PTSD: A Data Driven

Approach

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ABSTRACT

1. INTRODUCTION

General Background

- PTSD, also known as shell shock or combat stress, tends to occur after an individual experiences severe trauma or a life-threatening event

- 70% of adults in the U.S. have experienced some type of traumatic event at least once in their lives. This equates to approximately 223.4 million people

- Although common treatments for PTSD include medications and different types of psychological interventions, there is a growing body of research questioning the effectiveness of these treatments

Gaps in the area of the research/project

- "there exists an important gap in trauma research because available research has made important contributions to understand risk factors for negative mental health consequences of traumatic stress exposure, the identification of characteristics associated with resilience to the impact of traumatic stress exposure could inform studies of preventive and treatment procedures for people with or at risk of trauma exposure" (John H. Krystala and Alexander Neumeister, 2009)

Problem statement

The key question to be answered is how patient data such as demographic factors, encounter details, a record of antidepressants etc, can be used to improve the quality of treatment for Post Traumatic Stress Disorder.

2. METHOD

Data Cleaning

A PTSD_Flag variable was added to indicate whether a patient got PTSD. Since PTSD is a rare disease, we assumed all patients in the general dataset didn't get PTSD and we assigned a value zero to the PTSD_Flag of this group of patients. And for PTSD_Flag of patients from the PTSD dataset, assigned a value of one. A BMI column was added using the height and weight variables. Some evident outlier rows were removed by impossible heart rate. All patients with a heart rate less than 40 or greater than 250 were removed. All NULL values in binary columns were replaced by zero for ease of future analysis. A new dataset containing Patient_sk, PTSD_Age, and a number of encounters for each symptom type (PTSD, depression, suicide action, anxiety, drug and alcohol abuse) was generated. A flag was added for each symptom type to represent whether a patient never experienced any of a symptom type.

Data Analysis

We firstly used neural nets and regression in SAS EM trees to predict the target variable, PTSD_Flag, with the application of imputation and variable selection. We then plotted demographic variables as a percentage of the total using the PTSD_Flag to see patterns in PTSD patients with the aid of Tableau. We also graphed PTSD_Age over time in comparison with each

type of symptom encounters in order to see the trend of PTSD systems overtime. In SAS EM, each of total symptom encounters from 2011-2015 was regressed with the antidepressant flags and number of psychology procedures as the explanatory variables. Since the data are oversampled, we applied a decision node in SAS EM to adjust for the estimated of PTSD in the population (3.6%).

3. RESULT / SOLUTION

PTSD should be rebranded to better represent those who suffer from it. Doctors should track patients PTSD symptoms severity over time. There appears to be a natural pattern of decreasing symptoms and therefore doctors could convey this information to their patients which might give the patients hope of improvement which could ,in turn, lead to a lessening of symptoms. It may also mean that doctors could focus more on the symptoms of depression that don't seem to naturally improve over time. Finally, it may help to better advise the use of hospital resources as doctors spend more time on sypmtoms that will be less likely to improve without intervention. Treatments other than antidepressants and psychological procedures should be further investigated temporarily. Also separating out which psychological treatment a patient receives would be useful since research shows that Eye movement desensitization and reprocessing might be more useful than other methods for treating PTSD.

4. DISCUSSION

When trying to predict PTSD, only demographic variables can be used. The best model for prediction was the decision tree. The positive response was 52% after running a model as opposed to 50% (best guess). The model ,however, did not do much better than chance.

Potentially because of too many missing values, imputation does improve the neural net but it leads to bias. However, if we look at the individual factors in Tableau, it is clear that demographic factors related to stress are associated with PTSD. The project mined unknown patterns from large-size datasets, which would be useful predicting the possibility of illness based on patients' symptoms. If one assumes the number of encounters is an operationalization of severity of symptoms one can see that anxiety, suicidal thoughts and drug and alcohol abuse decrease over time.

The implication of this finding is that doctors can expect that symptoms to alleviate over time and tell their PTSD patients that even though they are feeling bad right now some symptoms will naturally get better over time.

Depression doesn't appear to improve over time and PTSD related encounters do not either. There are two limitations to this finding, first being that the time PTSD was diagnosed may long after its onset. Second is that specific patients are not tracked over time, a max of five years is possible. Statistically significant antidepressants and the number of psychological treatments lead to an increase in the number encounters relating to each symptom. There could be selection bias and no way to conduct a temporal analysis. This suggests though that other drugs may need to be investigated as the efficacy of these drugs is questionable. The World Health Organization recommends against the use of antidepressants in those having experienced trauma.[4] Target users could be individuals who are experiencing life stressors such as poor financial condition or a bad relationship. It is necessary to negate the connotation that PTSD can affect mostly war victims. It is also observed to be significantly higher for females mainly in Midwest and NorthEast.

5. CONCLUSION

PTSD should be rebranded to remove the stigma that PTSD is only associated with the extreme stressors. PTSD might also be related to common life stressors. Doctors should track severity level of PTSD patients and inform them which will potentially aid in the improvement of symptoms. Treatments other than antidepressants and psychological procedures should be further investigated temporarily.

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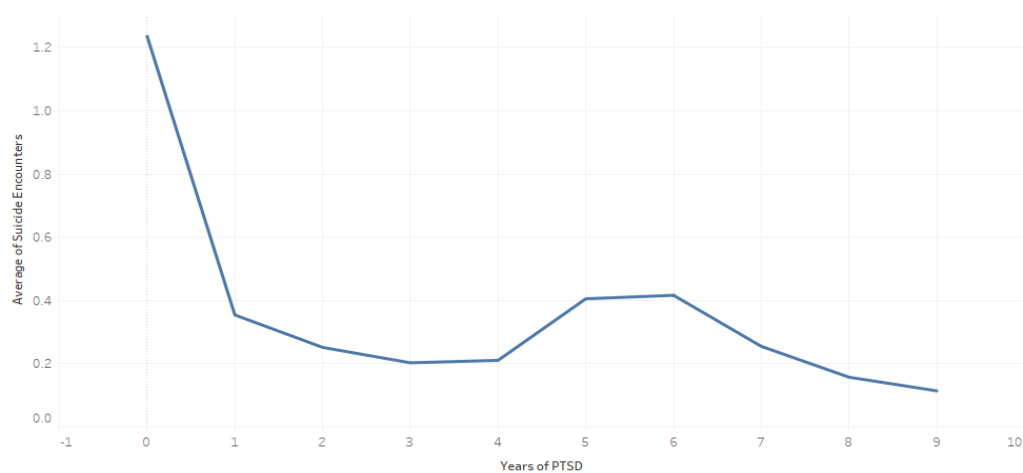https://www.sciencedirect.com/science/article/pii/S0006899309006064?via%3Dihub

Appendix / Supplement

Depression Encounters Over Years of PTSD
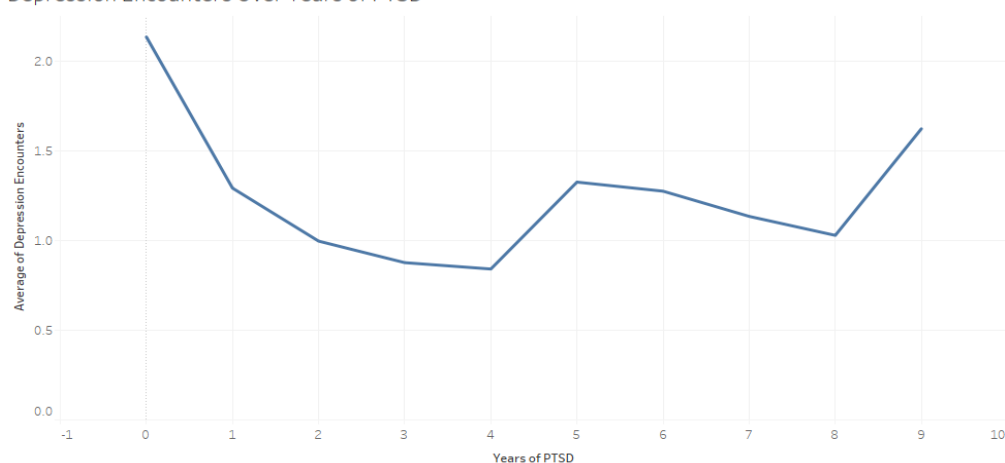
Suicide Encounters Over Years of PTSD

PTSD Encounters Over Years of PTSD
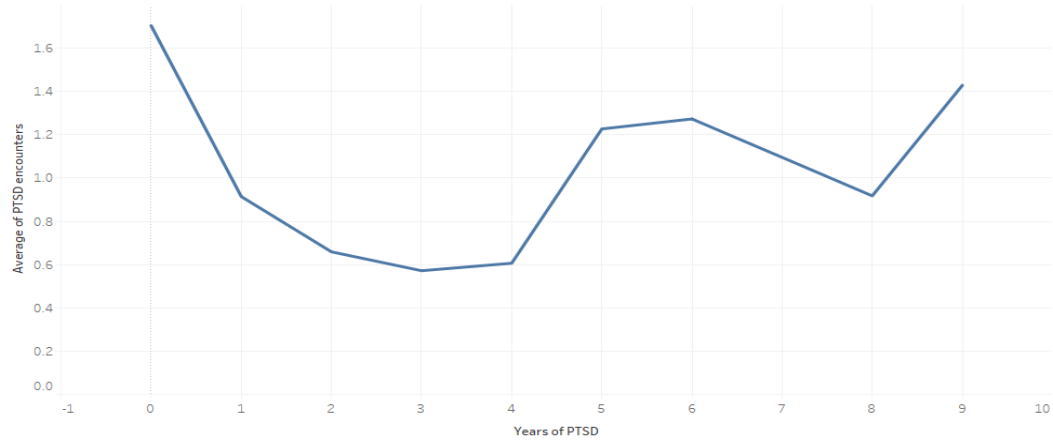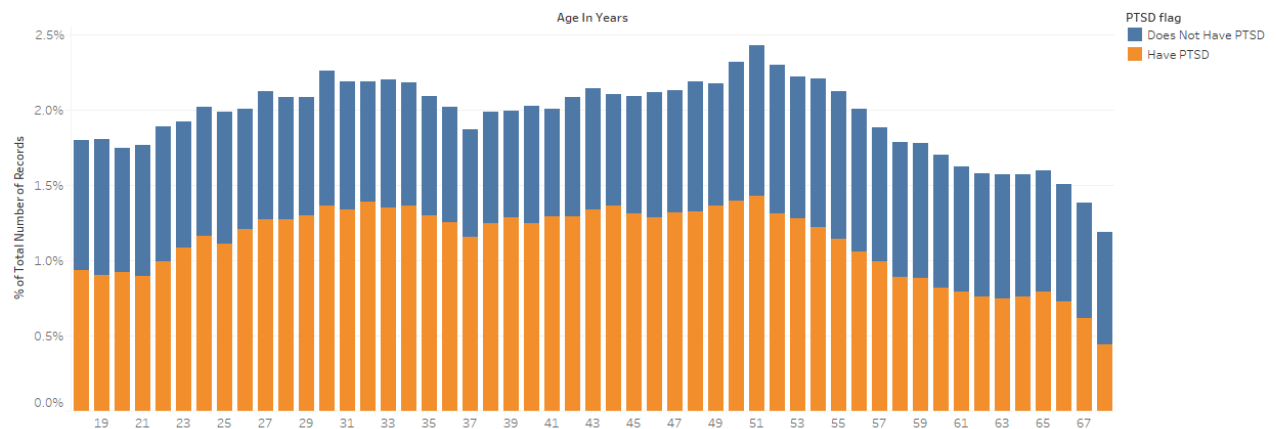

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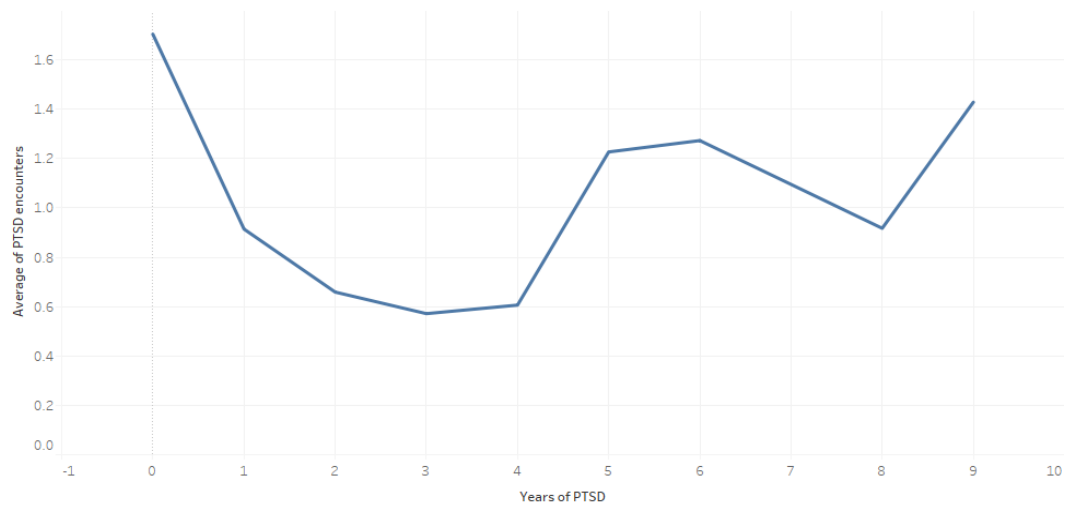
Age

Census Region By Gender

Census Region / Gender

| Midwest | Northeast | South | West |

PTSD flag
- Does Not Have PTSD
- Have PTSD