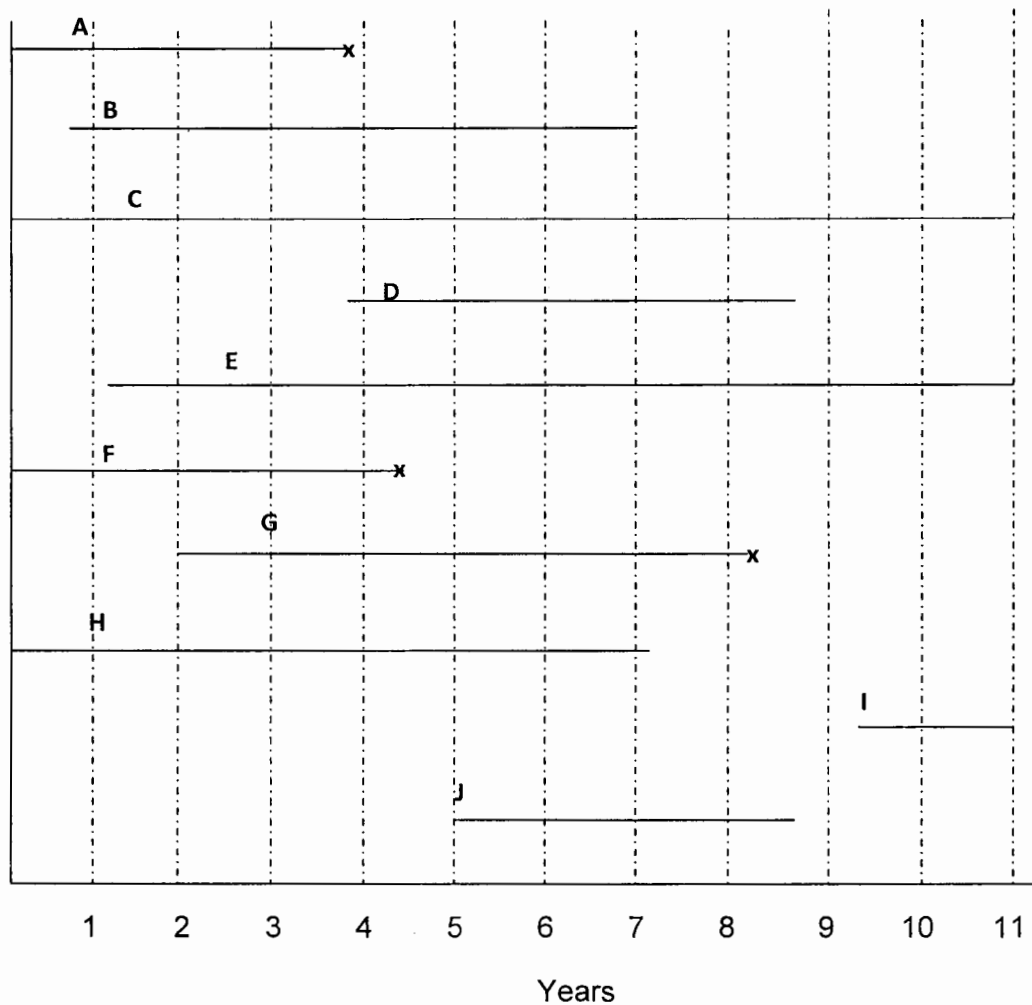
- a. What study design is described in the study? (1)
- b. Mention one advantage and one disadvantage of the study design. (2)
- c. Calculate an appropriate epidemiologic measure to assess the strength of association between smoking and lung cancer, and smoking and IHD. (4)
  - i. Which disease is strongly associated with smoking. (1)
  - ii. Reduction in mortality from which disease would have a greater impact public health impact if there were a reduction in smoking? Explain. (3)
  - iii. What assumptions did you make when estimating the impact of a reduction in smoking? (2)
- d. Assume that the data shown in Table 4 above are valid and that smoking causes lung cancer.
  - i. What percentage of the risk of death from lung cancer is attributable to smoking. (3)

- ii. If 50% of doctors stopped smoking, by what percentage would the risk of lung cancer death among the smokers be reduced? (4)

[20 marks]

**QUESTION 6**

Given below is a schematic representation of a study of 10 people who are at risk for some disease. Each line from A to J represents the monitoring period for a patient.



- What study design is illustrated in the diagram? Give reasons for your answer. (2)
- Write short notes about subjects A, C, and I (3)
- Give 3 possibilities of what could have happened to subject B at the end of the study period. (3)
- Calculate the prevalence rate of the disease on the 4<sup>th</sup> and on the 5<sup>th</sup> years (4)
- Calculate the incidence rate of the disease in the 11-year (4)



- study period. (2)
- f. What is the total number of person-years contributed by the subjects in the study period? (3)
- g. Use the person-years obtained in (vii) to calculate the prevalence rate of the disease in the 11 year study period. (3)

[20 marks]

#### QUESTION 7

- a. Discuss how personnel working in the following cadres may use epidemiology in tackling their day to day assignments:
- i. Health educator or promoter (3)
  - ii. Health services administrator (3)
  - iii. Government regulator or litigator (3)
- b. Some diseases are reversible and self-limiting. Using examples, explain which, infectious or chronic diseases, are reversible or self-limiting. (6)
- c. Using diarrhoeal diseases as an example, explain how an environmental health officer employed at a rural post may act at the primary level to prevent outbreaks of diarrhoea at the community level and among individuals and families. (5)

[20 marks]

---