

**UNIVERSITY OF SWAZILAND**  
FACULTY OF HEALTH SCIENCES

**MAIN EXAMINATION PAPER – DECEMBER, 2013**

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

INSTRUCTIONS : ANSWER QUESTION 1 AND ANY FOUR  
QUESTIONS

: 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

: CALCULATORS MAY BE USED BUT THEY MUST  
BE THE SILENT TYPE

: ALL CALCULATIONS/WORK-OUT DETAILS  
SHOULD BE SUBMITTED WITH YOUR ANSWER  
SHEET

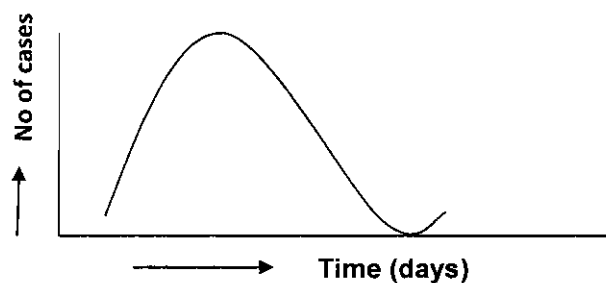
**This question paper consists of 7 printed pages including this one**

**QUESTION 1 MULTIPLE CHOICE [COMPULSORY]**

Indicate your responses to this question by writing the letter corresponding to your chosen answer.

- i. Construction and use of toilets to dispose faecal material to prevent ingestion of cysts of parasites is a:
  - A. primary level of prevention
  - B. secondary level of prevention
  - C. tertiary level of prevention
  - D. Both primary and secondary prevention
  - E. Both tertiary and secondary prevention
  
- ii. Several studies have found that approximately 85% of the cases of lung cancer are due to cigarette smoking. This measure is an example of:
  - A. an incidence rate
  - B. an attributable risk
  - C. a relative risk
  - D. a prevalence risk
  - E. a proportionate mortality ratio
  
- iii. During the investigation of a food-borne illness from a commercial kitchen, which one of the following is important?
  - A. The temperatures used to prepare and hold the food
  - B. The health status of the workers at the time the exposure took place
  - C. The health practices and training of the workers
  - D. The past inspection reports to determine if there has been reports of problems
  - E. All of the above
  
- iv. An epidemiological experiment in which the investigator randomly allocates selected individuals (or group of individuals) to an intervention group and control group is called a(n)
  - A. case-control study
  - B. intervention study
  - C. cohort study
  - D. case report
  - E. None of the above
  
- v. The major purpose of random assignment in a clinical trial is to:
  - A. help ensure that study subjects are representative of the general population
  - B. facilitate double blinding
  - C. facilitate the measurement of outcome variables
  - D. ensure that the study groups have comparable baseline characteristics
  - E. reduce selection bias in the allocation of treatment

- vi. 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 non-exposed individuals, is that:
- the study can be completed more rapidly
  - a number of outcomes can be studied simultaneously
  - a number of exposures can be studied simultaneously
  - the study will cost less to carry out
  - the allocation of participants is not biased
- vii. Residents of three villages with three different types of water supply were asked to participate in a survey to identify cholera carriers. Because several cholera deaths had occurred recently, virtually everyone present at the time underwent examination. The proportion of residents in each village who were carriers was computed and compared. What type of study design is described here?
- Case-control
  - Cross-sectional
  - Retrospective cohort
  - Historical cohort
  - Experimental study
- viii. In a study of a disease in which all cases that developed were ascertained, if the relative risk for the association between a factor and the disease is equal to or less than 1.0, then:
- there is no association between the factor and the disease
  - the factor protects against development of the disease
  - either matching or randomisation has been unsuccessful
  - the comparison group used was unsuitable, and a valid comparison is not possible
  - there is either no association or a negative association between the factor and the disease
- ix. The epidemic curve below probably represents cases caused by a:



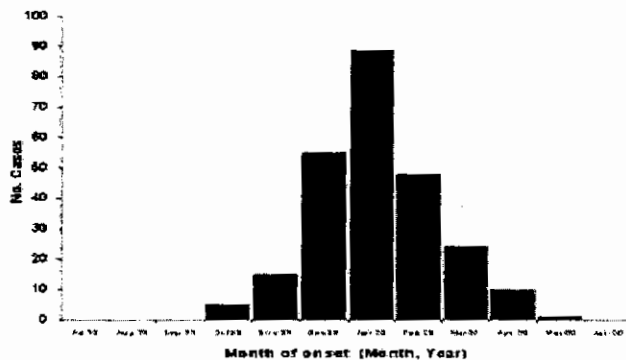
- common source, exposure not lasting more than one day
- common source and a few secondary cases
- propagated source
- common source, exposure lasting a week or longer
- propagated source, exposure not lasting more than one day

- x. Which of the following is an advantage of active surveillance?
  - A. Requires less project staff
  - B. Is relatively inexpensive to employ
  - C. More accurate due to reduced reporting burden for health care providers
  - D. Relies on different disease definitions to account for all cases
  - E. Reporting systems can be developed quickly

**[20 marks]**

**QUESTION 2**

- a. Epidemics have to be described before intervention measures are implemented.
  - i. Why is it important to describe an epidemic prior to implementation of control measures? (2)
  - ii. List three attributes you may use to describe epidemics. (3)
- b. During the description of an epidemic, an epidemiologist plots the number of cases of an epidemic by the date of onset of illness and obtains the curve below:



Do you consider this a common source or propagated source epidemic? Explain your answer. (3)

- c. After careful description of a tuberculosis epidemic, an investigator decides to apply measures at the Primary, Secondary and Tertiary level to try and alleviate disease and reduce incidence in a community. Design a most effective approach the investigator is likely to use to control TB at all these three levels, including a clear description of all personnel involved. (12)

**[20 marks]**

**QUESTION 3**

- a. A total of 26 cases were attended to at Emkhuzweni Health Centre for a condition thought to be a food-borne illness on 03 December, 1992. When interviewed, 24 of the persons who were ill said they had eaten stewed chicken at a Wedding ceremony the day before. Further investigations revealed a further 4 people that ate the stewed chicken but did not fall ill. Of the persons that were ill, two did not eat the stewed chicken.
  - i. What study design would you use to analyse this food-borne illness? Explain. (3)
  - ii. Draw a 2 x 2 contingency table for the analysis of the illness. (4)
  - iii. Using an appropriate epidemiologic measure, determine if the stewed chicken was associated with the illness. (5)

- b. Case-control studies are often preferred to cohort study designs.
- i. What is the main difference in the design of cohort and case-control studies? (2)
  - ii. Matching of cases and controls is often done during the planning and implementation of case-control studies. What purpose is served by matching of cases and controls in case-control studies? (2)
  - iii. Suppose a case-control study is conducted in which 13 of 17 cases were found to be exposed to the suspected cause of illness. Fifty-five controls were appropriately selected and 32 were found to be exposed to the same suspected cause of the illness. By using an appropriate epidemiologic measure, determine and describe the association between the exposure and the outcome. (4)

[20 marks]

**QUESTION 4**

A study was conducted among 80 000 children in Swaziland in 2002. Infants were eligible for inclusion in the study when they were presented at a health facility at the age of 1 month. Parents consented for their infants to be enrolled in the study to test the efficacy of a malaria vaccine.

Infants born on odd-numbered dates formed the vaccine group and received the malaria vaccine at 3, 4, 6 and 14 months along with other routinely administered vaccines. Children born on even-numbered dates constituted the control group and received only the routine vaccines at 3, 4, 6 and 14 months. All infants were followed up for immediate side effects and for episodes of malaria for 1 year.

- a. What design is described in the study? (1)
- b. Why was the consent of the parents sought for the vaccine group? (2)
- c. Describe two ways selection bias may limit the generalisability of the results in this study. (3)
- d.
  - i. Was there any blinding in the study? Explain. (3)
  - ii. If there was no double-blinding, what effect do you think this deficiency in the study design could have had in the results? (3)
  - iii. How was information bias likely to affect the physicians during the diagnosis of children with fever? (3)
  - iv. How would the presence and use of rapid diagnostic tests (with approximately 98% sensitivity) assist this information bias? (3)
- e. What effects do you think the incidence of the side effects of the vaccine would have on the measurement of the effect of the vaccine? (2)

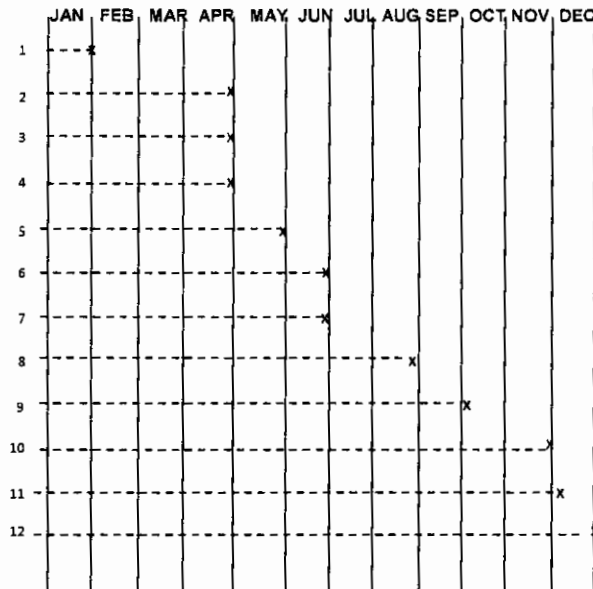
[20 marks]

**QUESTION 5**

- a. One thousand women working at Textile Factory A in Matsapha were screened for HIV and 100 were found to have HIV antibodies. The screening was repeated in the same 1000 women on 1 January, 2013 and this time 124 women were positive on the first screening (no one had died or was lost to follow up).
  - i. What study design was used in this investigation? Explain. (3)
  - ii. What was the prevalence of HIV in women working in Textile Factory A on 1 January, 2012 and on 01 January, 2013. (4)

iii. What is the annual risk of developing HIV infection in Textile Factory A in 2013? (3)

b. One thousand women in Textile Factory B were screened for HIV on January, 2012 and 100 women were found to be HIV-positive. All the women were tested for HIV once a month until 31 December, 2012. Twelve women became HIV-positive during the 12 months. The figure below shows the cohort of the 12 women that became HIV-positive during the study period. Tests were carried out at the end of every month. The remaining 888 women were still HIV-negative by 31 December, 2013. No one died or was lost to follow-up during the study period.



- iv. Describe the cohorts of participant number 12. (2)
- v. What were the odds of becoming infected with HIV in the first 6 months of 2012 in the 12 women who became HIV-positive that year? (2)
- vi. What is the total number of person-months at risk of HIV infection observed in this study? (3)
- vii. What is the incidence rate of HIV infection in women working at Textile Factory B? (3)

**[20 marks]**

**QUESTION 6**

- a. Define the following as applied to epidemiology:
- i. Confounding variable (2)
  - ii. Active surveillance (2)
  - iii. Secondary attack rate (2)
  - iv. Index case (2)
  - v. Virulence (2)
- b. A causal association has been established between standing and backache. Imagine that researchers wanted to establish how important standing was as a risk factor for backache in relation to all cases of backache. The risk of backache in 100 female workers over a 2-year period in standing workers is 12.3 and for other female workers it is 7.7. The risk of backache in all female workers is 8.3.
- i. What is the attributable risk resulting from standing at work over a 2-year period? (2)
  - ii. What is the risk of backache in all women attributable to standing at work? (2)
  - iii. Calculate how important standing is as a risk factor for backache in the whole population of working women and interpret your answer. (4)
  - iv. What assumptions have been made in this calculations. (2)

**[20 marks]**

**QUESTION 7**

A food-borne outbreak at a restaurant at Ezulwini in Swaziland is reported to your office and you respond with an investigation on different possibilities of the sources of infection. Discuss the steps you are likely to follow during the investigation of the outbreak until you are ready to implement control measures.

**[20 marks]**