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Analysis of the Military Medical Retirement System

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ANALYSIS OF THE MILITARY MEDICAL RETIREMENT SYSTEM

THESIS

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AFIT/GCA/ENV/09-M01

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ANALYSIS OF THE MILITARY MEDICAL RETIREMENT SYSTEM

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AFIT/GCA/ENV/09-M01

Abstract

The purpose of this research was to evaluate the 60 year old military medical retirement system. Specifically, this thesis answered three research questions regarding a comparison of pay between the current system and the societal standard for injury and illness, identification of current segments of the military population disproportionately affected by the current system, and establishment of a minimal standard for medical retirement compensation. Previous research established the societal standard for compensation as the Value of Statistical Life. This thesis compared the current military medical retirement system with the Value of Statistical Life and identified several segments of the military medical retiree population that were adversely affected by the current system. Further, this thesis proposed a new method for calculating medical retirement pay incorporating the societal standard for injury and illness.

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This work is dedicated to my wife

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Joseph Barnum

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I. Introduction

Background

Over the past 60 years, the military has dealt with the issue of compensating its disabled service-members based on five motivating guides (DoD Actuary 2007: B-2):

1. Continued service in the armed forces is competitive with the alternatives
2. Promotion opportunities are kept open for young and able members
3. Some measure of economic security is made available to members after retirement from a military career
4. A pool of experienced personnel is available for recall in times of war or national emergency
5. The costs of the system are reasonable.

Two of these motivating guides resonated with us: “economic security” and “reasonable costs.” We wanted to evaluatethe current military medical retirement system, as this is a subset of the entire military retirement system, to see if the compensation tracks with the motivating guides. But in order to understand the current military medical retirement system we must first examine how the military medical retirement system came about.

History of the Military Medical Retirement System

"The pilgrims at Plymouth provided in 1636 that any man sent forth as a soldier and returned maimed should be maintained by the colony during his life" (DoD Actuary: B-2). In 1776 the States adopted the Plymouth policy for the Revolutionary War and compensated any disabled military members with half-pay for life or throughout the life-cycle of the disability. Post-war compensation for disabled veterans went through a couple of changes culminating, in 1832, with full-pay for life for the service-member. Compensation to widows was added in 1836 (DoD Actuary: B-2). After the Civil War Congress instituted a fix on retirement pay to be 75 percent of pay to include those retired by disability. During World War I retirement pay was once again changed to two and a half percent of pay per years in service (DoD Actuary: B-3).

After World War II the disability retirement system was plagued with problems forcing Congress to pass the Career Compensation Act of 1949. "Under this system, all disabilities had to be rated under the standard schedule of rating disabilities in use by the Veterans Administration, and the resulting ratings became a factor in disability retired pay entitlement and taxability" (DoD Actuary: B-4). Since 1949 the disability retirement system has remained fundamentally the same where compensation is based on the higher of:

1. Years of service x 2.5 x base pay--high 3 average as applicable or
2. Percentage of disability x high 3 average.

Service-members entering the military before September 7, 1980 base final pay on the highest pay received, and those entering after base final pay as the average of the last 36 months of service.

Each military service branch has its own unique disability evaluation process. For the Air Force, the Secretary of the Air Force through the Chief, USAF Physical Disability Division HQ AFPC/DPSD performs Medical Evaluation Boards (MEB) and Physical Evaluation Boards (PEB) in order to determine fitness for duty of disabled airmen. The MEB, located at the service-members military treatment facility, evaluates each airman to determine fitness for duty. The PEB reviews the cases of airmen deemed to be unfit for duty by the MEB, and the PEB can either concur with the MEB's determination or find the airman fit for duty. If the PEB concurs with the MEB the PEB assigns a disability rating ranging from 10-100 percent increasing by increments of 10. Airmen with less than 20 years of service and who have a disability rating of 10 or 20 percent are given a one-time severance payment and those with a disability rating of 30 percent or higher are medically retired from the service.

Motivation for Research

We wanted to revisit the military medical retirement system to verify the 60 year old system still ensures "economic security." Our focus is not the disability rating given to a service-member. In order to verify "economic security" we must understand the purpose behind the Veteran's Affairs Schedule for Rating Disabilities (VASRD).

According to 38 Code of Federal Regulation (CFR) Section 4.1, the governing regulation behind military disability compensation, "the percentage ratings [VASRD] represent as far as can practicably be determined the average impairment in earning capacity resulting from such diseases and injuries and their residual conditions in civil occupations." However, our research examines if "impairment of earnings capacity" is the best way to value "economic security", or should the military medical disability retirement compensation be based on the value of the injury or illness. The value of an injury or illness is "the implicit value of life that society has determined" (Smith 2000: 170). Which measure of calculating compensation is more equitable? Here we define equitable as the "societal standard for government agencies in their consideration of the costs and benefits of life and injury-saving regulations" (Smith 2000:169). "Over the past three decades, a broad body of economic research has been published on estimates of the value of an anonymous human life" (Smith 2000:169). These estimates are referred to as the value of statistical life, hereafter known as (VSL).

The Office of Management and Budget (OMB) as well as the Environmental Protection Agency (EPA) calculate VSLs as part of cost-benefit analyses for the purpose of evaluating life-saving legislation (OMB 2003: 29, EPA 1990: I-3). As a part of litigation economists testify as expert witnesses about the VSL and to determine "reasonable" behavior by corporations (Smith 2000: 170). We know the United States government accepts and use of VSL as the societal standard for consideration of costs. Therefore, we are able to use

VSL as an acceptable method of evaluating current disability compensation. This leads us to the following research questions.

Research Questions

1. Is the net present value for military medical retirement payments equivalent to the societal standard of the implicit value of statistical life?
2. Are certain segments of the Air Force population disproportionately affected by the current military medical retirement system?
3. What is the minimum standard for military medical retirement compensation?

Summary of Results

We found the net present value of payments under the current military medical retirement system are not on par with societal standards for the value of illness or injury at all ranks and disability ratings. Junior enlisted with few years of service, senior enlisted, and senior officers are compensated far less under the current system compared with the societal standard.

The current military medical retirement system places junior enlisted with less than four years of service under the poverty threshold for the United States. More than half of the highly disabled, 80-100 percent, do not participate in the labor force after retirement (Buddin 2005: 48); therefore, junior enlisted with few years of service may not be able to escape poverty for their entire lifespan. Society has developed standards that are deemed equitable for injuries or illness. Our VSL model accounts for this equity and should be used as the minimum standard for military medical retirement compensation. In the next chapter we discuss why the VSL model is the best approach for valuing compensation, and we discuss the previous literature that has been published on this topic.

II. Literature Review

Introduction

In 2005, RAND National Defense Research Institute published a report entitled "An Analysis of Military Disability Compensation." In this report Richard Buddin and Kanika Kapur researched the "current policies for compensating veterans with service-connected disabilities" (Buddin 2005). They compared the current military disability retirement system to systems used by civilian firms. As part of their findings they noted:

> The military retirement system has become unduly complex…a more coherent system is needed that identifies the criterion for measuring economic loss from an injury. Should it be civilian earnings, quality of life, or some other criterion?" (Buddin 2005: 88).

Our research adds to their findings as we propose the VSL model meets the requirement for measuring economic loss. In the next section we deconstruct the VSL model to understand how it was developed, and why it is a measure of society's value for injury or illness.

The Approaches to Calculate the Value of Statistical Life

The three approaches to the valuation of statistical life are willingness-to-accept, willingness-to-pay, and contingent valuation. "The willingness-to-accept approach consists of determining the minimum amount that a person is willing to be paid to be exposed to an incremental increase in the risk of death" (Smith 2000: 170). Willingness-to-accept (WTA) studies typically assess risk tolerance for different occupations. Willingness-to-pay (WTP) studies examine how much an individual is willing to pay in order to decrease their risk of death. Contingent valuation studies blend willingness-to-accept and willingness-to-pay approaches through surveys of individuals (Smith 2000:170).

The current trend in economic literature prefers to use the willingness-to-pay approach to value statistical life. This trend is based on the limitation that the WTA approach lacks a budgetary constraint, while the WTP approach is bound by the limits of one's budget (EPA 1990: I-1). WTP is further distinguished into two separate methodologies. The first being the "revealed-preference" approach which is based on market data (Lanoie, Pedro, and Latour 1995: 235). The second approach is the "contingent-valuation" approach which is based on surveys (Lanoie et al 1995: 235). "A willingness-to-pay estimate values the change in well-being that would result from changing the risk of death; it is measured by how much wealth a person is willing to forgo to obtain that reduction in the risk of death" (Lanoie et al 1995: 236). The summation of each person's WTP is the overall value of statistical life.

The "revealed-preference" approach makes use of market behavior information involving the wealth and risk tradeoff. The most common way to obtain this information is through "wage-risk studies" which calculate a wage premium for increased risk of death for a particular job via regression analysis (Lanoie et al 1995: 237). Consumer-market studies are a second form of the "revealed-preference" approach. These studies focus on daily consumption decisions for such safety items as smoke detectors or fire extinguishers and their relative expenditure versus risk tradeoff.

Using "contingent-valuation", researchers survey individuals using tailored questionnaires in an effort to find their behavior in differing risk situations. This allows for greater generalization across populations which in turn increase external validity or the ability for research to "hold for other persons in other places and at other times" (Trochim 2008: 34). However, this approach is based off of hypothetical situations that individuals may never have experienced; therefore, their actual behavior may differ from their response behavior.

In their 1995 study, Lanoie et al attempted to compare willingness-to-pay to willingness-to-accept. In order to compare the two methods, a study was conducted on 16 firms with 100 or more workers located in the greater Montreal region. The researchers interviewed 200 participants and each participant was interviewed for approximately one half hour. Respondents ranked the risk of accidental job-related death via a given scale, and the respondents circled their job's associated risk. The interviewer then asked what they need to be paid in order to remain in the same job, but the risk of death would be increased one step further on the risk scale (WTA). The next question asked how much of a decrease in wage would they would forgo in order to stay in the same job but be one step lower on the risk scale (WTP). The findings, consistent with previous literature, indicated individuals "generally require far more compensation to give up a good than they are willing to pay to acquire it" (Lanoie et al 1995: 243). Psychologists refer to this theory as loss aversion. A third question asked the respondents to value the installation of air-bags in their car (revealed-preference approach). “The results showed that the value of a statistical life obtained from both methods [contingent-valuation and revealed-preference] were relatively high as compared with the rest of the literature” (Lanoie et al 1995: 254). The authors theorized this high value was due to problems individuals have with valuing low probability events.

The VSL estimates from previous literature are further detailed in section four. We will now look into how major oversight bodies utilize VSL figures in section three.

Utilization of VSL Estimates by Oversight Bodies

The government uses VSL estimates to assess the value of programs or regulations; courts have also deemed it appropriate to offer economist’s expert VSL testimony to determine equitable compensation for victims in tort litigation. The difficult question government officials must determine for government programs is how safe is safe enough? “Many public projects impose costs on society in exchange for reducing the risk of death. To determine whether a project is socially desirable, one has to compare the value of reducing risks to the costs of such reductions” (Lanoie et al 1995: 235). ”Risk reduction involves cost and this means that a monetary valuation of human life is unavoidable” (Rackwitz 2005: 469). However, “people often respond to risk in a seemingly irrational way—at least from the viewpoint of experts” (Rackwitz 2005: 470). This “irrational” thinking is attributed to cognitive limitations of people (Slovic, Fischhoff and Lichtenstein 1977: 12). The question in risk mitigation is how much society is willing to pay to reduce an accident or death by some sort of policy or program (Rackwitz 2005: 470).

In order to execute a cost-benefit analysis for the health benefits associated with cleaner air, one must compute the VSL. The VSL estimate is employed by the government and industry through cost-benefit analyses to determine what can be deemed “reasonable behavior.” Reasonable behavior is the societal standard which determines levels of safety for both government and industry within plants and products (Smith 2000: 169). “Optimization of technical facilities involving risks for human life and limb require an acceptability criterion and suitable discount rates both for the public and the operator depending on for whom the optimization is carried out” (Rackwitz 2005: 469). Reasonable levels for discount and optimization of VSL estimates aredirected by the OMB. The OMB recognized that federal agencies differed in their valuation methods and on January 11, 1996, Executive Order 12866 (Economic Analysis of Federal Regulations) directed:

> One acceptable explicit valuation approach would be for the agency to select a single estimate of the value of reductions in fatality risk at ordinarily encountered risk levels, or a distribution of such values, and use these values consistently for evaluating all its programs that affect ordinary fatality risks.

No explicit value has been determined to be the true VSL, but the OMB has determined for purposes of government programs to use a range of values from $1 million to $10 million.

Economists developed the value per statistical life year (VSLY) in order to calculate values in terms of years rather than lives. "Some economists have argued that the value of a statistical life should be converted to a value of per statistical life year (VSLY), and that lives saved should be valued by multiplying remaining life expectancy by the VSLY" (Alberini, Cropper, Krupnick, and Simon 2003: 770). The theory behind the VSLY is that each year of life is equally valued and does not vary with health and age. The counterargument is chronically ill individuals should be willing to pay less for risk reduction compared to their healthy counterparts. "This argument has been used to assign lower VSLs to beneficiaries of air pollution control programs than [those] currently used by USEPA" (Alberini et al 2003). However, Alberni et al found no support for a decline in the WTP from individuals suffering chronic illness, and only weak evidence supporting a lower WTP in people over 70.

The EPA looked into the relationship of air pollution and premature deaths as part of the Clean Air Act of 1990. Appendix I of the Clean Air Act of 1990 explains the procedure the EPA undertakes for mortality valuations due to air pollution. The procedure entails a cost-benefit analysis based on the VSL. The EPA noticed deaths in cases of exposure to hazardous air were more prevalent in people over the age of 64. Still within the Clean Air Act of 1990, the EPA reported a cost-benefit study regarding sulfate exposure related deaths where the VSL was estimated at 75 percent of the value of middle-aged individuals. Although the EPA had empirical evidence supported by prior research, the Office of Management and Budget ordered the EPA to discontinue use of different values for older individuals in a memorandum dated May 30, 2003.

We have discussed how government agencies utilize VSL estimates as part of their oversight. We briefly explained how the VSL is calculated. The next section will further expound on how the VSL is derived from economic theory as well as discuss previous VSL estimates that have been published.

VSL Calculation

"The VSL is equal to the monetary value of the individual's expected present value utility" (Johansson 2000:138). In order to find the present value of an individual's utility we must determine an appropriate rate of discount. According to the OMB, "regulations should report net present value and other outcomes determined using a real discount rate of 7 percent" (1992: 8). However, economic literature is inconsistent with that of the OMB. "The interest rates should be close to the long-term economic growth rate per capita as this is the rate with which a member of the public becomes wealthier" (Rackwitz 2005:477). Economists have called this long-term rate the natural interest rate. Rackwitz proposed the average yearly growth of a country's Gross Domestic Product (GDP) per capita over a long-term time horizon is the best measure of quality-of-life gains for the country. The United States' economic growth, measured by GDP, per year has averaged approximately 1.8 percent since 1928

(Rackwitz 2005: 476). Utilizing willingness-to-pay approach, he valued a statistical life in the United States to be 3.3 million dollars per person.

In his 2005 article Louis Kaplow stated:

> "An important strand of this literature measures the value of a statistical life (VSL) based on individuals' tradeoff between wages or prices on one hand and job or product safety on the other. Researchers have long recognized that VSL depends positively on income" (24).

In order to compute a meaningful VSL it is important to understand how risk and income can affect the VSL. Kaplow studied the relationship between income elasticity of the VSL and relative risk aversion. He noticed, "VSL depends (in significant part) on the marginal utility cost of expenditures to protect one's life" (2005: 24). One theory suggests that as income doubled an individual would pay twice as much for a given safety measure (Kaplow 2005: 25). However, a second effect on the VSL exists because "preserving one's life is higher when income is higher, because utility is accordingly higher" (Kaplow 2005: 25). The two components of the income elasticity of VSL are as follows:

$$U(x) = \big(1 - p(x)\big)u(y - x), \qquad (1)$$

where,

x is expenditures

p(x) is the probability of death,

y is income, and

u is the concave function of consumption.

And for an individual we have the following:

$$p' = \frac{(1-p)u'}{u} \qquad (2)$$

where u' is the derivative of u with respect to consumption. we can see the VSL is given:

$$VSL = \frac{u}{(1-p)u'} \qquad (3)$$

where

u is the utility benefit of saving one's life, and

(1-p)u' is the expected marginal cost (in units of utility per dollar), to give the value of statistical life (VSL) in dollars.

Both u and VSL depend on consumption c. If η is the elasticity of VSL with respect to c, then,

$$\eta = \frac{dVSL}{dc}\frac{c}{VSL} \qquad (4)$$

and we find,

$$\frac{dVSL}{dc} = \frac{(1-p)u'^2 - u[(1-p)u'' - u'p'x_c]}{(1-p)^2 u'^2} \qquad (5)$$

where

x_c = dx/dc

and x_c shows how a person's x of p(x) moves in relation to c increasing. When equations are combined we see:

$$\eta = c\frac{(1-p)u'^2 - u[(1-p)u'' - u'p'x_c}{(1-p)^2 u'^2} = \frac{cu'}{u} - \frac{cu''}{u'} + \frac{cp'x_c}{1-p} \qquad (6)$$

Substituting p' using the first order condition the equation can be simplified to

$$\eta = \frac{cu'}{u}(1 - x_c) - \frac{cu''}{u'} \qquad (7)$$

The first part of the equation is the elasticity of u with respect to c, or η_{uc}. The second part of the equation is the relative risk aversion R. When substituted into the above equation we get

$$\eta = \eta_{uc}(1 - x_c) + R \qquad (8)$$

where

η is the elasticity of VSL, the utility of saving one's life is indicated by η_{uc}, $1\text{-}x_c$ is the weighted effect due to expenditures of safety when income increases, and R is the marginal utility consumption with respect to consumption. See Kaplow (2005:26-7) for a more in depth explanation. As is evident from the equation when income increases, thereby increasing consumption, utility value of saving one's life also rises. Also, as income increases the cost of safety expenditures falls at the rate of R.

Now that we understand how the VSL is derived we can look into previous estimates of the VSL. Figure 2.1 shows a summary of 37 VSL estimates ranging in values of \$0.1 million to \$16.2 million with a mean of \$5.1 million and a standard deviation of \$4.7 million. This mean falls directly in line with the OMB's VSL range of \$1 million to \$10 million. We previously touched on how age plays a factor in the computation of the VSL. This next section will further delve into how age and risk affect the VSL.

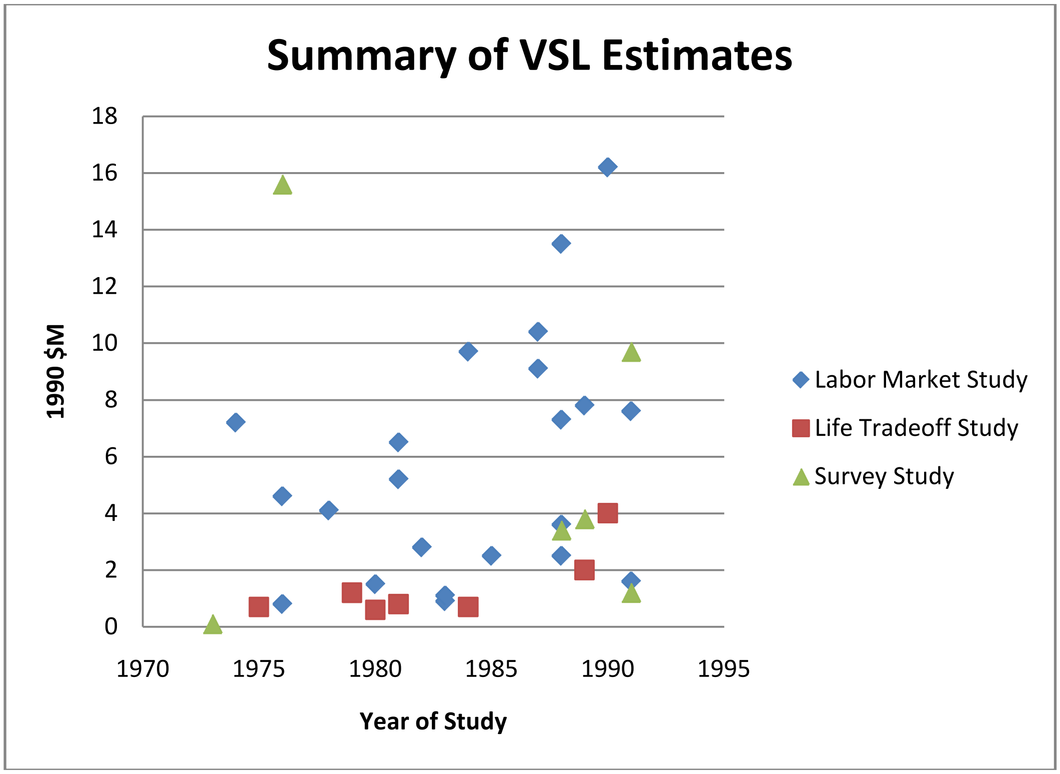

Figure 1. Summary of VSL Estimates (Viscusi 1993:16-7, 22-3, & 26)

Worker's Age Variation and the VSL

In 2003 the Environmental Protection Agency (EPA) conducted an analysis which included a "senior discount." This discount created a separate value for statistical life for individuals over 70 which was 63 percent of the value of under 70 (Aldy and Viscusi 2004). This separate VSL was soon dropped due to political pressures. The thought process behind why older people would have a lower VSL is based on the assumption that because life expectancy is lower older people would not be willing to pay as much for risk reduction. Under this philosophy the highest VSL would be at birth.

In order to add to previous literature involving job risk variation by age Aldy and Viscusi (2004) added an age variable to the worker's industry which had not been accomplished previously. The Bureau of Labor and Statistics (BLS) and Census of Fatal Occupational Injuries (CFOI) recently developed a database tracking every job-related fatality, and this database was utilized by Aldy and Viscusi to be able to track age and type of industry for each fatal accident. "Injury and mortality risks are not constant across a worker's life cycle, making the age adjustment in the risk variables potentially important" (Aldy and Viscusi 2004: 13). Younger workers have a higher frequency of injury than older workers, but this might be due to younger workers are subject to riskier jobs than their more senior coworkers. Older workers tend to be in management which lowers their job risk. In contrast, Aldy and Viscusi (2004: 15) find that older workers have higher fatality rates than their younger counterparts. The fatality rates for older workers are not based on job riskiness but on fragility. Older workers tend to suffer more serious injuries at a given level of risk. "The age-specific divergence in injury and mortality risks…facilitate[s] the estimation of wage premiums for both fatal and non-fatal risks" (Aldy and Viscusi 2004: 15).

To show empirically the age-VSL relationship Aldy and Viscusi used a standard hedonic wage regression:

$$\mathrm{Ln}(w_i) = \alpha + H_i'\beta + \gamma_1 p_i + \gamma_2 q_i + \gamma_3 q_i WC_i + \varepsilon_i \qquad (9)$$

where

w_i is the worker i's hourly after-tax wage rate,

α is a constant term,

H is a vector of personal characteristic variables for worker I,

p_i is the fatality risk associated with worker i's job,

q_i is the nonfatal injury risk associated with worker i's job,

WC_i is the workers' compensation replacement rate payable for a job injury suffered by worker i, and

ε_i is the random error reflecting unmeasured factors influencing i's wage rate.

Their assumption was a 2,000-hour work year. With $\alpha = .01$ the results of the equation were statistically significant with a sample mean VSL of $4.23 million (1996$). A 95 percent confidence interval had a range of values from $3.20 million to $5.28 million (1996$). The upper boundary for our VSL model is consistent with the values calculated by Aldy and Viscusi; however, our lower bound value of life was set to the OMB minimum in order to show the very lowest boundary for comparison purposes.

Aldy and Viscusi then expanded their results with: 1. separate age group subsample hedonic wage regressions, 2. a minimum distance estimator based on a series of age-specific hedonic wage regressions in the first stage, 3. a hedonic wage regression with the interaction of mortality risk and age, and 4. hedonic wage regressions evaluating the effects of life-cycle events on the age-VSL profile. The results of each of the further tests found an age-VSL relationship of an inverted-U. Aldy and Viscusi (2004) calculated the VSL similar to the methodology used by Kaplow (2005). However, Aldy and Viscusi added a time factor to the equation:

$$w_p = \frac{u[c(t)]}{\pi u_c} \quad (10)$$

where,

w_p is the VSL

u is the utility given by consumption at time t

π is the probability at time t to live to τ.

u_c is the marginal utility

The added time factor enables us to calculate value of statistical life years (VSLY) as well as the VSL. Values of life are lower in the beginning of life rising to a peak near the late 30s to early 40s and then decreases. The hedonic wage regression evaluating the effects of life-cycle events on the age-VSL profile showed no change in the VSL for married individuals or people with school age children.

Figure 2.2 is a graphical depiction of the what they referred to as an inverted-U effect of age on VSLY. The VSLY is the value of life for each continued year of life. It can be computed as follows:

$$VSLY = \frac{rVSL}{1-(1+r)^{-L}} \quad (11)$$

where,

r is the discount rate, and

L is years of expected life.

As the age of the worker increases from youth we see the VSLYs increase and plateau around in the worker's late 30s before the value decreases. We found the yearly cash-flows paid to disabled veterans followed a similar pattern as Figure 2.

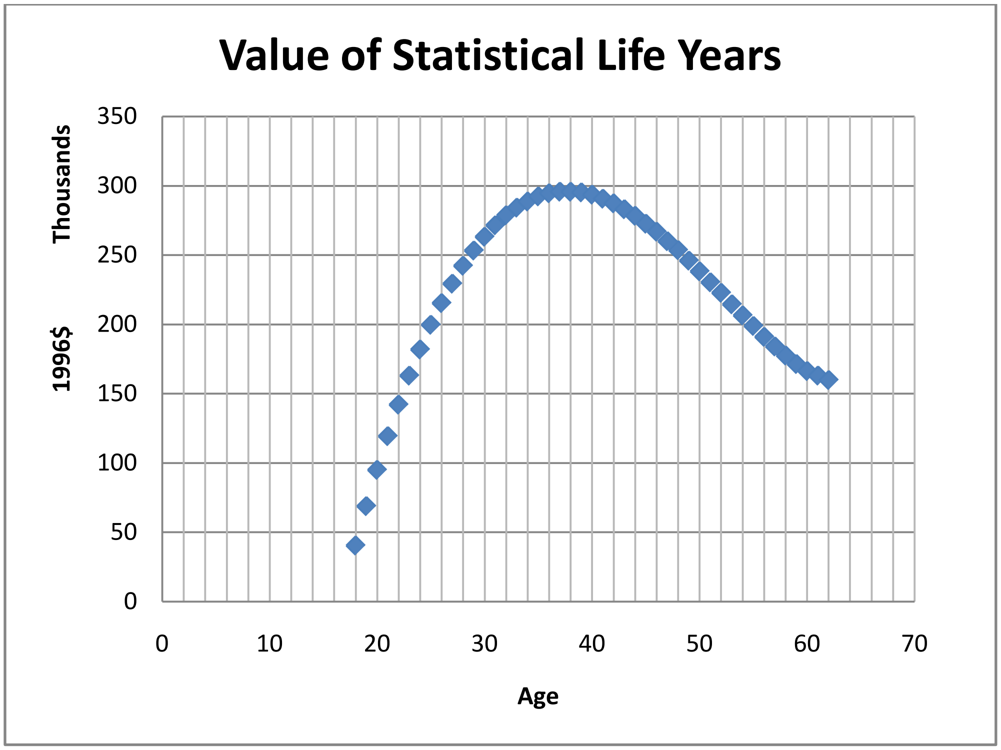

Figure 2. Value of Statistical Life Years (Aldy and Viscusi 2004: 47-8)

Ex Post Confirmation

In his 2000 study, Stan Smith observed previous studies regarding the VSL used ex ante data as “they estimate the value of life prior to [a] life-threatening event.” Smith’s argument was to value life using ex post data, after a traumatic event. By using ex post data he was able to determine compensations for actual injuries or fatalities. Smith hypothesized the VSL from previous ex ante literature was consistent with his ex post data for 340 jury awards in non-fatal car crashes throughout the United States. The model to test his theory was constructed as follows:

$$A = I + X\Lambda + \Theta PVIMP + M \quad (12)$$

where

A is the award given by jury verdict

I is the intercept

X is a vector of demographic information of the plaintiffs

Θ is the coefficient of the ordinary least square regression (OLS)

PVIMP is the present value of impairment

M is the error associated with the OLS regression line

PVIMP is the percentage of impairment due to the crash ranging from 0 to 1 on a continuous scale where 0 is no impairment and 1 is total impairment. Our measure of disability, VASRD, is much like the PVIMP with the exception that the VASRD is discreet and not continuous. Physicians evaluated the seven dimensions in order to create the overall ranking for PVIMP. The results of the regression model showed statistically significant for PVIMP at the 99% confidence interval for the logged model. The value of Θ, $2.3 million, was consistent with that of ex ante literature as well within the OMB VSL range, thereby accepting Smith's hypothesis.

The confirmation by the ex post data shows juries routinely value life at the same values calculated by experts. And because both the ex ante and ex post literature agree we have reasonable confirmation that the estimates properly determine an acceptable societal standard. Having an acceptable societal standard gives us the ability to properly value public work projects. Smith's calculated value of life is the upper boundary for our VSL model adjusted for inflation.

III. Methodology

Procedure for Data Analysis

We compared the net present value (NPV) of the current military medical retirement system with the NPV of the alternative VSL model in order to see if the current system is equitable. Remember, we defined equitable as the "societal standard for government agencies in their consideration of the costs and benefits of life and injury-saving regulations" (Smith 2000:169).

NPV is calculated by the equation:

$$NPV = \sum_{t=1}^{n} \frac{\mathrm{CF_t}}{(1+I)^{\mathrm{t}}}$$

where

NPV = net present value

CF = cash flow

t = period in which the cash flow occurs

I = interest rate

n = final period of payment

In both models, the current system and VSL, n represents the service-members mortality, given by the mortality tables published annually by the DoD Office of the Actuary. We specified our periods to be annual for ease of comparison. The same discounting interest rate was used for both models. No variation in interest rate changed our analysis. The only difference between the current medical disability retirement system and the proposed VSL model lies with the computation of the cash flows. Here, we delve into the method for computing cash flows for each model. We recall the current system calculates cash flows as is the higher of:

1. Years of Service x 2.5 x Base Pay, or
2. Disability Rating x Base Pay.

Data for the years of service, disability rating, and the gross compensation are collected and published by the DoD Office of the Actuary

The VSL model calculates cash flows as Disability Rating x VSL. We utilized the same disability rating for both the current system and the VSL model. The next step was determining an appropriate value for the VSL. As we determined from chapter 2 the VSL is not a constant number, but rather a range. As discovered by Lanoie et al 1995, the VSL varies with experience and supervisory responsibilities; therefore, our value for the VSL varies with rank equal to the variation in retirement pay and rank. Figure 3 represents the appropriate value for VSL depending on rank at time of medical retirement.

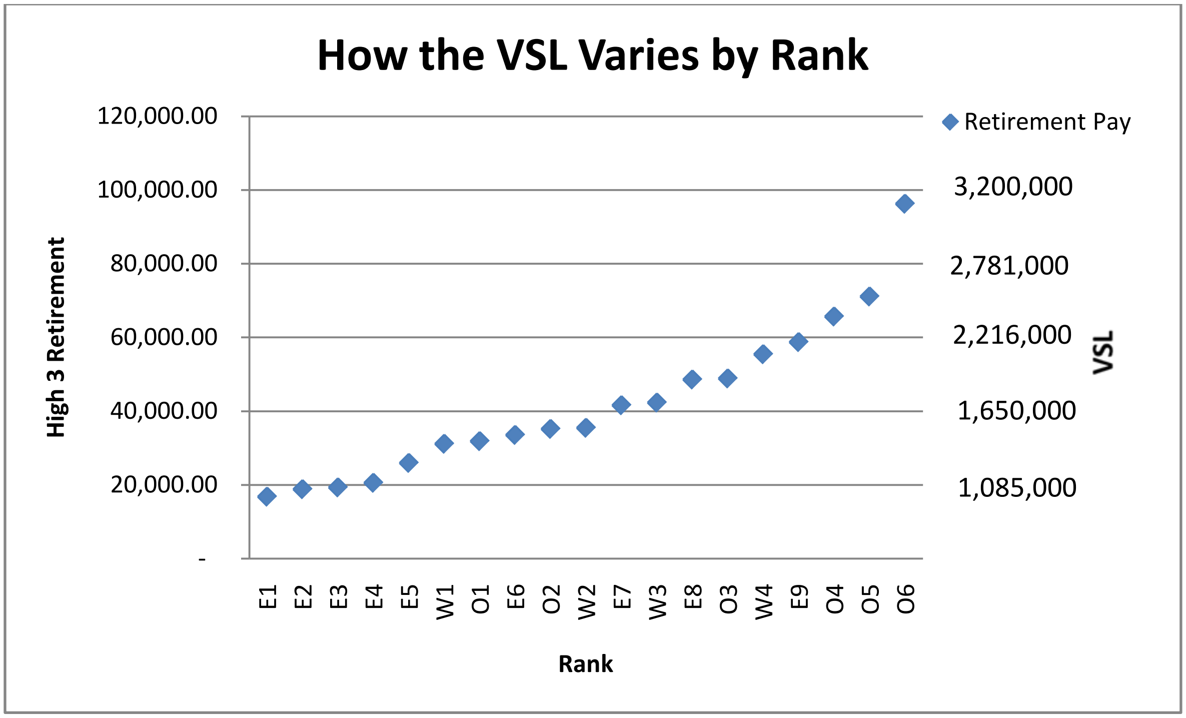

Figure 3. How the VSL Varies by Rank

The value for VSL can range from one million dollars for an individual ranked E-1 to a max value of 3,113,942 dollars for an O-6. The minimum value for VSL represents the lower bound value dictated by OMB, and the maximum value for VSL represents the inflation adjusted value of life calculated by Smith, 2000. The VSL for an individual case is calculated by referencing the appropriate High 3 retirement pay and interpolating the position on the line between the lower and upper bounds to the VSL. The appropriate VSL is then multiplied by the disability rating to determine the NPV for each medically retired service-member. As part of our calculations we made a few assumptions.

Assumptions

1. Cash flows for both models are adjusted annually for inflation. These cost-of-living adjustments are based on the consumer price index (CPI) which is a measure of inflation published by the Bureau of Labor Statistics. The discount rate in NPV is based on inflation which is also represented by the CPI; therefore, the cash flows are increased each subsequent period by the same rate that each cash flow is discounted.
2. Retirement pay calculations are based on the high-3 calculation or the average pay over the last 36 months of service since all service-members who could be medically retired have less than 20 years of service and entered active duty after September 7, 1980.
3. For forecasting purposes the rank at retirement is based off the average time in service for promotion.
4. The final cash flow when the veteran expires is for a full period.

Data

Annually, the Department of Defense Office of the Actuary publishes the *Department of Defense Statistical Report on the Military Retirement System* which details the number of disabled retirees as well as the compensation associated with each retiree. Our analysis is based on data from the DoD Office of the Actuary for the years 2001-2007.

We utilized the United States Census Bureau's poverty threshold to determine if the cash flows received by medically retired service-members would place the service-member below the poverty line. The threshold for being in poverty varies depending on the size of the family including the number of children and if there is a spouse. The Air Force Personnel Center (AFPC) publishes data on the average number of dependents per service-member. According to AFPC the average number of dependents is approximately 1.25. Once we had the average number of dependents we were able to calculate the average poverty threshold for service-members, and that value is 16,689 dollars per year.

We also utilized AFPC's personnel statistics for determining the average time of service for promotions as well as the average High-3 retirement pay. We needed this data in order calculate cash flows for the current medical retirement system.

IV. Analysis

Table 1 details the number of newly disabled veterans in 2007 as well as the number of all disabled veterans broken out by disability rating.

Table 1 Disabled Veterans by Percent Disabled

Newly Disabled in 2007				Total Disabled Veterans			
	All Department of Defense				All Department of Defense		
Disability Percent	Officer	Enlisted	Total	Disability Percent	Officer	Enlisted	Total
10	12	53	65	10	1,002	4,656	5,658
20	7	63	70	20	1,091	3,381	4,472
30	134	1,640	1,774	30	4,467	23,062	27,529
40	73	772	845	40	2,802	10,855	13,657
50	49	290	339	50	1,618	5,281	6,899
60	28	216	244	60	2,017	5,212	7,229
70	17	71	88	70	967	2,005	2,972
80	5	40	45	75	130	96	226
90	3	18	21	80	719	1,085	1,804
100	33	181	214	90	234	241	475
UNK	5	20	25	100	1,281	2,542	3,823
TOTAL	366	3,364	3,730	UNK	3,641	6,921	10,562
				TOTAL	19,969	65,337	85,306

Source: Department of Defense Office of the Actuary 2007: 194

The 85,000 service members across the Department of Defense who receive disability retirement pay is approximately nine percent of the total number of retirees and their annual compensation equates to $1.29 billion or less than four percent of all retirees compensation.

During 2001-2007, an average of 2,722 military members were medically retired from service annually--89 percent enlisted, 11 percent officers. Figure 4 shows the average number of service-members medically retired each year by branch of service and disability rating. The Army represents the largest percentage, 44 percent, of service-members who were medically retired.

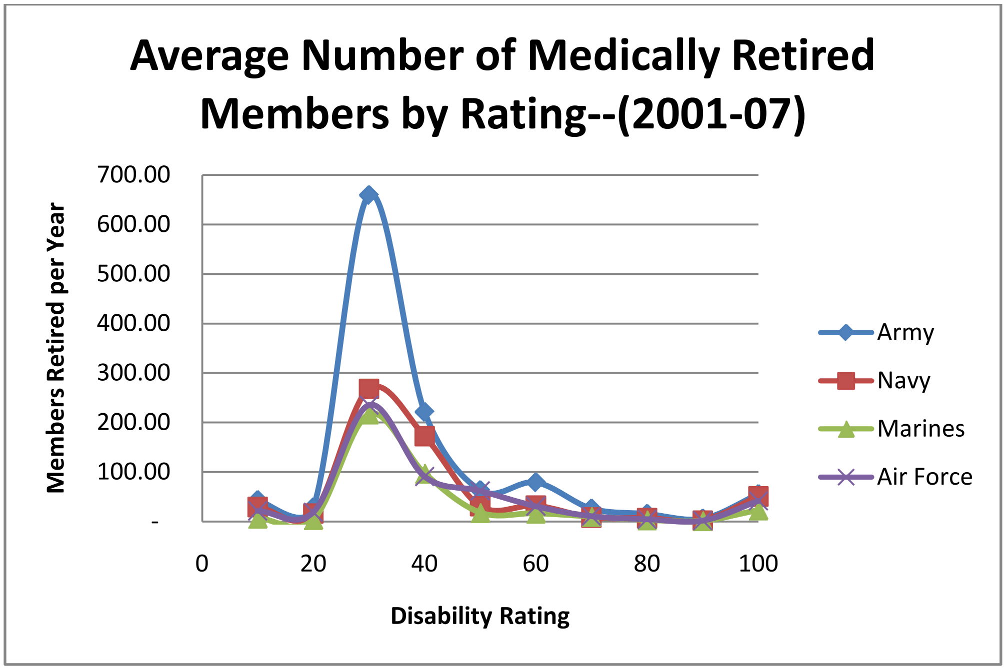

Figure 4. Average Number of Medically Retired Members by Rating 2001-2007

Examining Figure 4, we notice each service has the highest number of disability retirees rated at 30 percent. In order to compare the service branches, we decided to normalize the data by looking at the number of service-members medically retired from each service branch as a percentage. Figures 5 and 6 represent the number of medically retired service-members for each branch as a percentage of the total number of medically retired from each branch. We notice all the service branches follow a similar pattern when rating service-members disabilities with the exception that the Air Force routinely rates service-members at 50 percent disability over two times as often as the other services. We conducted a T-test on the 50 percent disability rating between the four service branches over the years 2001 through 2007 giving us eight observations for each service. Our alpha was .05 and the critical T value for the test was 2.3. Our resulting T-stat of -3.9 showed a statistically significant difference between the ratings of Air Force and other branches of service.

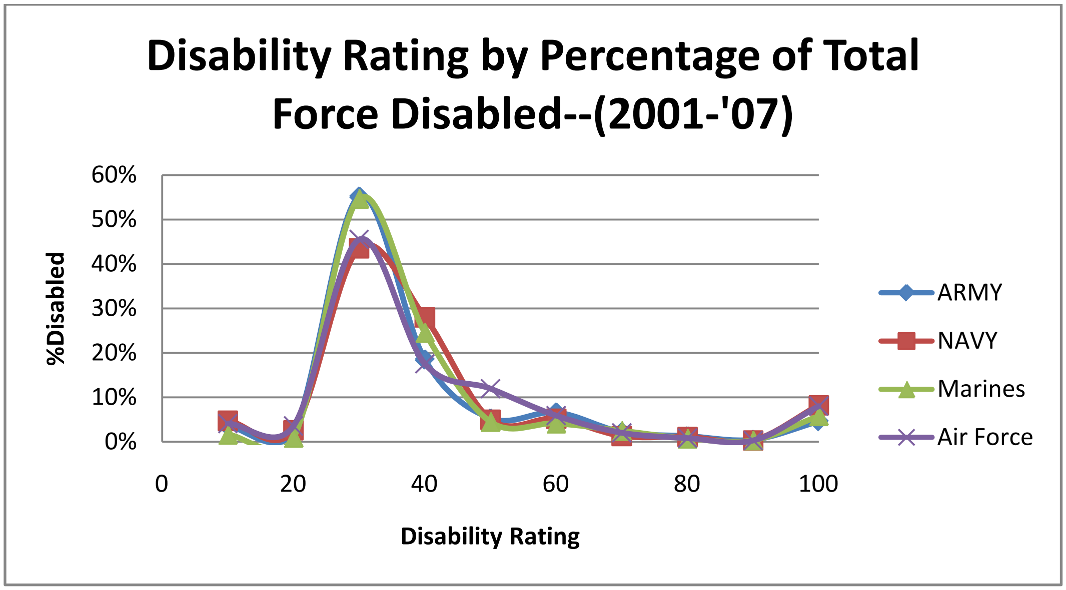

Figure 5. Disability Rating by Percentage of Total Force Disabled 2001-2007

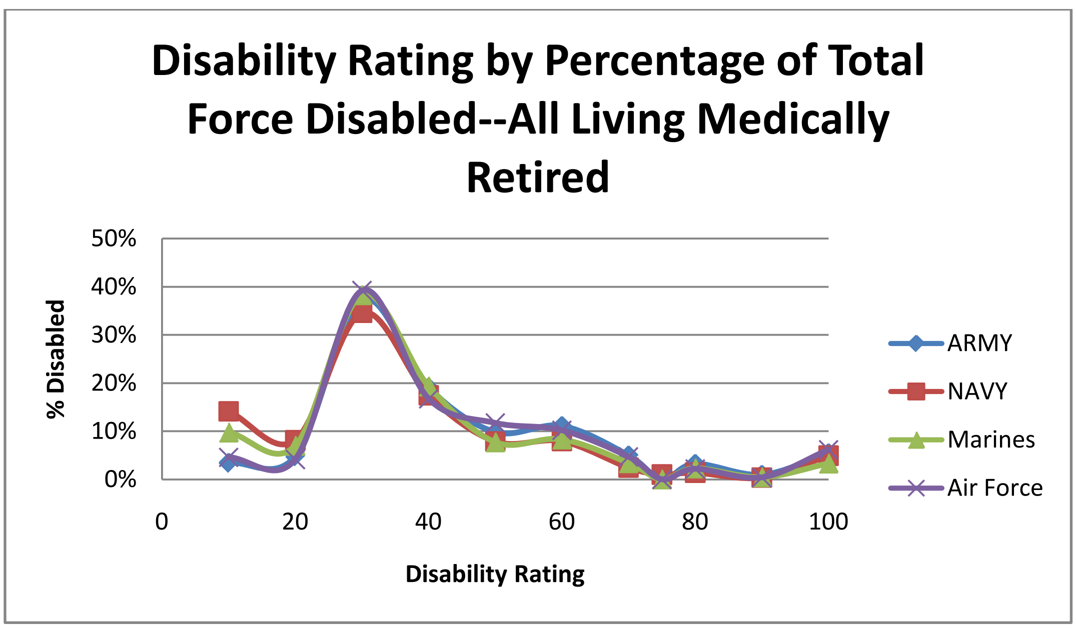

Figure 6. Disability Rating by Percentage of Total Force Disabled—All Living Medically Retired

When we broke out the total force into officers and enlisted we noticed the services followed similar rating patterns; however, officers were routinely rated at a higher disability than enlisted. Seventy-five percent of officers have a disability rating of 50 or below, but 86 percent of enlisted have a disability rating of 50 or below. Figures 7 and 8 illustrate the disparity between officer and enlisted disability ratings.

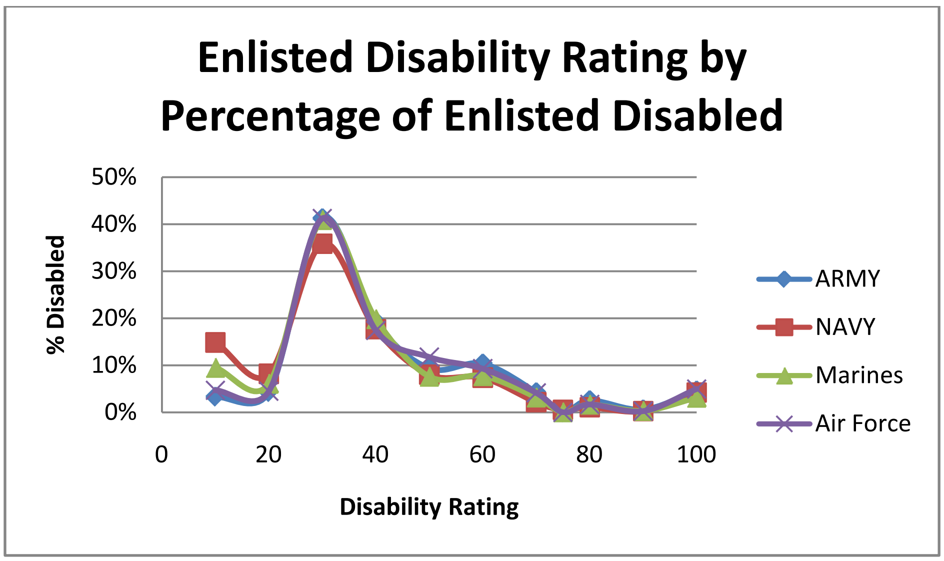

Figure 7. Enlisted Disability Rating by Percentage of Enlisted Disabled

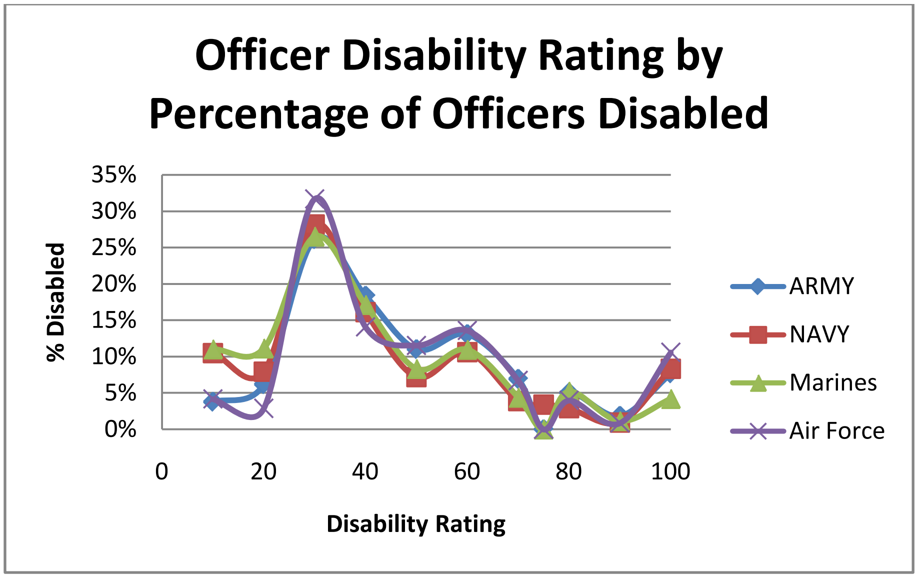

Figure 8. Officer Disability Rating by Percentage of Officers Disabled

We conducted a T-test between the disability ratings between officers and enlisted. The critical T for our test was 1.38 and our T-statistic was -1.7. The difference in disability ratings between officers and enlisted was determined to be statistically significant different with an alpha = .10.

Inconsistency exists between the disability ratings of officers and enlisted; however, this inconsistency did not answer our research question of whether or not a certain segment of service-members are disproportionately affected by the current system. In order to answer the research question, we calculated the retirement pay for service-members based on rank and years of service. Each service-member has a distinct calculation for base retirement pay; however, we are able to make the assumption of the most likely final pay based on average promotion times. Appendix A contains all of our calculations for each most likely final pay based on years of service, rank, and disability rating; moreover, the calculations consider the larger of two options for the current disability retirement system. Table 2 displays final pay for service-members rated 80 percent disabled which represent a service-member who had part of his or her skull removed due to a brain hernia.

Table 2. Final Pay Per Rank & Years of Service at 80% Disability

Pay Grade	Over 2	Over 3	Over 4	Over 6	Over 8
O-3	-	-	39,101.76	46,062.72	48,303.36
O-2	28,142.40	32,485.44	37,262.40	40,094.40	40,639.68
O-1	25,837.44	28,030.08	30,222.72	32,068.80	32,068.80
O-3E	-	-	-	-	43,724.16
O-2E	-	-	-	34,925.76	41,071.68
O-1E	-	-	24,630.72	32,795.52	-
E-5	-	-	-	22,276.80	24,540.48
E-4	16,445.76	17,905.92	19,435.20	20,715.84	21,297.60
E-3	15,910.08	16,841.28	17,513.28	-	-
E-2	14,518.08	15,059.52	-	-	-
E-1	13,435.20	-	-	-	-

The red shaded areas represent service-members whose disability retirement pay would place them below the poverty threshold, and the yellow shaded areas represent pay that is within ten percent of the poverty threshold. According to Buddin and Kapur's 2005 study (Page 48) a disability rating of 80 percent decreases after retirement labor force participation rate to 41 percent. Without additional gainful employment medically retired junior enlisted members with few years of service can receive pay lower than the poverty threshold.

Junior enlisted with few years of service are not compensated enough to meet society's standard for poverty. Next, we compared the current medical retirement system to the VSL model in order to determine if the current model is equitable. Table 3 displays the NPVs for both models.

Table 3. NPV Comparison of Current and VSL Models

100 Percent Disability	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	16,794.00	839,700.00	19,980.02	1,000,000.00	-16.0%
E2	20	50	18,824.40	941,220.00	21,059.05	1,054,005.58	-10.7%
E3	22	48	21,891.60	1,050,796.80	22,066.86	1,066,932.45	-1.5%
E4	24	47	24,294.00	1,141,818.00	23,556.65	1,100,095.46	3.8%
E5	28	43	27,846.00	1,197,378.00	28,652.90	1,243,535.82	-3.7%
O1	25	46	32,296.80	1,485,652.80	30,552.42	1,400,828.68	6.1%
E6	35	38	33,546.00	1,274,748.00	38,293.46	1,445,577.99	-11.8%
O2	27	44	35,178.00	1,547,832.00	33,687.48	1,488,986.73	4.0%
E7	40	34	41,610.00	1,414,740.00	49,260.19	1,660,068.26	-14.8%
E8	43	31	48,588.00	1,506,228.00	58,967.17	1,845,672.55	-18.4%
O3	32	40	48,877.20	1,955,088.00	46,161.02	1,853,364.84	5.5%
E9	45	30	58,741.20	1,762,236.00	71,236.78	2,115,732.40	-16.7%
O4	38	35	65,678.40	2,298,744.00	65,070.76	2,300,251.48	-0.1%
O5	43	31	71,115.60	2,204,583.60	78,110.95	2,444,872.81	-9.8%
O6	48	27	96,270.00	2,599,290.00	114,483.16	3,113,942.00	-16.5%

We observe a difference in the societal standard for a disability and the current compensation given to service-members. This disparity is prevalent amongst the very junior enlisted ranks as well as the senior enlisted and officer ranks. Table 4 displays the sensitivity in the difference between models due to shorter life span as well as the average difference between the VSL and current models for all disability retirement ratings

Table 4. Variations in Life-Span and the Average Difference in NPV between VSL & Current Models Across VASRD

Rank	100 Percent Disability	100 Percent Disability 5% Fewer Cash-flows	100 Percent Disability 10% Fewer Cash-flows	Average Difference Between Models for All VASRD
E1	-16.0%	-19.4%	-24.4%	-16.0%
E2	-10.7%	-14.3%	-19.6%	-10.7%
E3	-1.5%	-5.6%	-11.8%	-1.5%
E4	3.8%	-0.6%	-7.2%	3.8%
E5	-3.7%	-8.2%	-12.7%	-3.7%
O1	6.1%	1.4%	-5.5%	6.1%
E6	-11.8%	-16.5%	-21.1%	-11.8%
O2	4.0%	-0.8%	-5.5%	4.0%
E7	-14.8%	-19.8%	-22.3%	-11.2%
E8	-18.4%	-23.7%	-26.3%	-10.5%
O3	5.5%	0.2%	-5.1%	5.5%
E9	-16.7%	-19.5%	-25.0%	-8.7%
O4	-0.1%	-5.8%	-8.6%	-0.1%
O5	-9.8%	-15.6%	-18.6%	-7.9%
O6	-16.5%	-19.6%	-25.8%	-13.7%

Our computations for the number of cash-flows are composed of the average life-span for disabled veterans; therefore, the number of cash-flows is a ceiling for our computations. However, we can assume higher ratings of disabilities can decrease the average life-span. Testing this assumption we see the discrepancy between the models grows wider with as the life-span decreases. Figure 9 displays the delta between the two systems per rank per disability rating.

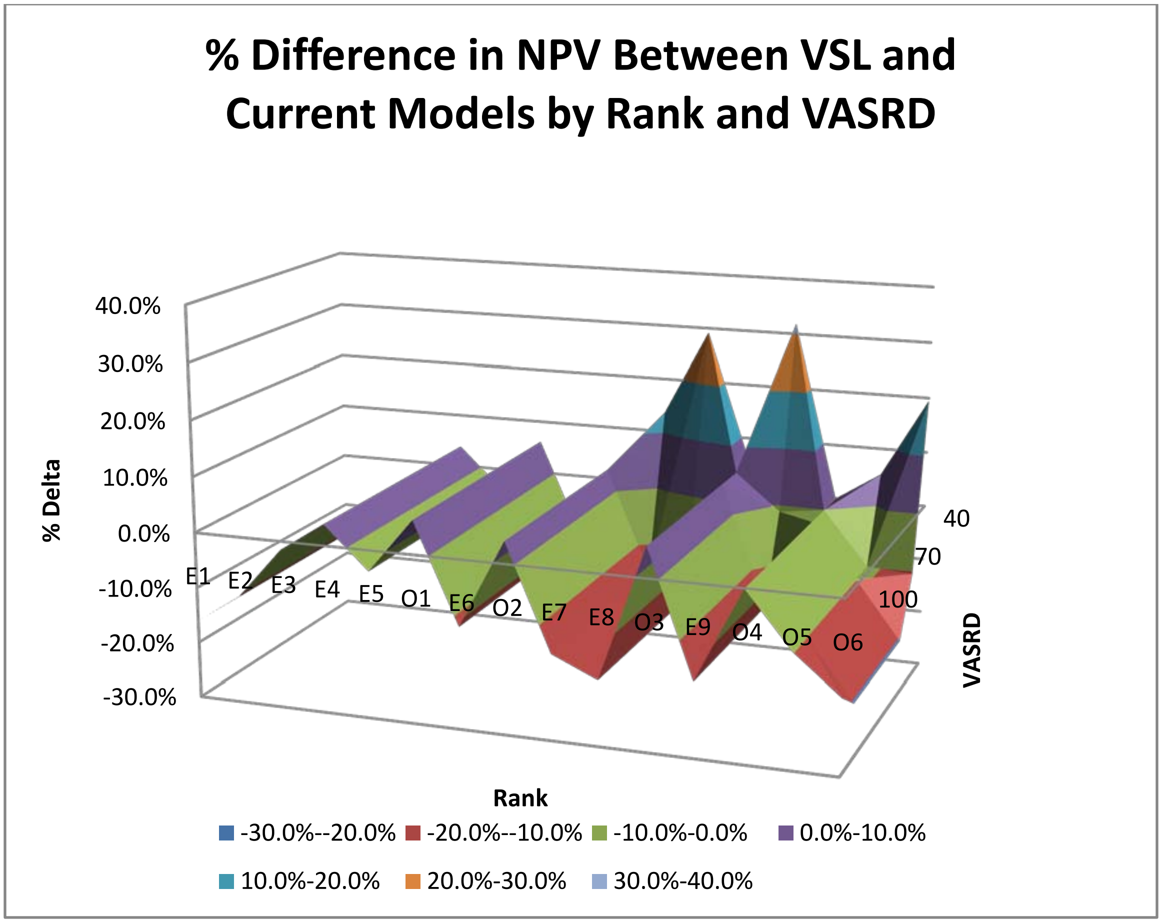

Figure 9. Percentage Difference in NPV Between Models

A negative delta represents compensation below the VSL. Junior officers and E4s have positive deltas representing overcompensation compared to the VSL. The three sharp peaks in Figure 4.6 representing E8, E9, and O6 at the 30 percent disability show large overcompensation compared to the VSL. These three points embody less than one-half of one percent of cases for newly disabled veterans. In Figure 4.6 we also notice the delta does not vary much per each rank from 40 to 100 percent disability. This lack of variation is due to the calculation of the current system. The disability percentage multiplied by the High-3 becomes the higher of the two calculations for the current system at ratings of 40 percent and above; therefore, the compensation percentage for any disability rating higher than 40 percent moves in unison with the VSL model.

We have identified inconsistencies between the current model and the societal standard for equitable compensation. Junior enlisted members, E5 and below, with few years of service represents 61.4 percent of all newly disabled veterans, and these are the same service-members who are disproportionately affected by the current medical retirement system. A more equitable means of calculating medical retirement pay is the VSL model which takes into account the value society has placed on the injury or disease.

The cost to implement the VSL would increase the budget for newly medically retired service-members approximately $1.17 million per year for all DoD. This assumes disability ratings remain constant. If the VSL model applied retroactively to all medically retirees the cost for all DoD would increase by $176 million.

V. Summary and Conclusion

The goal of this research was to scrutinize the 60 year old method for calculating compensation for medical military retirement. Our research proposed the VSL model as the equitable measure for valuing disability compensation because it incorporates society's value of compensation per injury or disease. The comparison of the current system to the VSL model shows a pay discrepancy for junior enlisted service-members with few years in service. The current system places these junior enlisted members into or just above poverty. The VSL model corrects the inadequacies in pay; moreover, the VSL model can easily be updated from year-to-year to account for changes in society's value of injury or illness. The VSL model is the minimum standard for compensating our disabled veterans. The costs to implement this model increase the DoD budget by $176 million per year.

Limitations

One limitation in this research is the lack of knowledge of how disability ratings affect life-span. Our calculations for the number of cash-flows a service-member receives are based on the average life-span for disabled service-members. We showed in Table 4.4 the discrepancy in pay between the two systems increased as average life-span decreased.

Future Research

Future research could be done on the affects of disabilities on life-span. Those results could enhance the VSL model by having a more precise calculation for yearly cash-flows. We would also like to see future research testing inconsistencies in disability ratings between officers and enlisted as well as differences between disability ratings between services. The results would further ensure equity compensation to our disabled veterans.

Appendix A. Comparisons of Two Models per Disability Rating

Table 5. NPV Comparison of Current and VSL Models 30% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	5,038.20	251,910.00	6,000.00	300,000.00	-16.0%
E2	20	50	5,647.32	282,366.00	6,324.03	316,201.68	-10.7%
E3	22	48	6,567.48	315,239.04	6,668.33	320,079.74	-1.5%
E4	24	47	7,288.20	342,545.40	7,021.89	330,028.64	3.8%
E5	28	43	8,353.80	359,213.40	8,675.83	373,060.75	-3.7%
O1	25	46	9,689.04	445,695.84	9,135.84	420,248.60	6.1%
E6	35	38	10,063.80	382,424.40	11,412.46	433,673.40	-11.8%
O2	27	44	10,553.40	464,349.60	10,152.18	446,696.02	4.0%
E7	40	34	16,644.00	565,896.00	14,647.66	498,020.48	13.6%
E8	43	31	23,079.30	715,458.30	17,861.35	553,701.77	29.2%
O3	32	40	14,663.16	586,526.40	13,900.24	556,009.45	5.5%
E9	45	30	27,902.07	837,062.10	21,157.32	634,719.72	31.9%
O4	38	35	19,703.52	689,623.20	19,716.44	690,075.44	-0.1%
O5	43	31	24,890.46	771,604.26	23,660.06	733,461.84	5.2%
O6	48	27	41,336.46	1,116,084.42	34,599.36	934,182.60	19.5%

Table 6. NPV Comparison of Current and VSL Models 40% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	6,717.60	335,880.00	8,000.00	400,000.00	-16.0%
E2	20	50	7,529.76	376,488.00	8,432.04	421,602.23	-10.7%
E3	22	48	8,756.64	420,318.72	8,891.10	426,772.98	-1.5%
E4	24	47	9,717.60	456,727.20	9,362.51	440,038.18	3.8%
E5	28	43	11,138.40	478,951.20	11,567.78	497,414.33	-3.7%
O1	25	46	12,918.72	594,261.12	12,181.12	560,331.47	6.1%
E6	35	38	13,418.40	509,899.20	15,216.61	578,231.20	-11.8%
O2	27	44	14,071.20	619,132.80	13,536.24	595,594.69	4.0%
E7	40	34	16,644.00	565,896.00	19,530.21	664,027.30	-14.8%
E8	43	31	23,079.30	715,458.30	23,815.13	738,269.02	-3.1%
O3	32	40	19,550.88	782,035.20	18,533.65	741,345.94	5.5%
E9	45	30	27,902.07	837,062.10	28,209.77	846,292.96	-1.1%
O4	38	35	26,271.36	919,497.60	26,288.59	920,100.59	-0.1%
O5	43	31	28,446.24	881,833.44	31,546.75	977,949.13	-9.8%
O6	48	27	41,336.46	1,116,084.42	46,132.47	1,245,576.80	-10.4%

Table 7. NPV Comparison of Current and VSL Models 50% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	8,397.00	419,850.00	10,000.00	500,000.00	-16.0%
E2	20	50	9,412.20	470,610.00	10,540.06	527,002.79	-10.7%
E3	22	48	10,945.80	525,398.40	11,113.88	533,466.23	-1.5%
E4	24	47	12,147.00	570,909.00	11,703.14	550,047.73	3.8%
E5	28	43	13,923.00	598,689.00	14,459.72	621,767.91	-3.7%
O1	25	46	16,148.40	742,826.40	15,226.40	700,414.34	6.1%
E6	35	38	16,773.00	637,374.00	19,020.76	722,789.00	-11.8%
O2	27	44	17,589.00	773,916.00	16,920.30	744,493.37	4.0%
E7	40	34	20,805.00	707,370.00	24,412.77	830,034.13	-14.8%
E8	43	31	24,294.00	753,114.00	29,768.91	922,836.28	-18.4%
O3	32	40	24,438.60	977,544.00	23,167.06	926,682.42	5.5%
E9	45	30	29,370.60	881,118.00	35,262.21	1,057,866.20	-16.7%
O4	38	35	32,839.20	1,149,372.00	32,860.74	1,150,125.74	-0.1%
O5	43	31	35,557.80	1,102,291.80	39,433.43	1,222,436.41	-9.8%
O6	48	27	45,929.40	1,240,093.80	57,665.59	1,556,971.00	-20.4%

Table 8. NPV Comparison of Current and VSL Models 60% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	10,076.40	503,820.00	12,000.00	600,000.00	-16.0%
E2	20	50	11,294.64	564,732.00	12,648.07	632,403.35	-10.7%
E3	22	48	13,134.96	630,478.08	13,336.66	640,159.47	-1.5%
E4	24	47	14,576.40	685,090.80	14,043.77	660,057.27	3.8%
E5	28	43	16,707.60	718,426.80	17,351.66	746,121.49	-3.7%
O1	25	46	19,378.08	891,391.68	18,271.68	840,497.21	6.1%
E6	35	38	20,127.60	764,848.80	22,824.92	867,346.79	-11.8%
O2	27	44	21,106.80	928,699.20	20,304.36	893,392.04	4.0%
E7	40	34	24,966.00	848,844.00	29,295.32	996,040.95	-14.8%
E8	43	31	29,152.80	903,736.80	35,722.69	1,107,403.53	-18.4%
O3	32	40	29,326.32	1,173,052.80	27,800.47	1,112,018.90	5.5%
E9	45	30	35,244.72	1,057,341.60	42,314.65	1,269,439.44	-16.7%
O4	38	35	39,407.04	1,379,246.40	39,432.88	1,380,150.89	-0.1%
O5	43	31	42,669.36	1,322,750.16	47,320.12	1,466,923.69	-9.8%
O6	48	27	55,115.28	1,488,112.56	69,198.71	1,868,365.20	-20.4%

Table 9. NPV Comparison of Current and VSL Models 70% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	11,755.80	587,790.00	14,000.00	700,000.00	-16.0%
E2	20	50	13,177.08	658,854.00	14,756.08	737,803.91	-10.7%
E3	22	48	15,324.12	735,557.76	15,559.43	746,852.72	-1.5%
E4	24	47	17,005.80	799,272.60	16,384.40	770,066.82	3.8%
E5	28	43	19,492.20	838,164.60	20,243.61	870,475.08	-3.7%
O1	25	46	22,607.76	1,039,956.96	21,316.96	980,580.08	6.1%
E6	35	38	23,482.20	892,323.60	26,629.07	1,011,904.59	-11.8%
O2	27	44	24,624.60	1,083,482.40	23,688.43	1,042,290.71	4.0%
E7	40	34	29,127.00	990,318.00	34,177.88	1,162,047.78	-14.8%
E8	43	31	34,011.60	1,054,359.60	41,676.48	1,291,970.79	-18.4%
O3	32	40	34,214.04	1,368,561.60	32,433.88	1,297,355.39	5.5%
E9	45	30	41,118.84	1,233,565.20	49,367.09	1,481,012.68	-16.7%
O4	38	35	45,974.88	1,609,120.80	46,005.03	1,610,176.03	-0.1%
O5	43	31	49,780.92	1,543,208.52	55,206.81	1,711,410.97	-9.8%
O6	48	27	64,301.16	1,736,131.32	80,731.83	2,179,759.40	-20.4%

Table 10. NPV Comparison of Current and VSL Models 80% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	13,435.20	671,760.00	16,000.00	800,000.00	-16.0%
E2	20	50	15,059.52	752,976.00	16,864.09	843,204.47	-10.7%
E3	22	48	17,513.28	840,637.44	17,782.21	853,545.96	-1.5%
E4	24	47	19,435.20	913,454.40	18,725.03	880,076.37	3.8%
E5	28	43	22,276.80	957,902.40	23,135.55	994,828.66	-3.7%
O1	25	46	25,837.44	1,188,522.24	24,362.24	1,120,662.95	6.1%
E6	35	38	26,836.80	1,019,798.40	30,433.22	1,156,462.39	-11.8%
O2	27	44	28,142.40	1,238,265.60	27,072.49	1,191,189.39	4.0%
E7	40	34	33,288.00	1,131,792.00	39,060.43	1,328,054.60	-14.8%
E8	43	31	38,870.40	1,204,982.40	47,630.26	1,476,538.04	-18.4%
O3	32	40	39,101.76	1,564,070.40	37,067.30	1,482,691.87	5.5%
E9	45	30	46,992.96	1,409,788.80	56,419.53	1,692,585.92	-16.7%
O4	38	35	52,542.72	1,838,995.20	52,577.18	1,840,201.18	-0.1%
O5	43	31	56,892.48	1,763,666.88	63,093.49	1,955,898.25	-9.8%
O6	48	27	73,487.04	1,984,150.08	92,264.95	2,491,153.60	-20.4%

Table 11. NPV Comparison of Current and VSL Models 90% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	15,114.60	755,730.00	18,000.00	900,000.00	-16.0%
E2	20	50	16,941.96	847,098.00	18,972.10	948,605.03	-10.7%
E3	22	48	19,702.44	945,717.12	20,004.98	960,239.21	-1.5%
E4	24	47	21,864.60	1,027,636.20	21,065.66	990,085.91	3.8%
E5	28	43	25,061.40	1,077,640.20	26,027.49	1,119,182.24	-3.7%
O1	25	46	29,067.12	1,337,087.52	27,407.52	1,260,745.81	6.1%
E6	35	38	30,191.40	1,147,273.20	34,237.37	1,301,020.19	-11.8%
O2	27	44	31,660.20	1,393,048.80	30,456.55	1,340,088.06	4.0%
E7	40	34	37,449.00	1,273,266.00	43,942.98	1,494,061.43	-14.8%
E8	43	31	43,729.20	1,355,605.20	53,584.04	1,661,105.30	-18.4%
O3	32	40	43,989.48	1,759,579.20	41,700.71	1,668,028.36	5.5%
E9	45	30	52,867.08	1,586,012.40	63,471.97	1,904,159.16	-16.7%
O4	38	35	59,110.56	2,068,869.60	59,149.32	2,070,226.33	-0.1%
O5	43	31	64,004.04	1,984,125.24	70,980.18	2,200,385.53	-9.8%
O6	48	27	82,672.92	2,232,168.84	103,798.07	2,802,547.80	-20.4%

Table 12. NPV Comparison of Current and VSL Models 100% Disability

Rank	Average Age	Number of Cash Flows	Yearly Payments--Current	NPV--Current	Yearly Payments--VSL	NPV--VSL	Difference (%)
E1	20	50	16,794.00	839,700.00	19,980.02	1,000,000.00	-16.0%
E2	20	50	18,824.40	941,220.00	21,059.05	1,054,005.58	-10.7%
E3	22	48	21,891.60	1,050,796.80	22,066.86	1,066,932.45	-1.5%
E4	24	47	24,294.00	1,141,818.00	23,556.65	1,100,095.46	3.8%
E5	28	43	27,846.00	1,197,378.00	28,652.90	1,243,535.82	-3.7%
O1	25	46	32,296.80	1,485,652.80	30,552.42	1,400,828.68	6.1%
E6	35	38	33,546.00	1,274,748.00	38,293.46	1,445,577.99	-11.8%
O2	27	44	35,178.00	1,547,832.00	33,687.48	1,488,986.73	4.0%
E7	40	34	41,610.00	1,414,740.00	49,260.19	1,660,068.26	-14.8%
E8	43	31	48,588.00	1,506,228.00	58,967.17	1,845,672.55	-18.4%
O3	32	40	48,877.20	1,955,088.00	46,161.02	1,853,364.84	5.5%
E9	45	30	58,741.20	1,762,236.00	71,236.78	2,115,732.40	-16.7%
O4	38	35	65,678.40	2,298,744.00	65,070.76	2,300,251.48	-0.1%
O5	43	31	71,115.60	2,204,583.60	78,110.95	2,444,872.81	-9.8%
O6	48	27	96,270.00	2,599,290.00	114,483.16	3,113,942.00	-16.5%

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14. ABSTRACT

The purpose of this research was to evaluate the 60 year old military medical retirement system. Specifically, this thesis answered three research questions regarding a comparison of pay between the current system and the societal standard for injury and illness, identification of current segments of the military population disproportionately affected by the current system, and establishment of a minimal standard for medical retirement compensation. Previous research established the societal standard for compensation as the Value of Statistical Life. This thesis compared the current military medical retirement system with the Value of Statistical Life and identified several segments of the military medical retiree population that were adversely affected by the current system. Further, this thesis proposed a new method for calculating medical retirement pay incorporating the societal standard for injury and illness.

15. SUBJECT TERMS

Military Medical Retirement, Value of Statistical Life, Disability Compensation, Schedule of Ratings

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