Applied Healthcare Quality Improvement Analytics - Fundamentals

Syllabus

Training Objective
The primary objective of the training program is to increase the knowledge and skills of the hospital quality analyst in a manner that notably enhances the organization’s quality improvement initiatives by facilitating decision making based on sound data analysis.

Participants will acquire the following knowledge and skills:
- Develop an effective data analysis plan
- Perform data management operations to produce an analytic data set
- Understand the fundamental concept of confidence intervals and how to apply them
- Understand the fundamental concepts of hypothesis testing and effectively conduct hypothesis testing using the following techniques:
  - t-test, Robust t-test, Mann-Whitney test
  - One-Way Analysis of Variance, Robust One-Way Analysis of Variance, Kruskall-Wallis test
  - Pearson and Spearman correlation coefficients
  - Chi-Squared test
- Appropriately interpret the analytic results in a manner that facilitates decision making
- Develop a working familiarity with the statistical software package R

Training Topics
- Introduction to Healthcare Data Analysis
- Data Analysis Planning
- Data Management
- Confidence Intervals
- Hypothesis Testing
- Analyzing Averages
- Correlation Analysis
- Analyzing Proportions
- Non-Parametric Methods

Training Topic Description

Introduction to Healthcare Quality Improvement Analysis
This session will provide participants an overview of the field of data analytics and its critical role in healthcare quality improvement

Data Analysis Planning
This session will cover the fundamental steps required to conduct effective data analytics starting with formulating the question(s) to be answered through interpretation and communication of analytic results. A well constructed data analysis plan goes hand-in-hand with conducting effective data analysis.
Data Management

Prior to conducting any data analysis, the data will need to be acquired from disparate data sources and combined into a common data set. We will discuss data sources, data dictionaries and data integration. Subsequently, the data require screening and cleaning to ensure the data is suitable for analysis. This session provides the participants with the skills necessary to produce the analytic data set suitable for analysis.

Confidence Intervals

This session will review the fundamental concept of confidence intervals and how they can be effectively applied in the healthcare setting. Topics covered include: sampling, population parameters, precision of estimates and practical application of confidence intervals.

Hypothesis Testing

The foundation of statistical data analysis is hypothesis testing. In this session the participants will gain an understanding of what a hypothesis test is and how it is utilized to answer the question formulated in the data analysis planning phase. Topics covered include: the null and alternate hypothesis; the sample; the population and the p-value.

Analyzing Averages

After learning about hypothesis testing participants will conduct analysis to determine if average values of important variables are different among two or more groups. Topics covered include: assessing normality and homogeneity of variance; t-test; one-way analysis of variance; identifying and handling outliers; robust t-test, robust one-way analysis of variance. Practical applications to healthcare will be covered through examples and class exercises.

Correlation Analysis

Participants will learn how to assess the linear relationship between two continuous variables. Topics covered include: Pearson and Spearman correlation coefficients as well as LOESS curves.

Analyzing Proportions

Participants will conduct analysis to determine if proportion values of important variables are different among two or more groups. Topics covered include: the Chi-Squared test and converting continuous variables to categorical variables. Practical applications to healthcare will be covered through examples and class exercises.

Non-Parametric Methods

There are times when the data being analyzed does not meet the requirements of parametric methods such as the t-test or one-way analysis of variance. In these instances non-parametric methods can be utilized. Topics covered include: data transformations, Mann-Whitney test, Kruskall-Wallis test.
Capstone Project

Project Overview
The capstone project ensures that the participants apply what they learn in their workplace setting: Thereby facilitating learning through active learning and providing tangible organizational value of the training experience.

During the course of the program each student is required to complete and present an analytics project that is relevant to their work situation. On the last class of the program each student will present their project to the class. Each participant should come to the program with a proposed analytics project.

Project Content
The project should entail analyzing data using any of the inferential analytical techniques taught in the program. Note that just producing descriptive statistics does not meet the intent of the project - one or more of the inferential techniques must also be utilized.

Project Topic
The analytical topic can be anything that is relevant to the participant's job. Ideally the analytics project pertains to a project the participant currently working on.

Project Presentation
The length of the presentation should not exceed ten minutes. The presentation format is a PowerPoint presentation.