Federal Employee Retirement Statistics

An Analysis of Federal Employee Retirement Data

Introduction

This paper discusses Federal retirement statistics in order to gain a better understanding of the future makeup of the Federal workforce. A significant number of employees are eligible or will become eligible to retire in the near future, making a deeper analysis of the retirement of Federal civilians more timely and meaningful. The findings will hopefully provide valuable insight into workforce planning as the workforce ages and the needs of the Federal Government continue to evolve.

Included among the findings is the median number of years an employee stays with the Government after first becoming eligible to retire is four years. Nearly 25 percent remain for nine or more years.

How Retirement Eligibility is Calculated

Retirement eligibility is determined based on factors including type of retirement system, age, length of service, and minimum retirement age, as described below.

CSRS (Civil Service Retirement System)
employees are eligible to retire if they are:

a) At least 55 years of age and have at least 30 years of service; or
b) At least 60 years of age and have at least 20 years of service; or
c) At least 65 years of age and have at least 5 years of service.

FERS (Federal Employees' Retirement System)
employees are eligible to retire if they are:

a) Of minimum retirement age (MRA – see Table 1) and have at least 30 years of service; or
b) At least 60 years of age and have at least 20 years of service; or
c) At least 62 years of age and have at least 5 years of service; or
d) Of minimum retirement age (MRA) and have at least 10 years of service (with a reduced annuity, as explained on page 2).

The DC Police and Firemen's Retirement Fund
employees are eligible to retire at any age if they have a minimum of 20 years of service.

FSPS (Foreign Service Pension System) employees are eligible to retire if they are:

a) At least 50 years of age and have at least 20 years of service; or
b) At least 62 years of age and have at least 5 years of service; or
c) Of minimum retirement age (MRA) and have at least 10 years of service (with a reduced annuity, as explained on page 2).

The Foreign Service Retirement and Disability System
employees are eligible to retire if they are:

a) At least 50 years of age and have at least 20 years of service; or
b) At least 60 years of age and have at least 5 years of service.

Minimum retirement age (MRA) is calculated based on year of birth, as shown in Table 1.

Table 1 – Minimum Retirement Age (MRA) for FERS and FSPS Employees

Birth Year	MRA
Before 1948	55.00
1948	55.17
1949	55.33
1950	55.50
1951	55.67
1952	55.83
1953 – 1964	56.00
1965	56.17
1966	56.33
1967	56.50
1968	56.67
1969	56.83
After 1969	57.00

MRA/10 Rule for FERS and FSPS

As shown above in part (d) of the FERS rules and (c) of the FSPS rules for retirement eligibility, employees who have reached their minimum retirement age (see Table 1) and have at least 10 years of service are eligible to retire. However, employees who wish to retire under this rule receive an annuity reduction of 5 percent a year for each year under 62 years of age. Very few employees eligible to retire only under this rule actually exercise this option. In FY 2006, this figure was a mere 3.4 percent; therefore, including employees eligible to retire under the MRA/10 rule seriously overestimates calculations of retirement statistics. In all calculations of retirement eligibility in this paper, the MRA/10 rule for FERS and FSPS is excluded unless otherwise noted.

Current and Future Retirement Eligibility Statistics

As of March 2007, approximately 18 percent of the non-seasonal full-time permanent workforce was eligible to retire. Table 2 shows the number and percent of the non-seasonal full-time permanent employees on-board as of October 2006 by fiscal year through fiscal year 2016. By the year 2016, an ostensibly large 60.8 percent of the non-seasonal full-time permanent workforce as of October 2006 will be eligible to retire. However, the projected percentage of retirements is only 37.3 percent of the full-time permanent workforce as of October 2006, as explained in the following section, *Retirement Predictions.*

Table 2 – Retirement Eligibility Counts and Percentages by Fiscal Year

Fiscal Year	Retirement Eligibility Counts for Full-Time Permanent Employees on-board as of October 1, 2006	Percent of Full-Time Permanent Employees on-board as of October 1, 2006 that will be Eligible to Retire
End of FY 2006 Count	1,572,855	-
through 2007	360,373	22.90%
through 2008	428,167	27.20%
through 2009	494,619	31.40%
through 2010	566,801	36.00%
through 2011	637,645	40.50%
through 2012	707,750	45.00%
through 2013	775,035	49.30%
through 2014	836,516	53.20%
through 2015	896,335	57.00%
through 2016	956,613	60.80%

Retirement Predictions

The Office of Personnel Management's Workforce Information and Planning group has attempted to predict future retirement probabilities from FY 2007 through 2016 using past retirement probability data from the Central Personnel Data File (CPDF). The methodology is as follows:

The full-time permanent Executive Branch workforce as of September 30, 2004, was cross-categorized by sex (2 categories), white-collar occupational category (Professional, Administrative, Technical, Clerical, and Other – PATCO – 6 categories), retirement system (3 categories), and number of years since or until retirement eligibility (13 categories), resulting in 468 distinct subcategories.

For each subcategory, the proportion of employees retiring during the FY 2005 one-year period from October 1, 2004, through September 30, 2005, was computed. For employees not retiring or otherwise separating during that year, their retirement eligibility was recalculated as of September 30, 2005. In each subcategory, the proportion of employees retiring in FY 2006 (from October 1, 2005, through September 30, 2006) was computed. This resulted in two one-year retirement probabilities for each of the 468 subcategories. The estimated one-year probability of retirement in each subcategory was derived by computing the average of the FY 2005 and the FY 2006 retirement probabilities.

The full-time permanent Executive Branch workforce as of September 30, 2006, was cross-categorized, as in (1), by sex, PATCO, retirement system, and number of years since or until retirement eligibility.

Retirement eligibility for each employee was also calculated as of September 30 for years 2007 through 2016. We assumed the future one-year retirement probabilities within a given subcategory

are identical to the past one-year probabilities. Using this assumption and taking into account an employee's eligibility at the beginning of each year, we calculated the probability of retirement in each year for each employee. Each computation assumes an employee has not previously retired or otherwise separated.

Step 5 results in 10 retirement probabilities for each employee corresponding to each of the next 10 years (FY 2007 – 2016).

Retirement projections for each year are calculated by summing that year's retirement probabilities for each employee.

The FY 2007 – 2016 retirement projections are shown in Table 3. For each FY, there is a column for the following: predicted count of retirements; predicted percent of end of FY 2006 count of retirements; predicted cumulative count of retirements, a predicted cumulative percent of end of FY 2006 count of retirements; the retirement eligibility counts from Table 2; and a predicted cumulative count of retirements as a percent of eligibility counts.

If we compare the cumulative counts and cumulative percentages to the counts and percentages in Table 2, we see not nearly as many employees will retire as are eligible. Of the 956,613 employees who are eligible to retire through FY 2016, it is predicted 586,339 employees (61.3 percent) will retire during that period.

Evaluation of past retirement projections confirms this method of projecting retirements is reasonably accurate. Table 4 contains FY 2002 – 2006 retirement projections calculated in 2001. A comparison of predicted and actual retirement projections results in differences of no more than 0.7 percent.

Another source of data with which to compare the projections is the 2006 Federal Human Capital Survey (FHCS), administered at the end of FY 2006. The 2006 FHCS is a survey of full-time permanent Federal civilian employees that measures employees' perceptions of whether, and to what extent, conditions characterizing successful organizations are present in their agencies. A weighted count of 58,717 responded they intended to retire within one year, a difference of only 2,024 fewer than the number projected for FY 2007.

Table 3 – FY 2007 – 2016 Retirement Projections

Fiscal Year	Predicted Count of Retirements	Predicted Retirements as a Percent of End of FY 2006 Count	Predicted Cumulative Count of Retirements	Predicted Retirements as a Cumulative Percent of End of FY 2006 Count	Retirement Eligibility Counts for Full-Time Permanent Employees on-board as of October 1, 2006	Predicted Cumulative Count of Retirements as a Percent of Eligibility Counts
End of FY 2006 Count	1,572,855	1,572,855	1,572,855	1,572,855	1,572,855	-
through 2007	60,741	3.9%	60,741	3.9%	360,373	16.9%
through 2008	61,702	3.9%	122,442	7.8%	428,167	28.6%
through 2009	62,019	3.9%	184,461	11.7%	494,619	37.3%
through 2010	61,748	3.9%	246,209	15.7%	566,801	43.4%
through 2011	60,950	3.9%	307,159	19.5%	637,645	48.2%
through 2012	59,547	3.8%	366,707	23.3%	707,750	51.8%
through 2013	57,839	3.7%	424,546	27.0%	775,035	54.8%
through 2014	55,919	3.6%	480,464	30.5%	836,516	57.4%
through 2015	53,946	3.4%	534,411	34.0%	896,335	59.6%
through 2016	51,928	3.3%	586,339	37.3%	956,613	61.3%

Table 4 – Evaluation of Past Retirement Projections

FY	Number of Predicted Retirements	Predicted Retirement Percentage	Number of Actual Retirements	Actual Retirement Percentage	Difference of Predicted and Actual Number of Retirements	Difference of Predicted and Actual Retirement Percentages
2002	51,011	3.4%	41,705	2.8%	9,306	0.7%
2003	54,218	3.6%	50,240	3.4%	3,978	0.4%
2004	56,650	3.8%	53,649	3.6%	3,001	0.4%
2005	58,129	3.9%	59,609	4.0%	-1,480	0.2%
2006	59,269	4.0%	57,649	3.9%	1,620	0.4%

A Study of Occurrence and Timing of Retirement

An important question, thus far unanswered, is: How long after an employee becomes eligible to retire does he or she actually retire? To answer, we can look at a sample of employees which first become eligible to retire between the years 1997-1999 and track their personnel actions to determine if and when they retired, and construct a life table - a tool of longitudinal data analysis - to summarize the data.

The methodology for this analysis is as follows:

A 5 percent simple random sample of employees was selected from a population which first became eligible to retire sometime between 1997 and 1999.

Each of these employees' retirement and other separation personnel actions were collected from the CPDF Dynamics files through FY 2006, and the most recent data available.

For all employees who retired, the time of retirement was calculated by determining the number of days after first becoming eligible that the retirement action occurred, converting the number to a year by dividing by 365.25.

Employees who did not retire within the allotted time period, or employees who otherwise separated from the Government, were "censored", or flagged as having an unknown retirement time.

The data was summarized in a life table (see Table 5). Two important functions in the life table are the hazard function and the survivor function. The hazard function is the conditional probability an employee will retire in a specific year, given the did not retire or otherwise separate in a previous year. The survivor function is the probability an employee will remain employed in the Government past a specific year.

Table 5 is an informative summarization of time of retirement. Within one year of first becoming eligible, 15.3 percent of employees retired Approximately 24 percent of employees remained in the Government nine years after first becoming eligible. The median number of years an employee remained after first becoming eligible is about four years, as indicated by the survivor function. Figures 5a and 5b are graphical representations of the hazard and survival probability functions, respectively. This data indicates many employees wait several years to retire after first becoming eligible.

Table 5 – Life Table Describing the Number of Years Federal Employees Remain in Government after First Becoming Eligible to Retire

Time	Hazard Function (proportion of employees at the beginning of the year that left during the year)	Survivor Function (proportion of all employees still employed at the end of the year)
Year 0	.	100.0%
Year 1	15.3%	84.7%
Year 2	14.3%	72.6%
Year 3	15.3%	61.4%
Year 4	16.6%	51.3%
Year 5	15.9%	43.1%
Year 6	19.1%	34.9%
Year 7	16.5%	29.1%
Year 8	15.7%	24.5%
Year 9	2.8%	23.9%

Figure 5a

Hazard Probability

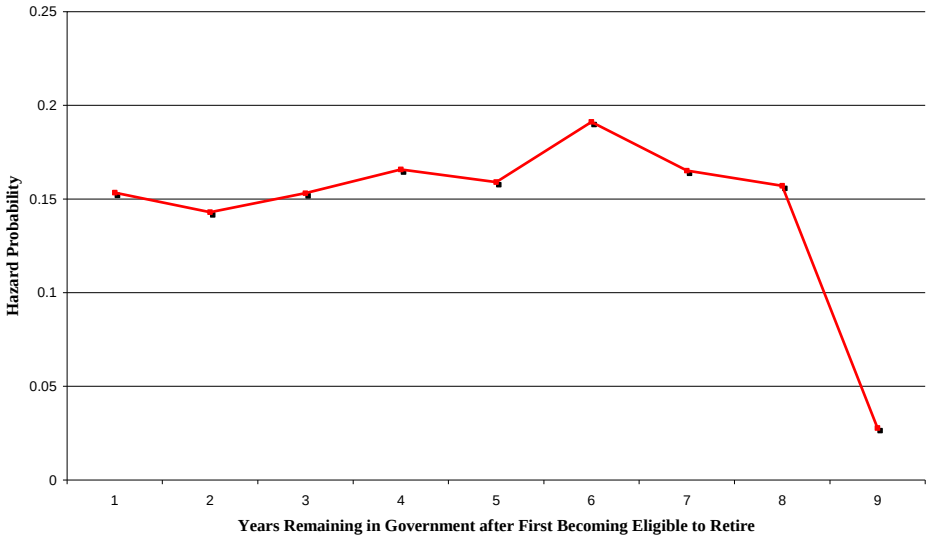
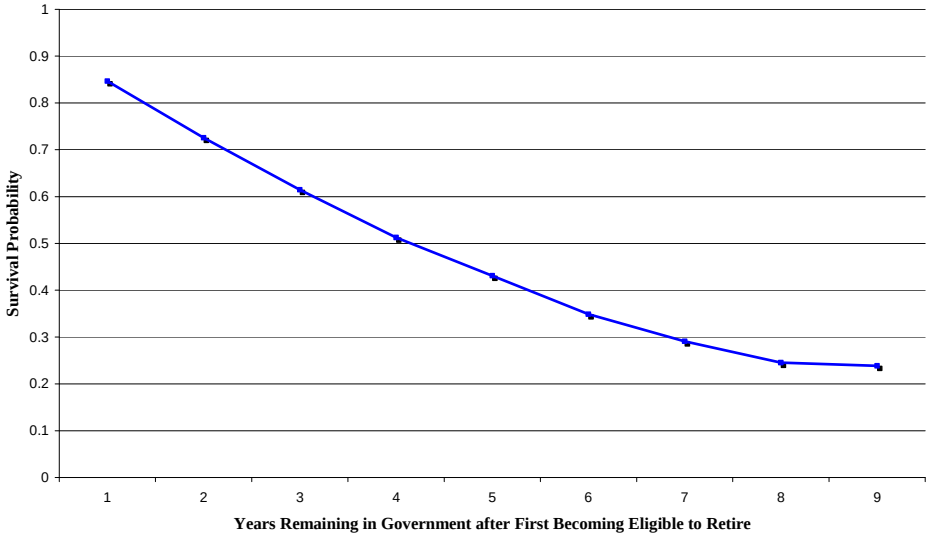


Figure 5b

Survival Probability



The life table gives insight as to when employees retire. But why do some retire within the first year of becoming eligible, while some wait five or even nine years? We can attempt to answer the question of why with a discrete-time hazard statistical model of the data.

A discrete-time hazard model estimates an individual's conditional probability of retirement in year *t*, given he or she did not retire in a previous year, and he or she has particular values for predictors in the model. While there is a potentially infinite number of factors related to an employee's decision to retire, our analysis is restricted to those variables available in CPDF. The 9 CPDF variables selected for potential inclusion in the discrete-time hazard model are described in Table 6. For simplification, all variable values were recorded at the time the employee first became eligible to retire.

Table 6 – Variables Selected for Potential Inclusion in Discrete-Time Hazard Model

Variable	Description	Values
Sex	employee's gender	Female=1
		Male=0
Supervisor	employee's supervisory status	Supervisor=1
		Non-supervisor=0
Agency_Type	employee's agency type	Defense*=1
		Non-Defense=0
Location	employee's work location	DC area=1
		All other locations=0
Age	employee's age	0-100
Length_of_Service	employee's length of service in Government	0-100
Salary	employee's salary	$4,000-$200,000
PATCO	employee's occupational category	Professional or Administrative=1
		All other categories=0
Retirement_Plan	employee's retirement plan	CSRS=1
		FERS=0

* Defense agencies are Department of the Army, Department of the Air Force, Department of the Navy, and all other defense activities

The response variable in this model, whether or not a person retired in a specific year, is binomially distributed. Therefore, logistic regression, a type of regression in which the response variable is binomial, is used to fit the model. A logistic regression model expresses the log odds (commonly referred to as logits) of a binomial dependent variable as a linear combination of predictors.

The form of a logistic regression discrete-time hazard model for the retirement data is

$$\text{logit } h(t_j) = [\alpha_1 Y_1 + \alpha_2 Y_2 + \ldots + \alpha_9 Y_9] + [\beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_p X_p],$$

where $h(t_j)$ is the hazard function (the conditional probability an employee will retire in a specific year, given they did not retire or otherwise separate in a previous year); α_1, α_2, …, α_9 are the intercept parameters that correspond to the value of the logit hazard (log odds of retirement) in that year; Y_1, Y_2, ..., Y_9 are indicator variables of the value of year (i.e., if the time period is year 3 after first becoming eligible to retire, then $Y_3 = 1$ and all other $Y_i = 0$); β_1, β_2 , …, β_9 are slope

parameters that indicate how a one unit difference in the corresponding predictor variable affects likelihood of retirement; and X_1, X_2, …, X_p are the predictors.

There are 9 variables we could potentially include as predictors in this model, as well as many interactions among these variables. The objective is to select predictors that result in a simple and practical, yet informative, model. Model building is a complex task requiring much experimentation, and we must use statistical tests for verification.

The final model chosen for this data includes the following predictors: Retirement plan, Patco, Location, Sex, and PATCO*Sex (interaction term of PATCO and Sex). The fit of this model was assessed using several statistical tests. A likelihood ratio test was used to determine if additional terms in a model contributed significantly more information about likelihood of retirement than a smaller number of terms in a nested model. A Hosmer-Lemeshow goodness-of-fit test was used to assess the fit of the model. The p-value of this test for the final model was .0585, indicating we cannot reject the hypothesis that the model fits the data well at the .05 level of significance.

The parameter estimates, their standards errors, and tests of significance are in Table 7 below. All parameters are significant at the .05 level, as proven by the last column.

First we will interpret the parameter estimates for year variables, Y1-Y9. We can convert these estimates into hazards of the baseline group (employees that have a value of 0 for every non-year predictor – Retirement_plan = 0, Patco = 0, Location = 0, and Sex = 0) by taking the antilogit: $h(t) = 1 / (1 + e^{-\alpha})$, as done in Table 8, for easier interpretation. The baseline group's estimated hazard, or conditional probability of retirement at time t, given the employee did not already retire or separate, is approximately 16 percent in the first year. It dips slightly in the second year, increases and peaks at year six, drops slightly at years seven and eight, and sharply drops in year nine.

Table 7 – Parameter Estimates, Standard Errors, and Significance Tests

		Analysis of Maximum Likelihood Estimates			
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Y1	1	-1.6226	0.0737	484.1383	<.0001
Y2	1	-1.7155	0.0778	485.7564	<.0001
Y3	1	-1.6297	0.0802	412.7041	<.0001
Y4	1	-1.5422	0.0829	346.2032	<.0001
Y5	1	-1.5798	0.0876	324.9982	<.0001
Y6	1	-1.3331	0.0884	227.6434	<.0001
Y7	1	-1.5291	0.0978	244.3847	<.0001
Y8	1	-1.5605	0.127	150.8692	<.0001
Y9	1	-3.4292	0.4185	67.1488	<.0001
Retirement_plan	1	0.1485	0.0568	6.8398	0.0089
PATCO	1	-0.2539	0.0558	20.7287	<.0001
Location	1	-0.188	0.0591	10.1183	0.0015
Sex	1	-0.2182	0.0714	9.3333	0.0023
PATCO*Sex	1	0.369	0.0939	15.4511	<.0001

Table 8 – Taking Antilogits of Paramater Estimates to get Hazard Estimates for the Baseline Group

Year	Parameter Estimate	Hazard
Y1	-1.6226	0.16485
Y2	-1.7155	0.15245
Y3	-1.6297	0.16387
Y4	-1.5422	0.17622
Y5	-1.5798	0.17082
Y6	-1.3331	0.20865
Y7	-1.5291	0.17813
Y8	-1.5605	0.17357
Y9	-3.4292	0.0314

Now we can interpret the parameter estimates of the main predictors. Here, we convert the parameter estimates in Table 7 to odds ratios in Table 9, the ratio the odds of retirement for the two values of the variable, by taking the antilog: odds ratio = e^{β}.

Table 9 – Taking Antilogs of Parameter Estimates to get Odds Ratios

Predictor	Parameter Estimate	Odds Ratio
Retirement_plan	0.1485	1.1600928
PATCO	-0.2539	0.7757694
Location	-0.188	0.8286147
Sex	-0.2182	0.8039646
PATCO*Sex	0.369	1.4462876

The odds ratios interpretations are as follows:

Retirement_plan: the estimated odds of retirement in every year are 16 percent higher for employees in CSRS as opposed to FERS, controlling for all other variables.

Location: the estimated odds of retirement in every year are about 17 percent less for employees working in the D.C. area in comparison to non-D.C. area employees, controlling for all other variables.

Since PATCO and Sex are involved in an interaction term, their interpretations are bit more complicated. Given an employee is Professional or Administrative, retirement is 16 percent more likely in any year if the employee is female, controlling for all other variables. Given the employee is not Professional or Administrative, females are about 20 percent less likely than males to retire in any year, controlling for all other variables. Given an employee is female, she is about 12 percent more likely to retire in any year if Professional or Administrative, as opposed to all other occupational categories, controlling for all other variables. Given an employee is male, he is approximately 22 percent less likely to retire in any year if Professional or Administrative, as opposed to all other occupation types, controlling for all other variables.

The odds ratios indicate no variables in the model are strongly associated with time of retirement, but they nonetheless provide some information. There are many other factors that may have stronger association with time of retirement, such as amount of money saved for retirement, the current state of the economy, number of children in college, whether or not a spouse is still employed, etc. However, these types of variables are not readily available, so we must make use of demographic variables available in CPDF.

The life table and the discrete-time hazard model have provided important insight as to when employees retire and what demographic factors may be associated with time of retirement. This study could be repeated in the future to determine if timing of retirement stays relatively consistent in later years.

Conclusion

Retirement projection statistics, calculated using past retirement and other demographic information, imply the percentage of employees that will actually retire is smaller than the predicted number of employees deemed eligible to retire. The study of occurrence and time of retirement indicates the median number of years an employee stays with the Government after first becoming eligible is four years, and nearly 25 percent remain for nine years or more. Several demographic variables provide some information as to time of retirement, but there are likely other factors unavailable to us that have a much larger impact.

Suggested Further Research

This study focuses on static data available to the U. S. Office of Personnel Management. There are likely any number of external factors that affect a person's decision to retire, data about which are unavailable to OPM or even immeasurable. Such factors include familial situations, illness, caretaker status, children in college, the cost of tuition for their children, and others.

A survey of Federal retirees and employees eligible to retire could provide more information on these and other factors that influence timing of retirement. Some suggested topics include preparation for retirement, savings and investments, dependents, and job satisfaction. Consideration might also be given to correlation or examination of larger external factors such as the economy as measured by the stock market indices and inflation rates, both of which may heavily influence financial status and decisions.

If you have questions concerning this analysis please e-mail Fedstats@opm.gov and reference this report in the subject line.