



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
DEPARTMENT OF BIOLOGICAL SCIENCES
UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN
BIOLOGICAL SCIENCES
4TH YEAR FIRST SEMESTER 2016/2017 ACADEMIC YEAR
REGULAR

COURSE CODE: SBI 3415

COURSE TITLE: BIostatISTICS II

EXAM VENUE: LAB 12

STREAM: (BSc. Bio/Comm & Public Health)

DATE: 15/12/16

EXAM SESSION: 9.00 – 11.00 AM

TIME: 2 HOURS

Instructions

- 1. Answer ALL questions in Section A (compulsory) and ANY TWO questions in Section B**
 - 2. Candidates are advised not to write on the question paper**
 - 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**
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SECTION A: SHORT ANSWER QUESTIONS (30 MARKS)

1. Explain your understanding of hypothesis testing. (3 marks)
2. Explain the purpose of “Coding” during data analysis. (3 marks)
3. How do you handle missing data during data cleaning. (3 marks)
4. Explain the purpose of stratifying crude data during analysis. (3 Marks)
5. Explain the “null hypothesis” in an ANOVA experiment. (3 Marks)
6. State three assumptions of ANOVA. (3 marks)
7. Define effect modification (3 marks)
8. How does one check for confounding during data analysis. (3 Marks)
9. During data analysis, why do we report strata-specific measures of association when “interaction” is present. (3 Marks)
10. How would you determine the overall effect of ten predictors on an outcome. (3 Marks)

SECTION B: ESSAY QUESTIONS (40 MARKS)

11. a. Explain the meaning of the following terms which are used in hypothesis testing
 - i. Type I error (3 Marks)
 - ii. The level of Significance (alpha level) for a statistical test. (3 Marks)
 - iii. Type II error (3 Marks)
 - iv. The power of a statistical test. (3 Marks)
- b. A researcher wishes to conduct an experiment to see whether or not consuming alcohol affects the mean - reaction time of drivers.
 - i. What would be a suitable null hypothesis, and an appropriate alternative hypothesis? (4 Marks)
 - ii. What would be the result of making a Type I error and what would be the result of making a Type II error. (2 Marks)
 - iii. If one researcher uses a significance level of $\alpha = 0.05$ and another uses a significance level of $\alpha = 0.01$, which would be more likely to make a Type I error and which would be more likely to make a Type II error. (2 Marks)

12. In a study to elderly persons with cancer of the throat, Epidemiologists wanted to establish which of the two treatments (surgery or chemotherapy) was better in terms of 5-year survival. The data below summarizes findings from the study.

Outcome	5-Year survival			
	Men		Women	
	Survived	Died	Survived	Died
Surgery	81	8	112	29
Chemotherapy	23	14	43	28

- a. Formulate a suitable Null hypothesis (2 marks)
- b. Test if there is an overall association between type of treatment and 5-year survival (2 marks)
- c. Explain the meaning of your measure of association in (b) above (2 marks)
- d. Determine if the association between the type of treatment and 5-year survival is different among men compared to women (4 marks)
- e. Assess whether sex is a Confounding Factor between in the relationship between treatment and outcome, or whether it is an Effect Modifier. (4 marks).
- f. Use the Mantel-Haenszel technique to calculate the adjusted measure of association between the intervention and 5-year survival (4 marks)
- g. What is your overall conclusion from your analysis (2 marks)

13. The following data was compiled from a food- borne outbreak investigation at JOOUST.

Student ID	Sick	Bloody diarrhea	Incubation (hrs)	Kachumbari	Nyama-Choma
1001	Yes	Yes	0.5	Yes	Yes
1002	Yes	Yes	1	Yes	Yes
1003	Yes	Yes	2	No	Yes
1004	Yes	Yes	4	No	Yes
1005	Yes	Yes	6	No	No
1006	No			Yes	No
1007	No			Yes	No
1008	No			No	Yes
1009	No			No	Yes
1010	No			No	No

Answer the following questions using this data. (Show all work for calculations)

- Summarize this information in a 2x2 table (**Hint:**Use the foods as the predictors and Sickness as the outcome) (5 Marks)
- What percentage of cases experienced bloody diarrhea. (1 marks)
- What is the median incubation period of this disease (1 mark)
- Calculate the attack rate in those who ate kachumbari (2 marks).
- Calculate the attack rate for those who did not eat kachumbari (2marks).
- Calculate the relative risk of sickness associated with kachumbari (2 marks).
- Calculate the attack rate in those who ate nyama-choma (2 marks).
- Calculate the attack rate in those who did not eat nyama-choma (2marks).
- Calculate the relative risk of sickness associated with nyama-choma (2 marks).
- Which of the two food items is the most likely cause of the outbreak (1 mark)

14. You conduct a study examining the relationship between drinking soda and colon cancer and find that among 1500 patients who have colon cancer, 400 drink soda, while among the 3000 controls who do not have colon cancer, 450 drink soda.

- Summarize this information in a 2x2 table (5 marks)

- b. Calculate the Crude Odds ratio (2 Marks)
- c. Upon stratifying by gender, you 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 while among men, 200 of the 500 who have colon cancer drink soda, but only 150 of the 1000 who do not have colon cancer drink soda. Summarize this information in a stratified table (8marks)
- d. Calculate their respective gender-specific Odds Ratios (4 marks).
- e. Is this an example of Effect Modification or Confounding. (1 mark)