Semester: I

Core Course

3. Course Code & Title: MPC-51 03 & Basic Biostatistics

Credits: 4

Course objectives:

The objectives of this course are:

1. To provide an introduction to the common concepts of Biostatistics applied in public health.
2. To introduce the MPH students to univariate, bivariate and multivariate statistical procedures
3. To provide hands on experience to MPH students in cleaning, preparing and analyzing statistical data
4. To develop the competencies among the students to make statistical inferences
5. To enable the MPH students use SPSS package to
    - Enter, clean and prepare statistical data for analysis
    - Conduct selected univariate, bivariate and multi-variate statistical procedures

Course outcomes:

On successful completion of the course, students will be able to

1. Understand the numerical statistical data and develop a detailed data analysis plan.
2. Enter and clean the data and conduct statistical analysis using Statistical Package for Social Sciences (SPSS)

3. Draw inferences from the statistical results and discuss on their generalizability.

Skills developed:

On successful completion of the course the student shall be able to manifest quantitative data analysis skills and ability to use univariate, bivariate and multivariate statistical procedure. The students shall also be skilled at using SPSS in statistical analysis. These skills could improve employability of MPH graduates.

Teaching methods: This course will be delivered using a variety of teaching methods which include (but not limited to) classroom lectures, online classes, webinar's, assignments, field work and group work. Additionally, practical training of SPSS will be provided for relevant modules.

Units and Topics	Teaching Methods								Mandatory Readings
Unit-I: Introduction to biostatistics ad its application in public health									
	L	FW	FV	CS	GW	SS	SP	P	
1.1 Scope and application of biostatistics in public health	X								Ahlbom, A. (1993). Biostatistics for epidemiologists. CRC Press.
1.2 Probability theory	X								
1.3 Commonly used distributions in biostatistics - normal distribution	X								

- binomial distribution - passion distribution									Greasley, P. (2007). *Quantitative data analysis using SPSS: an introduction for health & social science*. McGraw-Hill Education (UK).
1.4 Variable, variable types and its prominence in statistical analysis.	**X**							**X**	
Unit-II: Statistical inference ad hypothesis testing									
2.1 Statistical inference	**X**								Ahlbom, A. (1993). Biostatistics for epidemiologists. CRC Press.
2.2 p-value & statistical significance	**X**							**X**	
2.3. Confidence interval and confidence level	**X**							**X**	Du Prel, J. B., Hommel, G., Röhrig, B., & Blettner, M. (2009). Confidence interval or p-value? Part 4 of a series on evaluation of scientific publications. *Deutsches Ärzteblatt International*, *106*(19), 335.
2.4 Hypothesis testing	**X**								
Unit-III: Univariate statistics									
3.1 Measures of central tendency	**X**							**X**	Gertsman, B. B. (2015). Basic Biostatistics: Statistics for public health practice. Burlington, MA.
3.1 Measures of dispersion	**X**							**X**	Glasser, G. J. (1962). Variance formulas for the mean difference and coefficient of concentration. *Journal of the American Statistical Association*, *57*(299), 648-654.
3.3 Prevalence and incidence measures	**X**								Ahlbom, A. (1993). Biostatistics for epidemiologists. CRC Press.

3.4 Non-parametric tests for single sample	**X**								Gertsman, B. B. (2015). Basic Biostatistics: Statistics for public health practice. Burlington, MA.
Unit-IV: Bivariate statistics									
4.1 Measures ad methods commonly used in bivariate analysis	**X**								
4.3 t- test	**X**							**X**	Kim, T. K. (2015). T test as a parametric statistic. *Korean journal of anesthesiology*, *68*(6), 540.
4.4 Correlation analysis	**X**							**X**	Greasley, P. (2007). *Quantitative data analysis using SPSS: an introduction for health & social science*. McGraw-Hill Education (UK).
4.5 Chi-squared tests and Fischer's exact test	**X**				**X**			**X**	Gertsman, B. B. (2015). Basic Biostatistics: Statistics for public health practice. Burlington, MA.
4.6 Non-parametric tests for two sample	**X**							**X**	
UNIT-V: Multivariate statistics									
5.1 Introduction to multivariate statistical approaches	**X**								Gertsman, B. B. (2015). Basic Biostatistics: Statistics for public health practice. Burlington, MA.
5.2 Analysis of Variance (ANOVA)	**X**								
5.3 Linear regression analysis	**X**					**X**		**X**	Schneider, A., Hommel, G., & Blettner, M. (2010). Linear regression analysis: part 14 of a series on evaluation of scientific publications. *Deutsches Ärzteblatt International*, *107*(44), 776.
5.4 Logistic regression	**X**					**X**		**X**	
5.5 Non-parametric tests for three/more sample	**X**							**X**	Gertsman, B. B. (2015). Basic Biostatistics: Statistics for public health practice. Burlington, MA

Unit-VI: Sample size estimation									
6.1 Basic principles of sample size calculation	**X**								Devane, D., Begley, C. M., & Clarke, M. (2004). How many do I need? Basic principles of sample size estimation. *Journal of Advanced Nursing*, *47*(3), 297-302.
6.2 Sample size estimation in public health research	**X**								Charan, J., & Biswas, T. (2013). How to calculate sample size for different study designs in medical research? *Indian journal of psychological medicine*, *35*(2), 121. Röhrig, B., du Prel, J. B., Wachtlin, D., Kwiecien, R., & Blettner, M. (2010). Sample size calculation in clinical trials: part 13 of a series on evaluation of scientific publications. Deutsches Ärzteblatt International, 107(31-32). Hajian-Tilaki, Karimollah. "Sample size estimation in epidemiologic studies." *Caspian journal of internal medicine* 2, no. 4 (2011): 289.
1.1 Internet tools for sample size calculation (overview of OpenEpi)	X					X		X	Website: https://www.openepi.com/Menu/OE_Menu.htm
Unit-VII: Data preparation, data cleaning and data presentation									
7.1 Data preparation and data cleaning	X							X	

7.2 Presenting statistical data using tables and figures	X								Spriestersbach, A., Röhrig, B., Du Prel, J. B., Gerhold-Ay, A., & Blettner, M. (2009). Descriptive statistics: The specification of statistical measures and their presentation in tables and graphs. Part 7 of a series on evaluation of scientific publications. Deutsches Ärzteblatt International, 106(36), 578.

L- Lecture; FW- Field work; FV - Field Visit; CS - Case study; GW- Group work; SS- Self-study; SP- Seminar presentation; P-Practical

Evaluation: As per CBCS guidelines, this course will be evaluated for 100 marks with a Continuous Evaluation (CA) component of 40 marks and End-Semester Evaluation (ESA) component of 60 marks. CA would be conducted through Examinations, Assignments and Presentations.

Additional Readings

1) Landau, S. (2004). *A handbook of statistical analyses using SPSS*. CRC.

2) Blanca, M. J., Alarcón, R., Arnau, J., Bono, R., & Bendayan, R. (2017). Non-normal data: Is ANOVA still a valid option? Psicothema, 29(4), 552-557.

3) Barton, B., & Peat, J. (2014). Medical statistics: A guide to SPSS, data analysis and critical appraisal. John Wiley & Sons.

4) Starkweather, J., & Moske, A. K. (2011). Multinomial logistic regression. *Consulted page at September 10th: http://www. unt. edu/rss/class/Jon/Benchmarks/MLR_JDS_Aug2011. pdf*, *29*, 2825-2830.

5) Glasser, M. (1964). Linear regression analysis with missing observations among the independent variables. *Journal of the American Statistical Association*, *59*(307), 834-844.

6) Chao, Y. C. E., Zhao, Y., Kupper, L. L., & Nylander-French, L. A. (2008). Quantifying the relative importance of predictors in multiple linear regression analyses for public health studies. Journal of occupational and environmental hygiene, 5(8), 519-529.

7) Victor, A., Elsäßer, A., Hommel, G., & Blettner, M. (2010). Judging a plethora of p-values: how to contend with the problem of multiple testing-part 10 of a series on evaluation of scientific publications. Deutsches Arzteblatt International, 107(4).