

MSc Public Health

(Open & Distance Learning)

**MSPH116**

**Biostatistics**

**(3 Credits)**

Module Guide

**TITLE: Biostatistics COURSE CODE: MSPH116**

**PROGRAMME: MSc Public Health (ODL)**

**CONTENT SYNOPSIS:**

The module introduces the concepts of statistics for health professionals. Students learn to calculate basic statistical parameters and interpret statistical data.

Projects are incorporated to allow the students to gain hands-on experience with the collection of data preparation of questionnaire and applications of statistics in data analysis. They will also be trained in the use of the SPSS statistical analysis package.

**LEARNING OUTCOMES:**

At the completion of this module, the students shall be able to achieve the following outcomes:

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| --- | --- |
| CLO 1 | Apply basic principles of biostatistics in describing research data |
| CLO 2 | Interpret results of commonly used inferential statistics |
| CLO 3 | Demonstrate ability to use statistical software in data analysis and problem solving |

**TOTAL STUDENT LEARNING TIME (SLT):**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SLT | Face to Face | | | | | | | | Non-Face to Face | Total Student Learning Time (TSLT) |
| Physical | | | | Online/Technology mediated | | | |
| L | T | P | O | L | T | P | O | Independent Learning |  |
| L=Lecture  T=Tutorial  P-Practical  O=Others | 0 | 0 | 0 | 0 | 0 | 8 | 10 | 0 | 102 | 120 |

**ASSESSMENTS:**

In–course Assessment 100%

**MODULE COORDINATOR:** Dr Lwin Mie Aye

**ASSOCIATED LECTURERS: Assoc Prof Dr Aqil Mohammad Daher**

**Dr Lwin Mie Aye**

**SYLLABUS:**

**Unit 1: Descriptive Statistics**

* 1. **Introduction and Types of Biomedical Data/Describing Data** *(Lecture – ?min)*

1. LO1: Describe the basic concepts and terminology of biostatistics.
2. LO2: Define the terminology of biostatistics.
3. LO3: Explain the different type of variables, type of data and measurement scales used in research.
   1. **Descriptive Statistics** *(Guided Learning – ?min)*
4. LO1: Identify an appropriate method of presenting data in graphs and tables.
5. LO2: Describe the data using appropriate descriptive statistics.
   1. **Introduction of SPSS** *(Practical – ?min)*
6. LO1: Create data entry sheet.
7. LO2: Transform the data in SPSS.
8. LO3: Perform the descriptive data analysis using SPSS.
   1. **Data Presentation and Descriptive Statistics** *(Tutorial – ?min)*
9. LO1: Construct the appropriate diagrams from the given type of data.
10. LO2: Describe the diagrams and tables and interpret the content.
11. LO3: Calculate and interpret the mean, median and mode.
12. LO4: Calculate and interpret the variance, standard deviation, coefficient of variation, ranges and quartiles.

**Unit 2: Probability**

* 1. **Probability Concept** *(Lecture – ?min)*

1. LO1: Describe the basic concepts in probability.
2. LO2: Apply the operation of additive and multiplicative laws of probability in medicine.
3. LO3: Calculate probability of random variable.
   1. **Probability Distribution – Normal Distribution** *(Lecture – ?min)*
4. LO1: Describe characteristics of different probability distribution.
5. LO2: Apply standard normal distribution table to find the probability.
6. LO3: Apply binomial distribution table to find the probability.
   1. **Population, Sample & Sampling** *(Tutorial – ?min)*
7. LO1: Define population, samples and sampling method.
8. LO2: Determine the relevant sampling technique.
9. LO3: Identify advantages and disadvantages of each sampling technique.

**Unit 3: Estimation**

* 1. **Confidence Interval** *(Lecture – ?min)*

1. LO1: Explain basic terminology in estimation (sampling distribution, standard error of mean).
2. LO2: Describe basic components of confidence interval and their derivation.
3. LO3: Calculate and interpret confidence interval.
   1. **Probability & Probability Distribution - Confidence Interval** *(Tutorial – ?min)*
4. LO1: Compute and interpret probability of an event.
5. LO2: Calculate probability of random variable using probability distribution.
6. LO3: Calculate and interpret confidence interval with different confidence limit.

**Unit 4: Hypothesis Testing I**

* 1. **Hypothesis Testing – Quantitative Data I- t tests** *(Lecture – ?min)*

1. LO1: Explain the concepts of z-test and t-tests in comparing means.
2. LO2: Identify the different types of t-tests to compare means.
3. LO3: Discuss the steps involved in hypothesis testing using t-tests.
   1. **Hypothesis Testing – Quantitative Data II - ANOVA** *(Guided Learning – ?min)*
4. LO1: Explain the concept of ANOVA test.
5. LO2: Discuss the steps involved in hypothesis testing using ANOVA.
   1. **Hypothesis for Quantitative Data** *(Practical – ?min)*
6. LO1: Develop the appropriate hypothesis for the quantitative data.
7. LO2: Calculate the different types of t-tests and ANOVA using SPSS or test formula.
8. LO3: Interpret the test statistics and make conclusion.

**Unit 5: Hypothesis Testing II**

* 1. **Hypothesis testing - Qualitative data - Chisquare test, McNemar test** *(Guided Learning – ?min)*

1. LO1: Explain the concepts of Chisquare tests and McNemar test.
2. LO2: Analyse the relationship between variables in contingency table.
3. LO3: Discuss the steps involved in hypothesis testing for comparing the proportions.
   1. **Hypothesis Testing for Qualitative Data** *(Practical – ?min)*
4. LO1: Develop the appropriate hypothesis for the different type of qualitative data.
5. LO2: Calculate the chi-square test using SPSS or test formula.
6. LO3: Interpret the test statistics and make conclusion.

**Unit 6: Hypothesis Testing III**

* 1. **Simple Correlation and Regression** *(Lecture – ?min)*

1. LO1: Describe the concept of correlation and regression.
2. LO2: Calculate and interpret correlation and regression statistics.
3. LO3: Discuss the assumptions of correlation and regression analysis.
   1. **Logistic Regression** *(Lecture – ?min)*
4. LO1: Describe the application of simple logistic regression model.
5. LO2: Explain steps in fitting simple logistic regression model.
6. LO3: Interpret results of simple logistic regression model.
   1. **Correlation and Regression** *(Practical – ?min)*
7. LO1: Interpret scatter plot.
8. LO2: Calculate correlation and regression coefficient.
9. LO3: Test assumptions of correlation and regression analysis.

**Unit 7: Sample Size**

* 1. **Sample Size Calculation** *(Lecture – ?min)*

1. LO1: Determine prerequisites for sample size calculation.
2. LO2: Explain the relationship between parameters used in sample size calculation.
3. LO3: Discuss the importance of sample size calculation in research.
   1. **Sample Size Calculation** *(Tutorial – ?min)*
4. LO1: Calculate sample size for numerical variable.
5. LO2: Calculate sample size for categorical variable.
6. LO3: Apply software in calculating sample size.

**Unit 8: Multivariate Analysis**

* 1. **Multivariate analysis: Multiple Logistic and Linear Regression** *(Lecture – ?min)*

1. LO1: Develop appropriate multiple regression model according to type of data.
2. LO2: Explain steps in fitting multiple regression model.
3. LO3: Describe the assumption of multiple regression analysis.
   1. **Multivariate analysis: Multiple Logistic and Linear Regression** *(Practical – ?min)*
4. LO1: Perform data screening and cleaning.
5. LO2: Transform scale of measurement.
6. LO3: Perform and interpret multiple regression analysis.
7. LO4: Present the results in suitable tables.

**References**

**Main Textbooks**

1. David B. Medical Statistics from Scratch. 3rd Edition. Wiley Blackwell. 2014
2. Ronald NF, Eun SL, Mike H. Biostatistics: A Guide to Design, Analysis, and Discovery. 2nd Edition. Elsevier Science & Technology. 2006
3. Betty RK. Jonathan ACS. Essential Medical Statistics. 2nd edition. John Wiley and Sons. 2003.
4. John ML. Biostatistical methods: the assessment of relative risks. 2nd Edition. Wiley. 2011
5. Douglas CM, Elizabeth AP. Feoffrey VG. Introduction to linear regression analysis. 5th Edition. Wiley. 2012

**Supplementary Reading Materials**

1. Daly L, Bourke GJ. Interpretation and Uses of Medical Statistics. 5th Edition. Blackwell 2000
2. Kirkwood BR, Sterne JAC. Essential Medical Statistics. 2nd Edition. Blackwell. 2003
3. Lachin JM. Biostatistical Methods: The Assessment of Relative Risk. 2nd Edition. Wiley. 2011
4. Montgomery DC, Peck EA, Vining GG. Introduction to Linear Regression Analysis. 5th Edition. Wiley. 2012

**RECOMMENDED TIMELINE TO COMPLETE THE MODULE**

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| --- | --- | --- | --- |
| **UNIT** | **SUBUNIT** | **Topic** | **Week** |
| **Unit 1:**  **Descriptive Statistics** | 1.1 | Lecture: Introduction and Types of Biomedical Data/Describing Data | 3 |
| 1.2 | Guided Learning: Descriptive Statistics | 3 |
| 1.3 | Practical: Introduction to SPSS | 4 |
| 1.4 | Tutorial: Data Presentation/Descriptive Statistics (Formative Assessment) | 4 |
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| **Unit 2:**  **Probability** | 2.1 | Lecture: Probability Concept | 4 |
| 2.2 | Lecture: Probability Distribution – Normal Distribution | 5 |
| 2.3 | Tutorial: Population, Sample & Sampling | 5 |
|  | Summative Assessment I | 5 |
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| **Unit 3:**  **Estimation** | 3.1 | Lecture: Confidence Interval | 5 |
| 3.2 | Tutorial: Probability Distribution – Confidence Interval (Formative Assessment) | 6 |
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| **Unit 4:**  **Hypothesis Testing 1** | 4.1 | Lecture: Hypothesis Testing – Quantitative Data 1 – t-tests | 6 |
| 4.2 | Guided Learning: Hypothesis Testing – Quantitative Data 2 - ANOVA | 6 |
| 4.3 | Practical: Hypothesis Testing for Quantitative Data | 6 |
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| **Unit 5:**  **Hypothesis Testing 2** | 5.1 | Guided: Hypothesis testing - Qualitative data - Chi-square test, McNemar test | 7 |
| 5.2 | Practical: Hypothesis testing for qualitative data | 7 |
|  | Summative Assessment II | 7 |
|  |  |  |  |
| **Unit 6:**  **Hypothesis Testing 3** | 6.1 | Lecture: Simple Correlation and Regression | 7 |
| 6.2 | Lecture: Logistic Regression | 8 |
| 6.3 | Practical: Correlation and Regression | 8 |
|  |  |  |  |
| **Unit 7:**  **Sample Size** | 7.1 | Lecture: Sample Size Calculation | 9 |
| 7.2 | Tutorial: Sample Size Calculation (Formative Assessment) | 9 |
|  |  |  |  |
| **Unit 8:**  **Multivariate Analysis** | 8.1 | Lecture: Multivariate analysis: Multiple Logistic and Linear Regression | 9 |
| 8.2 | Practical: Data Management and Transformation using SPSS-Multiple Regression | 10 |
|  | Summative Assessment III | 10 |