Semester: III

Core Course

11. Course Code & Title: MPC 53 02 & Advanced Biostatistics

Credit - 2

Brief description:

Advanced Biostatistics (MPC 53 02) is the second bio-statistics course offered as a core course as part of MPH curriculum at Department of Public Health and Community Medicine, Central University of Kerala. The course takes on from where its predecessor (Basic Biostatistics) has left. The 2 credit course is divided in to 3 modules providing the students with a detailed understanding of the non-parametric tests, regression methods and tools used in quantitative tool development. The students attending this course are expected to have completed basic biostatistics course with an acceptable level of understanding of basics of biostatistics and parametric bivariate and multivariate methods (at least up to one way ANOVA).

Course Objectives:

1) To impart the essential quantitative data analysis skills to the Master of public health students.
2) To enable students, understand the application of advanced data analysis methods in analysing quantitative data
3) To provide hands on training to the students in analysing health data by application of advanced statistical methods.

Skills Developed:

On successful completion of the course the students will be skilled at applying multivariate data analysis procedures (linear and logistic regression), assessing reliability and validity of tools and use of non-parametric statistical tests. The students will also develop working level skill in SPSS.

Modules	Section	Topic	Contents
1(Non-Parametric Tests)	**Non-Parametric Tests (one sample)**	Kolmogrov-Smirnov Test Sign Test	- Assumptions of the Tests - Outlining Null/alternate hypothesis - Performing the tests/computing test statistic

		Wilcoxon signed rank test	- Hypothesis testing and interpretation
	Non-Parametric Tests (Two Sample)	Sign test for two samples Median Test Wilcoxon Signed Rank Test (two samples) Wilcoxon-Mann-Whitney U-test	- Assumptions of the Tests - Outlining Null/alternate hypothesis - Performing the tests/computing test statistic - Hypothesis testing and interpretation
	Non-Parametric Tests (K-Sample)	Median test for K-samples Kruskal-Wallis K sample test Friedman's Test for RBD	- Assumptions of the Tests - Outlining Null/alternate hypothesis - Performing the tests/computing test statistic - Hypothesis testing and interpretation
	Linear Regression	Simple linear regression Multiple linear regression	- Mathematical basis for linear regression - Assumptions and requirements of linear regression - Regression line and regression equation - Computing Regression coefficients (β_0 and β_1) - Conducting linear regression using SPSS - Interpretation of regression coefficients - Interpretation of SPSS output for linear regression (interpretation of r^2, standard errors, calculation of confidence intervals for beta coefficients)

2 (Regression Analysis)	**Logistic Regression**	Binary logistic regression	- Mathematical basis for binary logistic regression (probability, odds, odds ratio, natural log, anti-log) - Sigmoid curve and its prominence in predicting a binary dependent variable. - Assumptions of Binary logistic regression - Performing Binary logistic regression using SPSS - Interpretation of the results of Binary Logistic regression (interpretation of ODDs, Calculation of probability of outcome variable etc.)
		Multi nominal logistic regression	- Mathematical basis for Multi nominal logistic regression - Assumptions of logistic regression - Performing multi nominal logistic regression using SPSS - Interpretation of the results of Multi nominal logistic regression
3(Statistical Procedures in quantitative Tool Development)	**Test(s) for internal reliability**	**Cronbach's Alpha**	- Introduction to Cronbach's alpha - Statistical basis for cronbach's alpha (including assumptions and sample size required) - Manual computation of Cronbach's alpha - Computing Cronbach's alpha using SPSS - Interpretation of Cronbach's alpha.
	Factor Analysis	**Exploratory factor analysis**	- Introduction to factor analysis (basic uses and methods - Basic Assumptions and Procedural Guidelines - Procedure for conducting Factor Analysis - Interpretation and reporting the results of factor analysis
		Confirmatory factor analysis	

Books:

1) Daniel and Cross. (2013). *Biostatistics a Foundation for Analysis in Health Sciences.* 10th Edition. WILEY publications.
2) Manju Pandey. (2015). *Biostatistics: basics and advanced*. MV Learning. ISBN: 978-81-309-2753-4
3) Good, P., & Hardin, J. (2003). Common errors in statistics (and how to avoid them). John Wiely & Sons.

Weblinks:

1) https://people.exeter.ac.uk/SEGLea/multvar2/pathanal.html

2) http://www.statsoft.com/Textbook

3) https://www.researchgate.net/profile/Keith_Widaman/publication/232585482_Factor_Analysis_in_the_Development_and_Refinement_of_Clinical_Assessment_Instruments/links/00463521bc1179a08c000000/Factor-Analysis-in-the-Development-and-Refinement-of-Clinical-Assessment-Instruments.pdf

4) https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/