

Veteran Disability Compensation in the U.S. in 2021: A Poisson Regression Application

Raine Brooks, Achraf Cohen-Ph.D.
Mathematics and Statistics Department

INTRODUCTION

Veterans are proudly honored in this country for their dedication and sacrifice. Many veterans struggle to readjust to life after active duty though. More specifically, veterans who sustain a service connected disability. This can include either a physical or mental disability that occurred during active service. Pre-existing injuries that were exaggerated faster than normal progression is also tied to a service connected disability. Their recovery and rehabilitation can be a long process and even harder without support.

~16.5 Million Veterans

Disability is a term hard to define, but it is essentially a permanent impairment to the body or mind that makes certain activities for those individuals limited, unless modified (Altman 2001). There are many types and factors that constitute a classification of "disabled". For this project we specifically looked into veterans and their service connected disability (SCD). SCD includes post traumatic stress disorder (PTSD) and substance abuse (Wilmoth 2015). The Veterans Affairs Schedule for Rating Disabilities (VASRD) is used when evaluating a disability. The severity of a disability is measured on a percentage scale depending how much one's overall health and function is decreased. The scale is from 0 percent to 100 percent and goes in 10 percent increments (Miller 2015). The assigned percentage is then used to determine how much one is eligible for in compensation.

~4.5 Million with Disability

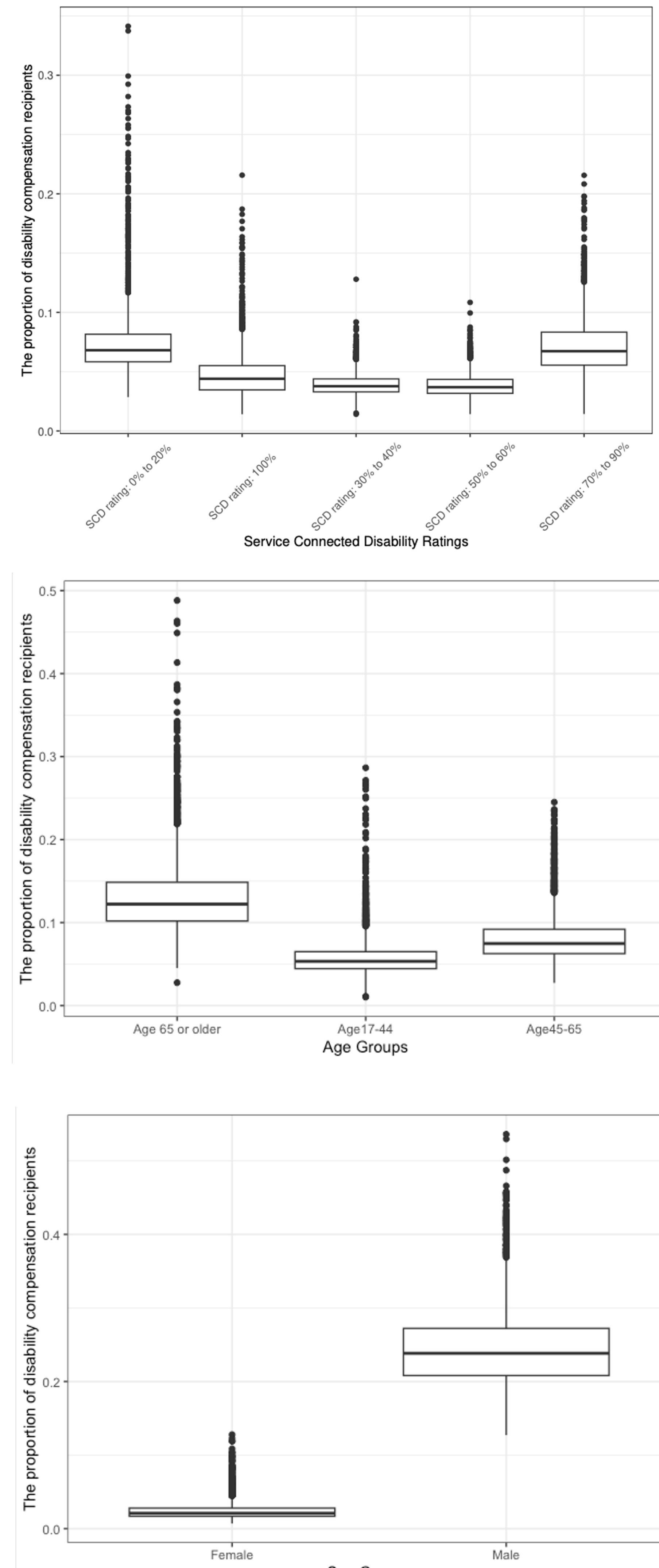
The purpose of this research was to understand how the disability compensation of veterans is associated with their service connected disability rating and the quality of life they can live.

DATA

This data comes from a 2021 annual statistic report through the Veterans Affairs.

In our data set there are 16 variables, but we focused on only 11 of them. This data set only includes the United States of America counting for all 50 states, it excludes Puerto Rico and other territories. Total there are 3,142 rows indicating that is how many counties there are.

Variable	Type	Values
Age	Categorical	[17 - 44], [45 - 64], [65 or older]
Service-Connected Disability Rating	Categorical	[0% - 20%], [30% - 40%], [50% - 60%], [70% - 90%], [100%]
Sex	Categorical	Male, Female



MODELING COUNT DATA

Poisson regression is mostly used when the dependent variables are count data with one or more independent variables. It is common for using that count of "events" with explanatory variables in order to gain insight into specific factors that can be helpful when making assumptions about the population (Warner, 2015). It allows for a comparison of rates between specific subgroups. In our case, the three age groups or the 5 SCD ratings. In order to run this analysis though, some conditions are required. The Poisson regression model is shown below:

$$\log(\mu) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p, \quad (1)$$

where μ is the mean count, β_i are the regression coefficients, and X_i are the explanatory variables.

The observed counts are assumed to follow a Poisson distribution. The other condition that must be met is the count of "events" have to be independent from each other (Warner, 2015). The expected value or mean of the Poisson distribution is also need to be equal to the variance, that is $E(Y) = \mu = \text{Var}(Y)$.

Negative binomial regression model is an alternative if the variance is greater than the mean of the count variable - that is called overdispersion.

It is often appropriate to model **rates** - that is the counts by populations.

ANALYSIS & RESULTS

SCD Model: $\text{counts}_i / \text{vetpop}_i = \beta_0 + \beta_1 \text{SCD}_i + \varepsilon_i$

Characteristics	IRR	95% CI	p-value
SCD rating: 100%	0.64	0.63, 0.65	<0.001
SCD rating: 30% to 40%	0.52	0.52, 0.53	<0.001
SCD rating: 50% to 60%	0.51	0.51, 0.52	<0.001
SCD rating: 70% to 90%	0.97	0.95, 0.98	<0.001

IRR = Incidence Rate Ratio, CI = Confidence Interval

Those with a SCD rating of 100 are actually receiving less compensation than those with a SCD rating of 70 according to the Incident Rate Ratio (IRR).

Age Model: $\text{counts}_i / \text{vetpop}_i = \beta_0 + \beta_1 \text{age}_i + \varepsilon_i$

Characteristics	IRR	95% CI	p-value
Age 45 - 64	1.39	1.37, 1.41	<0.001
Age 65 or older	2.21	2.17, 2.24	<0.001

IRR = Incidence Rate Ratio, CI = Confidence Interval

We see as one ages and health naturally declines, it is not surprising that the veterans in the 65 or older group receives the most compensation.

Sex Model: $\text{counts}_i / \text{vetpop}_i = \beta_0 + \beta_1 \text{sex}_i + \varepsilon_i$

Characteristics	IRR	95% CI	p-value
Male	9.78	9.59, 9.97	<0.001

IRR = Incidence Rate Ratio, CI = Confidence Interval

The incidence rate ratio shows that men are receiving a substantial amount of the disability compensation

CONCLUSIONS

- Veterans with a service-connected disability rating of 100 receive less compensation than those in the service connected disability rating of 70.
- As the veterans age, their service connected disability will most likely get worse too.
- Females make up a small portion of all military personnel, especially those who are receiving disability compensation.

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