UNIVERSITY OF ESWATINI
Faculty of Health Sciences
Department of Environmental Health Science

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

**RE-SIT EXAMINATION PAPER 2019**

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| TITLE OF PAPER | : | FUNDAMENTALS OF EPIDEMIOLOGY |
| COURSE CODE | : | EHS207 |
| DURATION | : | 2 HOURS |
| MARKS | : | 100 |
| INSTRUCTIONS | : | READ THE QUESTIONS & INSTRUCTIONS CAREFULLY |
| | : | **QUESTION ONE IS COMPULSORY** THEN ANSWER ANY OTHER THREE QUESTIONS |
| | : | EACH QUESTION **CARRIES 25** MARKS. |
| | : | WRITE NEATLY & CLEARLY |
| | : | NO PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM. |
| | : | BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER. |
| | : | **INDICATE YOUR PROGRAMME OF STUDY** |

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

**QUESTION 1**

Instruction: Write the letter representing the correct answer of your choice for example: I. B
**(Each correct answer is worth 2 marks)**

I. Many of a students at the boarding school, including 6 just coming down with chicken pox, went home during the Easter break. About 2 weeks later, 4 siblings of these 6 students (out of a total of 10 siblings) developed chicken pox. The secondary attack rate among siblings was, therefore,:

A. 4/6
B. 4/10
C. 4/16
D. 6/10

II. Investigators enrolled 100 diabetics without eye disease in a cohort (follow-up) study. The results of the first 3 years were as follows:
Year 1: 0 cases of eye disease detected out of 92; 8 lost to follow-up
Year 2: 2 new cases of eye disease detected out of 80; 2 had died; 10 lost to follow-up
Year 3: 3 new cases of eye disease detected out of 63; 2 more had died; 13 more lost to follow-up
The person-time incidence rate is calculated as:

A. 5/100
B. 5/63
C. 5/235
D. 5/250

III. The units for the quantity you calculated in Question II could be expressed as:

A. cases per 100 persons

B. percent

C. cases per person-year

D. cases per person per year

IV. Investigators examine data from police records to identify crash factors associated with a driver fatality vs. a driver non-fatality. The crash factors they consider are driver blood alcohol level, driver age and driver use of the seat belt. This is an example of a:

A. case control study

B. retrospective cohort study

C. prospective cohort study

D. large case report study

V. Select the correct statement:

A. The attributable risk is the excess risk of disease in the exposed compared to the non-exposed during a defined period of time

B. The attributable risk is a ratio of the disease risk in the exposed compared to the non-exposed during a defined period of time

C. The attributable risk is a ratio of the disease risk in the non-exposed compared to the exposed during a defined period of time

D. The attributable risk is the prevalence of disease in the exposed minus the prevalence of disease in the non-exposed

E. The attributable risk is the disease risk in a defined group at a specific point in time

VI. Disease X is incurable. It is known that the incidence of Disease X has been constant during the past 30 years. Researchers have determined that the prevalence of Disease X is higher today than it was 15 years ago. Select the answer that best explains this observation:

A. Patients with Disease X lived longer 15 years ago compared to today

B. The relative risk of getting Disease X has decreased during the past 15 years

C. The attributable risk of Disease X has increased during the past 15 years

D. The odds ratio of getting Disease X has increased during the past 15 years
E. Patients with Disease X had a shorter life span 15 years ago compared to today

VII. In the definition of epidemiology, "determinants" generally include the following except:

A. Agents and causes
B. Control measures
C. Risk factors
D. Sources

VIII. 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 2001. 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

IX. The hallmark feature of an analytic epidemiologic study is: (Choose one best answer)

A. Use of an appropriate comparison group
B. Laboratory confirmation of the diagnosis
C. Publication in a peer-reviewed journal
D. Statistical analysis using logistic regression

X. A study in which children are randomly assigned to receive either a newly formulated vaccine or the currently available vaccine, and are followed to monitor

for side effects and effectiveness of each vaccine, is an example of which type of study?

A. Experimental
B. Observational
C. Cohort
D. Case-control

XI. Indicate if the following statements are true or false through writing "True or False". Example: A. True **(each answer is worth 1 mark)**

A. Prospective studies are effective in evaluating rare diseases.
B. Analytic studies in epidemiology focus on answering the "how many and why" research questions.
C. Longitudinal studies are those studies conducted within a period of time.
D. Qualitative studies generate contextual data and are also known as explanatory studies.
E. The quality of "golden standard" in experimental studies can be achieved through randomization only.

**Total=25 marks**

**QUESTION 2**

According to World Health Organization (2018), on 13 July 2018, the Niger Ministry of Public Health notified WHO of a cholera outbreak in Madarounfa District, Maradi Region at the border with Nigeria. Three stool specimens had tested positive for Vibrio cholera O1 inaba by culture at the Centre for Medical and Health Research (CERMES) in Niamey on the 12$^{th}$ of July 2018. The initial case-patients were found to have epidemiological links to Nigeria. The outbreak was formally declared on 15 July 2018.

In the August bulletin, WHO (2018) reported that the cholera outbreak situation in Niger is improving, with the disease trend gradually declining. In week 31 (week ending 5 August 2018), a total of 129 new suspected cholera cases (and no deaths) were reported in

Madarounfa district, compared to 322 cases and four deaths reported in week 30. Since the beginning of the outbreak on 5 July 2018, a total of 739 suspected cholera cases, including 11 deaths have been reported. A total of 389 of the suspected cases are between 2 and 14 years, while the rest were 15 years and above. Fifty-four percent of the cases are females. The outbreak has remained localised to Madarounfa District.

a) What is meant by the word "outbreak"? [2]

b) What are the key factors related to the decline in number of cases? [5]

c) What is the crude case fatality rate? [2]

d) What was the age specific incidence rate? [2]

e) What was the sex ratio among the cases? [2]

f) In order to stop this outbreak, the Niger Ministry of health is expected to implement the 4 modes of prevention. Discuss these modes stating appropriate examples. [12]

**Total=25 marks**

**QUESTION 3**

On the 3rd September 2018, the Minister of Heath in the Republic of South Africa, Dr Aaron Motsoaledi declared the end of the Listeriosis outbreak. This outbreak has been termed the world's deadliest on record. Following the declaration, the advice against consuming ready-to-eat processed meat products has been withdrawn. Investigations revealed that the Enterprise factory in Limpopo was the source of the outbreak and was closed. However, following the recent developments, this factory could reopen in October 2018.

The outbreak has been costly in terms of the money lost by the Tiger Brands (USD 3.27 million) and also in terms of lives lost during the course of the outbreak. A total of 218 people died between January 2017 and July 2018 and 1064 cases were identified.

Although outbreak-related cases have declined sharply, sporadic cases continue to be reported, as expected. Therefore, healthcare workers are encouraged to continue providing risk reduction guidance to persons at high risk for contracting listeriosis and entire

population. In addition to that, surveillance and active investigation systems are still to be kept running and effective.

a) According to the Minister Motsoaledi, there was an investigation that took place before the situation was declared an outbreak.

i) Discuss the three components of an outbreak investigation. [6]

ii) Explain the first 5 steps in details which were taken in the investigation of this outbreak. [15]

b) Explain why the Minister recommended that the surveillance system is kept running. [3]

c) What is meant by sporadic cases? [1]

**Total=25 marks**

**QUESTION 4**

The previous school term has been a busy term for most schools as it involved trips and sports events. Ntabeni High school was not spared as the school had to take learners to bolly-game competitions in the region. However, what started on a high note ended in a tragic evening as 70 students were rushed to hospital by the paramedics' ambulance. This unforeseen incident started in the afternoon of that fateful Friday whereby students started complaining of abdominal pain and were vomiting. Tests conducted from the stool specimen revealed presence of Enteretidis (Salmonellosis causing agent). The first 12 students to complain of the above symptoms reported around 4 pm followed by 22 who reported at around 5pm. This led to the sports teachers calling the paramedics at around 5.30pm; 15 more students were spotted vomiting by the lavatory facilities. Fifteen minutes later, 17 students were lying on the ground and were in pain. By the time the paramedics arrived 9 and 5 more students had reported 15 minutes apart respectively.

a) Represent the above scenario in an epidemic curve. [8]

b) What type of outbreak is illustrated in a)? Explain your answer. [2]

Upon investigation, a total of 120 students attended the event from the school. Since the incubation period for Salmonellosis is 6 to 72 hours, students were interviewed on what

they ate for breakfast. The teachers stated that that they had 2 sets of sandwiches (polony and cheese sandwich and chicken-mayosandwich). Students chose among these 2 choices. Out of the 120 student, 72 ate the chicken-mayo sandwich and of these 56 developed the said symptoms.

c) Represent this information in a 2x2 table. [4]

d) Which sandwich is associated with the reported symptoms? [4]

e) What could be the possible explanation for those who didn't eat the sandwich in d) but reported the symptoms? [4]

f) What would explain the different times in manifestation of the symptoms? [3]

**Total=25 marks**

**QUESTION 5**

A recent study conducted by personnel from the Epidemiologic Unit in Country Y revealed that cigarette smoking is associated with noise induced hearing loss. This study was conducted among factory workers in the 3 steel producing factories in the country. In their study, 1853 tested positive to noise induced hearing loss of which 1501 had a history of cigarette smoking out of the 3761 study population. In total, 2436 reported to have smoked in their life time.

g) Represent the findings of the study in a 2x2 table. [5]

h) What study design was used in this study? Explain your answer. [3]

i) State 3 disadvantages of this study design. [3]

j) Is there any association between noise induced hearing loss and cigarette smoking? Show all the calculations. [4]

k) A group of students however, critiqued this study and stated that the association identified is biased. What are the possible sources of bias that are associated with this study? Explain in detail stating how they could have been prevented. [8]

I) The students further suggested that cigarette smoking was only a predisposing factor in noise induced hearing loss. What is a predisposing factor? [2]