"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

SPH 540: ADVANCED EPIDEMIOLOGY

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER/DECEMBER 2020

LECTURER: MR. E.CHIKAKA

DURATION: 24 HOURS

INSTRUCTIONS

ANSWER **ANY ONE** QUESTION

PLEASE STICK TO THE STANDARD HOUSE STYLE i.e.

- TIMES NEW ROMAN
- FONT SIZE 12
- DOUBLE SPACING
- APA REFERENCING
- SEND YOUR ANSWER AS A PDF DOCUMENT

THE MARK ALLOCATION FOR EACH QUESTION IS INDICATED AT THE END OF THE QUESTION

CREDIT WILL BE GIVEN FOR LOGICAL, SYSTEMATIC AND NEAT PRESENTATION

QUESTION 1

a. Outline or classify the epidemiologic study designs. [10]

b. Giving clear examples, explain the differences between probability and non-probability sampling methods. [10]

c. Distinguish between measures of association and impact/effect. Illustrate how each measure is calculated and under what circumstances. [15]

d. An outbreak of anthrax was detected among residents of Mutasa District of Manicaland. In a case-control study, investigators found that 21 of the 30 case-patients and four of the 60 controls had eaten infected meat.

   i. Draw a 2x2 table to summarize the data [5]

   ii. Calculate the measure of association. Interpret the result. Is it statistically significant? [10]

e. An investigator suspects that Zimbabwean physicians use a variety of drugs. This is a summary of his investigation.

Objective—To estimate the prevalence of substance abuse among Zimbabwean physicians.
Design—A mailed, anonymous, self-report survey.
Participants—A national sample of 9600 physicians, randomly selected from the ZIMA master file. Demographic characteristics of respondents closely reflected those of the Zimbabwean physician population.
Main Outcome Measures—Subjects' self-reported use of 13 substances in their lifetime, the past year, and the past month; reasons for use; self-admitted substance abuse or dependence; and whether treatment was received.

i. What is the design for this study? Support your answer. [5]

ii. The researchers used mailed anonymous self-report. Was this the best approach for this study? Why? Support your answer and give a suggestion for improvement. [5]

iii. What are the biases associated with this study? How were they introduced into the study and what stages? [10]

iv. How can these biases be taken care of? [5]

v. Some of the results from the study are shown in the table below

Estimated Prevalence of Marijuana Use in Past Year by Male Physicians

Age	**Use, %**	**SE**
25-34	10.3	1.2
35-44	7.5	0.7
45-54	2.1	0.5
55	0.5	0.2

Comment on their findings. [5]

vi. What hypothesis and tests can you do to assess your findings in e above? [5]

f. Explain the effects of confounding and effect modification in epidemiology. [15]

QUESTION 2

a. Briefly outline factors associated with disease causation. [10]
b. Giving clear examples, explain the differences between probability and non-probability sampling methods. [10]
c. Explain how bias can be introduced in a study. [10]
d. Outline methods used to reduce bias in a study. [10]
e. What are the advantages and disadvantages of case-control vs. cohort studies? Pay attention to the some of the areas given in the table below. [20]

	Case-control	Cohort
Sample size Costs Study time Rare disease Rare exposure Multiple exposures Multiple outcomes Progression, spectrum of illness Disease rates Recall bias Loss to follow-up Selection bias		

f. Why is probability sampling generally preferred in comparison to non-probability sampling? Explain the procedure of selecting a simple random sample. Explain by means of an example. [10]
g. Under what circumstances stratified random sampling design is considered appropriate? How would you select such sample? Explain by means of an example. [10]
h. You conduct a case-control study examining the relationship between drinking soda and colon cancer and find that among 1500 who have colon cancer, 400 drink soda, while among the 3000 controls who don't have colon cancer, 450 drink soda.

i. Draw a 2x2 table and calculate the crude measure of association [4]
ii. Interpret the measure calculated above [2]
iii. Now you stratify by gender and find the following: Among women, 200 of 1000 who have colon cancer drink soda, while among the 2000 who don't have colon cancer, 300 drink soda. Among men, 200 of the 500 who have colon cancer drink soda, but only150 of the 1000 who don't have colon cancer drink soda. Draw out the stratified 2x2 tables and calculate their respective measures of association [6]
iv. Interpret the measures of association. [2]
v. Is this an example of effect modification or confounding? [2]
vi. Explain in lay terms what this conclusion means. [2]
vii. What do you do now? [2]

QUSTION 3

a. “A systematic bias results from errors in the sampling procedures”. What do you understand by a systematic bias? Describe the important causes responsible for such a bias in any two epidemiological studies you have learned. [8]
b. Explain how differential and non-differential misclassification biases can be introduced in any epidemiological study. Outline methods used to reduce these biases in a study. [15]
c. The introduction of mobile phones in Zimbabwe has seen an increase in the number of users. As a Public Health Officer, you are approached by a medical aid society concerned about the possible health effects of the use of cellular phones. One such health effect is purported to be an increase in the risk of head, ear and brain tumors. The medical aid society is worried about the possible impact on their claims.

   i. Describe how you might undertake to assess the potential effects of cellular phones on the health of users. [10]
   ii. Discuss any potential confounders in this study and how you might overcome/control them [10]

d. Briefly summarize two criteria on which disease classifications are based. Discuss a reason why these two criteria do not always correspond with one another. [2]
e. List two examples of each of the two types of criteria you mentioned in d above [2]
f. Cohort studies can form the framework for efficient sub-studies, using nested case-control and case-cohort study designs. Compare and contrast these nested case control studies and case-cohort studies. [6]
g. Name the three component parts of any kind of incidence measure. [3]

h. To determine whether baldness causes coronary heart disease (CHD) in men, a hypothetical cohort study was carried out. The epidemiologist in charge of the study recruited 10,000 bald men and 10,000 men with hair into the study and followed all of them for 10 years to determine whether they developed CHD. Results are shown below.

CHD	Yes	No	Total
Bald	775	9225	10000
Hairy	190	9810	10000
Total	965	19035	20000

1. Calculate the risk of CHD among bald men. [2]
2. Calculate the risk of CHD among hairy men. [2]
3. What is the relative risk of CHD associated with baldness? Briefly explain how to interpret the value you calculated. [5]
4. Does this result suggest that baldness may be a cause of CHD? What alternate explanation can you provide? [2]
5. The investigator thought that the results might be confounded by age. What is meant by "confounded by age" in the context of this example? [3]

The investigator stratified the results, displaying them separately for the older subjects (aged 65 and over) and the younger subjects (aged 40–64). Examine the two tables that follow.

CHD in Older Subjects

CHD	Yes	No	Total
Bald	750	6750	7500
Hairy	100	900	1000
Total	850	7650	8500

CHD in Younger Subjects

CHD	Yes	No	Total
Bald	25	2475	2500
Hairy	90	8910	9000
Total	115	11385	11500

6. Calculate the risk of CHD in the older men. Calculate the risk of CHD in the younger men. Does there appear to be an association between age and CHD? Why or why not? [5]

7. What proportion of the older men are bald? What proportion of the younger men are bald? Does there appear to be an association between age and baldness? [5]

8. Based on your answers to Questions 6 and 7, does the association between baldness and CHD appear to be confounded by age? Why or why not? [5]

9. Calculate the relative risk of CHD associated with baldness in the stratum of older men. Briefly explain how to interpret the value you calculated. [5]

10. Calculate the relative risk of CHD in the stratum of younger men. Briefly explain how to interpret the value you calculated. [5]

11. Compare the relative risks in Questions 9 and 10 with each other and with the overall relative risk you calculated in Question 3. Do these results suggest that the association between baldness and CHD is confounded by age? Why or why not? [5]