

# Undo the 22:

A novel approach for the  
predictive analysis of Veteran  
suicide and prevention

Original image URL: <http://stopsoldiersuicide.org/blog/>  
Title: Veteran

**Capstone Project**

Bryon Kent (Mentor: Jeff Lipkowitz)

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# Outline

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- Situation
  - Why study suicide?
  - Issues
  - Objectives
- Methods
  - Methodology
  - Model Building
- Results
  - Exploratory analysis
  - Model comparison
- What's Next
  - Implications for suicide prevention
  - Future studies



Original image URL:  
<http://www.bushcenter.org/publications/articles/2016/02/understanding-invisible-wounds-tbi.html>  
Title: Invisible Wounds

# Why study suicide?

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Original image URL:

<https://clipartfest.com/categories/view/923f0cc12579a2a7977d0529ee70ee7e4421a000/22-clipart.html>

Title: 22

# Issues

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- Data surrounding Veteran suicide
  - Self-reported Veteran status at time of death
  - Difficult to obtain
- Methodology used in some studies
  - Can result in misleading assumptions
  - Results can be counterintuitive
- Only able to make anecdotal observation
  - More work needs to be done!

# Objectives

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- Determine risk factors of suicide
- Build a predictive model for suicide
- Reduce incidence rate of suicide

# Methodology

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- Data came from
  - CDC
  - Census Bureau
  - Department of Education
  - Department of Veterans Affairs
- Used to examine
  - Age
  - Education
  - Race
  - Marital Status
  - Sex



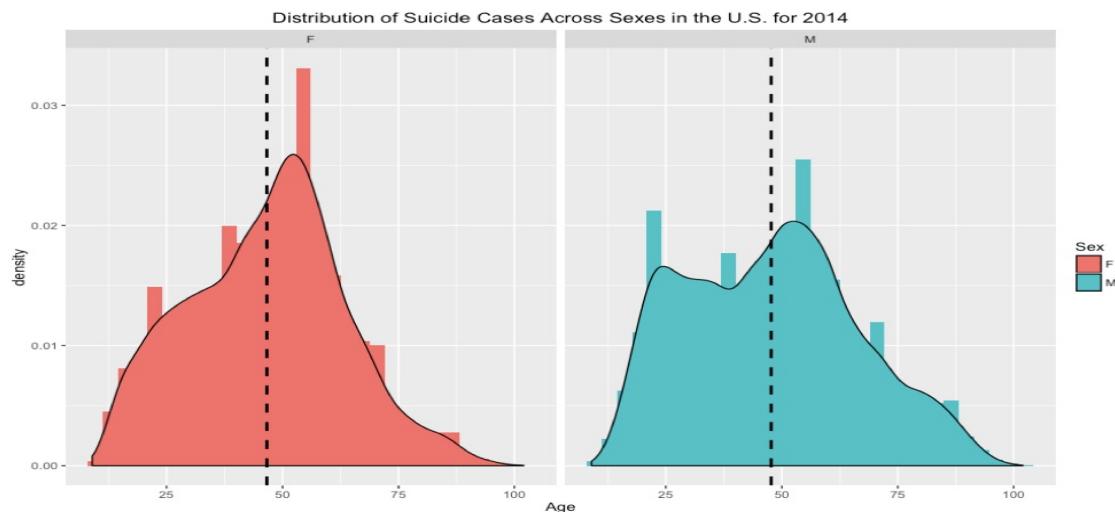
# Exploratory analysis

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- Age: the mean age in the sample was ca. 47
- Sex: 77% of reported cases were male

Sex <chr>	Cases <int>	Percentage <dbl>	Mean <dbl>	Std <dbl>
F	9775	22.66299	46.57483	16.78307
M	33357	77.33701	47.65932	18.85484

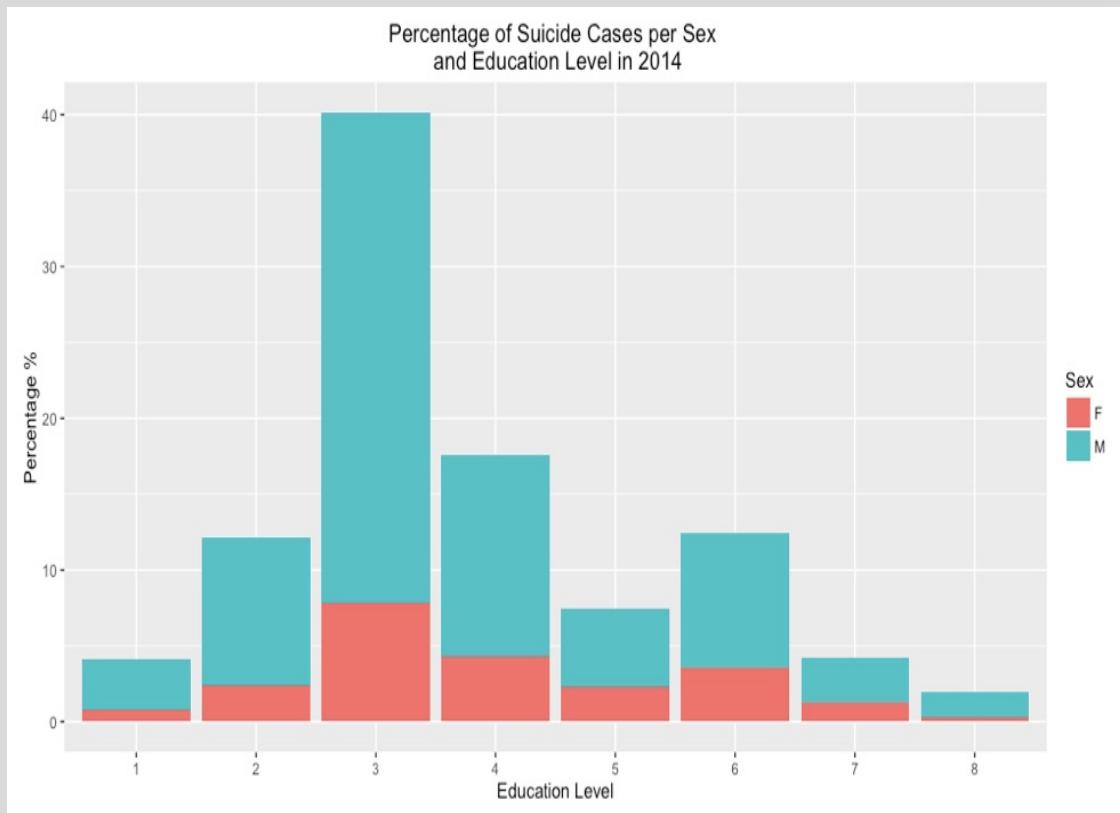
2 rows



# Exploratory analysis (cntd)

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- Education: highest incidence rate among HSG or GED



# Exploratory analysis (cntd)

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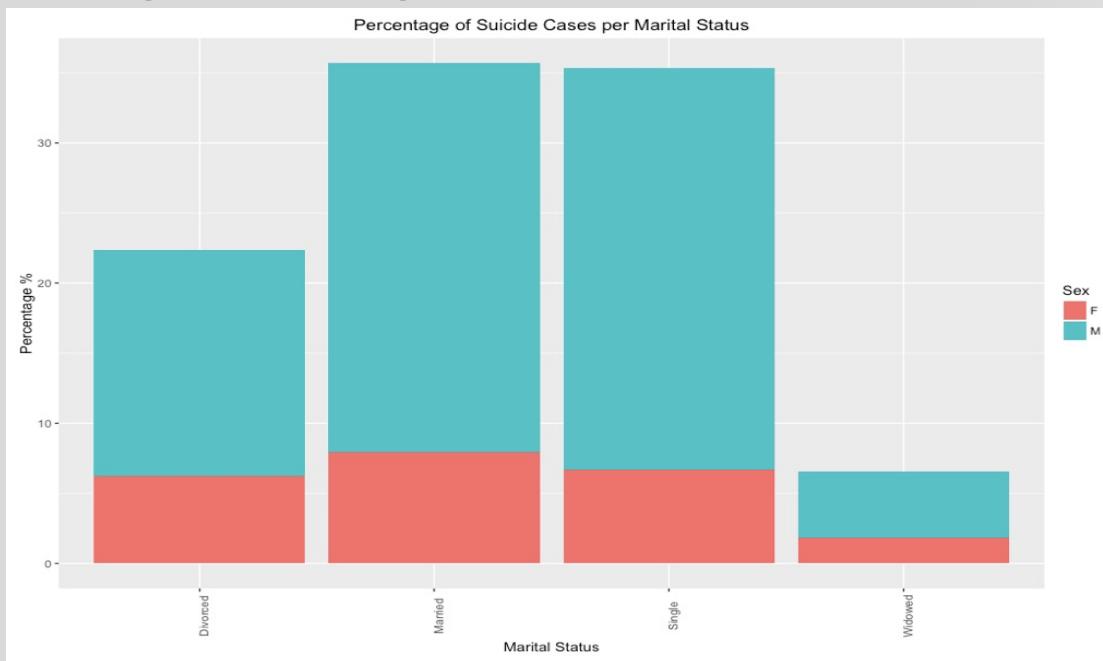
- Race: 90% of reported cases were white (Race Code 1)



# Exploratory analysis (cntd)

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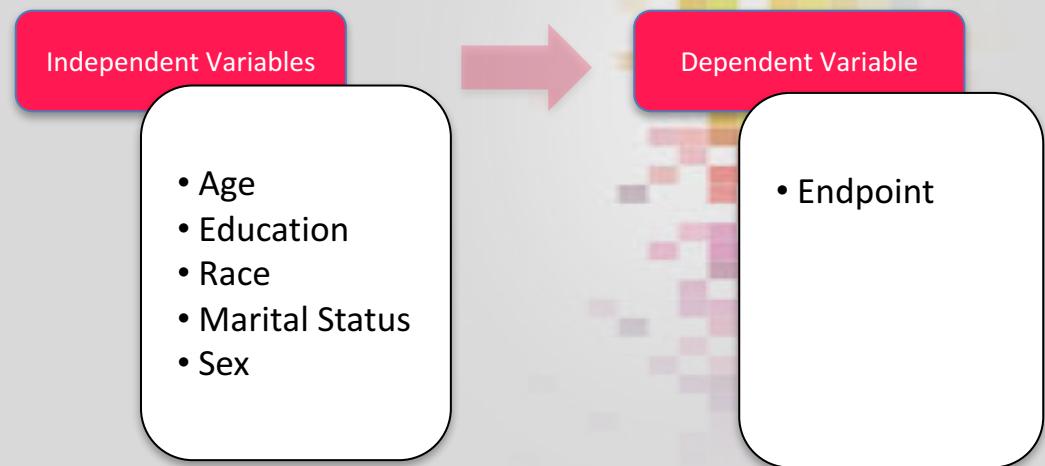
- Marital Status
  - Highest amongst singles for males (35%, yet only 12% of total pop\*)
  - Highest amongst married for females (8%)



# Model building

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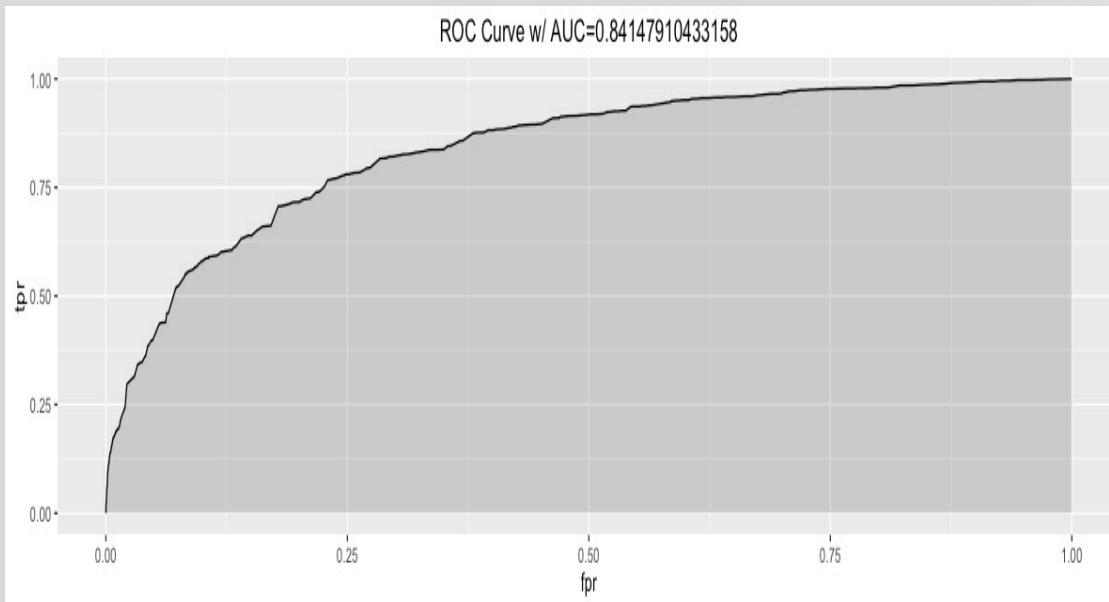
- Dependent variable: Endpoint
  - Represented by a 1 for suicide and a 0 for living
  - set of conditions within the sample population
- Predictive models
  - GLM
  - Decision Tree
  - KSVM
  - randomForest
- Model data set-up
  - Training
  - Test
  - Validation
  - 30M Lines (incomplete)



# GLM – good fit

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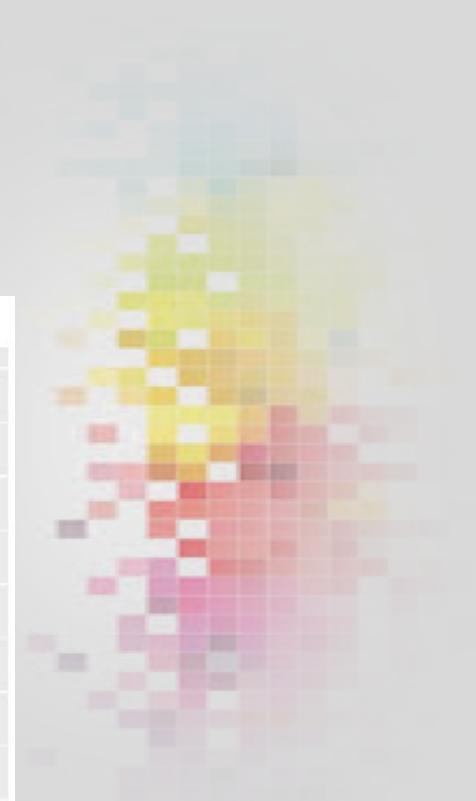
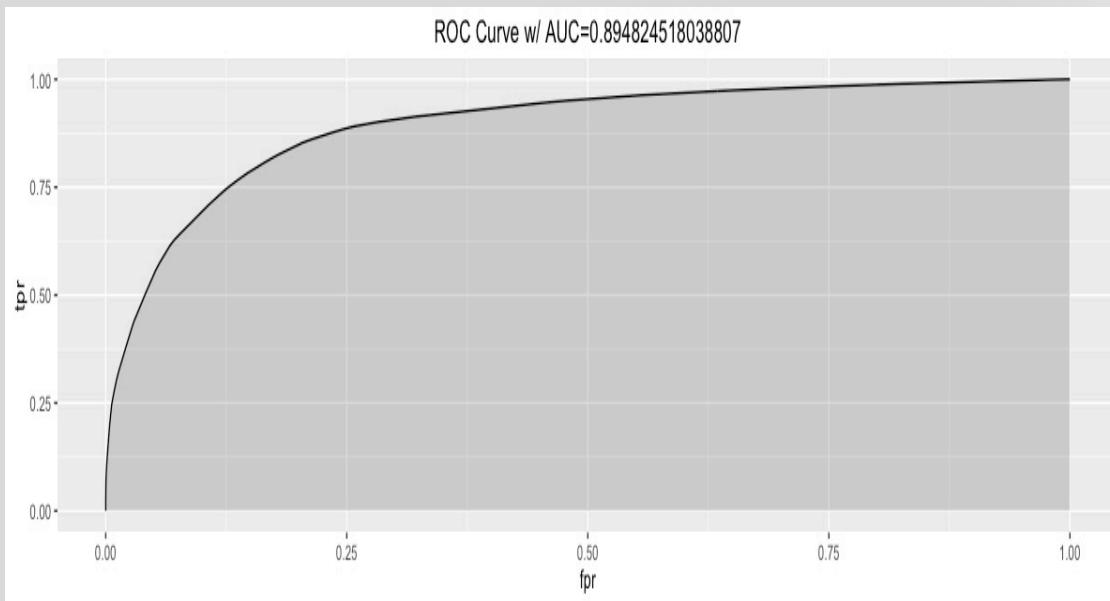
- MSE of Model = 0.00034
- MSE of Validation = 0.00033
- AUC = 0.84148



# Decision Tree – best fit

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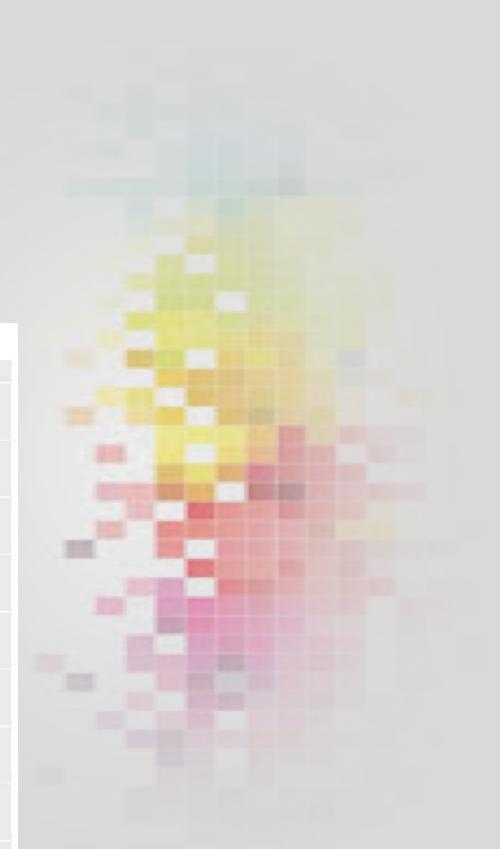
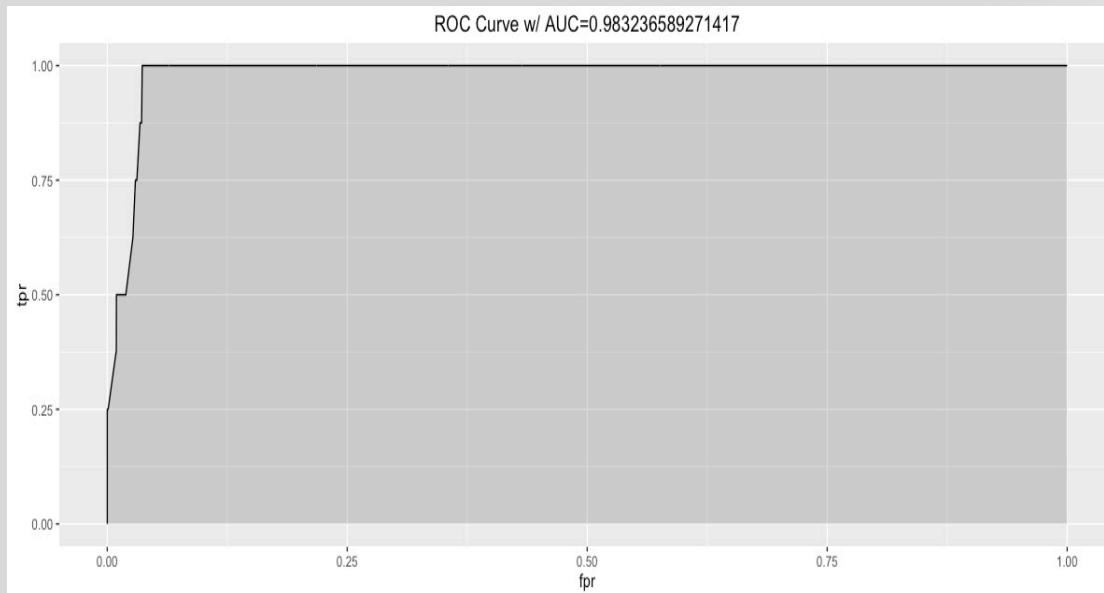
- MSE of Model = 0.00033
- MSE of Validation = 0.00033
- AUC = 0.89483



# KSVM – over fit

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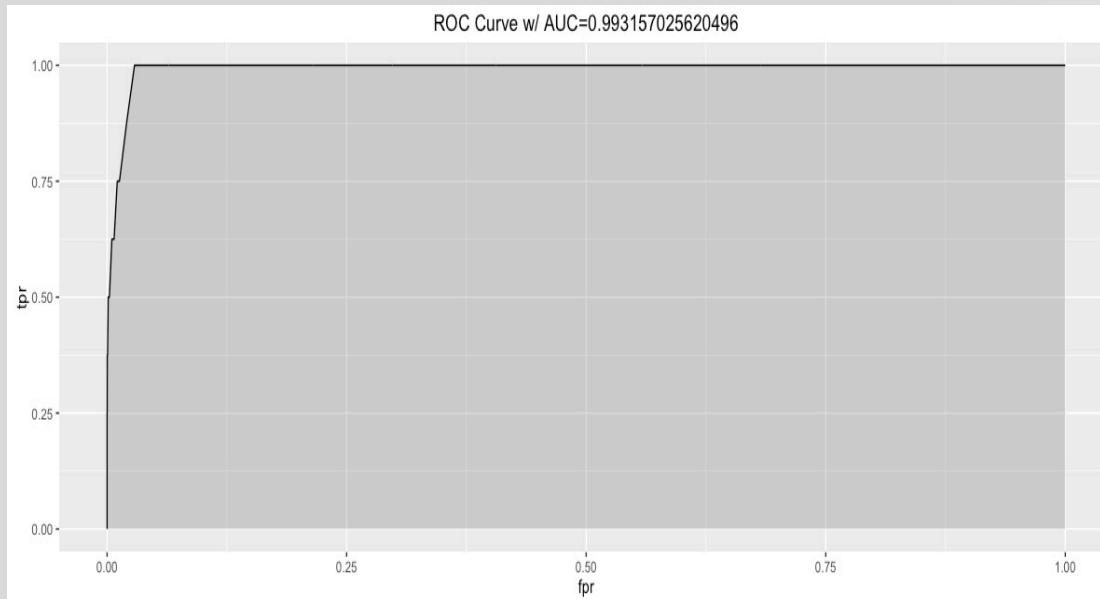
- MSE of Model = 0.00889
- MSE of Validation = 0.00852
- AUC = 0.98324



# randomForest – over fit

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- MSE of Model = 0.00072
- MSE of Validation = 0.00033
- AUC = 0.99316



# Limitations

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- Did not have Veterans data for models
  - Anecdotal evidence in line with exploratory results
- Full sample data set not built for model
  - Size
  - Time
- Sample size too large for some models (see above)
  - KSVM
  - randomForest

# Implications for suicide prevention

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**White males** in their **mid-to-late 40's** with a **high school education** (or GED) that are **single** are at **increased risk of suicide**. This subset of the population should be more closely **monitored** to aide in the **prevention of suicide** over the long-term

# Future studies

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- There is an interesting correlation between the incidence rate of suicide in Korea (ca. 21.4 per 100,000) and that of Veterans (ca. 22 per 100,000)
- Work is being conducted in Korea showing a high degree of correlation with suicidal ideation in social media and the seasons
- A study conducted using additional factors, like those listed above, and with Veterans data, could yield new insights into long-term prevention

# Together, we can undo the 22

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Original image URL: <http://www.scout.com/military/the-heroes-project/story/1500337-heroes-documentary-kickstarter-campaign>  
Title: The Heroes Project

# Questions

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