

**UNIVERSITY OF SWAZILAND**  
FACULTY OF HEALTH SCIENCES

**MAIN EXAMINATION PAPER – DECEMBER, 2011**

TITLE OF PAPER : INTRODUCTION TO EPIDEMIOLOGY  
COURSE CODE : HSC 310  
TIME : 2 HOURS  
MARKS : 80

INSTRUCTIONS : ANSWER **QUESTION 1** AND **ANY THREE**  
OTHER QUESTIONS  
: 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

**QUESTION 1: MULTIPLE CHOICE (This question is compulsory)**

Write the letter corresponding to your chosen answer among those provided for each sub-question

- i. One of the fundamental premises underlying the study of epidemiology is...
  - A. disease, illness and ill health are randomly distributed in a population.
  - B. disease, illness and ill health are not randomly distributed in a population.
  - C. disease, illness and ill health are only randomly distributed in large populations.
  - D. disease, illness and ill health are very rarely distributed in large populations.
  
- ii. Fluoridation of water would be an example of
  - A. A primary prevention strategy
  - B. A secondary prevention strategy
  - C. A tertiary prevention strategy
  - D. It is not a prevention strategy
  
- iii. A researcher is interested in recording the number of individuals in a particular geographic region who have a common cold at some point during the month of February 2010. Which of the following measures of morbidity would be most appropriate in answering this question?
  - A. Point Prevalence
  - B. Period prevalence
  - C. Cumulative Incidence
  - D. Incidence Density
  
- iv. It is assumed that diseases can be transmitted directly or indirectly. A vector such as a mosquito is an example of...
  - A. direct disease transmission
  - B. indirect disease transmission
  - C. single exposure
  - D. common vehicle exposure
  
- v. The resistance of a population to an attack by a disease to which a large proportion of the members of the group are immune is referred to as...
  - A. group resistance
  - B. population immunogenesis
  - C. herd immunity
  - D. the Panum Effect

- vi. The attack rate in susceptible people who have been exposed to a primary case is referred to as.....
- A. the morbidity attack rate
  - B. the post primary attack rate
  - C. the secondary attack rate
  - D. the person-to-person attack rate
- vii. Active surveillance is characterized by:
- A. health care providers taking the initiative to contact the health department
  - B. the health department taking the initiative to track down contacts of case-patients
  - C. the health department taking the initiative to identify undetected cases through sero-surveys
  - D. the health department taking the initiative to monitor potentially exposed individuals to detect early signs of disease
- viii. The *primary* reason for preparing and distributing periodic surveillance reports is to:
- A. document recent epidemiologic investigations
  - B. provide current information on disease occurrence to those who need it
  - C. provide reprints of *Morbidity & Mortality Weekly Report* articles, reports, and recommendations
  - D. acknowledge the contributions of those who submitted case reports
- ix. A health department sometimes adds a disease to the notifiable disease list even if no effective control measures are available. This action is justifiable if:
- A. the health department is well staffed and can handle the addition without compromising its other activities
  - B. the disease is on the notifiable disease list of a neighbouring state with a similar population
  - C. the disease is new, and surveillance reports may shed light on its epidemiology
  - D. the incidence of the disease has been steadily increasing

- x. The death rates from various conditions are often compared across geographic areas. These comparisons are usually based on directly age-standardized mortality rates. Which of the following best describes what is meant by an age-standardized rate created by the direct method?
- A. The number of events in each age stratum of a standard population is used to create a weighted average rate.
  - B. The event rates in each age stratum in the standard population are used to create a weighted average rate.
  - C. The event rates in the geographic area of interest are applied to the age-stratum sizes of a standard population to create a rate that is a weighted average.
  - D. The event rates in the geographic area of interest are compared to the event rates of a standard population to create a summary rate that is a weighted average

[20 marks]

## QUESTION 2

- a. Data from hospital records is one of the most important sources of information in epidemiologic studies. Unfortunately, one major limitation of hospital data is that hospital admissions are selective.
- i. Write down four factors used as a basis for selective admissions in hospitals. (4)
  - ii. List two reasons why hospital records are not suitable for research. (2)
- b. Assume a population of 100 000 people of whom 20 are sick with disease X, and in one year, 18 of the 20 die from disease X
- i. What is the mortality rate of disease X in that year? (2)
  - ii. What was the case-fatality rate due to disease X? (2)
- c. The table below shows all deaths and deaths from heart disease in two communities, A and B.

	Community A	Community B
Mortality rate from all causes	30/1 000	15/1 000
Proportionate mortality from heart disease	10%	20%
Mortality rate from heart disease	3/1 000	3/1 000

From the proportionate mortality data it can be deduced that 10% of deaths in community A and 20% of deaths in community B are due to heart disease. Does this tell us that the risk of dying from heart disease is twice as high in community B than in A? Explain. (4)

- d. The population of a city on March 30, 2003 was 183 000. The number of new active cases of tuberculosis (TB) occurring between January 1<sup>st</sup> and June 30<sup>th</sup>, 2003 were 23. The number of active TB cases according to the city register on June 30<sup>th</sup>, 2003 was 264.
- Calculate the incidence rate of active cases of TB for the 6-month period (3)
  - Determine the prevalence rate of active TB as of June 30<sup>th</sup>, 2003. (3)

[20 marks]

### QUESTION 3

- Write down two differences between a cohort study design and the case-control study design. (2)
- Write down two advantages of a cohort study design and two advantages of a case-control study design. (4)
- Briefly discuss two reasons why a case-control study is (or is not) well suited to examine risk factors for brain cancer. (4)
- Randomised trials have recently received high rating among many researchers as the design that produces the strongest evidence.
  - Write down two uses of randomised trials (2)
  - Define double-blinding as applied to randomised trials. (3)
- A group of researchers want to evaluate a newly developed therapy for acquired immune deficiency syndrome (AIDS). They use a population of AIDS patients from the country's biggest hospital and divide them into two groups. They give the therapy to one group and a placebo to the other group.
  - Were the researchers correct with the design of the study? Give reasons. (3)
  - What will be the outcomes that will be assessed at the end of the study? (2)

[20 marks]

### QUESTION 4

- Use a diagram to illustrate and explain the 'epidemiologic triad' of an infectious disease. (6)
- HIV and Ebola are two diseases with different incubation periods.
  - Define incubation period (2)
  - Explain why it is difficult to control HIV infection among humans yet it is always easy to control outbreaks of Ebola virus infections among susceptible human subjects. (3)
- With respect to modes of disease transmission, define, giving one example of a disease in each case:
  - direct transmission (3)
  - indirect transmission (3)
- Using the disease you gave as an example in c (ii), explain three methods of prevention you may recommend to prevent indirect transmission of disease. (3)

[20 marks]

## QUESTION 5

The following information is from a cross-sectional study carried out in Tanzania to investigate the association between insecticide-treated bed nets and the prevalence of malaria in young children.

- a. The investigators identified 985 eligible children, and interviewed the mothers of 827 of these children over the course of the three cross-sectional surveys (16 mothers refused consent, and 142 could not be contacted). Of the 827 interviewees, data from 748 were included in the analysis because 68 children were aged 2 years at the time of sampling and net status was not known for 11 children. The table below shows some of the results from the study:

Results of three cross-sectional surveys, 1977 – 1999.

	Year of survey		
	1997	1998	1999
Number of children eligible	325	320	330
Number of children analysed	240	269	239
Number (%) of net ownership			
no net	100 (42%)	49 (18%)	40 (17%)
untreated net	116 (48%)	64 (24%)	53 (22%)
treated net	24 (10%)	156 (58%)	146 (61%)
Number (%) of children			
with anaemia	118 (42%)	83 (31%)	62 (26%)
with parasitaemia	151 (63%)	126 (47%)	90 (38%)
with splenomegaly	207 (86%)	144 (54%)	117 (49%)

Source: data from Abdulla et al. (2001)

- i. Is this a descriptive or an analytical study? Explain your response. (3)
- ii. Does it matter that data from some of the eligible children was not included in the analysis? (3)
- iii. Describe the results of the study as shown in the table above. Can you calculate the effect of net ownership on the proportion of children with malaria parasitaemia from the table above? (4)

b. The table below shows the numbers of children with anaemia and parasitaemia according to net ownership for all three surveys.

Effect of nets on prevalence of anaemia and parasitaemia

	Number (%) of children		
	With anaemia	No parasitaemia	Total
Net ownership			
no net	103 (54%)	132 (70%)	189
untreated net	90 (39%)	115 (49%)	233
treated net	70 (21%)	120 (37%)	326
Total	263	367	

- i. What is the prevalence ratio for the effect of owning a treated net on the prevalence of anaemia? (5)
- ii. What is the prevalence ratio for the effect of not owning a net (whether treated or untreated) on the prevalence of parasitaemia? (5)

Hint: Construct a 2 x 2 table of each outcome and exposure variable, and convert two categories (i.e. net, no net, treated net, no treated net), as indicated in each question.

[20 marks]

## QUESTION 6

- a. Write down the difference between;
  - i. Isolation and quarantine (4)
  - ii. Incubation period and generation time (4)
  - iii. Passive immunisation and active immunisation (4)
- b. Suppose you are an environmental health officer in charge of a village in a rural settlement in Swaziland. The nurse at the clinic informs you that they suspect an epidemic of diarrhoea at their clinic. Outline the steps you would follow in the investigation and intervention to assist the community in the problem. (8)

[20 marks]