NeTReF

BASIC BIOSTATISTICS & RESEARCH DESIGN BOOTCAMP

When: Mondays, September 28, 2020 to January 25, 2021 from 4:30-6pm (excluding holidays; refer to Fall 2020 and Winter 2021 schedule included below)

Where: By Zoom: Instructions to follow; it's easy.

Who Can Participate?

This is a free course for VA-BUSM-HMS NeTReF fellows; research assistants and coordinators, post-docs, residents, VABHS employees not yet appointed faculty, and VA-BUSM-HMS faculty.

Who's Teaching?

Jennifer Fonda, Ph.D., Assistant Professor of Psychiatry, BUSM; Lecturer of Psychiatry, HMS
Francesca Fortenbaugh, Ph.D., Instructor of Psychiatry, HMS

How to Register and for Questions: Email *everyone* listed below, including Drs. Fonda, Fortenbaugh and Rasmusson (there is no registration form required)

A) Email Jennifer.Fonda@va.gov and jfonda@bu.edu
B) Email Francesca.Fortenbaugh@va.gov and francescafortenbaugh@gmail.com
C) Email Ann.Rasmusson@va.gov and ann.rasmusson@gmail.com

Content

This 14-week course will include weekly lecture and lab components. The course will meet once a week for 90 minutes. The goal of the course is to ensure that researchers from medical backgrounds or other employees new to the fields of biomedical research and statistics have the opportunity to gain proficiency in standard analytic and research methods. This will include descriptive analyses and group-level categorical analyses up to linear and logistic regression. Research methods will cover standard experimental designs and limitations, issues related to sample characteristics, measurements (including features pertinent to data from biological samples or specific technologies), as well as critical reading and writing skills for empirical papers.

Coming Spring 2021: Advanced Statistics & Research Methods Seminar This 10 to 15-week seminar series builds on the previous course (Basic Biostatistics & Research Design Bootcamp) while encouraging greater communication and possible collaboration among experts across the VABHS campus and affiliated academic institutions. The seminar aims to include multiple learning formats including: 1) Didactic/lecture classes covering advanced statistical techniques led by researchers who actually employ these methods in their own research projects; 2) Journal club presentations to discuss/learn about recent advances and novel applications of analytic techniques in biomedical research (e.g., machine learning); 3) Community/class member presentations of research ideas or datasets and analyses for feedback.

Biostatistics and Research Methods Bootcamp
Fall 2020 Schedule

Date	Topics

9/28	• Broad goals of seminar series
	• Introductory Concepts
	  ○ Components of a research study
	  ○ Population versus Sample
	  ○ Descriptive versus Inferential statistics
	  ○ Independent versus Dependent variables
	  ○ Distributions of data
	  ○ Measures of central tendency
	  ○ Measures of variability

10/5	• Normal Distribution
	  ○ Z-statistic is calculated from a sample which is drawn from a normal distribution
	• T-distribution
	  ○ t-statistics is calculated from a sample which is drawn from Student's t-distribution
	• Confidence Intervals
	  ○ Confidence interval of a mean value using normal distribution or t-distribution
	
	<u>SPSS Lab</u>:
	• Overview of SPSS

10/12	***HOLIDAY – NO CLASS***

10/19	• Hypothesis Testing
	• Type I and Type II Errors
	• One-Sample Test of Means
	  ○ One-Sample t-test or z-test
	  ○ Interpret the results
	• Two-Sample Test of Means
	  ○ Two-Sample t-test or z-test
	  ○ Interpret the results
	
	<u>SPSS Lab</u>:
	• One-Sample t-test or z-test
	• Two-Sample t-test or z-test

10/26	• One-Way ANOVA
	  ○ Assumptions
	  ○ F-test
	  ○ Multiple comparisons
	  ○ Interpret the results
	
	<u>SPSS Lab</u>:
	• One-Way ANOVA
	• Multiple Comparisons

Date	Topics

11/2	• Paired t-test
	  ○ Paired-Sample t-test or z-test
	  ○ Interpret the result
	• Repeated Measures ANOVA
	  ○ Assumptions
	  ○ F-test
	  ○ Interpret the results
	
	<u>SPSS Lab</u>:
	• Paired t-test
	• Repeated Measures ANOVA

11/9	• Nonparametric Statistics—Two Independent Sample
	  ○ Wilcoxon Rank Sum Test
	  ○ Mann-Whitney U Test
	  ○ Comparison to Two-Sample t-test
	  ○ Interpret the result
	• Nonparametric Statistics—Paired Data
	  ○ Sign Test and Signed Rank Test
	  ○ Comparison to Paired t-test
	  ○ Interpret the results
	
	<u>SPSS Lab</u>:
	• Wilcoxon Rank Sum Test
	• Mann-Whitney U Test
	• Sign Test and Signed Rank Test

11/16	• Correlation
	  ○ Pearson correlation and Spearman correlation
	  ○ Difference between Pearson and Spearman correlation
	  ○ Show the correlation in a scatter plot
	  ○ Interpret the result
	
	<u>SPSS Lab</u>:
	• Pearson's and Spearman's correlation
	• Scatterplot

11/23	• Linear Regression
	  ○ Assumptions
	  ○ Fitting the regression model
	  ○ Intercept and slope
	  ○ Interpret the result
	
	<u>SPSS Lab</u>:
	• Plotting regression data
	• Linear regression

Date	Topics

11/30	• Analysis of Categorical Data
	  ○ Cross-tabulation (2x2 table)
	  ○ Assumptions
	  ○ Parameter estimates
	  ▪ Probabilities
	  ▪ Odds
	  ▪ Effect Measures
	  ○ Chi-Square tests
	  ○ Fisher's exact test
	  ○ Extension of 2x2 table
	  ○ Interpret the results
	
	<u>SPSS Lab</u>:
	• Cross-tabulation
	• Chi-square tests
	• Fisher's exact test

12/7	• Logistic Regression
	  ○ Assumptions
	  ○ Fitting the regression model
	  ○ Intercept and slope
	  ○ Interpret the result
	
	<u>SPSS Lab</u>:
	• Logistic regression

12/14	• ANCOVA • Multiple Linear Regression ○ Standardized regression coefficients • Multiple Logistic Regression <u>SPSS Lab</u>: • ANCOVA • Multiple Linear Regression • Multiple Logistic Regression
12/21	*HOLIDAY BREAK – NO CLASS*
12/28	*HOLIDAY BREAK – NO CLASS*

Biostatistics and Research Methods Bootcamp
Winter 2021 Schedule

Date	Topics

1/4	• Types of Study Designs
	  ○ Ecologic
	  ○ Cross-sectional
	  ○ Cohort, including Randomized Control Trials
	  ○ Case-Control Studies

1/11	• Confounding
	  ○ Assess whether confounding is present in a particular study and characterize the direction of confounding
	  ○ Describe ways to control confounding in the analysis and design of the study
	  ○ Describe residual confounding
	• Effect Modification
	  ○ Describe effect modification
	  ○ Perform a stratified analysis to identify whether there is effect modification
	  ○ Determine whether there is effect modification, confounding or both

1/18	***HOLIDAY – NO CLASS***

1/25	• Selection Bias
	  ○ Describe selection bias
	  ○ Identify whether selection is present in a given study
	• Misclassification Bias
	  ○ Describe differential and non-differential misclassification of predictor (independent variable) and outcome (dependent variable)
	  ○ Identify whether and what type of misclassification bias is present in a study