

Mortality for Retired Federal Employees and Their Survivors

This paper presents data on the mortality, and mortality improvement trends, for retired U.S. Civil Service employees and their survivors, and analyzes the relationship to such factors as:

- Indexed final salary
- Amount of indexed annuity
- Total service at retirement
- Duration on the Annuity Rolls
- Retiree vs. beneficiary
- Disability vs. non-disability

Summary of Retirement Plan Provisions for Federal Employees

Federal civilian employees hired before 1984 are covered by the Civil Service Retirement System (CSRS), which started in 1920. Federal employees under this system are not covered under Social Security. However new Federal employees hired after 1983 are covered by Social Security. A separate retirement system, referred to as the Federal Employees Retirement System (FERS), was established for these employees, which was designed to integrate better with Social Security. It was also intended to be more similar to pension plans in the private sector. As of September 30, 2000, there were 1,640,000 CSRS retirees, 130,000 FERS retirees, 600,000 CSRS spouse survivors, and 11,000 FERS spouse survivors. Since most of the experience data in this paper is for CSRS annuitants, the plan provisions described below pertain mainly to CSRS.

Normal retirement is at age 55 with 30 years service, or at age 60 with 20 years service, or at age 62 with 5 years service. Early retirement can be authorized in some cases at age 50 with 20 years service, or at any age with 25 years service. The benefit amount under CSRS is determined as a percentage of the high-three average salary, with a credit of 1.5 percent for the first five years of service, 1.75 percent for the next five years, and 2 percent for each year thereafter.

Disability retirement is permitted after 5 years service for employees who are not able to perform their job or a similar job. However, employees who become disabled while they are eligible for normal retirement generally retire under the normal retirement provisions (rather than under disability retirement) because the benefits are the same. At one time there were tax advantages for retiring under disability, but this is no longer the case. When employees retire on disability, they continue to receive disability retirement benefits for the rest of their lives, unless they recover and are removed from the rolls. Employees who are disabled on the job generally elect Workers Compensation instead of disability retirement, because the benefits are higher, and data for these employees is not included in this study. There is a minimum disability benefit that is the lower of 40 percent of the high-three average salary, or the benefit projected to age 60.

Employees who terminate before retirement, and who do not elect a refund of their employee contributions, receive a deferred annuity commencing at age 62, which is based on their high-three average salary at the time of termination. The annuities under CSRS are fully indexed to inflation. A survivor annuity is payable for employees who die before retirement, and for

retirees who elect a survivor benefit. The reduction for survivor benefits is approximately 8.5% of the benefit amount. About 75 percent of all male retirees and 35 percent of all female retirees elect survivor benefits.

Tables 1 and 2

Overall mortality rates, and mortality improvement trends, are shown in Table 1, for male and female separately. The experience is for all retired employees, under both CSRS and FERS, including disability, non-disability, and deferred retirement. Although mortality tables for pension plans are often presented separately for disability and non-disability retirements, the data shown here is for all retirees, so as to be more comparable to the mortality for a general population, which would include disabled lives. The differences in mortality between disability and non-disability retirement are presented in Tables 15 and 16 later in this report. The experience data for Table 1 covers the period 1980 through 2000. Similar results are shown for spouse survivors of active and retired employees in Table 2, for the period 1984 through 2000.

Both Tables 1 and 2 are based on data files that have been extracted from the annuity rolls each year. These files have been prepared on a consistent basis over the entire 21-year period covered. One file contains the number of retired employees on the rolls at the beginning of each year, grouped by age and sex. Another file contains similar data for the deaths during the year, but only for those deaths that were on the roll at the beginning of the year. Mortality rates were determined by dividing the number of deaths during the year by the exposure, which in this case is the number at the beginning of the year. The mortality rates in Tables 1 and 2 are based only on the number of lives and numbers of deaths; there were no adjustments to take into account the amount of annuity payable. "Age" is defined as age nearest birthday at the beginning of the year.

Table 1 shows the total number of deaths and the total years of exposure over the entire period, 1980 through 2000, by age and sex. It also shows the average mortality improvement trend over this period. As part of the process of determining the mortality improvement trend, a separate graduated mortality table was determined for each year of experience. The method of graduation was Whittaker-Henderson Type B. An average exponential mortality improvement trend was then determined for each age, based on the slope of a least-squares best-fit trend line of the logarithms of the graduated death rates at that age. The mortality rates that fall on this least-squares trend line were also determined. These "trended" mortality rates are shown in Table 1 for the years 1980, 1990, and 2000. Finally, the difference between the graduated mortality rate and the "trended" mortality rate was determined for each year. The absolute value of this difference was then averaged over the 21 years, and this average absolute difference was divided by the trended mortality rate for the year 1990 in order to express this average difference as a percentage. This average annual percentage difference is also shown in Table 1. It is fairly large at the very oldest ages, indicating a greater statistical variation in the mortality improvement trend at these ages.

Table 2 shows the same mortality rates and trends as Table 1, except that Table 2 is for spouse survivors of active and retired employees. The data for spouse survivors was available for the years 1984 through 2000, and the trended mortality rates are shown for the years 1985, 1990, and 2000.

The mortality rates for male survivors of female employees (widowers) are about 50 percent higher than for retired male employees at the younger ages. The mortality rates for female survivors (widows) are higher at some ages but lower at others. The percentage of retirees that have a living spouse is much lower for female retirees than for male retirees, although it is difficult to obtain accurate data in this area. Thus a comparison of retiree and survivor mortality does not provide a good measure of the differences in mortality for single versus married persons.

Table 1
Mortality Rates and Mortality Improvement Trends
For All Retired Employees - Male

Age	Exposure	Deaths	Trended Mortality Rate			Avg. Diff. from Trend	Trend
			1980	1990	2000		
55	255452.	3564.	.01786	.01342	.01008	4.8%	2.82%
56	393945.	4974.	.01706	.01297	.00985	4.2%	2.71%
57	471471.	6142.	.01672	.01292	.00998	4.2%	2.55%
58	541113.	7435.	.01694	.01332	.01048	4.0%	2.37%
59	607992.	9002.	.01756	.01412	.01135	3.3%	2.16%
60	686462.	10647.	.01873	.01499	.01199	3.2%	2.21%
61	778435.	12880.	.01980	.01605	.01300	2.5%	2.08%
62	867828.	15283.	.02108	.01708	.01384	2.3%	2.08%
63	969816.	18027.	.02226	.01824	.01495	2.0%	1.97%
64	1013763.	20058.	.02347	.01958	.01634	1.8%	1.79%
65	1051418.	22609.	.02483	.02114	.01800	2.1%	1.60%
66	1081873.	24906.	.02661	.02285	.01962	2.1%	1.51%
67	1081924.	26799.	.02892	.02471	.02110	2.3%	1.56%
68	1065341.	28594.	.03120	.02699	.02334	2.0%	1.44%
69	1040436.	30756.	.03389	.02942	.02555	2.0%	1.40%
70	1006749.	31998.	.03684	.03204	.02786	2.4%	1.39%
71	971304.	33947.	.03971	.03505	.03094	2.6%	1.24%
72	928727.	34674.	.04329	.03814	.03361	2.8%	1.26%
73	880127.	36077.	.04717	.04162	.03671	2.8%	1.25%
74	825211.	36644.	.05139	.04545	.04020	2.7%	1.22%
75	764792.	37234.	.05632	.04947	.04345	2.1%	1.29%
76	700748.	37107.	.06140	.05394	.04738	1.9%	1.29%
77	636446.	36439.	.06668	.05890	.05202	2.1%	1.23%
78	571024.	35449.	.07340	.06382	.05549	1.9%	1.39%
79	506939.	34192.	.08024	.06950	.06020	2.1%	1.43%
80	444864.	32863.	.08727	.07600	.06618	2.3%	1.37%
81	388748.	31313.	.09511	.08314	.07268	2.3%	1.34%
82	336472.	29671.	.10378	.09101	.07981	2.3%	1.30%
83	290067.	28456.	.11274	.09984	.08842	2.3%	1.21%
84	247920.	26628.	.12227	.10935	.09779	2.2%	1.11%
85	209850.	24539.	.13243	.11945	.10774	2.3%	1.03%
86	175241.	22343.	.14318	.13027	.11852	2.4%	0.94%
87	145411.	20562.	.15410	.14208	.13099	2.4%	0.81%
88	117867.	18140.	.16569	.15464	.14433	2.4%	0.69%
89	94852.	15763.	.17857	.16767	.15744	2.4%	0.63%
90	74688.	13430.	.19305	.18109	.16986	2.5%	0.64%
91	58114.	11130.	.20742	.19592	.18506	2.6%	0.57%
92	44253.	9322.	.22185	.21214	.20285	2.5%	0.45%
93	32901.	7436.	.23615	.22981	.22363	3.0%	0.27%
94	24190.	5963.	.25630	.24537	.23491	3.7%	0.43%
95	17203.	4493.	.27074	.26503	.25944	3.5%	0.21%
96	12195.	3626.	.28433	.28587	.28741	4.2%	-0.05%
97	8263.	2495.	.30726	.30173	.29629	4.9%	0.18%
98	5477.	1751.	.31866	.32451	.33047	4.9%	-0.18%
99	3592.	1210.	.34609	.33821	.33051	6.6%	0.23%
100	2246.	828.	.34810	.36684	.38659	8.3%	-0.53%
101	1382.	510.	.39780	.36796	.34037	11.4%	0.78%
102	813.	325.	.39777	.39708	.39638	9.6%	0.02%
103	462.	188.	.41296	.41751	.42210	11.8%	-0.11%
104	258.	97.	.44453	.42807	.41221	14.1%	0.38%
105	143.	62.	.51723	.41778	.33744	22.3%	2.11%

Table 1 (cont.)
Mortality Rates and Mortality Improvement Trends
For All Retired Employees - Female

Age	Exposure	Deaths	Trended Mortality Rate			Avg. Diff. From Trend	Trend
			1980	1990	2000		
55	87928.	978.	.01433	.01193	.00993	10.7%	1.82%
56	117932.	1260.	.01410	.01163	.00960	9.5%	1.91%
57	135681.	1477.	.01412	.01131	.00906	9.2%	2.20%
58	151902.	1693.	.01387	.01119	.00903	8.3%	2.13%
59	168271.	1947.	.01333	.01125	.00949	6.5%	1.69%
60	193479.	2239.	.01294	.01124	.00976	5.5%	1.40%
61	232223.	2686.	.01242	.01133	.01034	4.8%	0.92%
62	272664.	3055.	.01227	.01141	.01060	4.6%	0.73%
63	324294.	3720.	.01242	.01165	.01093	4.8%	0.64%
64	344989.	4188.	.01273	.01224	.01177	3.8%	0.39%
65	364304.	4868.	.01350	.01295	.01242	3.1%	0.42%
66	382647.	5230.	.01439	.01389	.01341	2.6%	0.35%
67	390100.	5825.	.01564	.01487	.01413	2.9%	0.51%
68	391279.	6369.	.01670	.01616	.01564	2.9%	0.33%
69	389857.	6748.	.01806	.01749	.01694	3.5%	0.32%
70	385138.	7409.	.01922	.01916	.01909	3.7%	0.03%
71	379119.	7751.	.02095	.02075	.02056	3.3%	0.09%
72	369842.	8405.	.02295	.02249	.02205	3.0%	0.20%
73	357385.	8767.	.02502	.02453	.02405	3.0%	0.20%
74	342382.	9127.	.02752	.02675	.02599	3.0%	0.29%
75	325298.	9411.	.03072	.02911	.02758	2.5%	0.54%
76	305990.	9568.	.03396	.03207	.03029	2.7%	0.57%
77	285835.	10075.	.03794	.03534	.03291	2.6%	0.71%
78	264581.	10131.	.04237	.03907	.03602	2.8%	0.81%
79	243924.	10639.	.04683	.04347	.04036	2.5%	0.74%
80	222867.	10719.	.05199	.04823	.04474	2.4%	0.75%
81	203694.	10703.	.05760	.05352	.04973	2.5%	0.73%
82	184709.	10928.	.06355	.05955	.05581	2.7%	0.65%
83	166359.	10829.	.07060	.06600	.06170	2.4%	0.67%
84	148696.	10818.	.07773	.07353	.06955	2.4%	0.55%
85	131483.	10708.	.08573	.08179	.07804	2.4%	0.47%
86	114810.	10203.	.09503	.09063	.08643	2.6%	0.47%
87	99155.	10010.	.10430	.10084	.09750	2.6%	0.34%
88	84426.	9524.	.11470	.11179	.10894	2.8%	0.26%
89	70769.	8723.	.12616	.12358	.12104	3.0%	0.21%
90	58387.	7883.	.13876	.13625	.13377	3.2%	0.18%
91	47367.	7100.	.15142	.15051	.14961	3.4%	0.06%
92	37605.	6132.	.16689	.16478	.16271	3.6%	0.13%
93	29343.	5239.	.18166	.18097	.18029	3.7%	0.04%
94	22395.	4487.	.19652	.19843	.20035	4.1%	-0.10%
95	16730.	3631.	.21569	.21443	.21318	4.6%	0.06%
96	12098.	2813.	.23038	.23387	.23741	4.6%	-0.15%
97	8574.	2173.	.24940	.25142	.25346	5.4%	-0.08%
98	5895.	1681.	.26563	.27108	.27664	5.6%	-0.20%
99	3846.	1092.	.28415	.28974	.29543	6.4%	-0.19%
100	2511.	791.	.30491	.30723	.30956	7.8%	-0.08%
101	1575.	517.	.32356	.32592	.32831	9.0%	-0.07%
102	941.	314.	.34130	.34489	.34851	10.3%	-0.10%
103	555.	208.	.35600	.36508	.37440	13.0%	-0.25%
104	308.	117.	.36226	.38955	.41890	18.7%	-0.73%
105	157.	60.	.42522	.38008	.33973	20.4%	1.12%

Table 2
Mortality Rates and Mortality Improvement Trends
For Survivors of Employees and Retirees - Widowers

Age	Exposure	Deaths	Trended Mortality Rate			Avg. Diff. From Trend	Trend
			1985	1990	2000		
55	4013.	38.	.01524	.01228	.00796	13.8%	4.24%
56	4479.	76.	.01637	.01341	.00900	12.3%	3.91%
57	4876.	69.	.01756	.01464	.01017	10.6%	3.57%
58	5370.	72.	.01883	.01597	.01149	9.2%	3.24%
59	5949.	96.	.02023	.01744	.01295	9.1%	2.93%
60	6657.	133.	.02175	.01902	.01454	9.1%	2.65%
61	7368.	168.	.02338	.02072	.01627	8.9%	2.39%
62	8193.	196.	.02509	.02253	.01817	8.6%	2.13%
63	8911.	228.	.02685	.02444	.02026	8.5%	1.86%
64	9741.	257.	.02868	.02648	.02258	8.7%	1.58%
65	10460.	306.	.03061	.02866	.02513	8.6%	1.31%
66	11291.	376.	.03271	.03101	.02788	8.2%	1.06%
67	12114.	451.	.03498	.03353	.03082	7.5%	0.84%
68	12714.	460.	.03744	.03622	.03391	6.6%	0.66%
69	13375.	554.	.04013	.03910	.03711	6.1%	0.52%
70	13863.	632.	.04313	.04218	.04034	5.8%	0.44%
71	14293.	675.	.04650	.04550	.04356	6.3%	0.43%
72	14625.	743.	.05033	.04909	.04672	6.5%	0.49%
73	14776.	841.	.05467	.05300	.04982	6.4%	0.62%
74	14761.	888.	.05955	.05724	.05288	6.1%	0.79%
75	14649.	943.	.06496	.06181	.05596	5.4%	0.99%
76	14367.	960.	.07085	.06672	.05916	4.7%	1.19%
77	13930.	1035.	.07713	.07196	.06265	4.1%	1.38%
78	13397.	1013.	.08371	.07755	.06654	3.8%	1.52%
79	12704.	1103.	.09057	.08349	.07096	3.7%	1.61%
80	11877.	1106.	.09768	.08982	.07593	3.6%	1.67%
81	10924.	1045.	.10508	.09655	.08151	3.5%	1.68%
82	10007.	1056.	.11280	.10374	.08773	3.5%	1.66%
83	8979.	1083.	.12090	.11142	.09464	3.5%	1.62%
84	7991.	912.	.12937	.11964	.10231	3.6%	1.55%
85	7037.	905.	.13823	.12844	.11089	3.8%	1.46%
86	6099.	835.	.14742	.13785	.12053	4.2%	1.33%
87	5271.	743.	.15685	.14784	.13133	4.7%	1.18%
88	4451.	724.	.16639	.15833	.14336	5.0%	0.99%
89	3640.	608.	.17585	.16916	.15655	5.2%	0.77%
90	2997.	575.	.18501	.18012	.17072	5.3%	0.53%
91	2350.	478.	.19366	.19094	.18560	5.5%	0.28%
92	1804.	396.	.20156	.20132	.20085	5.7%	0.02%
93	1327.	309.	.20848	.21099	.21608	6.1%	-0.24%
94	981.	240.	.21420	.21963	.23092	7.0%	-0.50%
95	715.	168.	.21851	.22701	.24500	8.2%	-0.77%
96	517.	140.	.22123	.23284	.25794	9.7%	-1.03%
97	357.	111.	.22215	.23691	.26946	11.5%	-1.30%
98	229.	70.	.22110	.23899	.27924	13.6%	-1.57%
99	141.	40.	.21795	.23890	.28702	16.1%	-1.85%
100	91.	24.	.21260	.23646	.29254	19.1%	-2.15%
101	72.	19.	.20491	.23151	.29554	22.9%	-2.47%
102	50.	10.	.19475	.22384	.29571	27.6%	-2.82%
103	32.	2.	.18197	.21320	.29267	33.4%	-3.22%
104	26.	2.	.16637	.19927	.28587	40.9%	-3.67%
105	20.	4.	.14767	.18152	.27429	51.0%	-4.21%

Table 2 (cont.)
Mortality Rates and Mortality Improvement Trends
For Survivors of Employees and Retirees - Widows

Age	Exposure	Deaths	Trended Mortality Rate			Avg. Diff.	
			1985	1990	2000	From Trend	Trend
55	67524.	419.	.00638	.00607	.00548	7.5%	1.01%
56	77776.	490.	.00681	.00657	.00611	6.6%	0.72%
57	89041.	684.	.00737	.00717	.00680	5.8%	0.53%
58	101560.	829.	.00806	.00787	.00750	5.3%	0.47%
59	115702.	1036.	.00888	.00865	.00822	5.0%	0.51%
60	131371.	1376.	.00979	.00950	.00895	4.6%	0.59%
61	148140.	1568.	.01072	.01038	.00975	4.2%	0.63%
62	166099.	1942.	.01162	.01129	.01066	4.2%	0.57%
63	184496.	2381.	.01248	.01222	.01171	3.9%	0.42%
64	203131.	2852.	.01331	.01317	.01289	3.3%	0.21%
65	220910.	3335.	.01415	.01416	.01417	3.3%	-0.01%
66	238485.	3703.	.01508	.01523	.01553	3.7%	-0.20%
67	256177.	4529.	.01622	.01645	.01692	3.6%	-0.28%
68	272581.	5267.	.01762	.01784	.01828	3.2%	-0.25%
69	287842.	5877.	.01928	.01939	.01962	2.8%	-0.12%
70	301360.	6710.	.02113	.02110	.02106	2.7%	0.02%
71	313009.	7580.	.02311	.02295	.02263	2.5%	0.14%
72	321836.	8625.	.02520	.02489	.02429	2.4%	0.25%
73	327425.	9170.	.02743	.02694	.02598	2.6%	0.36%
74	330304.	9978.	.02983	.02914	.02779	2.7%	0.47%
75	329753.	10888.	.03243	.03154	.02983	2.7%	0.56%
76	325681.	11545.	.03524	.03419	.03218	2.7%	0.60%
77	318601.	12408.	.03833	.03716	.03491	2.8%	0.62%
78	308727.	13052.	.04179	.04052	.03809	2.8%	0.62%
79	295486.	13466.	.04575	.04441	.04186	2.7%	0.59%
80	281835.	14327.	.05035	.04894	.04623	2.4%	0.57%
81	267703.	15164.	.05568	.05413	.05116	2.3%	0.56%
82	251929.	15961.	.06176	.05999	.05658	2.1%	0.58%
83	237053.	16129.	.06857	.06650	.06256	1.9%	0.61%
84	218972.	16893.	.07605	.07373	.06930	1.8%	0.62%
85	200460.	16942.	.08413	.08169	.07703	2.0%	0.59%
86	180859.	17227.	.09281	.09042	.08582	2.3%	0.52%
87	161122.	16858.	.10221	.09998	.09567	2.6%	0.44%
88	141174.	16440.	.11243	.11045	.10660	2.9%	0.35%
89	122128.	15648.	.12359	.12193	.11870	3.0%	0.27%
90	103437.	14750.	.13572	.13450	.13210	3.0%	0.18%
91	85882.	13421.	.14873	.14812	.14690	2.8%	0.08%
92	70059.	12183.	.16244	.16267	.16312	2.6%	-0.03%
93	55767.	10726.	.17653	.17788	.18059	2.3%	-0.15%
94	43448.	8974.	.19061	.19336	.19899	2.3%	-0.29%
95	33183.	7529.	.20413	.20863	.21792	2.3%	-0.44%
96	24643.	5986.	.21645	.22308	.23696	2.3%	-0.61%
97	17816.	4709.	.22683	.23609	.25576	2.4%	-0.80%
98	12564.	3564.	.23457	.24704	.27401	2.6%	-1.04%
99	8689.	2524.	.23908	.25542	.29153	3.0%	-1.33%
100	5942.	1801.	.23992	.26083	.30825	3.5%	-1.68%
101	4084.	1206.	.23686	.26298	.32419	4.4%	-2.11%
102	2646.	784.	.22978	.26167	.33937	5.9%	-2.63%
103	1747.	525.	.21862	.25668	.35385	8.4%	-3.26%
104	1129.	380.	.20341	.24778	.36767	11.9%	-4.03%
105	702.	177.	.18413	.23462	.38092	16.4%	-4.97%

Table 3 below compares the life expectancy at attained ages 55, 65, and 85 based on the mortality rates shown in Tables 1 and 2. It shows, for example, that the expected age at death for a male retiree age 55 was 76.39 in 1980, and was 79.33 years in 2000. Thus the life expectancy for a male age 55 increased by 2.94 years over this period.

Table 3

Expected Age at Death
For All Retired Employees - Male

Attained Age	1980	1990	2000
55	76.39	77.90	79.33
65	79.85	80.83	81.80
85	90.10	90.39	90.68

Expected Age at Death
For All Retired Employees - Female

Attained Age	1980	1990	2000
55	81.06	81.75	82.38
65	84.10	84.43	84.75
85	91.65	91.75	91.84

Expected Age at Death
Survivors - Widowers

Attained Age	1985	1990	2000
55	75.31	76.08	77.51
65	78.91	79.31	80.10
85	90.35	90.48	90.73

Expected Age at Death
Survivors - Widows

Attained Age	1985	1990	2000
55	81.90	82.04	82.33
65	84.05	84.14	84.33
85	91.90	91.89	91.89

Various Factors Influencing Mortality of Retired Federal Employees and Survivors

Experience Data

Tables 4 through 19 below show the effect of various factors, such as amount of annuity, on the mortality rates for retired Federal employees and survivors. These tables are based on a file that contains individual records for all annuitants on the rolls as of April 2001, and which includes data for all drops since the beginning of calendar year 1990. The data for each annuitant includes the date of birth, sex, final salary, amount of annuity, annuity commencement date, type of retirement, total service at retirement, date of drop (if dropped), and reason for drop. Unfortunately, data concerning the precise former occupation of the retired employee is not available, nor is accurate data on whether the retiree is currently married.

In the tables presented below, the deaths and exposures are divided into various subgroups, based on the factor being analyzed, e.g. into subgroups based on amount of annuity. The breakpoints used to determine these subgroups, e.g., the annuity amount breakpoints, were determined so that the total exposure over all age bands would roughly be the same for each subgroup. The breakpoints are generally different for male and female because the distributions are different. The deaths and exposures are also grouped into five-year age bands. A mortality rate is determined for each subgroup by dividing the total deaths by the total exposure for that age band.

A "mortality ratio" is displayed in the tables, which is the ratio of the mortality rate for each subgroup to the overall mortality rate for that age band. The overall mortality rate is also presented. There is a separate display that shows the total number of years of exposure for each of the subgroups, for each age band.

For the tables that show mortality by duration on the annuity roll (Tables 12, 13, 14, and 19), a year of exposure is defined as one of the successive 12-month periods following the annuity commencement date. Age is defined as "age nearest birthday" at the beginning of each of these years of exposure. For the other tables (not showing mortality based on duration on the annuity roll) a year of exposure is defined as a calendar year, 1990 through 2000, and age is defined as "age nearest birthday" at the beginning of the calendar year. In both of these cases, fractional years of exposure are included, and deaths during these fractional years are counted.

In some cases, the expected age at death is also shown for the various subgroups, as well as for the entire population. The expected age at death is equal to the attained age plus the complete expectation of life. To calculate this, a mortality table applicable to each subgroup was determined as follows. First, a mortality table for the entire population covered by the table was determined, with mortality rates calculated at each age. Then these overall mortality rates were multiplied by the applicable mortality ratio for each subgroup, within each age band.

Tables 4 and 5

Table 4 shows the ratio of the mortality rate for various levels of indexed final salary to the overall mortality rate, for all CSRS immediate retirements (including disability retirements, but excluding FERS retirements, and excluding deferred retirements). The disability retirement rate is somewhat higher for lower salaried employees, and so the higher mortality associated with disability retirements would contribute somewhat to the higher mortality associated with the lower salary levels. The final salaries for all deaths are indexed to year 2001 levels, based on the historical salary increases that are given to all Federal employees each year. The salary associated with each year of exposure is also the salary as of the year 2001.

Table 4 shows a strong relationship between amount of indexed final salary and the mortality rate, especially at the younger ages. For example, at age 55-59, for male lives, the mortality for the lowest salary band is about 3.5 times higher than for the highest salary levels. However, as with most of these factors affecting mortality, the correlation declines to near zero at the older ages. The relationship between salary level and mortality is not as strong for females as it is for males.

Table 5 shows the expected age at death for each of the different salary bands for retirees at attained ages of 55, 65 and 85. Males age 55 in the highest salary band could be expected to live to age 81.9 on the average, but only to age 75.8 for the lowest band, which is a difference of 6.1 years. For females age 55, the difference is 3.8 years.

As was mentioned, the precise former occupation of the retired employee is not available in the database, so studies of mortality by occupation could not be done. However, the mortality of former employees of the U.S. Postal Service was compared with the mortality for all other retired employees, in an attempt to quantify some differences by occupation. However, the mortality for these two groups of retirees was found to be nearly identical.

Tables 6 and 7

Table 6 also shows the mortality ratio for various levels of indexed final salary, but limited to non-disability retirements. In this case, the correlation between amount of final salary and the mortality rate is weaker than in Table 4, which includes disability retirements. For example, at age 55-59, for male lives, the mortality for the lowest salary band is about 2.25 times higher than for the highest salary level.

Table 7 shows that non-disabled males age 55 in the highest salary band could be expected to live to age 82.3 on the average, but only to age 78.0 for the lowest band, a difference of 4.3 years. For females age 55, the difference is 1.7 years.

Tables 8 and 9

Table 8 shows the ratio of the mortality rate for various amounts of annuity to the overall mortality rate, for non-disability CSRS immediate retirements. Disability retirements are excluded because the annuity amounts tend to be smaller than for non-disability, and it would be difficult to isolate the effect of disability retirements on the results. FERS annuities are excluded because FERS annuity amounts are considerably smaller than for CSRS, for the

same service and salary levels. Deferred annuities are excluded since they are based on the salary at termination, which can be many years before the annuity commences at age 62. The amount of the annuity for all deaths is indexed to a level for 2001, based on the rate of inflation. (All CSRS annuities are indexed to inflation after commencement.) The amount of annuity applicable to the exposure for each year is also the amount for year 2001.

There is a strong relationship between the amount of the annuity and the mortality level, especially for males. However, this relationship tends to disappear at the older ages and the mortality ratios become close to 1.0. Table 9 shows that males age 55 live to 82.1 on the average for the highest amount levels, but only to 78.6 for the lowest, a difference of 3.5 years. For females, the difference is 0.7 years.

Tables 10 and 11

Table 10 shows the mortality based on length of service at retirement, for non-disability CSRS immediate retirements. Disability retirements are excluded because they would predominately occur for employees with fewer years of service, and would result in much higher mortality for employees in these service bands.

There is small but clear trend for lower mortality to be associated with greater amounts of service for males, and less so for females. Table 11 shows that the expected age at death for males age 55 who retire with less than 25 years of service is 79.4, but is 80.8 if they retire with 36 or more years of service.

A comparison of mortality similar to this was also done by age at retirement (also limited to non-disability retirements), and it did not showed a consistent relationship between mortality and age at retirement.

Tables 12, 13, and 14

These tables show mortality by duration on the annuity roll for all retired employees, including both CSRS and FERS, and including deferred retirements. Table 12 shows the results for non-disability retirement, Table 13 for disability retirement, and Table 14 for disability and non-disability combined. For non-disability, mortality is lower for the first years on the roll, and for disability retirement, mortality is higher for these years. For non-disability retirement, the difference in mortality becomes greater at the older ages, in contrast to the usual pattern where the differences tend to disappear at older ages. It does seem reasonable that employees who work to more advanced ages would be more healthy than the general population of retirees, and that this would continue after retirement.

Tables 15 and 16

Table 15 compares the mortality for disability versus non-disability retirement. The differences in mortality are greatest at the younger ages, and tend to disappear at the oldest ages. The differences for women are slightly greater than for men. Thus non-disabled male retirees at age 55 can

expect to live 5.7 years longer than disabled retirees do. For female retirees, the difference is 6.0 years.

Tables 17 and 18

Table 17 shows mortality by amount of annuity for survivors of active and retired employees. For widows, there is a clear pattern of higher mortality for lower amounts. For widowers, the pattern is not consistent. The total exposure for widowers is much smaller than for widows.

Table 19

Table 19 shows mortality by duration on the annuity roll for survivors. For widows, the mortality is lower by about 25 percent or more during the first year on the roll, and somewhat less for widowers. The mortality ratio during the first year also tends to be lower at the older ages. During the second year on the roll, the mortality is lower than average by about 8 percent. This would be consistent with a pattern of lower mortality while married that changes fairly quickly to higher level of mortality that prevails after the death of the spouse. However, it is not possible to directly compare mortality for single versus married using the data available here.

Table 4
Mortality Ratio by Amount of Indexed Final Salary- Male
For All CSRS Immediate Retirements

Age Group	0 - 38000	38000- 43000	43000- 48000	48000- 58000	58000- 78000	78000+	Overall Rate
55 59	1.897	1.451	1.086	0.932	0.745	0.540	0.01075
60 64	1.614	1.268	1.047	0.934	0.783	0.588	0.01515
65 69	1.418	1.130	0.980	0.928	0.824	0.652	0.02297
70 74	1.293	1.074	0.975	0.936	0.836	0.699	0.03509
75 79	1.210	1.042	1.003	0.940	0.858	0.738	0.05418
80 84	1.123	1.035	1.013	0.954	0.892	0.796	0.08535
85 89	1.064	1.031	1.009	0.959	0.922	0.860	0.13480
90 94	1.028	1.030	0.983	0.954	0.944	0.926	0.20751
95 99	1.009	1.003	1.003	0.971	0.948	0.992	0.29890
100 104	1.016	1.092	0.969	0.854	0.866	1.087	0.37867

Exposure

55 59	112455.	142441.	191935.	183905.	247778.	230097.	1108609.
60 64	238425.	297391.	370622.	323509.	382804.	337798.	1950543.
65 69	430535.	503070.	461252.	430340.	440995.	365934.	2632114.
70 74	563640.	578002.	385515.	433316.	412269.	341529.	2714259.
75 79	525389.	433953.	240399.	315450.	297120.	259698.	2071998.
80 84	354279.	203579.	111523.	152364.	148659.	142765.	1113168.
85 89	177936.	64678.	38010.	50797.	53084.	52850.	437355.
90 94	66571.	14652.	9172.	11946.	12993.	11392.	126727.
95 99	16989.	2574.	1441.	1951.	2053.	1278.	26286.
100 104	2062.	220.	134.	204.	183.	68.	2871.

Mortality Ratio by Amount of Indexed Final Salary - Female
For All CSRS Immediate Retirements

Age Group	0 - 28000	28000- 33000	33000- 38000	38000- 43000	43000- 53000	53000+	Overall Rate
55 59	1.634	1.371	1.059	1.127	0.873	0.635	0.00965
60 64	1.429	1.223	1.006	1.047	0.862	0.748	0.01149
65 69	1.326	1.117	1.037	0.984	0.835	0.777	0.01525
70 74	1.173	1.081	0.977	1.005	0.878	0.851	0.02274
75 79	1.119	1.043	1.003	0.977	0.928	0.846	0.03502
80 84	1.107	1.025	0.987	0.984	0.919	0.883	0.05896
85 89	1.099	1.000	0.981	0.930	0.941	0.917	0.09947
90 94	1.030	1.001	0.977	0.972	0.950	0.979	0.16484
95 99	1.013	0.994	0.979	0.895	1.019	1.138	0.25055
100 104	0.992	0.980	1.120	0.963	0.939	1.090	0.34599

Exposure

55 59	33044.	46122.	53248.	53273.	77576.	104212.	367476.
60 64	65470.	91765.	99351.	88677.	143833.	132671.	621766.
65 69	123314.	157359.	151543.	129187.	188936.	139016.	889355.
70 74	160295.	191540.	176588.	146796.	180843.	120229.	976290.
75 79	146166.	171215.	156573.	121035.	128492.	85534.	809015.
80 84	102739.	122345.	107188.	71660.	72057.	48509.	524498.
85 89	69976.	72971.	56280.	32584.	31557.	20611.	283979.
90 94	41276.	30591.	18984.	9839.	8446.	5279.	114414.
95 99	14190.	7094.	3654.	1730.	1277.	740.	28685.
100 104	2124.	705.	307.	174.	80.	61.	3451.

Table 5

Expected Age at Death by Amount of Indexed Final Salary
For All CSRS Immediate Retirements

Male

<u>Attained Age</u>	<u>0 - 38000</u>	<u>38000- 43000</u>	<u>43000- 48000</u>	<u>48000- 58000</u>	<u>58000- 78000</u>	<u>78000+</u>	<u>Overall Rate</u>
55	75.8	77.6	78.7	79.4	80.4	81.9	78.8
65	79.8	80.9	81.4	81.8	82.5	83.6	81.4
85	90.2	90.3	90.4	90.6	90.7	90.9	90.4

Female

<u>Attained Age</u>	<u>0 - 28000</u>	<u>28000- 33000</u>	<u>33000- 38000</u>	<u>38000- 43000</u>	<u>43000- 53000</u>	<u>53000+</u>	<u>Overall Rate</u>
55	80.0	81.2	82.1	82.2	83.1	83.8	82.2
65	83.5	84.2	84.6	84.8	85.3	85.6	84.6
85	91.4	91.7	91.8	92.0	91.9	91.8	91.7

Table 6
Mortality Ratio by Amount of Indexed Final Salary - Male
For Non-Disability CSRS Immediate Retirements

Age Group	0 - 38000	38000- 43000	43000- 48000	48000- 58000	58000- 78000	78000+	Overall Rate
55 59	1.533	1.305	1.202	1.012	0.867	0.681	0.00764
60 64	1.383	1.244	1.143	0.993	0.843	0.664	0.01244
65 69	1.305	1.157	1.037	0.969	0.857	0.700	0.02012
70 74	1.226	1.104	1.013	0.973	0.866	0.730	0.03168
75 79	1.176	1.067	1.032	0.958	0.885	0.760	0.05044
80 84	1.109	1.047	1.029	0.971	0.908	0.815	0.08178
85 89	1.059	1.035	1.011	0.973	0.929	0.875	0.13157
90 94	1.026	1.038	0.985	0.953	0.949	0.937	0.20517
95 99	1.007	1.025	1.008	0.959	0.958	0.991	0.29862
100 104	1.021	1.073	0.961	0.848	0.873	1.091	0.37741

Exposure

55 59	61376.	105622.	171732.	164474.	228717.	223286.	955207.
60 64	154056.	246330.	341277.	293558.	356217.	326584.	1718016.
65 69	296621.	431710.	423388.	385887.	404445.	347820.	2289858.
70 74	394606.	498373.	344128.	378626.	368723.	317197.	2301643.
75 79	383814.	375141.	209528.	273868.	263559.	239422.	1745322.
80 84	275064.	177271.	97567.	135161.	134518.	133292.	952871.
85 89	146386.	57641.	34161.	46607.	49711.	50239.	384746.
90 94	57412.	13439.	8543.	11291.	12544.	10995.	114223.
95 99	14625.	2371.	1365.	1875.	1992.	1243.	23471.
100 104	1770.	205.	130.	203.	176.	68.	2552.

Mortality Ratio by Amount of Indexed Final Salary - Female
For Non-Disability CSRS Immediate Retirements

Age Group	0 - 28000	28000- 33000	33000- 38000	38000- 43000	43000- 53000	53000+	Overall Rate
55 59	1.198	1.147	1.015	1.179	1.018	0.844	0.00547
60 64	1.199	1.165	0.984	1.061	0.966	0.866	0.00870
65 69	1.210	1.093	1.046	1.015	0.899	0.855	0.01277
70 74	1.080	1.064	0.980	1.055	0.925	0.904	0.02002
75 79	1.061	1.022	1.015	1.014	0.959	0.894	0.03196
80 84	1.066	1.028	1.009	0.997	0.933	0.915	0.05571
85 89	1.078	1.002	0.995	0.946	0.967	0.938	0.09638
90 94	1.027	1.002	0.980	0.971	0.964	0.997	0.16317
95 99	1.013	0.995	0.981	0.896	1.015	1.130	0.24983
100 104	0.998	0.977	1.109	0.937	0.917	1.078	0.34969

Exposure

55 59	11893.	26763.	38691.	39210.	66411.	96923.	279891.
60 64	36417.	64711.	79054.	72364.	129644.	124687.	506877.
65 69	83600.	119668.	123470.	108775.	171108.	129576.	736196.
70 74	114854.	148392.	145240.	124758.	160932.	109841.	804018.
75 79	104791.	134506.	130911.	104070.	112470.	77312.	664060.
80 84	71036.	99621.	92836.	63117.	64108.	44581.	435299.
85 89	50157.	63253.	51004.	29904.	29273.	19561.	243152.
90 94	32408.	27953.	17771.	9299.	8100.	5091.	100621.
95 99	11728.	6578.	3425.	1670.	1226.	726.	25353.
100 104	1793.	653.	281.	171.	78.	61.	3037.

Table 7

Expected Age at Death by Amount of Indexed Final Salary
For Non-Disability CSRS Immediate Retirements

Male

<u>Attained Age</u>	<u>0 - 38000</u>	<u>38000- 43000</u>	<u>43000- 48000</u>	<u>48000- 58000</u>	<u>58000- 78000</u>	<u>78000+</u>	<u>Overall Rate</u>
55	78.0	78.9	79.5	80.2	81.1	82.3	80.0
65	80.7	81.3	81.8	82.2	82.8	83.8	82.0
85	90.3	90.4	90.5	90.7	90.8	90.9	90.5

Female

<u>Attained Age</u>	<u>0 - 28000</u>	<u>28000- 33000</u>	<u>33000- 38000</u>	<u>38000- 43000</u>	<u>43000- 53000</u>	<u>53000+</u>	<u>Overall Rate</u>
55	82.7	83.1	83.6	83.5	84.0	84.4	83.6
65	84.6	84.9	85.1	85.2	85.6	85.8	85.2
85	91.5	91.8	91.8	92.0	91.9	91.8	91.8

Table 8

Mortality Ratio by Amount of Monthly Annuity for Retirees - Male
For Non-Disability CSRS Immediate Retirements

Age Group	0 - 1200	1200- 1600	1600- 2000	2000- 2400	2400- 3000	3000+	Overall Rate
55 59	1.390	1.264	1.196	0.995	0.916	0.681	0.00764
60 64	1.320	1.245	1.129	0.991	0.860	0.667	0.01244
65 69	1.186	1.150	1.073	0.987	0.865	0.726	0.02012
70 74	1.139	1.118	1.057	0.974	0.926	0.762	0.03168
75 79	1.115	1.099	1.064	0.994	0.935	0.802	0.05044
80 84	1.082	1.092	1.050	1.007	0.967	0.850	0.08178
85 89	1.056	1.052	1.035	1.007	0.996	0.895	0.13157
90 94	1.012	1.025	1.025	1.010	1.004	0.934	0.20517
95 99	1.018	1.028	0.971	0.978	1.005	0.982	0.29862
100 104	0.990	1.042	0.943	1.027	1.132	0.940	0.37741

Exposure

55 59	51213.	124742.	208566.	153335.	169941.	247410.	955207.
60 64	172488.	256207.	374278.	264026.	274503.	376520.	1718016.
65 69	357034.	384524.	484640.	339049.	315982.	408640.	2289858.
70 74	400274.	382729.	477950.	335677.	297011.	408013.	2301643.
75 79	314409.	262385.	350563.	249546.	221049.	347379.	1745322.
80 84	171172.	129822.	183703.	133906.	119366.	214902.	952871.
85 89	69771.	53255.	71373.	52975.	48715.	88657.	384746.
90 94	23578.	18476.	20307.	15156.	14390.	22316.	114223.
95 99	6137.	4446.	4240.	3005.	2525.	3118.	23471.
100 104	827.	420.	531.	320.	206.	248.	2552.

Mortality Ratio by Amount of Monthly Annuity for Retirees - Female
For Non-Disability CSRS Immediate Retirements

Age Group	0 - 600	600- 1000	1000- 1300	1300- 1600	1600- 2000	2000+	Overall Rate
55 59	0.957	1.102	1.047	1.197	1.007	0.829	0.00547
60 64	1.163	1.023	1.030	1.018	1.003	0.894	0.00870
65 69	1.078	1.049	1.002	1.032	0.991	0.869	0.01277
70 74	1.028	0.977	1.002	1.017	1.010	0.958	0.02002
75 79	1.023	0.953	1.005	1.019	1.026	0.961	0.03196
80 84	0.996	1.008	0.996	1.024	1.021	0.962	0.05571
85 89	0.989	1.011	1.008	1.040	0.989	0.971	0.09638
90 94	0.971	1.022	1.020	1.002	0.997	0.993	0.16317
95 99	1.006	0.966	1.030	1.009	0.982	1.002	0.24983
100 104	1.037	0.988	0.923	1.010	1.088	0.927	0.34969

Exposure

55 59	6678.	23034.	45190.	51436.	66753.	86799.	279891.
60 64	34099.	55710.	96418.	98666.	110640.	111345.	506877.
65 69	104700.	100270.	143461.	128626.	135496.	123643.	736196.
70 74	150763.	114359.	148001.	126166.	138310.	126419.	804018.
75 79	139541.	91110.	113614.	96525.	113908.	109362.	664060.
80 84	87127.	55050.	71323.	64100.	79188.	78512.	435299.
85 89	44316.	31424.	41981.	37914.	44960.	42558.	243152.
90 94	19778.	15226.	18578.	16028.	16984.	14027.	100621.
95 99	6232.	4574.	4817.	3679.	3394.	2657.	25353.
100 104	1029.	689.	508.	334.	255.	222.	3037.

Table 9

Expected Age at Death by Amount of Monthly Annuity for Retirees
For Non-Disability CSRS Immediate Retirements

Male

Attained Age	0 - <u>1200</u>	1200- <u>1600</u>	1600- <u>2000</u>	2000- <u>2400</u>	2400- <u>3000</u>	3000+	Overall Average
55	78.6	78.8	79.3	80.0	80.6	82.1	80.0
65	81.1	81.2	81.5	82.0	82.4	83.5	82.0
85	90.3	90.3	90.4	90.5	90.5	90.9	90.5

Female

Attained Age	0 - <u>600</u>	600- <u>1000</u>	1000- <u>1300</u>	1300- <u>1600</u>	1600- <u>2000</u>	2000+	Overall Average
55	83.4	83.5	83.5	83.3	83.5	84.1	83.6
65	85.1	85.2	85.1	85.0	85.1	85.5	85.2
85	91.8	91.7	91.7	91.7	91.8	91.9	91.8

Table 10

Mortality Ratio by Service at Retirement - Male
For All Non-Disability Retirements

Age Group	<25	25-29	30-32	33-35	36+	Overall Rate
55 59	1.030	1.030	1.093	0.957	0.865	0.00765
60 64	1.165	1.066	1.016	0.951	0.888	0.01243
65 69	1.084	1.055	0.998	0.976	0.914	0.02011
70 74	1.065	1.032	1.030	0.962	0.911	0.03168
75 79	1.062	1.067	1.013	0.947	0.897	0.05044
80 84	1.052	1.063	0.997	0.940	0.922	0.08178
85 89	1.042	1.025	0.984	0.957	0.962	0.13157
90 94	1.014	1.013	0.990	0.981	0.985	0.20517
95 99	1.026	0.991	1.003	0.992	0.971	0.29862
100 104	0.962	1.025	1.081	1.016	1.012	0.37741

Exposure

55 59	77722.	194379.	265889.	253812.	162877.	954680.
60 64	236097.	273056.	425644.	380264.	403716.	1718769.
65 69	457413.	360030.	506604.	422339.	543809.	2290191.
70 74	514949.	375323.	494118.	400223.	517021.	2301632.
75 79	424341.	285603.	396437.	293425.	345511.	1745314.
80 84	244540.	164650.	224465.	143628.	175585.	952868.
85 89	105414.	73637.	81339.	48921.	75434.	384745.
90 94	35689.	22427.	17880.	12081.	26147.	114223.
95 99	8658.	3957.	2517.	2009.	6330.	23471.
100 104	1005.	365.	196.	193.	793.	2552.

Mortality Ratio by Service at Retirement - Female
For All Non-Disability Retirements

Age Group	<20	20-23	24-27	28-31	32+	Overall Rate
55 59	1.639	0.970	0.979	1.118	0.915	0.00547
60 64	1.056	0.969	0.980	1.013	1.018	0.00870
65 69	1.024	0.959	1.000	1.026	0.998	0.01277
70 74	1.012	0.967	0.990	1.023	1.007	0.02002
75 79	1.016	0.972	0.989	1.031	0.987	0.03196
80 84	0.989	0.992	1.014	1.027	0.981	0.05571
85 89	0.989	1.015	0.997	1.028	0.971	0.09638
90 94	0.972	1.024	1.030	0.988	1.000	0.16317
95 99	1.003	0.970	1.058	0.981	0.987	0.24983
100 104	1.023	0.944	0.943	1.136	0.990	0.34969

Exposure

55 59	1114.	49168.	63441.	79901.	86264.	279889.
60 64	29161.	108927.	106537.	130747.	131578.	506949.
65 69	113691.	155755.	133532.	160854.	172430.	736261.
70 74	165711.	166243.	133499.	160317.	178281.	804052.
75 79	161304.	134383.	107185.	130036.	131152.	664059.
80 84	111564.	85460.	72163.	88351.	77762.	435299.
85 89	64748.	46837.	43913.	47292.	40363.	243152.
90 94	30165.	19845.	18804.	16302.	15505.	100621.
95 99	9031.	5254.	4123.	3178.	3767.	25353.
100 104	1384.	654.	370.	219.	410.	3037.

Table 11

Expected Age at Death by Service at Retirement
For All Non-Disability Retirements

Male

Attained Age	<u><25</u>	<u>25-29</u>	<u>30-32</u>	<u>33-35</u>	<u>36+</u>	Overall Average
55	79.4	79.6	79.8	80.4	80.8	80.0
65	81.5	81.6	81.9	82.3	82.6	82.0
85	90.4	90.4	90.6	90.6	90.6	90.5

Female

Attained Age	<u><20</u>	<u>20-23</u>	<u>24-27</u>	<u>28-31</u>	<u>32+</u>	Overall Average
55	83.1	83.8	83.6	83.4	83.7	83.6
65	85.2	85.3	85.2	85.0	85.3	85.2
85	91.8	91.7	91.7	91.7	91.8	91.8

Table 12

Mortality Ratio by Duration on the Annuity Roll - Male
For Non-Disability Retirements

Age Group		<1	1-2	2-3	3-5	5+	Overall Rate
55	59	0.865	0.959	0.982	1.084	1.074	0.00769
60	64	0.884	1.005	0.989	0.978	1.032	0.01236
65	69	0.730	0.874	0.915	0.935	1.033	0.02012
70	74	0.736	0.809	0.818	0.862	1.010	0.03186
75	79	0.682	0.735	0.742	0.882	1.003	0.05056
80	84	0.585	0.599	0.744	0.809	1.002	0.08203
85	89	0.424	0.674	0.950	0.845	1.001	0.13188

Exposure

55	59	187283.	181269.	172957.	276355.	169490.	987354.
60	64	180123.	188209.	192025.	350276.	914622.	1825253.
65	69	67007.	84469.	109244.	344010.	1831259.	2435987.
70	74	14035.	18156.	24354.	80108.	2248469.	2385121.
75	79	3482.	4520.	5729.	16944.	1796650.	1827325.
80	84	792.	976.	1262.	3663.	1013899.	1020593.
85	89	125.	169.	207.	565.	422131.	423198.

Mortality Ratio by Duration on the Annuity Roll - Female
For Non-Disability Retirements

Age Group		<1	1-2	2-3	3-5	5+	Overall Rate
55	59	0.921	0.932	1.082	0.996	1.100	0.00527
60	64	0.884	0.948	0.995	0.954	1.116	0.00828
65	69	0.861	0.965	0.956	0.939	1.036	0.01238
70	74	0.913	0.994	0.876	0.895	1.009	0.01959
75	79	0.534	0.865	0.745	0.844	1.005	0.03171
80	84	0.513	0.611	0.746	0.641	1.003	0.05505
85	89	0.779	0.323	0.601	0.466	1.001	0.09631

Exposure

55	59	64816.	58563.	53244.	78461.	49972.	305056.
60	64	96614.	95953.	91652.	130513.	194368.	609100.
65	69	38076.	46876.	58780.	181230.	568037.	892999.
70	74	9286.	12166.	15907.	48854.	846608.	932821.
75	79	2243.	2880.	3682.	10806.	738402.	758012.
80	84	496.	654.	828.	2352.	501717.	506046.
85	89	80.	96.	138.	379.	286495.	287188.

Table 13

Mortality Ratio by Duration on the Annuity Roll - Male
For Disability Retirements

Age Group	<1	1-2	2-3	3-5	5+	Overall Rate
55 59	1.761	1.708	1.464	1.241	0.802	0.03101
60 64	1.550	1.773	1.421	1.315	0.930	0.03591
65 69	0.814	1.004	1.282	1.240	0.997	0.04233
70 74	0.563	0.829	1.234	1.049	1.000	0.05452
75 79	0.663	1.274	1.319	0.661	1.000	0.07441
80 84	0.856	0.810	1.284	0.918	1.000	0.10617
85 89	0.000	1.255	0.512	0.000	1.001	0.15935

Exposure

55 59	10016.	10008.	9892.	19589.	121487.	170993.
60 64	4132.	5639.	7037.	16587.	212383.	245777.
65 69	435.	635.	848.	4021.	340276.	346215.
70 74	163.	177.	223.	682.	411090.	412334.
75 79	61.	74.	81.	224.	325110.	325550.
80 84	22.	23.	29.	72.	159741.	159888.
85 89	2.	10.	12.	29.	52416.	52469.

Mortality Ratio by Duration on the Annuity Roll - Female
For Disability Retirements

Age Group	<1	1-2	2-3	3-5	5+	Overall Rate
55 59	1.890	1.770	1.457	1.173	0.740	0.02330
60 64	1.657	1.918	1.603	1.409	0.880	0.02396
65 69	1.341	2.312	0.983	1.642	0.989	0.02758
70 74	0.000	2.728	1.339	0.892	1.000	0.03576
75 79	1.716	0.000	2.020	2.647	0.999	0.04890
80 84	0.000	0.000	0.000	2.475	1.000	0.07516
85 89	0.000	0.000	0.000	0.000	1.000	0.11742

Exposure

55 59	7244.	7129.	6777.	12408.	65931.	99489.
60 64	2519.	3612.	4608.	10932.	101960.	123631.
65 69	189.	267.	369.	2098.	152806.	155729.
70 74	34.	51.	63.	220.	171994.	172362.
75 79	12.	15.	20.	54.	144367.	144468.
80 84	2.	3.	2.	11.	89086.	89104.
85 89	0.	0.	0.	0.	40555.	40555.

Table 14

Mortality Ratio by Duration on the Annuity Roll - Male
For Disability and Non-Disability Retirements Combined

Age Group	<1	1-2	2-3	3-5	5+	Overall Rate
55 59	0.817	0.877	0.862	0.928	1.365	0.01114
60 64	0.787	0.918	0.897	0.903	1.099	0.01516
65 69	0.647	0.777	0.817	0.839	1.055	0.02288
70 74	0.668	0.738	0.751	0.787	1.012	0.03520
75 79	0.641	0.703	0.708	0.825	1.003	0.05417
80 84	0.576	0.586	0.735	0.785	1.002	0.08530
85 89	0.407	0.705	0.911	0.786	1.001	0.13491

Exposure

55 59	197299.	191278.	182848.	295945.	290977.	1158345.
60 64	184254.	193847.	199063.	366862.	1127004.	2071028.
65 69	67442.	85104.	110091.	348030.	2171533.	2782199.
70 74	14197.	18333.	24577.	80789.	2659556.	2797453.
75 79	3543.	4594.	5811.	17167.	2121758.	2152873.
80 84	814.	999.	1292.	3735.	1173638.	1180478.
85 89	128.	179.	220.	594.	474547.	475667.

Mortality Ratio by Duration on the Annuity Roll - Female
For Disability and Non-Disability Retirements Combined

Age Group	<1	1-2	2-3	3-5	5+	Overall Rate
55 59	0.906	0.913	0.917	0.851	1.267	0.00971
60 64	0.745	0.845	0.886	0.906	1.219	0.01092
65 69	0.737	0.836	0.815	0.820	1.085	0.01464
70 74	0.806	0.896	0.782	0.795	1.016	0.02211
75 79	0.502	0.792	0.698	0.791	1.006	0.03446
80 84	0.484	0.577	0.706	0.620	1.003	0.05806
85 89	0.758	0.315	0.585	0.454	1.001	0.09892

Exposure

55 59	72060.	65692.	60021.	90869.	115903.	404545.
60 64	99132.	99565.	96261.	141444.	296328.	732731.
65 69	38266.	47143.	59149.	183327.	720843.	1048727.
70 74	9320.	12218.	15970.	49074.	1018602.	1105181.
75 79	2255.	2894.	3703.	10860.	882769.	902480.
80 84	498.	657.	830.	2363.	590803.	595150.
85 89	80.	96.	138.	379.	327050.	327743.

Table 15

Mortality Ratio for Disability vs. Non-Disability Retirement - Male

Age Group			<u>Non-dis.</u>	<u>Disab.</u>	<u>Overall Rate</u>
55	59	1	0.69095	2.78446	0.01114
60	64	1	0.81564	2.36907	0.01516
65	69	1	0.87916	1.85016	0.02288
70	74	1	0.90507	1.54910	0.03520
75	79	1	0.93343	1.37364	0.05417
80	84	1	0.96167	1.24465	0.08530
85	89	1	0.97754	1.18113	0.13491
90	94	1	0.99015	1.10189	0.20654
95	99	1	1.00044	0.99577	0.29854
100	104	1	0.99516	1.04578	0.38443

Exposure

55	59	1	987354.	170993.	1158345.
60	64	1	1825253.	245777.	2071028.
65	69	1	2435987.	346215.	2782199.
70	74	1	2385121.	412334.	2797453.
75	79	1	1827325.	325550.	2152873.
80	84	1	1020593.	159888.	1180478.
85	89	1	423198.	52469.	475667.
90	94	1	127450.	12325.	139775.
95	99	1	26186.	2731.	28917.
100	104	1	2797.	296.	3093.

Mortality Ratio for Disability vs. Non-Disability Retirement - Female

Age Group			<u>Non-dis.</u>	<u>Disab.</u>	<u>Overall Rate</u>
55	59	2	0.54335	2.40015	0.00971
60	64	2	0.75779	2.19326	0.01092
65	69	2	0.84587	1.88379	0.01464
70	74	2	0.88595	1.61723	0.02211
75	79	2	0.92011	1.41916	0.03446
80	84	2	0.94814	1.29452	0.05806
85	89	2	0.97359	1.18701	0.09892
90	94	2	0.99052	1.08384	0.16435
95	99	2	0.99804	1.01899	0.25124
100	104	2	1.00581	0.94497	0.35037

Exposure

55	59	2	305056.	99489.	404545.
60	64	2	609100.	123631.	732731.
65	69	2	892999.	155729.	1048727.
70	74	2	932821.	172362.	1105181.
75	79	2	758012.	144468.	902480.
80	84	2	506046.	89104.	595150.
85	89	2	287188.	40555.	327743.
90	94	2	119484.	13513.	132997.
95	99	2	30218.	3125.	33343.
100	104	2	3519.	371.	3890.

Table 16

Expected Age at Death for Disability vs. Non-Disability Retirement

Male

<u>Attained Age</u>	<u>Non-dis.</u>	<u>Disab.</u>	<u>Overall Average</u>
55	79.9	74.2	78.8
65	81.9	78.4	81.4
85	90.5	89.9	90.4

Female

<u>Attained Age</u>	<u>Non-dis.</u>	<u>Disab.</u>	<u>Overall Average</u>
55	83.6	77.6	82.2
65	85.2	81.6	84.6
85	91.8	91.1	91.7

Table 17
Mortality Ratio by Amount of Monthly Annuity for Survivors - Widowers

Age Group	0 - 360	360- 375	375- 525	525+	Overall Rate
55 59	0.663	1.397	0.767	0.691	0.01702
60 64	0.860	1.240	0.890	0.870	0.02340
65 69	0.889	1.136	1.029	0.934	0.03254
70 74	0.945	1.069	1.074	0.934	0.04737
75 79	1.011	1.004	0.986	0.998	0.06793
80 84	0.963	0.951	1.041	1.039	0.09887
85 89	0.991	0.897	1.017	1.062	0.13677
90 94	0.996	1.033	1.048	0.944	0.20958
95 99	0.941	1.010	1.024	1.035	0.27999
100 104	0.933	1.212	0.859	1.103	0.33742

Exposure

55 59	5052.	11021.	4903.	4932.	25908.
60 64	6612.	11128.	6917.	7610.	32266.
65 69	10784.	12256.	10249.	11523.	44812.
70 74	14952.	12699.	13205.	15660.	56516.
75 79	16532.	10717.	13140.	16126.	56515.
80 84	13260.	7278.	9790.	11647.	41975.
85 89	7337.	4019.	5163.	6396.	22915.
90 94	2606.	1469.	1816.	2259.	8150.
95 99	493.	301.	391.	480.	1664.
100 104	64.	22.	35.	43.	163.

Mortality Ratio by Amount of Monthly Annuity for Survivors - Widows

Age Group	0 - 550	550- 900	900- 1250	1250+	Overall Rate
55 59	1.106	1.083	0.944	0.833	0.00707
60 64	1.065	1.083	0.992	0.838	0.01118
65 69	1.100	1.067	0.980	0.849	0.01659
70 74	1.085	1.050	0.991	0.885	0.02443
75 79	1.054	1.056	0.990	0.912	0.03689
80 84	1.038	1.044	1.004	0.924	0.05918
85 89	1.028	1.022	1.016	0.936	0.09885
90 94	1.016	1.013	0.994	0.967	0.16023
95 99	1.003	1.020	0.963	0.999	0.24194
100 104	1.008	0.998	0.997	0.981	0.32872

Exposure

55 59	58064.	82987.	55881.	59465.	256398.
60 64	109310.	147069.	111899.	113958.	482236.
65 69	190016.	244833.	201991.	208504.	845344.
70 74	262313.	318776.	280371.	309409.	1170867.
75 79	273168.	308868.	281027.	330723.	1193785.
80 84	221760.	239682.	214054.	261251.	936746.
85 89	146547.	159350.	127148.	151415.	584459.
90 94	72948.	79102.	52778.	56168.	260996.
95 99	23976.	22841.	13478.	11804.	72100.
100 104	4153.	2993.	1812.	1212.	10170.

Table 18

Expected Age at Death by Amount of Monthly Annuity for Survivors

Widower

Attained <u>Age</u>	<u>0 - 360</u>	<u>360- 375</u>	<u>375- 525</u>	<u>525+</u>	<u>Overall Average</u>
55	77.2	74.8	76.4	76.9	76.1
65	80.0	79.3	79.4	79.8	79.6
85	90.5	90.6	90.3	90.3	90.4

Widow

Attained <u>Age</u>	<u>0 - 550</u>	<u>550- 900</u>	<u>900- 1250</u>	<u>1250+</u>	<u>Overall Average</u>
55	81.6	81.7	82.3	83.2	82.2
65	83.7	83.8	84.2	84.9	84.2
85	91.7	91.7	91.7	92.0	91.7

Table 19

Mortality Ratio by Duration on the Annuity Roll for Survivors - Widowers

Age Group	<1	1-2	2-3	3-5	Overall 5+	Rate
55 59	0.741	1.007	0.553	1.022	1.066	0.01694
60 64	0.724	0.857	1.097	0.925	1.050	0.02358
65 69	0.835	1.048	1.047	1.030	1.003	0.03208
70 74	0.734	1.009	0.925	0.926	1.048	0.04796
75 79	0.856	1.022	1.050	1.000	1.009	0.06793
80 84	0.755	1.021	1.055	1.053	1.012	0.09843
85 89	0.797	1.067	1.034	0.953	1.020	0.13782
90 94	0.822	0.981	0.965	0.998	1.023	0.20695
95 99	0.884	1.173	0.858	0.989	1.008	0.28779
100 104	0.771	2.202	0.914	0.612	0.978	0.32432

Exposure

55 59	1832.	1817.	1709.	3061.	17437.	25856.
60 64	2343.	2277.	2203.	4126.	21329.	32277.
65 69	3321.	3154.	2977.	5478.	29803.	44734.
70 74	4063.	3904.	3720.	6845.	37933.	56464.
75 79	4352.	4063.	3812.	6815.	37277.	56320.
80 84	3379.	3205.	2977.	5288.	27048.	41897.
85 89	1684.	1673.	1551.	2839.	15159.	22906.
90 94	553.	547.	526.	978.	5572.	8176.
95 99	79.	80.	89.	197.	1223.	1668.
100 104	4.	7.	7.	10.	136.	163.

Mortality Ratio by Duration on the Annuity Roll for Survivors - Widows

Age Group	<1	1-2	2-3	3-5	Overall 5+	Rate
55 59	0.689	1.092	0.972	1.040	1.027	0.00707
60 64	0.787	0.911	1.017	0.947	1.046	0.01120
65 69	0.750	0.914	0.904	0.991	1.047	0.01669
70 74	0.756	0.932	0.945	0.955	1.040	0.02453
75 79	0.756	0.921	0.955	0.963	1.032	0.03709
80 84	0.709	0.916	0.914	0.953	1.031	0.05935
85 89	0.752	0.917	0.861	0.940	1.022	0.09915
90 94	0.685	0.953	0.952	0.973	1.009	0.16047
95 99	0.684	0.844	0.951	0.869	1.007	0.24294
100 104	0.420	0.421	0.763	0.939	1.008	0.33000

Exposure

55 59	22785.	21510.	20225.	36570.	154777.	255867.
60 64	38571.	36583.	34770.	63859.	308176.	481959.
65 69	60448.	58100.	55644.	103555.	565880.	843627.
70 74	73975.	71572.	69017.	131181.	821711.	1167455.
75 79	65424.	64184.	62901.	120160.	877671.	1190340.
80 84	40572.	41208.	41116.	81276.	729971.	934142.
85 89	16835.	18017.	18810.	39752.	488766.	582181.
90 94	4019.	4588.	5117.	11805.	234345.	259874.
95 99	457.	610.	701.	1733.	68162.	71664.
100 104	50.	50.	60.	161.	9805.	10127.