



**FACULTY OF ENVIRONMENTAL SCIENCE**  
**DEPARTMENT OF ENVIRONMENTAL HEALTH**  
**MASTER OF SCIENCE DEGREE IN ENVIRONMENTAL HEALTH**  
**RESEARCH AND BIOSTATISTICS**  
**EEH 5202**

**Final Examination Paper**

**April 2025**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Special Requirements: Calculators**

**Examiner's Name: Dr. L Moyo & Miss N. Sibanda**

**INSTRUCTIONS**

1. **Answer question one and any three questions.**
2. **Each question carries 25 marks.**

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
<b>1. <u>COMPULSORY</u></b>	<b>25</b>
2.	25
3.	25
4.	25
5.	25
6.	25
<b>TOTAL</b>	<b>100</b>

### Question 1 (Compulsory – 25 marks)

**Read the following abstract and answer the questions that follow:**

*Background:* Hypertension is a leading risk factor for cardiovascular diseases globally. Lifestyle modifications, including dietary changes, are recommended for blood pressure control. This study investigates the effect of a Dietary Approaches to Stop Hypertension (DASH) diet intervention on blood pressure among adults with prehypertension and stage 1 hypertension.

*Methods:* A randomized controlled trial was conducted with 150 participants aged 30-65 years, assigned to either the DASH diet group or a control group receiving standard dietary advice. The primary outcome was the change in systolic and diastolic blood pressure after 12 weeks. Secondary outcomes included changes in body weight and lipid profiles.

*Results:* The DASH diet group showed a significant reduction in systolic blood pressure (mean decrease of 11.4 mmHg) compared to the control group (mean decrease of 3.8 mmHg) ( $p < 0.001$ ). Diastolic blood pressure decreased by 7.5 mmHg in the DASH group and 2.1 mmHg in the control group ( $p < 0.001$ ). There were also significant improvements in total cholesterol and LDL cholesterol levels in the DASH group.

*Conclusions:* The DASH diet is effective in reducing blood pressure and improving lipid profiles among adults with prehypertension and stage 1 hypertension. Implementing the DASH diet could be a beneficial strategy for cardiovascular risk reduction.

- a) Identify and discuss the key components of the research methodology used in this study. **(5marks)**
- b) Interpret the statistical significance of the results presented in the abstract. **(10 marks)**
- c) Discuss potential limitations of this study that could impact the generalizability of the findings. **(10 marks)**

### Question 2 (25 marks)

- a) Discuss the ethical principles that must be considered when conducting research involving human subjects, with a focus on informed consent and confidentiality. **(15 marks)**
- b) Describe the role of Institutional Review Boards (IRBs) in the oversight of research ethics. **(10 marks)**

**Question 3 (25 marks)**

- a) Compare and contrast probability and non-probability sampling methods, providing examples of each. **(10 marks)**
- b) Identify specific examples of studies where you will use each of these methods. **(5marks)**
- c) Discuss the advantages and disadvantages of using surveys versus focus groups in collecting data for public health research. **(10 marks)**

**Question 4 (25 marks)**

**Read the following abstract and answer the questions that follow:**

*Background:* Statistical methods are essential in public health research for analyzing data and drawing valid conclusions. This study aims to quantify the use of basic and advanced statistical methods in public health literature.

*Methods:* A random sample of 216 published articles from seven top-tier general public health journals was reviewed. Data were collected on the study design and statistical methods used, including descriptive statistics, inferential statistics, modeling, and advanced statistical techniques.

*Results:* Approximately 81.9% of articles reported an observational study design, and 93.1% were substantively focused. Descriptive statistics in table or graphical form were reported in more than 95% of the articles, and statistical inference was reported in more than 76% of the studies reviewed.

*Conclusions:* The findings highlight the prevalent use of both descriptive and inferential statistical methods in public health research, underscoring the need for statistical literacy among public health professionals.

- a) Conduct the appropriate test to show the difference between two proportions 81.9% and 93.1%. Is there a significant difference between these two proportions? **(5 marks)**
- b) Explain the difference between descriptive and inferential statistics, and provide examples of how each is used in public health research. **(10 marks)**
- c) Based on the abstract, discuss the importance of statistical literacy for public health professionals. **(10 marks)**

**Question 5 (25 marks)**

Develop a brief research proposal for a study assessing the impact of air pollution on respiratory health among children in urban areas. Your proposal should include the following components:

- a) Title and background of the study. **(5 marks)**
- b) Research objectives and hypotheses. **(10 marks)**
- c) Proposed methodology, including study design, sampling strategy, and data collection methods. **(10 marks)**

**Question 6 (25 marks)**

**Read the following abstract and answer the questions that follow:**

*Background:* The validity of a research study refers to how well the results among the study participants represent true findings among similar individuals outside the study. This concept of validity applies to all types of clinical studies, including those about prevalence, associations, interventions, and diagnosis.

*Methods:* This article discusses the two domains of study validity: internal and external validity. Internal validity is the degree to which a study establishes the cause-and-effect relationship between the treatment and the observed outcome. External validity refers to the extent to which the results of a study can be generalized to other situations and to other people.

*Conclusions:* Both internal and external validity are crucial for the applicability of research findings. Researchers must consider these validity aspects when designing studies to ensure the results are both accurate and generalizable.

- a) Define internal and external validity in research and discuss their importance in study design. **(15 marks)**
- b) Explain how researchers can enhance internal and external validity when conducting public health studies. **(10 marks)**