



**Cavanaugh Macdonald**  
CONSULTING, LLC

*The experience and dedication you deserve*



**EMPLOYEES'  
RETIREMENT SYSTEM  
OF GEORGIA**

**GEORGIA PUBLIC SCHOOL EMPLOYEES' RETIREMENT SYSTEM**

**EXPERIENCE INVESTIGATION FOR THE  
FIVE-YEAR PERIOD ENDING JUNE 30, 2009**





# Cavanaugh Macdonald

CONSULTING, LLC

*The experience and dedication you deserve*

December 16, 2010

Board of Trustees  
Georgia Public School Employees' Retirement System  
Two Northside 75, Suite 300  
Atlanta, GA 30318

Members of the Board:

We are pleased to submit the results of an investigation of the economic and demographic experience for the Georgia Public School Employees' Retirement System. The purpose of the investigation was to assess the reasonability of the actuarial assumptions currently used by the Retirement System. This investigation covers the five-year period from July 1, 2004 to June 30, 2009.

This report shows a comparison of the actual and expected cases of separation from active service and actual and expected number of deaths. A comparison between the rates of separation and mortality presently in use and the recommended revised rates are also shown in this report.

All new assumptions are shown in the attached tables in Appendix C of this report. In the actuary's judgment, the recommended assumptions are suitable for use until further experience indicates that modifications are desirable.

The experience investigation was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Edward A. Macdonald, ASA, FCA, MAAA  
President

Cathy Turcot  
Principal and Managing Director

EAM/mjn



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## Section I Executive Summary

The following table summarizes the findings and recommendations with regard to the assumptions utilized for the Georgia Public School Employees' Retirement System. Detailed explanations for the recommendations are found in the sections that follow.

<b>Summary of Recommended Assumptions</b>	
<b>Economic Assumptions</b>	
<b>Investment Rate of Return</b>	Composed of Inflation component and Real Rate of Return component.
Inflation	Recommend change to annual rate of inflation assumption from 3.75% to 3.00%.
Real Rate of Investment Return	Recommend 4.50% assumption resulting in no change to the 7.50% net investment return assumption.
<b>Demographic Assumptions</b>	
<b>Withdrawal</b>	Recommend change to current assumption.
<b>Retirement</b>	Recommend change to current assumption.
<b>Mortality</b>	Recommend change to current assumption.
<b>Disability</b>	Recommend change to current assumption.
<b>Other Assumptions and Methods and Administrative Changes</b>	
<b>Administrative Expenses</b>	Recommend change to current assumption.
<b>Amortization Method</b>	Recommend no change to current method.
<b>Asset Smoothing</b>	Recommend no change to current method.
<b>Option Factors</b>	Recommend change in current option factors to reflect change in mortality rate tables.
<b>All others</b>	Recommend no change to other actuarial methods.



## Section II Financial Impact

The following table highlights the impact of the recommended changes on the principal valuation results.

<b>Impact on Principal Valuation Results</b>		
	<b>Valuation Results 2009</b>	<b>Recommended Assumptions</b>
<b>Unfunded Accrued Liability</b>	\$53,613,829	\$86,342,375
<b>Funding Ratio</b>	93.5%	89.9%
<b>Employer Annual Required Contribution</b>		
<b>Normal</b>	\$11,345,000*	\$13,516,000**
<b>Accrued Liability</b>	<u>\$4,539,000</u>	<u>\$7,311,000</u>
<b>Total</b>	\$15,884,000	\$20,827,000
<b>Amortization Period (in years)</b>	30	30

\*Normal Cost includes estimated administrative expenses of \$588,000.

\*\*Normal Cost includes estimated administrative expenses of \$1,606,000.



### Section III Economic Assumptions

There are two economic assumptions used in the actuarial valuations performed for the System. They are:

- Price Inflation
- Investment Return

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 27, “*Selection of Economic Assumptions for Measuring Pension Obligations*”, which provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. As noted in ASOP No. 27, because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes based on a mixture of past experience and future expectations. These estimates therefore are best stated as a range utilizing the actuary’s professional judgment. In setting the range and the single point within that range to use, the actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by detailed discussions of each assumption.

Item	Current	Proposed
Price Inflation	3.75%	3.00%
Real Rate of Return	<u>3.75</u>	<u>4.50</u>
Investment Return	7.50%	7.50%



## Price Inflation

**Background:** As can be seen from the table on the previous page, assumed price inflation is used as the basis for both the investment return assumption and the wage inflation assumption. These latter two assumptions will be discussed in detail in the following sections.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27 and is also required to meet the parameters for determining pension liabilities and expense under Governmental Accounting Standards Board (GASB) Statements No. 25 and 27.

The current price inflation assumption is 3.75% per year.

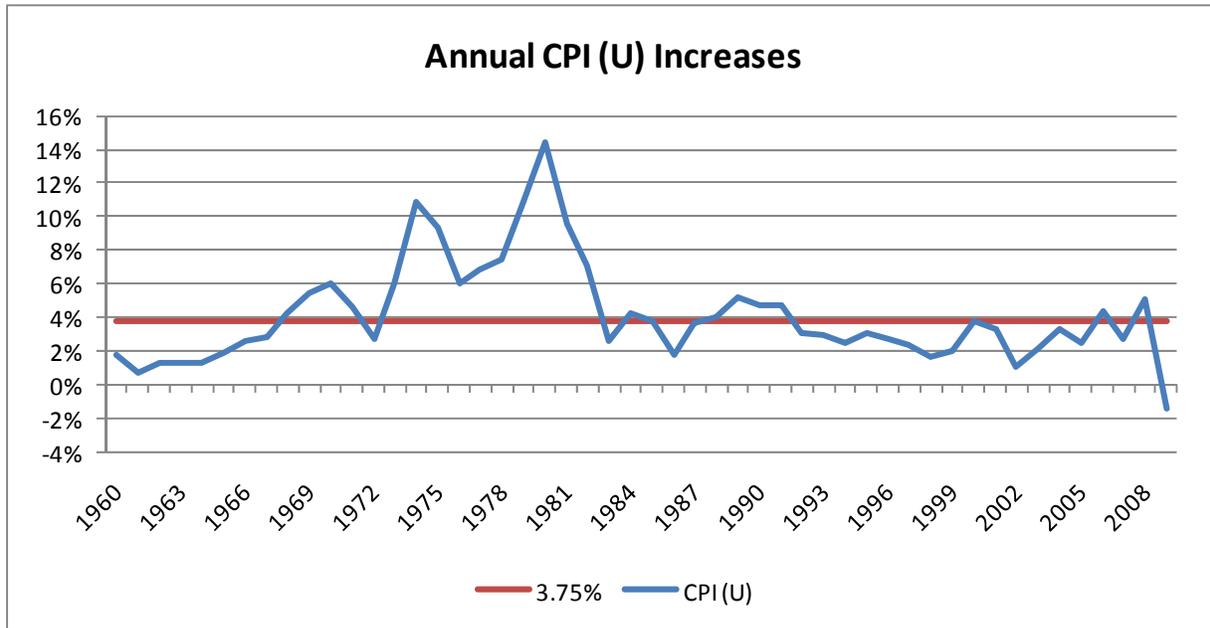
**Past Experience:** The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The level of that index in June of each of the last 50 years is provided in Appendix A.

In analyzing this data, annual rates of inflation have been determined by measuring the compound growth rate of the CPI (U) over various time periods. The results are as follows:

Period	Inflation
2000-2009	2.64%
1990-1999	2.96
1980-1989	5.55
1970-1979	7.04
1960-1969	2.32
1990-2009	2.80%
1980-2009	3.71
1970-2009	4.53
1960-2009	4.09



The graph below shows the annual increases in the CPI (U) over the entire 50 year period.



**Recommendation:** It is difficult to accurately predict inflation. Inflation’s short-term volatility is illustrated by comparing its average rate over the last 10, 30 and 50 years. Although the 10-year average of 2.6% is significantly lower than the System’s assumed rate of 3.75%, the longer 30, 40 and 50-year averages of 3.7%, 4.5% and 4.1% respectively, are at or slightly higher than the System’s rate. The validity of the System’s assumption is, therefore, dependent upon the emphasis one assigns to the short and long-terms.

Current economic forecasts suggest lower inflation but are generally looking at a shorter time period than appropriate for our purposes. In the 2009 OASDI Trustees Report, the Chief Actuary for Social Security bases the 75 year cost projections on an intermediate inflation assumption of 2.8% with a range of 1.8% to 3.8%. We concur in general with a range of 2.0% - 4.0%, and recommend use of a 3.00% per year rate recognizing the likely inflation pressures built into the economy at the current time.

Price Inflation Assumption	
Current	3.75%
Reasonable Range	2.00% - 4.00%
Recommended	3.00%



## Investment Return

**Background:** The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members of the System. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Trustees.

The current assumption is 7.50%, consisting of a price inflation assumption of 3.75% and a real rate of return assumption of 3.75%. The return is net of all investment and administrative expenses.

**Past Experience:** The assets for the System are valued using a widely accepted asset-smoothing methodology that fully recognizes the expected investment income and also recognizes 1/7 of each year's investment gain or loss (the difference between actual and expected investment income). The recent experience over the last five years is shown in the table below.

Year Ending 6/30	Actuarial Value	Market Value
2005	6.8%	7.8%
2006	7.0	6.2
2007	7.8	14.7
2008	6.6	(3.5)
2009	3.1	(13.0)
Average	6.3%	2.4%

Because of the significant variability in past year-to-year results and the inter-play of inflation on those results in the short term, we prefer to base our investment return assumption on the capital market assumptions utilized by the Board in setting investment policy and the asset allocation established by the Board as a result of that policy. This approach is referred to as the building block method in ASOP No. 27.



**Analysis:** The current capital market assumptions and asset allocation are shown in Appendix B. Using stochastic projection results provides an expected range of real rates of return over a 50 year time horizon. Looking at one year results produces an expected real return of 5.85% but also has a high standard deviation or measurement of volatility. By expanding the time horizon, the average return does not change much but the volatility declines significantly. The following table provides a summary of results.

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5 <sup>th</sup>	25 <sup>th</sup>	50 <sup>th</sup>	75 <sup>th</sup>	95 <sup>th</sup>
1	6.81%	15.33%	-16.43%	-4.13%	5.85%	16.63%	33.54%
5	6.03%	6.73%	-4.44%	1.34%	5.81%	10.42%	17.65%
10	6.00%	4.73%	-1.50%	2.74%	5.90%	9.16%	13.97%
20	5.98%	3.32%	0.61%	3.61%	5.96%	8.17%	11.45%
30	5.95%	2.72%	1.55%	4.04%	5.95%	7.74%	10.43%
40	5.98%	2.33%	2.18%	4.38%	5.97%	7.53%	9.77%
50	5.98%	2.07%	2.66%	4.55%	5.95%	7.37%	9.43%

The percentile results are percentage of the 5,000 random results that produce returns over the time span shown of less than the amount indicated. Thus for the 10 year time span, 5% of the resulting real rates of return were below -1.50% and 95% were above that. As the time span increases, the results begin to merge. Over a 50 year time span, the results indicate there is a 25% chance that real returns will be below 4.55% and a 25% chance they will be above 7.37%. In other words there is a 50% chance the real returns will be between 4.55% and 7.37%.

**Investment Expenses:** There are currently no investment expenses allocated to the System. We recommend that a portion of the investment expenses incurred by the fund as a whole be allocated to this System. We would not expect the investment expense ratio long term to exceed 0.10% and are recommending that level in setting the net investment return assumption.



**Recommendation:** Using the building block approach of ASOP No. 27 and the projection results outlined above, we are recommending a range for the investment return assumption of the 25<sup>th</sup> to 75<sup>th</sup> percentile real returns over the 50 year time span plus the recommended inflation assumption less the recommended expense ratio. The following table details the range.

Item	25 <sup>th</sup> Percentile	50 <sup>th</sup> Percentile	75 <sup>th</sup> Percentile
Real Rate of Return	4.55%	5.95%	7.37%
Inflation	3.00	3.00	3.00
Expenses	<u>(0.10)</u>	<u>(0.10)</u>	<u>(0.10)</u>
Net Investment Return	7.45%	8.85%	10.27%

There is a 50% chance that the net return will be 8.85% or more over a 50-year period. A net return of 7.50% is at the 26<sup>th</sup> percentile. Although not in the center of the recommended range, in our opinion a return of 7.50% is conservative yet reasonable. We recommend that the long-term net investment return assumption remain at 7.50%.

Investment Return Assumption	
Current	7.50%
Reasonable Range	7.45% - 10.27%
Recommended	7.50%



## **Section IV Demographic Assumptions**

There are several demographic assumptions used in the actuarial valuations performed for the Georgia Public School Employees' Retirement System. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rate of Mortality

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 35, "*Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*", which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2004, through June 30, 2009) with what was expected to happen based on the assumptions used in the most recent Actuarial Valuations.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately annotating those who experience a demographic event, also referred to as a decrement. In addition the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition non-recurring events, such as early retirement windows, need to be taken into account in determining the weight to give to recent experience.

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results (A/E Ratios) under the current assumptions. If a change is being proposed, the revised A/E Ratios are shown as well.

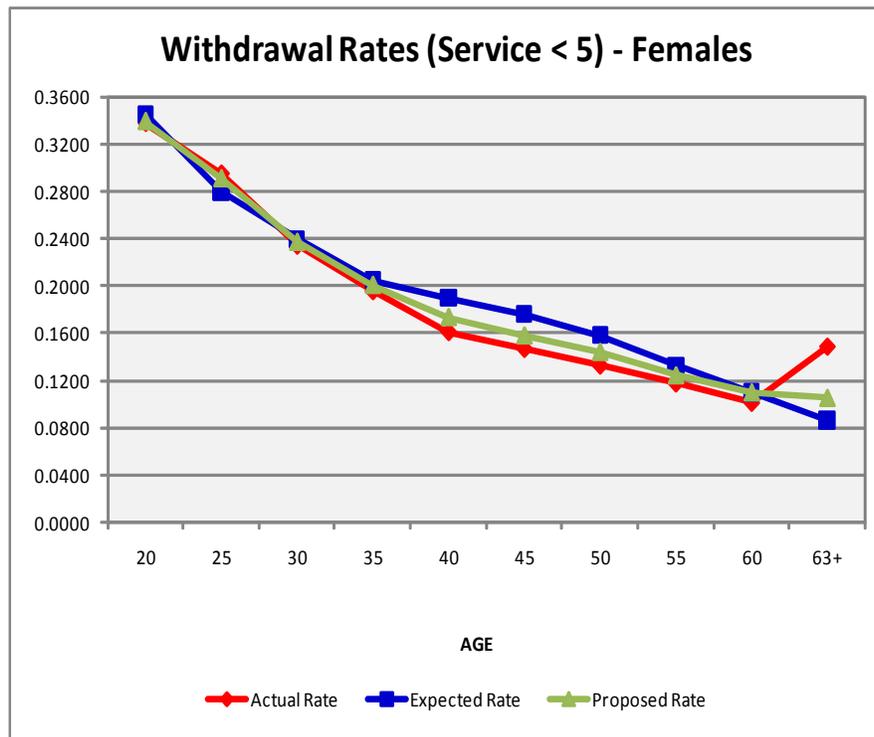
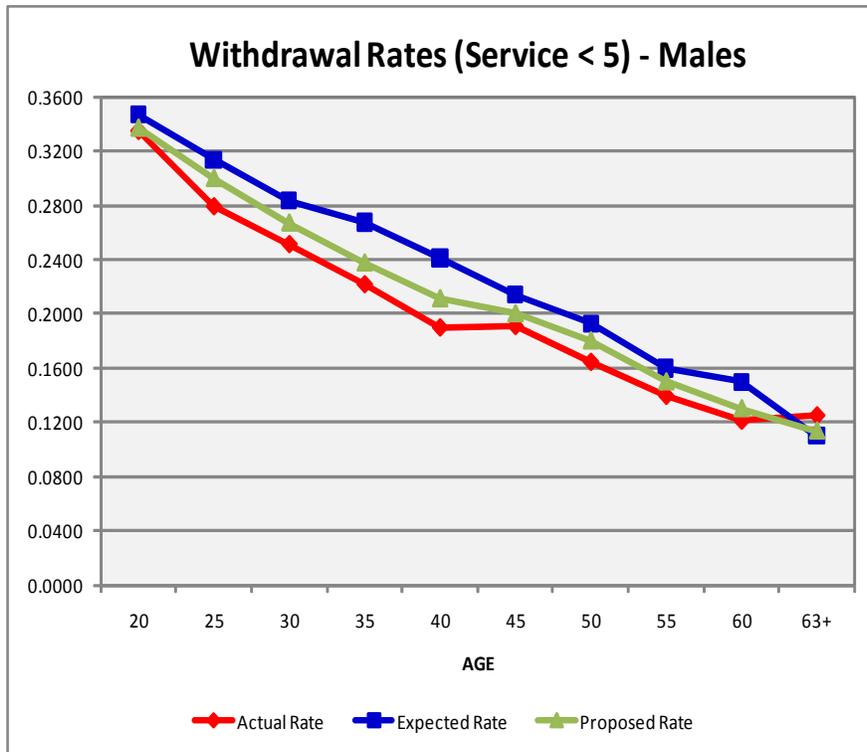


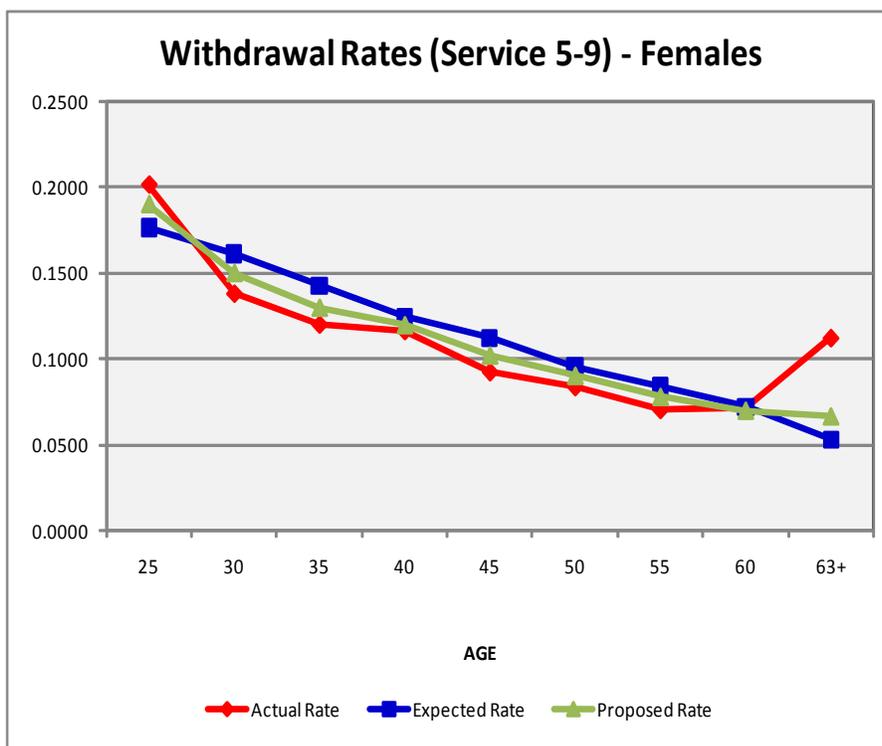
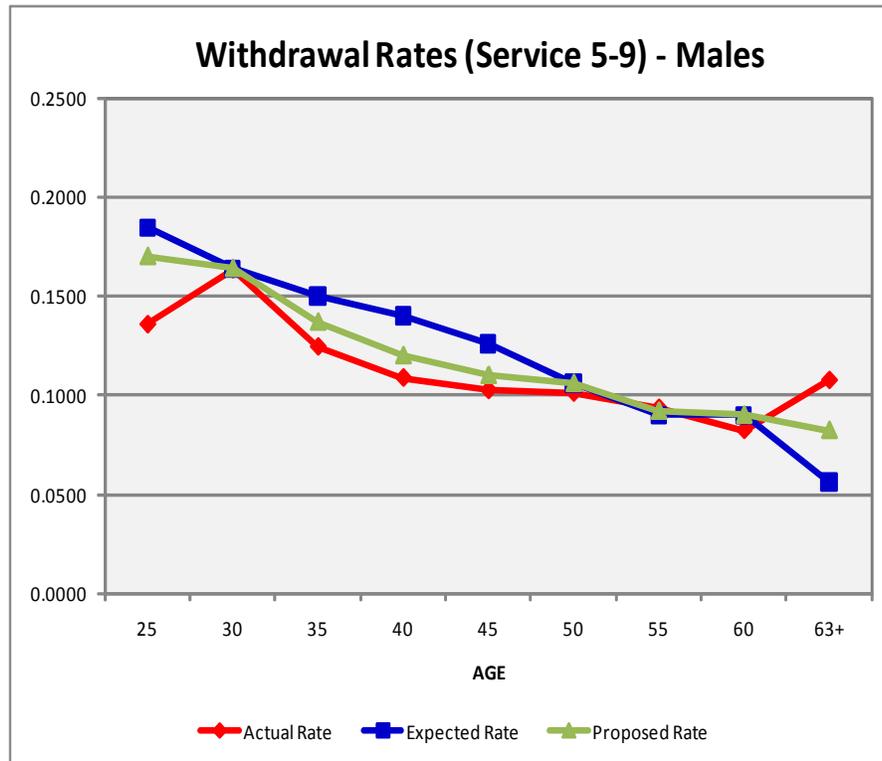
**RATES OF WITHDRAWAL**  
**COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS**  
**FROM ACTIVE SERVICE**

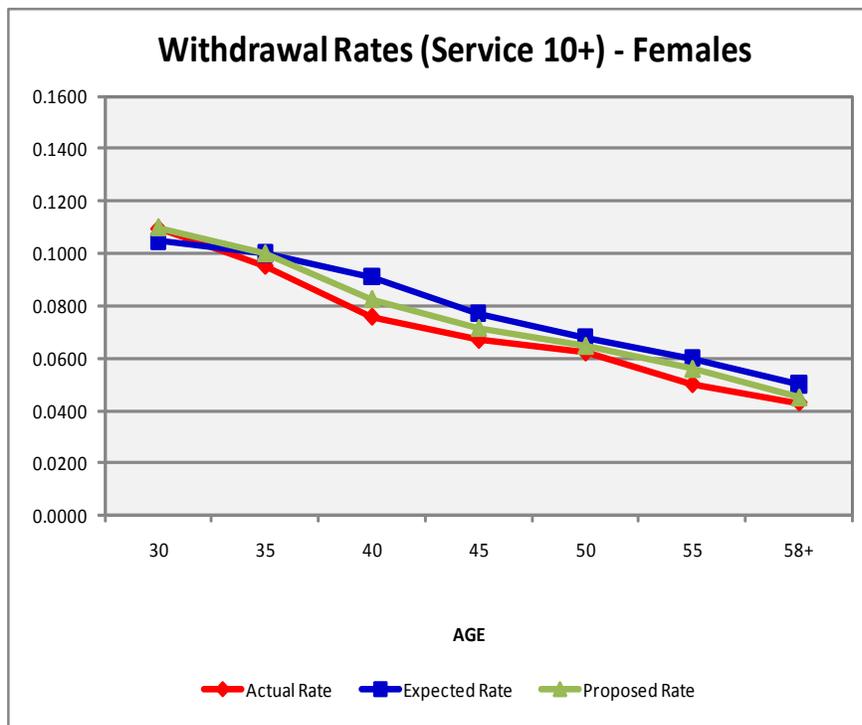
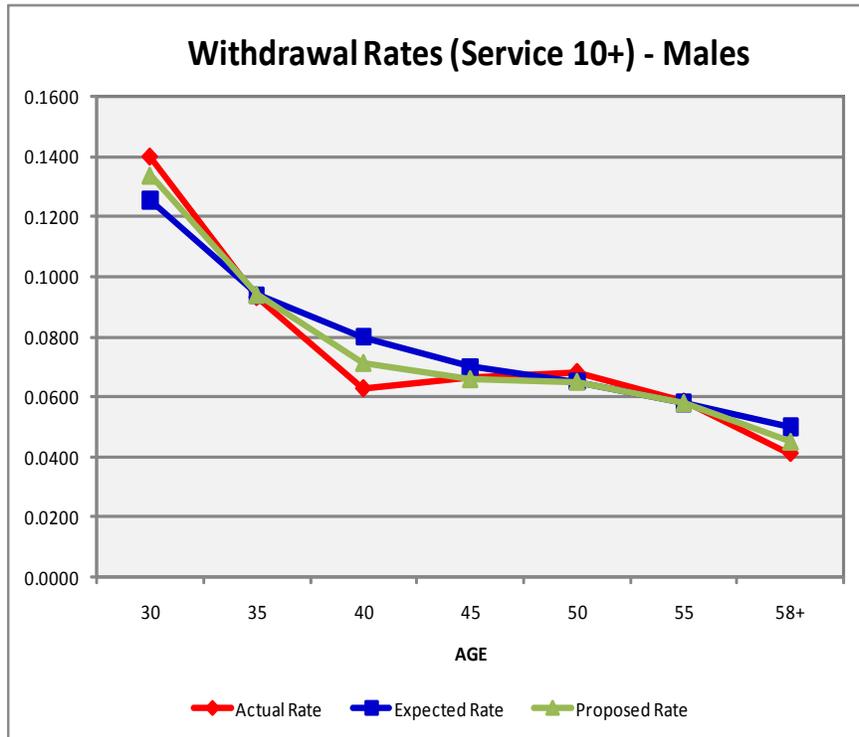
CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
	Withdrawals with less than 5 years of service					
20	160	165.7	0.965	98	100.2	0.978
25	366	411.4	0.890	503	476.7	1.055
30	325	366.7	0.886	895	916.3	0.977
35	385	464.1	0.830	1,456	1,526.3	0.954
40	471	597.8	0.788	1,470	1,732.4	0.849
45	586	656.7	0.892	1,390	1,666.8	0.834
50	509	596.7	0.853	1,012	1,206.8	0.839
55	442	506.4	0.873	717	806.6	0.889
60	443	548.4	0.808	523	567.8	0.921
63 & Over	632	555.6	1.138	670	390.8	1.714
<b>TOTAL</b>	<b>4,319</b>	<b>4,869.4</b>	<b>0.887</b>	<b>8,734</b>	<b>9,390.7</b>	<b>0.930</b>
	Withdrawals with at least 5 but less than 10 years of service					
25	33	44.4	0.743	32	28.3	1.133
30	83	83.3	0.996	140	163.5	0.857
35	95	114.6	0.829	388	461.8	0.840
40	127	163.7	0.776	717	768.7	0.933
45	160	196.8	0.813	694	841.4	0.825
50	173	181.5	0.953	525	596.8	0.880
55	156	150.5	1.037	355	423.3	0.839
60	168	184.1	0.913	323	324.1	0.997
63 & Over	439	229.9	1.910	504	239.1	2.108
<b>TOTAL</b>	<b>1,434</b>	<b>1,348.6</b>	<b>1.063</b>	<b>3,678</b>	<b>3,846.9</b>	<b>0.956</b>
	Withdrawals with 10 or greater years of service					
30	14	12.5	1.116	8	8.1	0.990
35	45	45.4	0.991	60	62.9	0.954
40	73	93.0	0.785	190	228.3	0.832
45	130	136.9	0.950	381	438.6	0.869
50	169	161.1	1.049	482	526.5	0.915
55	147	146.0	1.007	436	524.0	0.832
58 & Over	47	57.0	0.825	161	187.7	0.858
<b>TOTAL</b>	<b>625</b>	<b>651.8</b>	<b>0.959</b>	<b>1,718</b>	<b>1,976.1</b>	<b>0.869</b>



The following graphs show a comparison of the current expected, actual, and proposed rates of withdrawal for actives.









The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service which will occur as a result of resignation or dismissal. The preceding results indicate that during the study period fewer members than expected withdrew for both males and females at most ages and overall. We recommend that the rates of withdrawal be revised at this time to partially reflect the experience of the System.

**COMPARATIVE RATES OF WITHDRAWAL  
FROM ACTIVE SERVICE**

AGE	RATES OF WITHDRAWAL					
	Present			Proposed		
	Years Of Service			Years Of Service		
	0 - 4	5 - 9	10 +	0 - 4	5 - 9	10 +
	Male					
20	36.00%			35.00%		
25	31.00%	19.00%		30.00%	17.00%	
30	28.00%	16.00%	13.00%	27.00%	16.00%	14.00%
35	27.00%	14.00%	9.00%	24.00%	14.00%	9.00%
40	24.00%	12.00%	8.00%	21.00%	12.00%	7.00%
45	21.00%	11.00%	7.00%	20.00%	11.00%	6.50%
50	19.50%	11.00%	6.50%	18.00%	11.00%	6.50%
55	16.00%	9.00%	6.00%	15.00%	9.00%	6.00%
60	15.00%	9.00%	0.00%	13.00%	9.00%	0.00%
64	15.00%	9.00%	0.00%	13.00%	9.00%	0.00%
	Female					
20	36.00%			34.00%		
25	28.00%	18.00%		29.00%	19.00%	
30	24.00%	16.00%	11.00%	24.00%	15.00%	11.00%
35	20.00%	14.00%	10.00%	20.00%	13.00%	10.00%
40	19.00%	12.50%	9.00%	17.00%	12.00%	8.00%
45	17.50%	11.00%	8.00%	16.00%	10.00%	7.00%
50	16.00%	9.50%	7.00%	14.00%	9.00%	6.50%
55	13.00%	8.00%	6.00%	12.00%	8.00%	6.00%
60	11.00%	7.00%	0.00%	11.00%	7.00%	0.00%
64	11.00%	7.00%	0.00%	11.00%	7.00%	0.00%



**COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS  
BASED ON PROPOSED RATES**

CENTRAL AGE OF GROUP	NUMBER OF WITHDRAWALS					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
	Withdrawals with less than 5 years of service					
20	160	161.0	0.994	98	98.3	0.997
25	366	392.8	0.932	503	495.6	1.015
30	325	345.1	0.942	895	905.8	0.988
35	385	412.0	0.934	1,456	1,493.5	0.975
40	471	523.4	0.900	1,470	1,582.6	0.929
45	586	613.8	0.955	1,390	1,496.6	0.929
50	509	556.6	0.915	1,012	1,098.1	0.922
55	442	474.7	0.931	717	757.4	0.947
60	443	475.3	0.932	523	567.8	0.921
63 & Over	632	573.8	1.101	670	474.5	1.412
<b>TOTAL</b>	<b>4,319</b>	<b>4,528.4</b>	<b>0.954</b>	<b>8,734</b>	<b>8,970.1</b>	<b>0.974</b>
	Withdrawals with at least 5 but less than 10 years of service					
25	33	41.0	0.806	32	30.4	1.052
30	83	83.3	0.996	140	152.3	0.920
35	95	104.6	0.908	388	419.8	0.924
40	127	140.3	0.905	717	737.9	0.972
45	160	171.9	0.931	694	765.9	0.906
50	173	181.5	0.953	525	565.5	0.928
55	156	153.7	1.015	355	392.8	0.904
60	168	184.1	0.913	323	314.4	1.027
63 & Over	439	336.3	1.305	504	299.7	1.682
<b>TOTAL</b>	<b>1,434</b>	<b>1,396.7</b>	<b>1.027</b>	<b>3,678</b>	<b>3,678.7</b>	<b>1.000</b>
	Withdrawals with 10 or greater years of service					
30	14	13.4	1.047	8	8.5	0.945
35	45	45.4	0.991	60	62.9	0.954
40	73	82.9	0.881	190	206.9	0.919
45	130	128.8	1.009	381	407.6	0.935
50	169	161.1	1.049	482	502.5	0.959
55	147	146.0	1.007	436	488.1	0.893
58 & Over	47	51.3	0.916	161	169.0	0.953
<b>TOTAL</b>	<b>625</b>	<b>628.9</b>	<b>0.994</b>	<b>1,718</b>	<b>1,845.3</b>	<b>0.931</b>

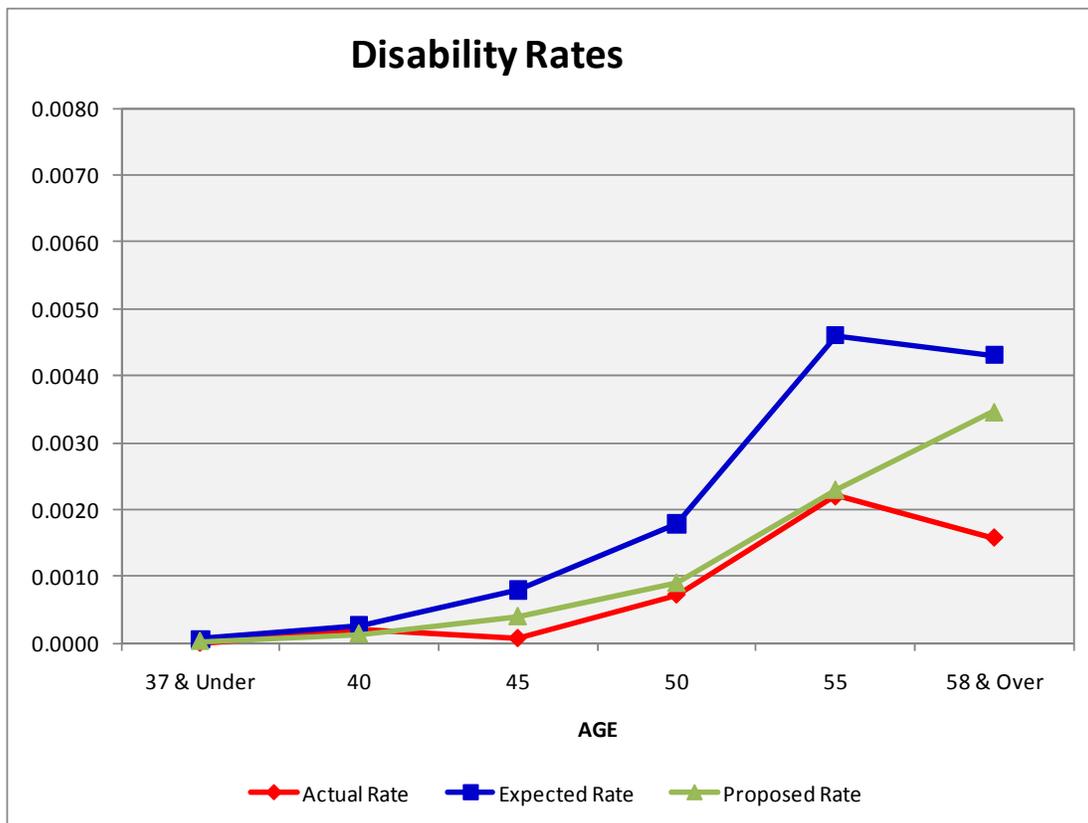


## RATES OF DISABILITY RETIREMENT

### COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
37 & Under	0	0.9	0.000
40	5	6.2	0.806
45	2	23.4	0.085
50	21	51.6	0.407
55	60	125.3	0.479
58 & Over	89	241.8	0.368
<b>TOTAL</b>	<b>177</b>	<b>449.2</b>	<b>0.394</b>

The following graph shows a comparison of the current expected, actual, and proposed rates of disability retirement.





During the period under investigation, the actual rates of disability retirement were significantly less than expected over all age groups. Therefore, we recommend the rates of disability retirement be reduced to reflect the experience of the System. The following table shows a comparison between the present disability retirement rates and the proposed rates.

**COMPARATIVE RATES OF DISABILITY RETIREMENTS**

AGE	RATES OF DISABILITY RETIREMENT	
	Present	Proposed
35	0.005%	0.003%
40	0.022%	0.011%
45	0.074%	0.037%
50	0.173%	0.087%
53	0.350%	0.175%
54	0.400%	0.200%
55	0.450%	0.225%
56	0.500%	0.250%
57	0.600%	0.300%
58	0.650%	0.325%
59	0.700%	0.350%
60	0.700%	0.350%
61	0.700%	0.350%
62	0.700%	0.350%
63	0.700%	0.350%
64	0.700%	0.350%

**COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS  
BASED ON PROPOSED RATES**

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
37 & Under	0	0.4	0.000
40	5	3.1	1.613
45	2	11.7	0.171
50	21	26.0	0.808
55	60	62.6	0.958
58 & Over	89	121.1	0.735
<b>TOTAL</b>	<b>177</b>	<b>224.9</b>	<b>0.787</b>



## RATES OF RETIREMENT

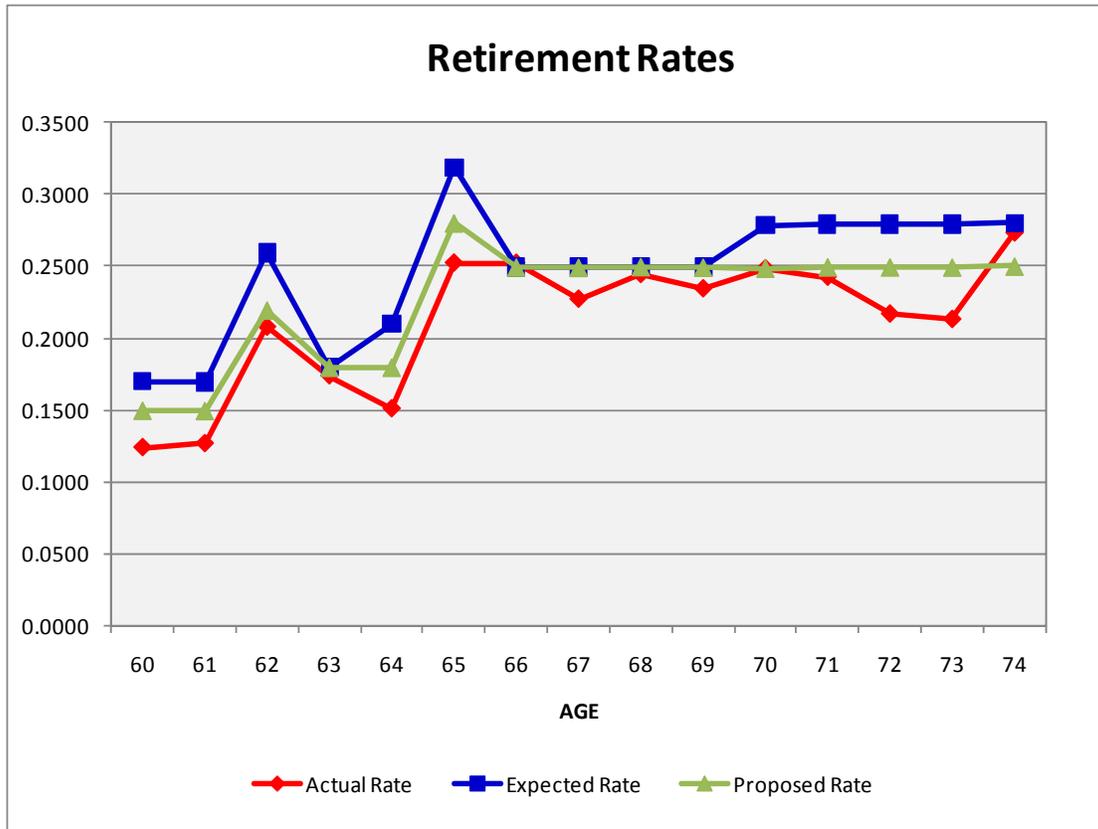
### COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
60 & Under	300	411.6	0.729
61	282	377.9	0.746
62	429	536.1	0.800
63	293	303.3	0.966
64	230	319.8	0.719
65	354	447.7	0.791
66	281	278.0	1.011
67	207	227.3	0.911
68	188	192.3	0.978
69	152	161.8	0.940
70	133	149.2	0.891
71	118	136.1	0.867
72	91	117.3	0.776
73	76	99.7	0.762
74	86	88.2	0.975
75 & Over	258	850.0	0.304
<b>TOTAL</b>	<b>3,478</b>	<b>4,696.2</b>	<b>0.741</b>

The analysis of the experience reflects that the current assumed rates of retirement over-anticipate retirements. We recommend adjustment to the rates to reflect the experience as well as maintain a reasonable degree of margin.



The following graph shows a comparison of the present, actual, and proposed rates of service retirements.





The following table shows a comparison of the present and proposed rates of service retirement.

### COMPARATIVE RATES OF RETIREMENT

AGE	RATES OF SERVICE RETIREMENT	
	Present	Proposed
60	17%	15%
61	17%	15%
62	26%	22%
63	18%	18%
64	21%	18%
65	32%	28%
66	25%	25%
67	25%	25%
68	25%	25%
69	25%	25%
70	28%	25%
71	28%	25%
72	28%	25%
73	28%	25%
74	28%	25%
75	100%	100%



**COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS  
BASED ON PROPOSED RATES OF RETIREMENT**

AGE	NUMBER OF SERVICE RETIREMENTS		
	Actual	Expected	Ratio of Actual to Expected
60 & Under	300	363.2	0.826
61	282	333.5	0.846
62	429	453.6	0.946
63	293	303.3	0.966
64	230	274.1	0.839
65	354	393.1	0.901
66	281	278.0	1.011
67	207	227.3	0.911
68	188	192.3	0.978
69	152	161.8	0.939
70	133	133.3	0.998
71	118	121.5	0.971
72	91	104.8	0.868
73	76	89.0	0.854
74	86	78.8	1.091
75 & Over	258	850.0	0.304
<b>TOTAL</b>	<b>3,478</b>	<b>4,357.6</b>	<b>0.798</b>



**RATES OF PRE-RETIREMENT MORTALITY**

**COMPARISON OF ACTUAL AND EXPECTED PRE-RETIREMENT MORTALITY**

CENTRAL AGE OF GROUP	NUMBER OF DEATHS					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
27 & Under	0	1.5	0.000	0	0.7	0.000
30	0	1.6	0.000	0	2.0	0.000
35	1	3.1	0.328	1	6.4	0.155
40	2	7.2	0.277	1	14.8	0.068
45	2	15.6	0.128	5	25.6	0.195
50	4	29.4	0.136	14	37.6	0.372
53 & Over	51	535.5	0.095	44	380.3	0.116
<b>TOTAL</b>	<b>60</b>	<b>593.9</b>	<b>0.101</b>	<b>65</b>	<b>467.4</b>	<b>0.139</b>

The experience indicates that the pre-retirement mortality rates were significantly lower than anticipated. We recommend that the rates of mortality in active service for both males and females be revised to the same mortality table that is used for post-retirement mortality, which is the RP-2000 Combined Mortality table set back two years for males and set forward one year for females. The following table shows a comparison between the present death rates and the proposed rates.

**COMPARATIVE RATES OF PRE-RETIREMENT MORTALITY**

AGE	RATES OF MORTALITY			
	MALE		FEMALE	
	Present	Proposed	Present	Proposed
20	0.06%	0.04%	0.03%	0.02%
25	0.08%	0.04%	0.03%	0.02%
30	0.08%	0.05%	0.04%	0.03%
35	0.10%	0.08%	0.06%	0.05%
40	0.15%	0.11%	0.08%	0.07%
45	0.23%	0.16%	0.11%	0.11%
50	0.40%	0.24%	0.17%	0.17%
55	0.71%	0.42%	0.29%	0.27%
60	1.29%	0.77%	0.58%	0.51%
64	1.99%	1.27%	0.97%	0.86%



### RATES OF POST-RETIREMENT MORTALITY

The current basis for rate of post-retirement mortality for service retirees and beneficiaries is the 1994 Group Annuity Table set forward four years for males and set forward two years for females. The current basis for rate of post-retirement mortality for disability retirees is the RP-2000 Disability Mortality Table set back 5 years for males.

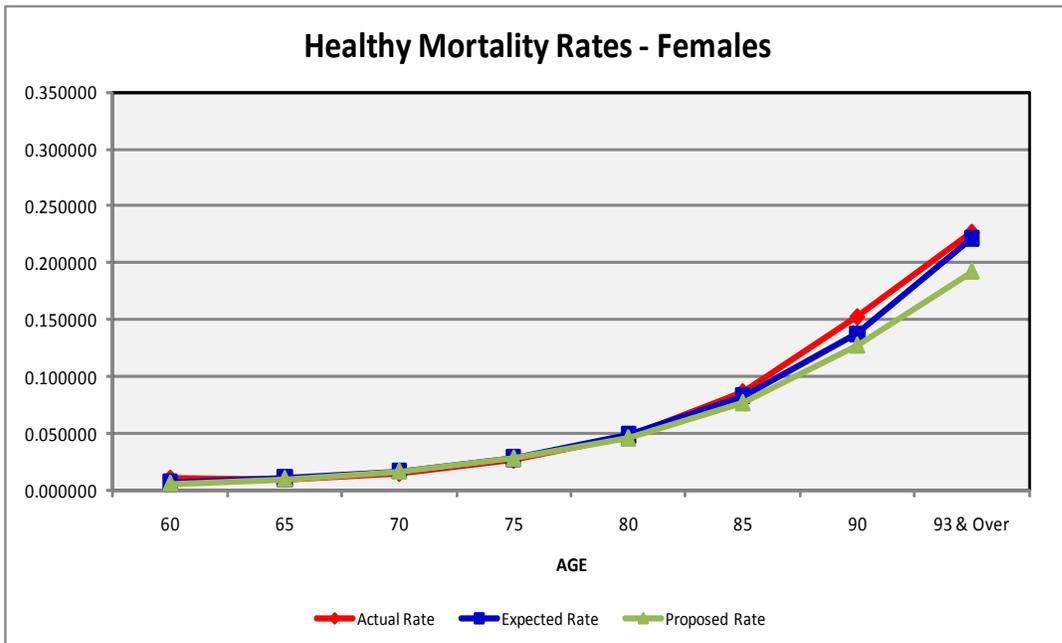
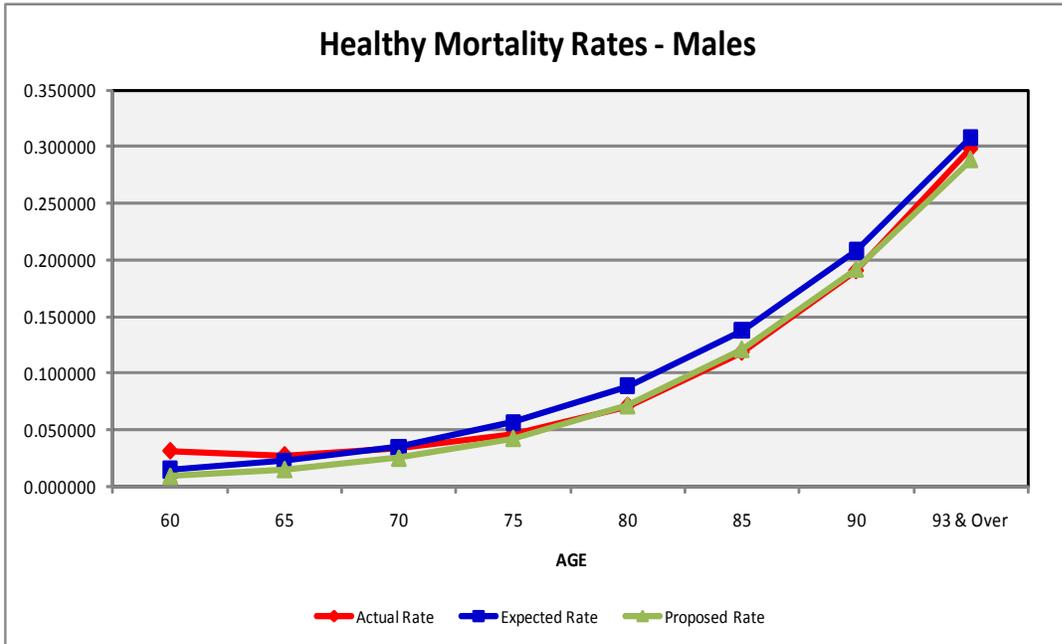
#### **COMPARISON OF ACTUAL AND EXPECTED CASES OF POST-RETIREMENT DEATHS**

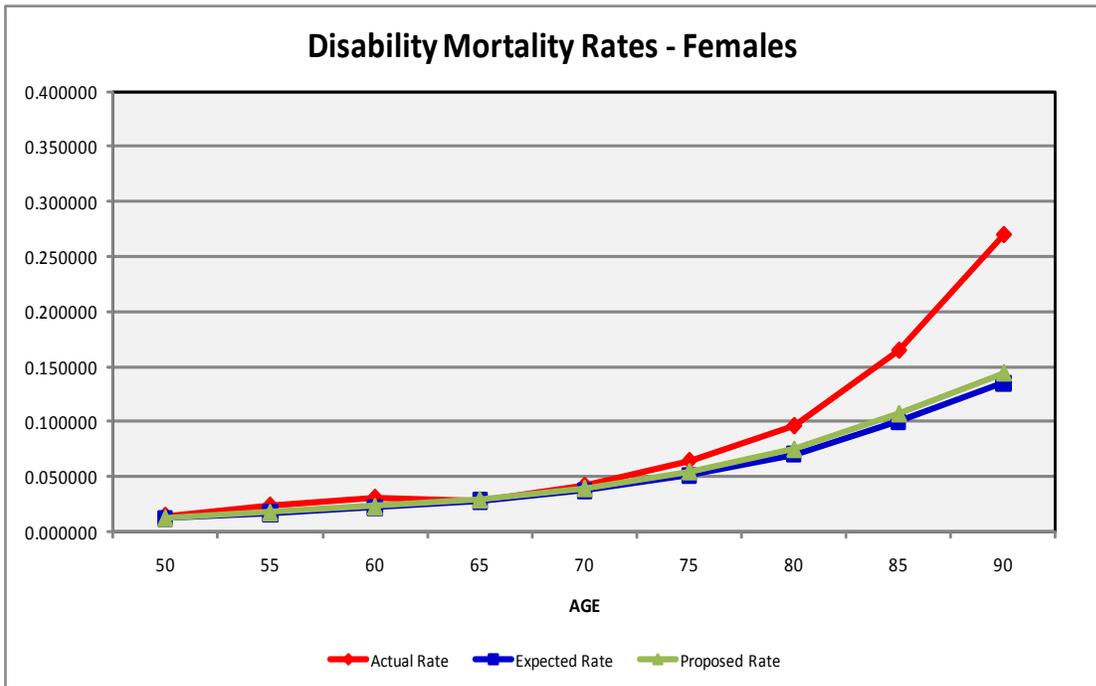
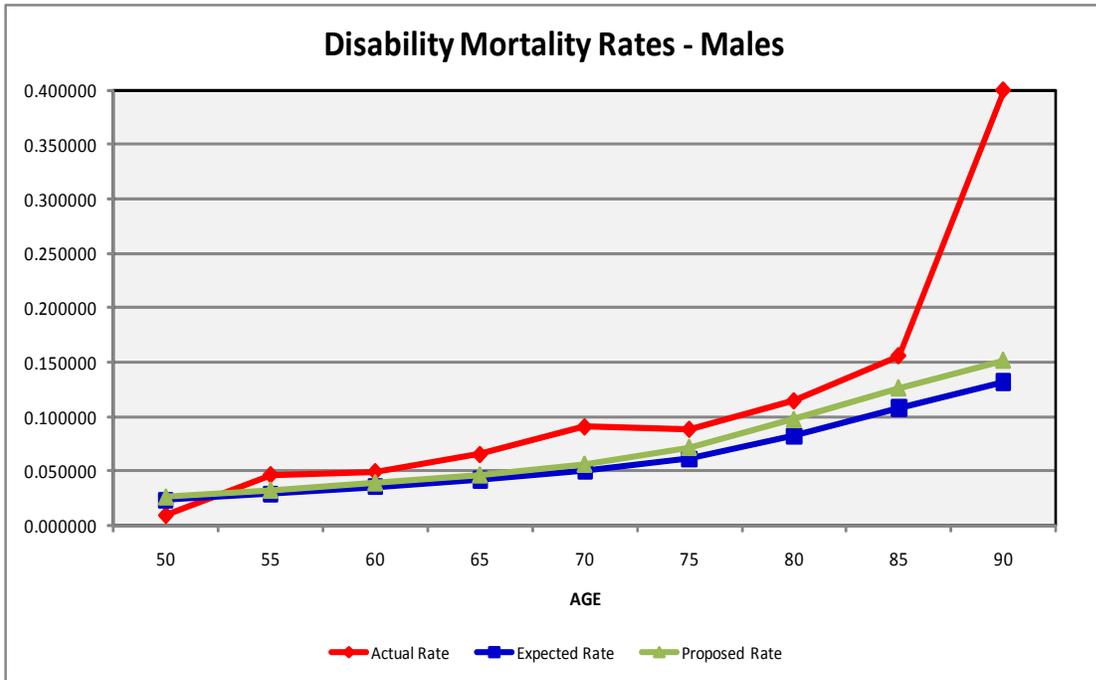
CENTRAL AGE OF GROUP	NUMBER OF DEATHS AMONG SERVICE RETIREMENTS AND BENEFICIARIES					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
57 & Under	12	1.4	8.889	18	1.3	13.636
60	13	6.3	2.080	18	11.9	1.508
65	62	51.1	1.213	81	86.5	0.937
70	111	115.7	0.959	151	167.3	0.903
75	166	202.0	0.822	239	255.3	0.936
80	192	239.4	0.802	325	334.7	0.971
85	187	217.0	0.862	406	390.6	1.039
90	122	133.0	0.918	369	333.3	1.107
93 & Over	60	61.9	0.969	203	198.4	1.023
<b>TOTAL</b>	<b>925</b>	<b>1,027.8</b>	<b>0.900</b>	<b>1,810</b>	<b>1,779.3</b>	<b>1.017</b>

CENTRAL AGE OF GROUP	NUMBER OF DEATHS AMONG DISABILITY RETIREMENTS					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
47 & Under	1	1.0	1.031	1	0.2	4.348
50	1	2.4	0.412	2	1.7	1.212
55	7	4.3	1.620	9	6.4	1.406
60	11	7.9	1.394	27	19.4	1.391
65	18	11.6	1.553	33	32.5	1.015
70	19	10.4	1.822	32	28.5	1.124
75	11	7.6	1.442	25	20.0	1.251
80	7	5.0	1.397	15	11.0	1.364
85	5	3.5	1.445	16	9.7	1.644
90	2	0.7	3.030	10	5.0	2.000
93 & Over	0	0.0	0.000	1	1.1	0.917
<b>TOTAL</b>	<b>82</b>	<b>54.4</b>	<b>1.508</b>	<b>171</b>	<b>135.5</b>	<b>1.262</b>



.For service retirements and beneficiaries we recommend use of the RP-2000 Combined Mortality Table set forward one year for males. For disability retirements, we recommend the use of the RP-2000 Disabled Mortality Table set back two years for males and set forward one year for females. The following graphs show a comparison of the present, actual, and proposed rates of post-retirement mortality for service retirees and beneficiaries.







The following tables show a comparison of the present and proposed rates of post-retirement mortality.

### COMPARATIVE RATES OF POST-RETIREMENT MORTALITY

AGE	SERVICE RETIREMENTS AND BENEFICIARIES			
	MALE		FEMALE	
	Present	Proposed	Present	Proposed
35	0.10%	0.08%	0.06%	0.05%
40	0.15%	0.11%	0.08%	0.07%
45	0.23%	0.16%	0.11%	0.11%
50	0.40%	0.24%	0.17%	0.17%
55	0.71%	0.42%	0.29%	0.27%
60	1.29%	0.77%	0.58%	0.51%
65	2.17%	1.44%	1.08%	0.97%
70	3.41%	2.46%	1.65%	1.67%
75	5.59%	4.22%	2.84%	2.81%
80	8.96%	7.20%	4.92%	4.59%
85	13.95%	12.28%	8.40%	7.74%
90	21.57%	19.98%	14.20%	13.17%

AGE	DISABILITY RETIREMENTS			
	MALE		FEMALE	
	Present	Proposed	Present	Proposed
35	2.26%	2.26%	0.75%	0.75%
40	2.26%	2.26%	0.75%	0.75%
45	2.26%	2.26%	0.75%	0.82%
50	2.26%	2.64%	1.15%	1.25%
55	2.90%	3.29%	1.65%	1.76%
60	3.54%	3.93%	2.18%	2.29%
65	4.20%	4.66%	2.80%	2.96%
70	5.02%	5.69%	3.76%	4.01%
75	6.26%	7.33%	5.22%	5.58%
80	8.21%	9.76%	7.23%	7.71%
85	10.94%	12.83%	10.02%	10.71%
90	14.16%	16.22%	14.00%	14.97%



**COMPARISON OF ACTUAL AND EXPECTED CASES  
OF POST-RETIREMENT DEATHS  
BASED ON PROPOSED RATES OF MORTALITY**

CENTRAL AGE OF GROUP	NUMBER OF DEATHS AMONG SERVICE RETIREMENTS AND BENEFICIARIES					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
57 & Under	12	0.9	14.118	18	1.2	14.516
60	13	3.8	3.412	18	10.4	1.726
65	62	34.1	1.818	81	79.6	1.018
70	111	83.8	1.325	151	168.0	0.899
75	166	152.6	1.088	239	252.3	0.947
80	192	192.7	0.997	325	313.1	1.038
85	187	191.1	0.979	406	360.1	1.127
90	122	122.7	0.994	369	308.4	1.197
93 & Over	60	58.0	1.035	203	172.4	1.178
<b>TOTAL</b>	<b>925</b>	<b>839.5</b>	<b>1.102</b>	<b>1,810</b>	<b>1,665.5</b>	<b>1.087</b>

CENTRAL AGE OF GROUP	NUMBER OF DEATHS AMONG DISABILITY RETIREMENTS					
	MALE			FEMALE		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
47 & Under	1	1.0	1.031	1	0.2	4.167
50	1	2.7	0.365	2	1.8	1.130
55	7	4.9	1.431	9	6.8	1.324
60	11	8.8	1.257	27	20.4	1.324
65	18	12.9	1.401	33	34.4	0.961
70	19	11.8	1.607	32	30.3	1.055
75	11	8.9	1.232	25	21.3	1.172
80	7	6.0	1.176	15	11.7	1.279
85	5	4.1	1.235	16	10.4	1.537
90	2	0.8	2.632	10	5.3	1.873
93 & Over	0	0.0	0.000	1	1.2	0.862
<b>TOTAL</b>	<b>82</b>	<b>61.7</b>	<b>1.329</b>	<b>171</b>	<b>143.9</b>	<b>1.189</b>



## **Section V**

### **Other Assumptions and Methods and Administrative Procedures**

**ADMINISTRATIVE EXPENSES:** Recommend change to current method to add the budgeted expenses for the fiscal year to the normal cost.

**AMORTIZATION METHOD:** Currently the valuation uses a level dollar amortization method. We recommend no change to this method.

**ASSETS:** Currently the actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected actuarial value of assets, based on the assumed valuation rate of return. The amount recognized each year is 1/7 of the difference between market value and expected actuarial value. We recommend maintaining the current smoothing method.

**COST OF LIVING:** Currently we assume cost of living increases of 1.5% semi-annually. We recommend maintaining this assumption.

**OPTION FACTORS:** The option factors currently used by the Retirement System are based on the mortality tables and investment rate of return (discount rate) used in the valuation. We recommend that the factors be revised to the mortality table recommended in this experience study.

**VALUATION COST METHOD:** Currently the valuation uses the entry age actuarial cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. We recommend no change to this assumption.



**APPENDIX A**

**Historical June CPI (U) Index**

Year	CPI (U)	Year	CPI (U)
1959	29.10	1985	107.60
1960	29.60	1986	109.50
1961	29.80	1987	113.50
1962	30.20	1988	118.00
1963	30.60	1989	124.10
1964	31.00	1990	129.90
1965	31.60	1991	136.00
1966	32.40	1992	140.20
1967	33.30	1993	144.40
1968	34.70	1994	148.00
1969	36.60	1995	152.50
1970	38.80	1996	156.70
1971	40.60	1997	160.30
1972	41.70	1998	163.00
1973	44.20	1999	166.20
1974	49.00	2000	172.40
1975	53.60	2001	178.00
1976	56.80	2002	179.90
1977	60.70	2003	183.70
1978	65.20	2004	189.70
1979	72.30	2005	194.50
1980	82.70	2006	202.90
1981	90.60	2007	208.35
1982	97.00	2008	218.82
1983	99.50	2009	215.69
1984	103.70		



**APPENDIX B**

**Capital Market Assumptions and Asset Allocation**

**Real Rates of Return and Standard Deviations by Asset Class**

<b>Asset Class</b>	<b>Expected Real Rate of Return</b>	<b>Standard Deviation</b>
Fixed Income	6.0%	8.0%
US Large Stocks	9.5%	21.5%
US Mid Stocks	13.0%	24.5%
US Small Stocks	16.0%	34.0%
Int'l Developed Mkt Stocks	9.5%	22.5%
Int'l Emerging Mkt Stocks	14.0%	28.0%

**Asset Class Correlation Coefficients**

<b>Asset Class</b>	<b>Fixed Income</b>	<b>US Large Stocks</b>	<b>US Mid Stocks</b>	<b>US Small Stocks</b>	<b>Int'l Dev Mkt Stocks</b>	<b>Int'l EM Mkt Stocks</b>
Fixed Income	1.00					
US Large Stocks	0.20	1.00				
US Mid Stocks	0.20	0.90	1.00			
US Small Stocks	0.20	0.85	0.90	1.00		
Int'l Developed Mkt Stocks	0.15	0.70	0.60	0.60	1.00	
Int'l Emerging Mkt Stocks	0.15	0.55	0.60	0.60	0.65	1.00

**Asset Allocation Targets**

<b>Asset Class</b>	<b>Asset Allocation</b>
Fixed Income	30.0%
US Large Stocks	39.7%
US Mid Stocks	3.7%
US Small Stocks	1.6%
Int'l Developed Mkt Stocks	18.9%
Int'l Emerging Mkt Stocks	6.1%



**APPENDIX C**

**TABLE 1  
RATES OF SEPARATION FROM ACTIVE SERVICE - MALES**

AGE	Rates of Withdrawal			Death	Disability	Retirement
	Service					
	0 - 4	5 - 9	10+			
19	0.35000	0.25000	0.15000	0.00035		
20	0.35000	0.25000	0.15000	0.00036		
21	0.34000	0.23000	0.15000	0.00037		
22	0.33000	0.21000	0.15000	0.00037		
23	0.32000	0.17000	0.14000	0.00038		
24	0.31000	0.17000	0.14000	0.00038		
25	0.30000	0.17000	0.14000	0.00038		
26	0.29000	0.17000	0.14000	0.00038		
27	0.28000	0.17000	0.14000	0.00039		
28	0.28000	0.17000	0.14000	0.00041		
29	0.28000	0.17000	0.14000	0.00044		
30	0.27000	0.16000	0.14000	0.00050		
31	0.26000	0.16000	0.13500	0.00056	0.00001	
32	0.25000	0.16000	0.13000	0.00063	0.00001	
33	0.25000	0.15000	0.11000	0.00070	0.00001	
34	0.24000	0.15000	0.10000	0.00077	0.00001	
35	0.24000	0.14000	0.09000	0.00084	0.00003	
36	0.23000	0.13000	0.09000	0.00090	0.00004	
37	0.23000	0.12000	0.09000	0.00096	0.00005	
38	0.22000	0.12000	0.08000	0.00102	0.00008	
39	0.22000	0.12000	0.07000	0.00108	0.00010	
40	0.21000	0.12000	0.07000	0.00114	0.00011	
41	0.21000	0.12000	0.07000	0.00122	0.00016	
42	0.20000	0.12000	0.07000	0.00130	0.00022	
43	0.20000	0.11000	0.07000	0.00140	0.00027	
44	0.20000	0.11000	0.06500	0.00151	0.00032	
45	0.20000	0.11000	0.06500	0.00162	0.00037	
46	0.20000	0.11000	0.06500	0.00173	0.00047	
47	0.20000	0.11000	0.06500	0.00186	0.00057	
48	0.19000	0.11000	0.06500	0.00200	0.00067	
49	0.19000	0.11000	0.06500	0.00214	0.00077	
50	0.18000	0.11000	0.06500	0.00245	0.00087	
51	0.17000	0.10000	0.06500	0.00267	0.00102	
52	0.17000	0.10000	0.06500	0.00292	0.00117	
53	0.16000	0.10000	0.06000	0.00320	0.00175	
54	0.15000	0.09000	0.06000	0.00362	0.00200	
55	0.15000	0.09000	0.06000	0.00420	0.00225	
56	0.15000	0.09000	0.06000	0.00469	0.00250	
57	0.14000	0.09000	0.05000	0.00527	0.00300	
58	0.13000	0.09000	0.04500	0.00595	0.00325	
59	0.13000	0.09000	0.04500	0.00675	0.00350	
60	0.13000	0.09000	0.00000	0.00768	0.00350	0.15000
61	0.13000	0.09000	0.00000	0.00876	0.00350	0.15000
62	0.13000	0.09000	0.00000	0.01001	0.00350	0.22000
63	0.13000	0.09000	0.00000	0.01128	0.00350	0.18000
64	0.13000	0.09000	0.00000	0.01274	0.00350	0.18000
65	0.13000	0.09000	0.00000	0.01441		0.28000
66	0.13000	0.09000	0.00000	0.01608		0.25000
67	0.13000	0.09000	0.00000	0.01787		0.25000
68	0.13000	0.09000	0.00000	0.01980		0.25000
69	0.13000	0.09000	0.00000	0.02221		0.25000
70	0.13000	0.09000	0.00000	0.02457		0.25000
71	0.13000	0.09000	0.00000	0.02728		0.25000
72	0.13000	0.09000	0.00000	0.03039		0.25000
73	0.13000	0.09000	0.00000	0.03390		0.25000
74	0.13000	0.09000	0.00000	0.03783		0.25000
75	0.00000	0.00000	0.00000	0.04217		1.00000



**TABLE 2  
RATES OF SEPARATION FROM ACTIVE SERVICE – FEMALES**

AGE	Rates of Withdrawal			Death	Disability	Retirement
	Service					
	0 - 4	5 - 9	10+			
19	0.34000	0.21000	0.15000	0.00019		
20	0.34000	0.21000	0.15000	0.00019		
21	0.34000	0.20000	0.14000	0.00019		
22	0.34000	0.20000	0.13000	0.00019		
23	0.34000	0.19000	0.13000	0.00020		
24	0.31000	0.19000	0.12000	0.00020		
25	0.29000	0.19000	0.11000	0.00021		
26	0.28000	0.19000	0.11000	0.00021		
27	0.27000	0.19000	0.11000	0.00022		
28	0.26000	0.15000	0.11000	0.00024		
29	0.25000	0.15000	0.11000	0.00025		
30	0.24000	0.15000	0.11000	0.00026		
31	0.23000	0.15000	0.11000	0.00031	0.00001	
32	0.22000	0.15000	0.11000	0.00035	0.00001	
33	0.22000	0.14000	0.10000	0.00039	0.00001	
34	0.21000	0.13000	0.10000	0.00044	0.00001	
35	0.20000	0.13000	0.10000	0.00048	0.00003	
36	0.19000	0.13000	0.10000	0.00051	0.00004	
37	0.19000	0.12500	0.10000	0.00055	0.00005	
38	0.19000	0.12500	0.09000	0.00060	0.00008	
39	0.18000	0.12000	0.09000	0.00065	0.00010	
40	0.17000	0.12000	0.08000	0.00071	0.00011	
41	0.17000	0.12000	0.08000	0.00077	0.00016	
42	0.16000	0.11500	0.08000	0.00085	0.00022	
43	0.16000	0.11000	0.08000	0.00094	0.00027	
44	0.16000	0.10500	0.07000	0.00103	0.00032	
45	0.16000	0.10000	0.07000	0.00112	0.00037	
46	0.16000	0.10000	0.07000	0.00122	0.00047	
47	0.15000	0.09500	0.07000	0.00133	0.00057	
48	0.15000	0.09500	0.07000	0.00143	0.00067	
49	0.14000	0.09000	0.07000	0.00155	0.00077	
50	0.14000	0.09000	0.06500	0.00168	0.00087	
51	0.14000	0.09000	0.06000	0.00185	0.00102	
52	0.14000	0.08500	0.06000	0.00202	0.00117	
53	0.14000	0.08000	0.06000	0.00221	0.00175	
54	0.13000	0.08000	0.06000	0.00242	0.00200	
55	0.12000	0.08000	0.06000	0.00272	0.00225	
56	0.12000	0.08000	0.05000	0.00309	0.00250	
57	0.11000	0.07000	0.05000	0.00348	0.00300	
58	0.11000	0.07000	0.04500	0.00392	0.00325	
59	0.11000	0.07000	0.04500	0.00444	0.00350	
60	0.11000	0.07000	0.00000	0.00506	0.00350	0.15000
61	0.11000	0.07000	0.00000	0.00581	0.00350	0.15000
62	0.11000	0.07000	0.00000	0.00666	0.00350	0.22000
63	0.11000	0.07000	0.00000	0.00765	0.00350	0.18000
64	0.11000	0.07000	0.00000	0.00862	0.00350	0.18000
65	0.11000	0.07000	0.00000	0.00971		0.28000
66	0.11000	0.07000	0.00000	0.01095		0.25000
67	0.11000	0.07000	0.00000	0.01216		0.25000
68	0.11000	0.07000	0.00000	0.01345		0.25000
69	0.11000	0.07000	0.00000	0.01486		0.25000
70	0.11000	0.07000	0.00000	0.01674		0.25000
71	0.11000	0.07000	0.00000	0.01858		0.25000
72	0.11000	0.07000	0.00000	0.02067		0.25000
73	0.11000	0.07000	0.00000	0.02297		0.25000
74	0.11000	0.07000	0.00000	0.02546		0.25000
75	0.00000	0.00000	0.00000	0.02811		1.00000



**TABLE 3  
RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF SERVICE  
AND BENEFICIARIES OF DECEASED MEMBERS**

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.000345	0.000190	71	0.027281	0.018579
20	0.000357	0.000191	72	0.030387	0.020665
21	0.000366	0.000192	73	0.033900	0.022970
22	0.000373	0.000194	74	0.037834	0.025458
23	0.000376	0.000197	75	0.042169	0.028106
24	0.000376	0.000201	76	0.046906	0.030966
25	0.000378	0.000207	77	0.052123	0.034105
26	0.000382	0.000214	78	0.057927	0.037595
27	0.000393	0.000223	79	0.064368	0.041506
28	0.000412	0.000235	80	0.072041	0.045879
29	0.000444	0.000248	81	0.080486	0.050780
30	0.000499	0.000264	82	0.089718	0.056294
31	0.000562	0.000307	83	0.099779	0.062506
32	0.000631	0.000350	84	0.110757	0.069517
33	0.000702	0.000394	85	0.122797	0.077446
34	0.000773	0.000435	86	0.136043	0.086376
35	0.000841	0.000475	87	0.150590	0.096337
36	0.000904	0.000514	88	0.166420	0.107303
37	0.000964	0.000554	89	0.183408	0.119154
38	0.001021	0.000598	90	0.199769	0.131682
39	0.001079	0.000648	91	0.216605	0.144604
40	0.001142	0.000706	92	0.233662	0.157618
41	0.001215	0.000774	93	0.250693	0.170433
42	0.001299	0.000852	94	0.267491	0.182799
43	0.001397	0.000937	95	0.283905	0.194509
44	0.001508	0.001029	96	0.299852	0.205379
45	0.001616	0.001124	97	0.315296	0.215240
46	0.001734	0.001223	98	0.330207	0.223947
47	0.001860	0.001326	99	0.344556	0.231387
48	0.001995	0.001434	100	0.358628	0.237467
49	0.002138	0.001550	101	0.371685	0.244834
50	0.002449	0.001676	102	0.383040	0.254498
51	0.002667	0.001852	103	0.392003	0.266044
52	0.002916	0.002018	104	0.397886	0.279055
53	0.003196	0.002207	105	0.400000	0.293116
54	0.003624	0.002424	106	0.400000	0.307811
55	0.004200	0.002717	107	0.400000	0.322725
56	0.004693	0.003090	108	0.400000	0.337441
57	0.005273	0.003478	109	0.400000	0.351544
58	0.005945	0.003923	110	0.400000	0.364617
59	0.006747	0.004441	111	0.400000	0.376246
60	0.007676	0.005055	112	0.400000	0.386015
61	0.008757	0.005814	113	0.400000	0.393507
62	0.010012	0.006657	114	0.400000	0.398308
63	0.011280	0.007648	115	0.400000	0.400000
64	0.012737	0.008619	116	0.400000	0.400000
65	0.014409	0.009706	117	0.400000	0.400000
66	0.016075	0.010954	118	0.400000	0.400000
67	0.017871	0.012163	119	1.000000	0.400000
68	0.019802	0.013445	120	1.000000	1.000000
69	0.022206	0.014860	121	1.000000	1.000000
70	0.024570	0.016742	122	1.000000	1.000000



**TABLE 4  
RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF DISABILITY**

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.022571	0.007450	71	0.059613	0.042851
20	0.022571	0.007450	72	0.062583	0.045769
21	0.022571	0.007450	73	0.065841	0.048895
22	0.022571	0.007450	74	0.069405	0.052230
23	0.022571	0.007450	75	0.073292	0.055777
24	0.022571	0.007450	76	0.077512	0.059545
25	0.022571	0.007450	77	0.082067	0.063545
26	0.022571	0.007450	78	0.086951	0.067793
27	0.022571	0.007450	79	0.092149	0.072312
28	0.022571	0.007450	80	0.097640	0.077135
29	0.022571	0.007450	81	0.103392	0.082298
30	0.022571	0.007450	82	0.109372	0.087838
31	0.022571	0.007450	83	0.115544	0.093794
32	0.022571	0.007450	84	0.121877	0.100203
33	0.022571	0.007450	85	0.128343	0.107099
34	0.022571	0.007450	86	0.134923	0.114512
35	0.022571	0.007450	87	0.141603	0.122464
36	0.022571	0.007450	88	0.148374	0.130972
37	0.022571	0.007450	89	0.155235	0.140049
38	0.022571	0.007450	90	0.162186	0.149698
39	0.022571	0.007450	91	0.169233	0.159924
40	0.022571	0.007450	92	0.183408	0.170433
41	0.022571	0.007450	93	0.199769	0.182799
42	0.022571	0.007450	94	0.216605	0.194509
43	0.022571	0.007450	95	0.233662	0.205379
44	0.022571	0.007450	96	0.250693	0.215240
45	0.022571	0.008184	97	0.267491	0.223947
46	0.022571	0.008959	98	0.283905	0.231387
47	0.022571	0.009775	99	0.299852	0.237467
48	0.023847	0.010634	100	0.315296	0.244834
49	0.025124	0.011535	101	0.330207	0.254498
50	0.026404	0.012477	102	0.344556	0.266044
51	0.027687	0.013456	103	0.358628	0.279055
52	0.028975	0.014465	104	0.371685	0.293116
53	0.030268	0.015497	105	0.383040	0.307811
54	0.031563	0.016544	106	0.392003	0.322725
55	0.032859	0.017598	107	0.397886	0.337441
56	0.034152	0.018654	108	0.400000	0.351544
57	0.035442	0.019710	109	0.400000	0.364617
58	0.036732	0.020768	110	0.400000	0.376246
59	0.038026	0.021839	111	0.400000	0.386015
60	0.039334	0.022936	112	0.400000	0.393507
61	0.040668	0.024080	113	0.400000	0.398308
62	0.042042	0.025293	114	0.400000	0.400000
63	0.043474	0.026600	115	0.400000	0.400000
64	0.044981	0.028026	116	0.400000	0.400000
65	0.046584	0.029594	117	1.000000	0.400000
66	0.048307	0.031325	118	1.000000	0.400000
67	0.050174	0.033234	119	1.000000	1.000000
68	0.052213	0.035335	120	1.000000	1.000000
69	0.054450	0.037635	121	1.000000	1.000000
70	0.056909	0.040140	122	1.000000	1.000000