# **Teacher Notes for Suicide in Veterans with PTSD**

## **Motivation and Essential Understandings**

Research has consistently shown that evidence-based assessment is necessary to inform evidence-based therapeutic interventions or treatment. Existing self-report measures tend to focus on either risk or protective factors for the assessment of military Veterans with a series of combat-related experiences. The MSRI-28 has the advantage of evaluating risk and protective factors simultaneously. This lesson will examine the contribution of evaluating the responses of groups of Veterans with a diagnosis of posttraumatic stress disorder (PTSD; DSM-5) between two groups: exposed to combat vs. not exposed.

* How do risk and protective factors correlate to suicide in military Veterans?

## **Context and Dataset**

Students will interpret trends for and form hypotheses using data from the **Multidimensional Suicide-related Response Inventory-28** (MSRI-28) published by Dr. Augustine Osman, Professor of Clinal Psychology, University of Texas at San Antonio. Students will document results as a summative project.

## **Learning Objectives**

Students will be able to:

## Describe methods of exploratory data analysis used in research

## Analyze hypotheses for data-related to risk and protective factors for PTSD

## Evaluate a predictive model to inform decision making for evidence-based assessment

## Describe methods of exploratory data analysis used in research

## **Data Science Concepts and Skills**

1. Summary statistics
2. Exploratory data analysis; Static and interactive data visualization
3. Data wrangling; data dictionary
4. Hypothesis testing
5. Predictive modeling with Decision tree; Random Forest

## **Students**

This lesson is for late undergraduate students. Students should be familiar with statistical concepts, basic data visualizations, and have worked in Excel. In addition, students will run models in notebooks coded in R.

## **Time to Teach this Lesson**

This lesson can be taught in 3 sessions along with TA assistance in running models in R

**First Week**: 1-hour prep, 2-hour class session; MRSI-28 dataset; hypothesis testing; review of Statistics

**Second Week**: 1-hour class session to review decision trees; guided work running models in R

**Third Week**: Review visualizations; summarize hypothesis; directions for incorporating work into final projects

## **Lesson Materials**

You will find all the lesson materials in the GenAI GitHub repository. The R notebook is not necessary to teach this lesson but is available to those who wish to teach more hands-on Data Science.

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| **Materials** | **File** | **Description** |
| Lecture 1 | Lecture\_Suicide\_in\_ Veterans\_with\_PTSD\_2020.ppt | PPT Lecture on PTSD |
| Lecture 2 | Instructor proprietary | PPT Lecture on Statistics |
| Dataset |  | Cleaned MSRI dataset |
| Data dictionary |  | pdf of data dictionary explaining the column headings (data fields) in the datasets |
| R notebook | RNotebook\_R\_Suicide\_in\_Veterans\_with\_PTSD\_2020 | R notebook |
| R notebook pdf | RNotebook\_pdf\_ Suicide\_in\_ Veterans\_with\_PTSD\_2020.pdf | pdf of annotated R notebook and instructions for running models |
| Template | Lesson\_Template\_ Suicide\_in\_ Veterans\_with\_PTSD\_2020.docx | Lesson planner with links to resources |

## **Teaching Strategies**

* Review concepts in Statistics such as descriptive stats, correlation, and hypothesis testing
* Pose **challenge questions** for engagement and allow students to interpret visualizations and hypothesize. Students may have difficulty limiting inferences to within the scope of the dataset, so discuss over-hypothesizing beyond the data.
* Discuss the difference between Inferential vs. Predictive modeling
* Provide worksheets for student practice using R Studio or R Studio Cloud and running models in notebooks

## **Lesson Narrative**

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| **Module 0: Pre-lesson** |

Ask students to read foundational articles on PTSD – diagnostic vs. self-reporting of symptoms. Review survey instruments and interpretation of correlations relating to risk and protective factors.

Review measures related to Protective Factors (3 scales) and Risk Factors (3 scales).

Review lessons on Inferential Statistics, hypothesis testing between 2, independent groups (Combat vs. Non-Combat Veterans).

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| **Module 1: Dataset and Exploratory Data Analysis** |

Using an existing data set (Chen et al. in press; Gutierrez et al., 2016), ask the students to examine the performances of the two groups on this new self-report measure, the MSRI-28. Scores on other risk and protective factors are also included in the proposed analyses.

Pose three hypotheses:

* H1: Veterans who have not been exposed to combat will be more likely to have a higher mean score on the MSRI-28 Family Connectedness scale than those who have been exposed to combat.
* H2: The relation between scores on the MSRI-28 Positive Self-Perception and the Reasons for Living Inventory will likely be higher for Veterans who have been exposed to combat than those who have not been exposed to combat.
* H3: There is an interaction effect between suicide ideation (BSSI) and problematic drinking (AUDIT) when considering veteran suicide attempts (regardless of combat group).

Illustrate **Descriptive Stats**: Boxplots, histograms, counts, means, and standard deviations of sample data; compare group means via Student t-test (independent).

Discuss Correlations: magnitude & directionality across and between combat groups.

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| **Module 2: Explain Predictive Modeling** | | |

Present and demonstrate two models for prediction.

* **Decision tree** (coding categorical variables, transformation, selection, information gain), data dictionary, accuracy; Demonstrate over-correlation – binary variable for suicide attempt; Confusion Matrix: Precision, Accuracy, Recall
* **Random Forest** as a sum of decisions to reduce overfit

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| **ASSIGNMENT:** Ask students to test hypothesis using standard t-tests; run the models in R notebooks and generate visualizations to understand prediction. Provide the students guidance on how to incorporate these findings into their final project reports. |

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| **Module 3: Close Out** |

Post-assessment questions.

* Using guidelines for interpreting correlations (i.e., magnitude and directionality) how are risk and protective factors are related?
* What are some of the limitations of using this dataset?