UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

FINAL EXAMINATION PAPER – DECEMBER 2009

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/WORKOUT DETAILS SHOULD BE SUBMITTED WITH YOUR ANSWER SHEET

Answer **QUESTION 1** and **ANY FOUR** others.

QUESTION 1 MULTIPLE CHOICE : indicate your response by writing the letter corresponding to your chosen answer among those given for each item.

i.   Endemic means that a disease
    A. Occurs clearly in excess of normal expectancy
    B. Is habitually present in human populations
    C. Affects a large number of countries simultaneously
    D. Exhibits a seasonal pattern
    E. Is prevalent among animals

ii. In the study of an outbreak of an infectious disease, plotting an epidemic curve is useful because:
    A. It helps to determine what type of outbreak (e.g. single-source, person-to-person) has occurred
    B. It shows whether herd immunity has occurred
    C. It helps to determine the median incubation period
    D. A and C
    E. A, B and C

Questions iii and iv use the information below:

Population of the city of Atlantis on March 30th, 2003 = 183 000
Number of new active cases of tuberculosis (TB) occurring between January 1st and June 30th, 2003 = 26
Number of active TB cases according to the city register on June 30th, 2003 = 264

iii. The incidence rate of active cases of TB for the 6-month period was:
    A. 7 per 1000 000 population
    B. 14 per 100 000 population
    C. 26 per 100 000 population
    D. 28 per 100 000 population
    E. 130 per 100 000 population

iv. The prevalence rate of active TB as of June 30th, 2003 was:
    A. 14 per 100 000 population
    B. 130 per 100 000 population
    C. 144 per 100 000 population
    D. 264 per 100 000 population
    E. None of the above

v.   The incidence rate of a disease is five times greater in women than in men, but prevalence rates show no sex difference. The best explanation is that:
    A. The crude all-cause mortality rate is greater in women
    B. The case-fatality rate for this disease is greater in women
    C. The case-fatality rate for this disease is lower in women
    D. The duration of this disease is shorter in men

E. Risk factors for the disease are more common in women

vi. Consider the information given on Table 1 below:

Table 1: ANNUAL CANCER DEATHS IN WHITE MALE WORKERS IN TWO INDUSTRIES

	Industry A		Industry B	
	No. of Cancer Deaths	% of All Deaths	No of Cancer Deaths	% of All Deaths
Respiratory system	180	33	248	45
Digestive system	160	29	160	29
Genitourinary system	80	15	82	15
All other sites	130	23	60	11
Total	550	100	550	100

Based on the preceding information, it was concluded that workers in industry B are at higher risk of death from respiratory system cancer than workers in industry A. (Assume that age distributions of the workers in the two industries are nearly identical).

Which of the following statements is true?
A. The conclusion reached is correct.
B. The conclusion reached may be incorrect because proportionate mortality rates were used when age-specific mortality rates were needed
C. The conclusion reached may be incorrect because there was no comparison group
D. The conclusion reached may be incorrect because proportionate mortality was used when cause-specific mortality rates were needed
E. None of the above

vii. 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. A and D

viii. In general, screening should be undertaken for diseases with the following feature(s):
A. Diseases with a low prevalence in identifiable subgroups of the population

B. Diseases for which case-fatality rates are low
C. Diseases with a natural history that can be altered by medical intervention
D. Diseases that are readily diagnosed and for which treatment efficacy has been shown to be equivocal in evidence from a number of clinical trials
E. None of the above

ix. 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 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 is the proper classification of this study?
  A. Cross-sectional study
  B. Case-control study
  C. Concurrent cohort study
  D. Non-concurrent cohort study
  E. Experimental study

x. A case-control study is characterised by all the following except:
  A. It is relatively inexpensive compared to most other epidemiologic study designs
  B. Patients with the disease (cases) are compared with persons without the disease (controls)
  C. Incidence rates may be computed directly
  D. Assessment of past exposure may be biased
  E. Definition of cases may be difficult

QUESTION 2

Fifteen people had a New Year's dinner together. Within 24 hours, five of them became ill with gastroenteritis. The dinner had consisted several courses and food items, and the participants had not eaten the same items. In investigating the cause of the disease, a health officer sent all the guests a list of the food items that had been served and asked to indicate what they had eaten. As the lists came back, their replies were recorded in a double table, with guests who had been ill on the left, and the ones who remained well on the right (Table 2).

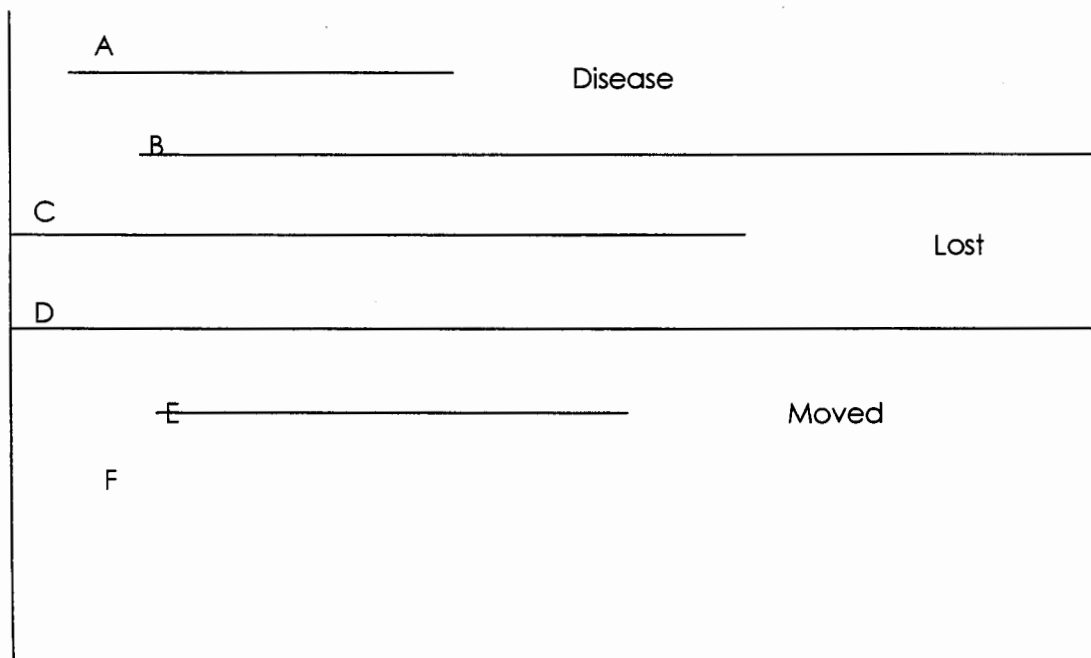Table 2 : Table filled out from questionnaires given to 15 people during an outbreak of gastroenteritis

Food Items	Gastroenteritis (5 people)	No Gastroenteritis (10 people)
Quinche	2	10
Cheesecake	4	5
Swiss roll	3	7
Chocolate cake	1	3
Cheese dip	4	11

a. Calculate the relative risk of gastroenteritis associated with eating each of the food items. (10)
b. Which one of the foods was responsible for the gastroenteritis illness? Explain your answer. (3)
c. Are there any people who became ill yet did not eat the food item responsible for the gastroenteritis? If yes, give a reason. (3)
d. Are there any people who ate the food item responsible for the gastroenteritis yet did not become ill? Explain why? (3)

[20 marks]

QUESTION 3

a. Define the following:
   i. Attack rate (2)
   ii. Reproductive rate (2)
   iii. Index case (2)

b. Seven people who are at risk for some disease are followed in a cohort study that lasts 12
   years. A schematic diagram of the cohort study is represented below:
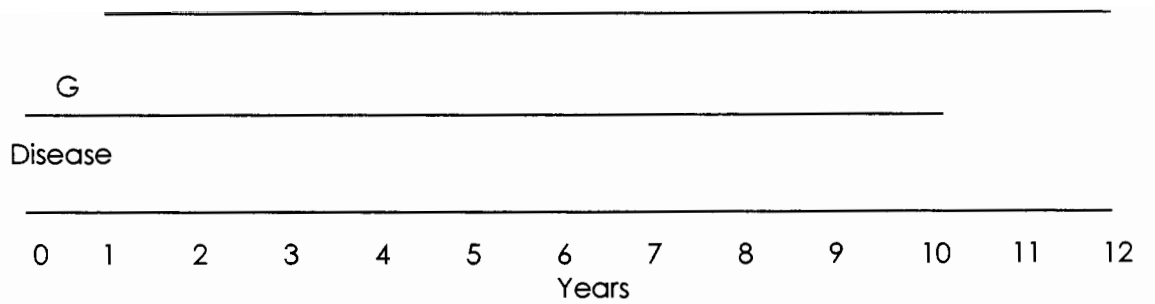
A ———————————————— Disease

B ————————————————————————————

C ———————————————————————— Lost

D ————————————————————————————

E ——————————————————— Moved

F

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       G
Disease

      0    1    2    3    4    5    6    7    8    9    10   11   12
                               Years
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Figure   Schematic representation of a cohort study. Each line from A to G represents the monitoring period for a patient.

    i.   Describe the cohorts of monitoring subjects A, C and D. (6)
    ii. How many person-years did each contribute? (6)
    iii. Calculate the number of person years in this study. (2)

[20 marks]

QUESTION 4

A study from Malawi attempted to assess the sensitivity and specificity of directly observable clinical signs for the diagnosis of malaria and pneumonia in children. The study subjects were 1469 children under 5 years of age who came to a children's outpatient department with fever and/or cough. The purely clinical definition of malaria was: *fever or history of fever* and the definition of pneumonia was: *history of cough; or difficulty in breathing and lower chest-wall indrawing; or increased respiratory rate*.

Blood films for microscopic examination for malaria parasites were taken from all of the children, but only those with evidence of pneumonia (or who had parasitaemia) had a chest X-ray. A total of 1290 children fulfilled the clinical definition of malaria (i.e. fever or history of fever). Of these, 486 children had a positive blood film, while in 804 children no parasitaemia could be diagnosed. In total, 179 children did not meet the clinical case definition, but of these 22 individuals had a positive blood film.

    a. Define:
        i.   Sensitivity   (2)
        ii.   Specificity   (2)
        iii.   Positive predictive value   (2)

    b. If we assume that 'positive blood film' is the gold standard for diagnosing malaria, calculate the sensitivity of the clinical definition of malaria. (2)
    c. What does this sensitivity mean? (2)
    d. Calculate the specificity of the clinical diagnosis. (2)
    e. Explain the meaning of the specificity value obtained in (d) (2)

QUESTION 5

During the years around 1950, Dr Hope Simpson meticulously collected data on all cases of measles, chicken pox and mumps in a district in Western England. One of the issues he wanted to study was the risk of transmission from one child in a family to another. In order to do this he had to register all instances where a child was exposed to a sibling with the disease, and then establish how many of the exposures led to a new case. The results that he obtained during a 4-year period are shown in Table below.

Table   Numbers of individuals infected out of siblings exposed to three childhood infections

	Measles	Chicken-pox	Mumps
Number of children exposed to sibling with the disease	251	238	218
Number who fell ill	201	172	82

    a. Define attack rate (1)
    b. Calculate the attack rate for:
        i.   Measles (2)
        ii.   Chicken-pox (2)
        iii.   Mumps (2)

    c. Measles is almost never subclinical but mumps is very often asymptomatic. Explain how a subclinical disease such as mumps, with a long incubation period, could be prevented from spreading in a family. (4)

In the 1980s there was much concern about the attack rate of monkey-pox, since it was known that vaccination against small-pox also protected against monkey-pox, but as small-pox had been eradicated, this vaccination was no longer necessary. In one study, 147 individuals who caught the monkey-pox virus from monkeys in Zaire were identified. For each case, the investigators counted all of the people who had lived in the same residence, and the number of these individuals who became cases. They also tried to calculate the number of more remote contacts that the cases had had, and the number of transmission to these. The results were as follows:

Secondary cases			Healthy	
Same residence	More remote		Same residence	
More remote				
36	11		798	728

    d. i.   With respect to this study, define secondary case. (2)
       ii.   Calculate the attack rate (=risk) in people who shared their residence with an infective case, and (2)
       iv.   the attack rate in the less close contacts (2)

v.   What is the additional risk of sharing a residence with a case compared to staying further away (remote contact)   (3)

[20 marks]

QUESTION 6

A community at which you are a health worker has high prevalence of human immunodeficiency virus (HIV) infection rate. Members of the community are at varying states and levels with respect to the disease: those not infected (disease free), those with in-apparent infections (subclinical disease), those hospitalised (clinical disease) and those who are bedridden (in disability).

Discuss a programme of intervention you may introduce to the community in order to prevent further development or progression of disease at all levels.

[20 marks]

QUESTION 7

a. Define disease surveillance and personal surveillance.   (4)
b. Mention FOUR components of a good surveillance programme.   (4)
c. Malaria incidence has significantly gone down in Swaziland in the last decade. The Malaria Control Unit's (MCU) major strategy of control has now switched to surveillance.
     i.   Why is it important to maintain a good surveillance programme in Swaziland now that the disease is rare?   (3)
     ii. As an epidemiologist attached to the MCU, design and discuss a good surveillance programme you would recommend for the MCU to put into operation at this phase of control of the disease if elimination of the disease is to be realised in Swaziland. Make sure to clearly define the roles of other teams and groups of workers you will include in your surveillance programme.   (9)

[20 marks]