EXPERIENCE STUDY ANALYSIS

State Retirement System
1995-1999

PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION

TABLE OF CONTENTS

EXPERIENCE STUDY – STATE RETIREMENT SYSTEM

Introduction

The Public Employee Retirement Administration Commission (PERAC) has completed an Experience Study of the State Retirement System. This study reflects the first part of our analysis of the actuarial assumptions used in determining Commonwealth liabilities.

This report presents the results of the experience study for members of the State Retirement System over the five-year period from January 1, 1995 through December 31, 1999. Two elements were essential in performing this study: software capable of performing a thorough analysis for such a large group and accurate data.

One of PERAC's first initiatives was the procurement of new software for performing actuarial valuations and experience studies. After an RFP process, the new software was purchased in 1998, customized for Chapter 32, and implemented and tested throughout 1999. Apart from improving the quality and efficiency of valuations, the new software has the capability of performing a detailed historical experience analysis that the prior system could not produce due to software constraints.

State Retirement plan data has continually improved over the last 10 years and currently is in good condition. The nature of an experience study is to track how members leave a system (retirement, death, disability, or withdrawal). This task requires not only accurate data but also more detailed data than a regular actuarial valuation requires. We received additional information and a number of data listings from the State Retirement Board to complete this study.

This report represents the first detailed experience study completed by PERAC. However, each year as part of the valuation, we test how well the assumptions are working by performing a gain/loss analysis. If plan liabilities increase more than assumed, there is an actuarial loss. If plan liabilities increase less than assumed, there is an actuarial gain. If each year the results consistently produced an actuarial loss (or an actuarial gain), then this would indicate that the assumptions are not properly reflecting actual experience. In this way, the gain/loss analysis serves as a proxy to the performance of a detailed experience study.

We reviewed the gains and losses on plan liabilities (excluding asset gains and losses) from 1990 (the first PERA actuarial valuation for the Commonwealth) through 1999. PERA/PERAC performed Commonwealth valuations in 1990, 1992, 1993, 1995, 1996, 1998, 1999, and 2000. Our review of the past gains and losses shows the results to be within a reasonable range. For the State Retirement System, there is a cumulative gain (experience better than anticipated) of approximately $300 million over the 10 year period. This amount is quite small considering the total accrued liability of approximately $14.1 billion as of January 1, 2000.

Introduction (continued)

As part of this experience study, we performed a detailed member reconciliation of actual retirements, terminations, and disabilities over the 5-year period. We analyzed these results using not only our valuation data from each year, but also listings generated by the PERAC disability unit, additional listings prepared by the State Retirement Board, and that Board's response to a number of our data questions.

The annual funding schedule appropriation (the total plan cost) reflects two sources of plan costs and liabilities. The first is the amortization of the unfunded liability. The actuarial accrued liability less plan assets equals the unfunded liability. The unfunded liability is amortized through FY2017 under the current schedule. In addition to the amortization of the unfunded liability, the annual appropriation also reflects the normal cost (or current cost), which represents the value of benefits accruing during the coming year. The measure of the impact on the total plan cost of any change in assumptions is the impact of that change on these two components.

Although the normal cost and accrued liability directly determine the appropriation under the funding schedule, these items are components that make up a portion of the present value of future benefits (PVFB). The PVFB may be the most accurate measure of the "true" total cost of a plan since it represents the present value of total projected benefits for all active, inactive and retired members. Any change in the actuarial assumptions will change the PVFB and, accordingly, the normal cost and accrued liability (and thereby the amortization of the unfunded liability).

Our proposed assumptions generally increase turnover rates, decrease disability rates and decrease the salary increase assumption. These changes decrease total plan cost. For example, higher turnover means that members are more likely to leave service before they become vested, thereby reducing retirement benefits to be paid. We are also proposing assumptions that generally decrease mortality rates and therefore serve to increase total plan cost.

Based on the January 1, 2000 actuarial valuation results, the proposed assumptions would produce a total cost (normal cost and amortization of the unfunded liability) that is less than that produced under the current assumptions. The proposed assumptions will first be implemented in the January 1, 2001 actuarial valuation. That valuation will also reflect investment return experience during 2000, any gains or losses on plan liabilities, and the impact of recent legislation. We will continue to monitor the experience with respect to the valuation assumptions each year and recommend changes to any of the assumptions as necessary.

It is important to note that the results for the State reflect only one component of the total Commonwealth obligation. The next funding schedule adopted will also include results for State and Boston teachers as well as the local COLA liability. The Teachers' experience study will be released later this year. In light of the common goal of addressing the pension funding of the Commonwealth in a disciplined and appropriate manner, it is recommended that no change in the existing funding schedule take place at this time that would reduce the current level of appropriation.

Introduction (continued)

We gratefully acknowledge the efforts of the State Retirement Board staff in completing this project. We would also like to thank the members of PERAC's *Actuarial Advisory Committee*: David Driscoll, Buck Consultants, Inc.; Wilson Lowry, Watson Wyatt Worldwide; Joseph Macaulay, George Beram & Co., Inc.; Kathy Riley, The Segal Company; Dan Sherman, PricewaterhouseCoopers, LLP; Larry Stone, Stone Consulting; and David Wean, John Hancock Actuarial Consulting Services. We presented our methodology, findings, and proposed assumptions to the Committee at several meetings this year. The Committee provided comments and suggestions with respect to our preparation of this report.

Respectfully submitted,
Public Employee Retirement Administration
Commission

_____

James R. Lamenzo
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 99-4709

_____

Joseph E. Connarton
Executive Director

Dated: October 18, 2000

Executive Summary

General

The principal results of the five-year experience study can be summarized as follows:

- **Experience indicates that changes should be made for the following:**
  - Rates of retirement for active members; small change in total plan cost
  - Rates of disability for active members; decrease in total plan cost
  - Rates of withdrawal for active members; decrease in total plan cost
  - Rates of salary increases for active members; decrease in total plan cost
  - Rates of mortality for retired members; increase in total plan cost
  - Rates of mortality for disabled members; increase in total plan cost
- **Nature and effect of changes:**
  - Proposed changes are based on both actual past and anticipated future experience
  - Overall, proposed changes produce a total plan cost less than that under the current assumptions

Executive Summary (continued)

- **Retirement**
  - For Group 1, propose decreasing rates at ages 55 and 65, slight increase in rates between ages 56 and 64, and adding gender distinct rates between ages 50 and 59
  - For Group 2, propose adding rates at ages 50 to 54, decreasing the rate at age 65, increasing rates at ages 56 to 61, with small rate changes at other ages
  - For Group 3, propose reducing rates significantly at age 50 and above, with slight changes at other ages
  - For Group 4, propose significant decrease in rate at age 50, significant increase at age 55, and generally moderate increases at other ages below 65
  - Overall, proposed assumptions would have small impact on total plan cost
- **Disability**
  - For Groups 1 and 2, propose significant decrease in rates at all ages
  - For Group 3, propose increasing rates at most ages and adding rates at age 50 and later
  - For Group 4, propose increasing rates from ages 20 to 37 and decreasing rates thereafter
  - Proposed assumptions would decrease total plan cost
- **Withdrawal**
  - For Groups 1 and 2, propose age and service based table up to 10 years of service and age based thereafter
  - For Groups 3 and 4, propose service based table (current tables are age based)
  - New tables would reflect higher rates for Groups 1, 2 and 4
  - Propose modest adjustments in rates for Group 3
  - Proposed assumptions would decrease total plan cost

Executive Summary (continued)

- **Post-Retirement Mortality**
  - Propose adopting RP-2000 table projected for 10 years with improved mortality (with adjustments based on experience results) until more experience determined
  - Propose separate tables by gender
  - Propose separate tables for members who retired under disability provisions
  - Generally, proposed rates assume longer life expectancy and include an adjustment for projected mortality improvements
  - Proposed assumptions would increase total plan cost
- **Salary Increases**
  - Current assumption is 6.0% at all ages for each Group
  - Propose adopting service based tables for each Group, with ultimate assumption of 4.75% for Groups 1 and 2, and 5.5% for Groups 3 and 4
  - Proposed salary increase assumption generally greater than current rates for short service and younger ages and less than the current 6% assumption thereafter
  - Proposed assumptions would decrease total plan cost

Methodology

General methodology for all assumptions

- Study comprises the years January 1, 1995 through January 1, 2000
- Data used in this study was provided by the State Retirement Board and reflects the January 1, 1995, 1996, 1998, 1999 and 2000 data used in the State actuarial valuations
- Reconciliation of members completed for each year
- Adjustments made to account for the two-year period January 1, 1996 to January 1, 1998
- For each period in the 5 year experience study period (1/95 to 1/96, 1/96 to 1/98, 1/98 to 1/99, and 1/99 to 1/00), we determined the member experience relating to:
  - Retirement
  - Disability
  - Withdrawal (Turnover)
  - Post-retirement mortality
  - Salary increases
- Actual experience determined at each age (and/or years of service) for each assumption. For example, for retirement, we determined the actual number of members retiring at each age.
- Expected experience determined for each assumption. For example, for retirement, we determined the expected number of members retiring at each age based on the plan assumptions.
- An actual/expected (A/E) ratio was computed at each age for each assumption.
- Graphed experience results and used various smoothing techniques to select assumptions
- Analysis reflects a review by age and job group:
  - Group 1- general employees
  - Group 2- certain employees with hazardous positions
  - Group 3- state police
  - Group 4- generally public safety and correction officers
- In some cases, experience analyzed within the same job group by isolating certain departments and/or agencies.

Methodology (continued)

In addition to the general methodology that was used for each assumption outlined on the previous page, the following specific analysis was conducted:

- **Retirement**
  - Assumed a member retired if the member was eligible to retire at the beginning of a period and is not in the active file at the end of the period
  - Analyzed results by gender
  - Analyzed results separately for members retiring before or after age 55
  - Analyzed results both including and excluding UMASS Medical Center employees due to the merger with Memorial Healthcare and transfer of some employees (applicable only for Groups 1 and 2)

- **Disability**
  - Results modified to reflect that some members retire from an inactive status as opposed to an active status
  - Compared results to historical disability counts from PERAC disability unit
  - Analyzed results by the percentage of disabilities that are job related (accidental) compared to non-job-related (ordinary)

- **Withdrawal**
  - Assumed a member withdrew if the member was not eligible to retire at the beginning of the period and is not in the active file at the end of the period
  - Analyzed results both including and excluding UMASS Medical Center employees due to the merger with Memorial Healthcare and transfer of some employees (applicable only for Groups 1 and 2)
  - Analyzed results by service and age/service combined in addition to age
  - Analyzed results in 5 year age brackets in selecting assumptions

Methodology (continued)

- **Post-Retirement Mortality**
  - Analyzed results by gender
  - Adjusted results for each Group to reflect retiree deaths with continuing payments to beneficiaries
  - Compared actual experience for each Group to several standard mortality tables (83GAM, 94GAM, UP94 and RP-2000)
  - Performed testing for disabled retired members separately by gender

- **Salary Increases**
  - Analyzed results both including and excluding UMASS Medical Center employees due to the merger with Memorial Healthcare and transfer of some employees (applicable only for Groups 1 and 2)
  - Determined ratios of salaries at the end of the year to salaries at the beginning of the year for continuing members
  - Analyzed results by service and age/service combined in addition to age

Findings

- **Retirement**
  - In aggregate, Group 1 female rates generally somewhat greater than male rates prior to age 60
  - For Group 1, actual retirements significantly less than expected at ages 55 and 65; actual greater than expected for ages 56-64
  - Effect of removing UMASS Medical Center employees made a slight difference for Group 1 members; negligible for Group 2
  - For Group 1, approximately 250 members per year shown as retirements prior to age 55 with over 20 or more years of service, were actually deferred vested. Reviewed allocation among retirement and turnover before selecting assumptions.
  - Group 3 A/E ratios significantly less that 1 (actual retirements less than expected)
  - Small number of exposures in Group 4 in 1/95 data presumably reflects miscoding for some members; other years show more reasonable counts
  - Group 4 A/E rates generally greater than 1 (actual retirements greater than expected) but relatively small number of exposures
- **Disability**
  - Actual number of disability retirements much less than expected for Groups 1 & 2
  - Actual number of disability retirements about as expected (in total) for Groups 3 & 4
  - Ratio of accidental disability to ordinary disability retirements about as expected
- **Withdrawal**
  - Effect of removing UMASS Medical Center employees decreased withdrawal rate for Group 1 members; negligible for Group 2
  - Group 2 exposures decreased dramatically from 1/95 to 1/96 (5,766 to 3,665) and increased dramatically from 1/96 to 1/98 (3,655 to 6,624) due to assumed data miscodings on 1/96 file
  - A/E ratios (with UMASS removed) significantly greater than 1 (much higher withdrawal than expected) for Groups 1, 2 and 4 at most ages
  - Group 3 A/E ratios are generally approximately 1 (actual withdrawal about as expected)

Findings (continued)

- **Post-Retirement Mortality**
  - Male mortality somewhat less than expected in all years
  - Female mortality significantly greater than expected in all years
  - Recent retiree data is more credible than past data for retirees
  - Data issues with 1/98 file did not allow analysis of 1/96-1/98 and 1/98-1/99 periods
  - Disabled male mortality significantly less than expected
  - Disabled female mortality about the same as expected, however, there is small number of exposures
  - Mortality not significantly different by Group

- **Salary Increases**
  - Effect of removal of UMASS Medical Center employees not significant
  - For Groups 1 and 2, salary increases generally average from 7-15% for the first several years of service then grade down quickly to generally less than 4% after 5 years of service
  - For Group 1, salary increases exceed 6% until age 30, then are generally about 4%
  - In aggregate, Groups 3 and 4 reflect greater overall increases than Groups 1 and 2, but significantly more variability by year presumably due to contract settlements

Summary of Assumptions

The selection of the actuarial assumptions reflects a work in progress. We expect the assumptions shown here will be used in the January 1, 2001 actuarial valuation. However, we will continue to test and refine the assumptions in future years.

In this section, we show sample rates for each assumption, and where appropriate, an illustration showing a comparison of the current and proposed assumptions. A rate essentially represents the likelihood of an event occurring at a given time. For example, the mortality rates represent the likelihood of death. The complete tables for Group specific assumptions are shown in the Appendix. In all illustrations that follow, the current rates are represented by a dashed line and the proposed rates by a solid line.

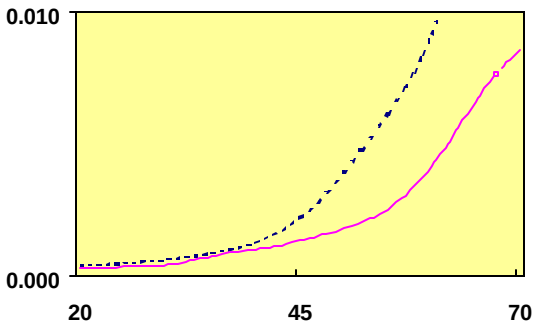
Assumptions Common to All Groups

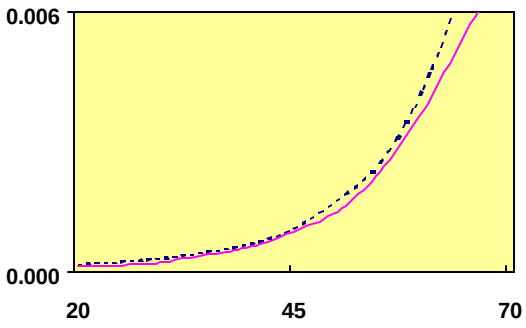
1. Rate of Investment Return: Current: 8.25% annually. This assumption is determined by the legislature and was not reviewed as part of this study.

2. Pre-Retirement Mortality: Current rates of mortality are in accordance with the 1983 Group Annuity Mortality (GAM83) table. The proposed rates reflect the RP-2000 Employees table projected 10 years with Scale AA.

The following tables and graphs compare current and proposed mortality rates for active males and females respectively. The proposed male table indicates lower mortality rates and reflects longer life expectancy than the current table. The proposed female table reflects a slightly longer life expectancy than the current table. The proposed rates would increase total plan cost.

	Male		Female	
Age	Current	Proposed	Current	Proposed
20	.000377	.000285	.000189	.000163
30	.000607	.000422	.000342	.000239
40	.001238	.000996	.000665	.000607
50	.003909	.001783	.001647	.001412
60	.009158	.004151	.004241	.003739



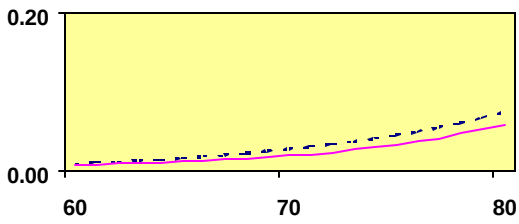


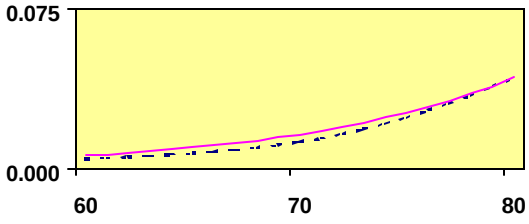
Summary of Assumptions (continued)

3. Post-Retirement Mortality: Current rates of mortality are in accordance with the 1983 Group Annuity Mortality (GAM83) table. The proposed rates reflect the RP-2000 Healthy Annuitant table projected 10 years with Scale AA. For disabled members, current rates are in accordance with GAM83 with rates set forward 10 years. The proposed rates reflect the RP-2000 table set forward 3 years for males.

The following tables and graphs compare current and proposed mortality rates for non-disabled retired males and females respectively. The proposed male table reflects a slightly longer life expectancy than the current tables. The proposed female table reflects a slightly shorter life expectancy than the current tables. The proposed rates would increase total plan cost.

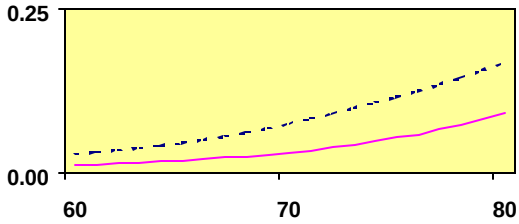
Non Disabled	Male		Female	
Age	Current	Proposed	Current	Proposed
60	.009158	.006975	.004241	.005897
70	.027530	.019091	.012385	.015923
80	.074070	.058213	.042945	.042767
90	.166307	.176202	.111750	.127784

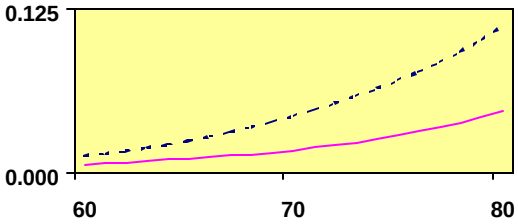




The following tables and graphs compare the current and proposed mortality rates for disabled retired males and females respectively. The proposed male and female tables reflect a slightly longer life expectancy than the current tables. The proposed rates would increase total plan cost.

Disabled	Male		Female	
Age	Current	Proposed	Current	Proposed
60	.027530	.01095	.012385	.006200
70	.074070	.03039	.042945	.016742
80	.166307	.08971	.111750	.045879
90	.319185	.23366	.295187	.131682



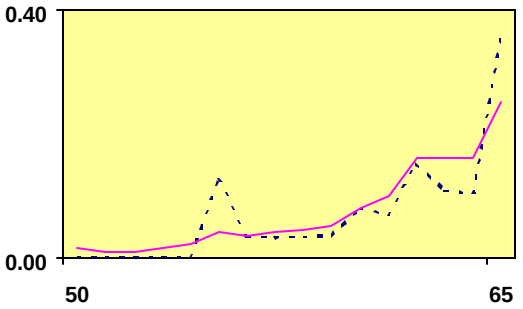


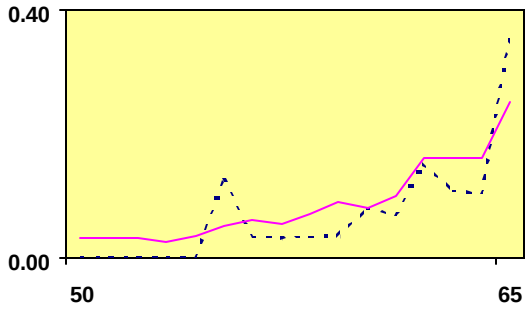
Summary of Assumptions (continued)

Group 1 – Specific Assumptions:

1. Rates of Retirement: The following table and graphs compare current and proposed retirement rates for males and females respectively. The proposed assumptions are gender specific between ages 50-59. The proposed rates are less than the current rates at ages 55 and 65 and generally greater than the current rates at other ages. The proposed rates have a negligible impact on total plan cost.

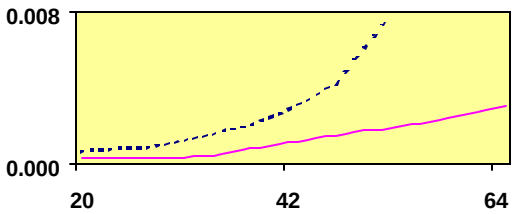
Age	Current	Proposed	
		Male	Female
50	.0000	.015	.030
55	.1255	.040	.050
60	.0784	.080	.080
65	.3568	.250	.250
66-69	.2159-.2536	.250	.250
70	1.0000	1.000	1.000





2. Rates of Disability: The following table and graph show that the proposed disability rates are less than the current rates. The proposed rates decrease total plan cost.

Age	Current	Proposed
20	.0006	.00030
30	.0011	.00033
40	.0024	.00091
50	.0061	.00168
60	.0123	.00250



Summary of Assumptions (continued)

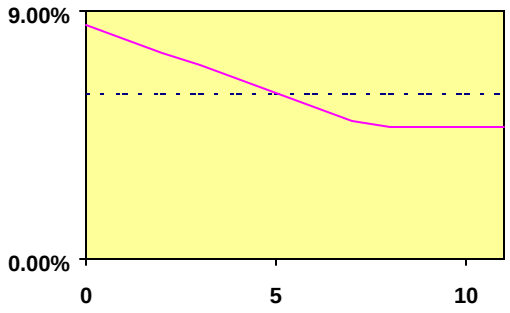
Group 1 – Specific Assumptions (continued):

3. Rates of Withdrawal: Current rates are strictly age based. Proposed rates are age and service based rates for the first 10 years of service and age based after 10 years. The proposed rates decrease total plan cost.

Age	Current	Proposed (0 years)	Proposed (5 years)	Proposed (after 10 years)
20	.1200	.180	-----	-----
30	.0555	.150	.090	.041
40	.0231	.125	.070	.031
50	.0146	.100	.048	.021

4. Rate of Salary Increase: The following table and graph compare current and proposed salary increase rates. The proposed rates are less than the current rate after 5 years of service. The proposed rates decrease total plan cost.

Service	Current	Proposed
0	6.00%	8.50%
1	6.00%	8.00%
2	6.00%	7.50%
3	6.00%	7.00%
4	6.00%	6.50%
5	6.00%	6.00%
6	6.00%	5.50%
7	6.00%	5.00%
8+	6.00%	4.75%

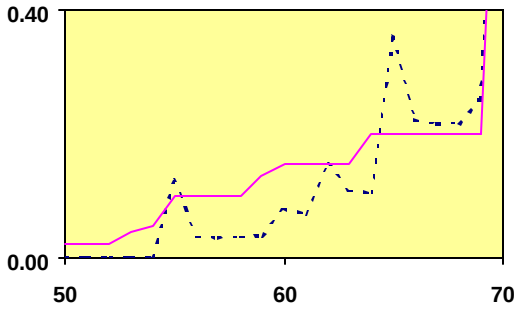


Summary of Assumptions (continued)

Group 2 - Specific Assumptions:

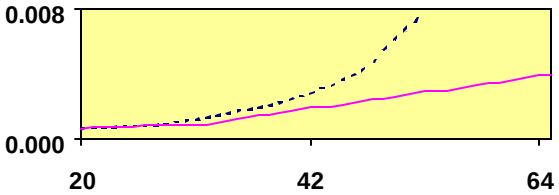
1. Rates of Retirement: The following table and graph compare current and proposed retirement rates. The proposed rates are less than the current rates at age 55 and between ages 65-69 and higher than the current rates at other ages. The proposed rates have a negligible impact on total plan cost.

Age	Current	Proposed
50	.0000	.02
55	.1255	.10
60	.0784	.15
65	.3568	.20
66-69	.2159-.02536	.20
70	1.0000	1.00



2. Rates of Disability: The following table and graph show that the proposed disability rates are less than the current rates. The proposed rates decrease total plan cost.

Age	Current	Proposed
20	.0006	.00060
30	.0011	.00080
40	.0024	.00166
50	.0061	.00260
60	.0123	.00350



Summary of Assumptions (continued)

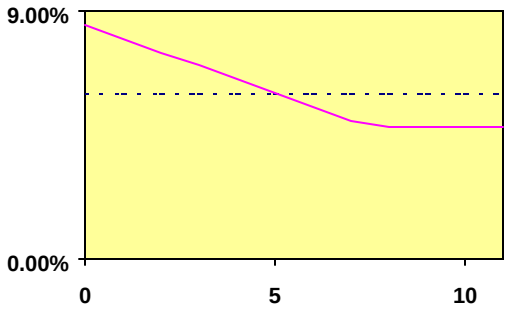
Group 2 - Specific Assumptions (continued):

3. Rates of Withdrawal: Current rates are strictly age based. Proposed rates are age and service based rates for the first 10 years of service and age based after 10 years. The proposed rates decrease total plan cost.

Age	Current	Proposed (0 years)	Proposed (5 years)	Proposed (after 10 years)
20	.1200	.180	-----	-----
30	.0555	.150	.090	.041
40	.0231	.125	.070	.031
50	.0146	.100	.048	.021

4. Rate of Salary Increase: The following table and graph compare current and proposed salary increase rates. The proposed rates are less than the current rate after 5 years of service. The proposed rates decrease total plan cost.

Service	Current	Proposed
0	6.00%	8.50%
1	6.00%	8.00%
2	6.00%	7.50%
3	6.00%	7.00%
4	6.00%	6.50%
5	6.00%	6.00%
6	6.00%	5.50%
7	6.00%	5.00%
8+	6.00%	4.75%

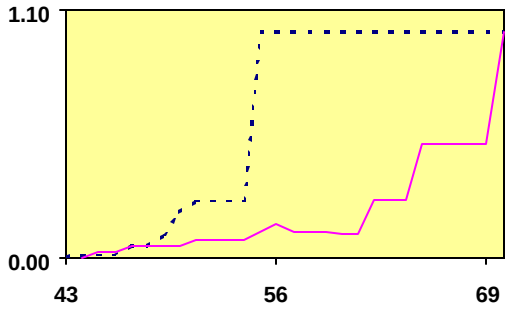


Summary of Assumptions (continued)

Group 3 – Specific Assumptions:

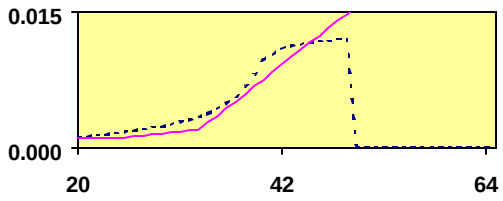
1. Rates of Retirement: The following table and graph compare current and proposed retirement rates. The proposed rates are less than the current rates except at ages 45 and 46. The proposed rates have a negligible impact on total plan cost.

Age	Current	Proposed
43	.0030	.000
45	.0075	.020
50	.2000	.050
51 – 54	.2500	.075
55	1.0000	.110
56	1.0000	.150
57 – 59	1.0000	.110
60 – 61	1.0000	.100
62 – 64	1.0000	.250
65 – 69	1.0000	.500
70	1.0000	1.000



2. Rates of Disability: The following table and graph show that the proposed disability rates are less than the current rates until age 45 and are greater thereafter. The proposed rates slightly decrease total plan cost.

Age	Current	Proposed
20	.0011	.00100
30	.0025	.00160
40	.0096	.00753
50	.0000	.01559
60	.0000	.02000



Summary of Assumptions (continued)

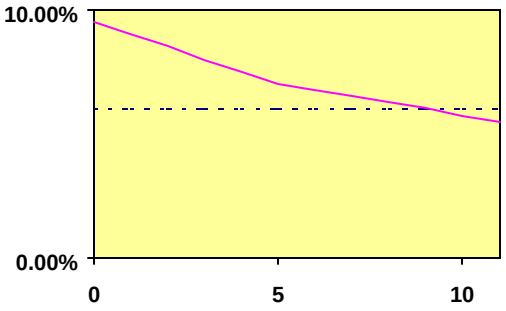
Group 3 - Specific Assumptions (continued):

3. Rates of Withdrawal: Current rates are strictly age based. Proposed rates are strictly service based. The proposed rates decrease total plan cost.

Age	Current (age based)		Service	Proposed (service based)
20	.0210		0-4	.008
30	.0165		5-9	.008
40	.0056		10-14	.009
50	.0000		15+	.009

4. Rate of Salary Increase: The following table and graph compare current and proposed salary increase rates. The proposed rates are less than the current rate after 5 years of service. The proposed rates decrease total plan cost.

Service	Current	Proposed
0	6.00%	9.50%
1	6.00%	9.00%
2	6.00%	8.50%
3	6.00%	8.00%
4	6.00%	7.50%
5	6.00%	7.00%
6	6.00%	6.75%
7	6.00%	6.50%
8	6.00%	6.25%
9	6.00%	6.00%
10	6.00%	5.75%
11+	6.00%	5.50%

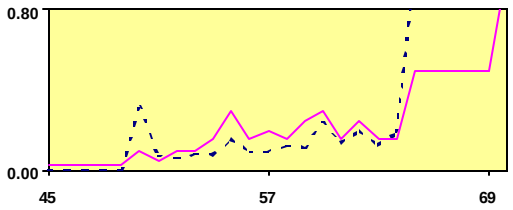


Summary of Assumptions (continued)

Group 4 – Specific Assumptions:

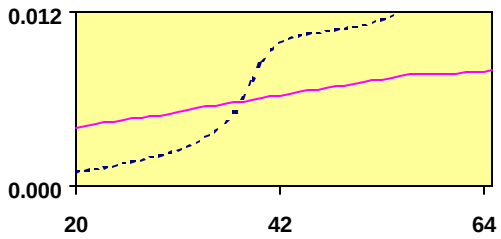
1. Rates of Retirement: The following table and graph compare current and proposed retirement rates. The proposed rates are less than the current rates at ages 50-51 and between ages 64-69 and greater than the current rates at other ages. The proposed rates have a negligible impact on total plan cost.

Age	Current	Proposed
45 – 49	.0000	.030
50	.3201	.100
55	.1554	.300
60	.2395	.300
62	.1950	.250
65 – 69	1.0000	.500
70	1.0000	1.000



2. Rates of Disability: The following table and graph show that the proposed disability rates are greater than the current rates until age 37 and are less than the current rates thereafter. The proposed rates decrease total plan cost.

Age	Current	Proposed
20	.0010	.00410
30	.0023	.00504
40	.0087	.00608
50	.0110	.00712
60	.0150	.00780



Summary of Assumptions (continued)

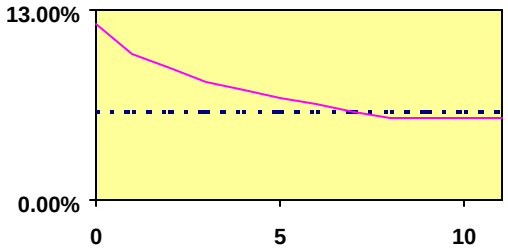
Group 4 - Specific Assumptions (continued):

3. Rates of Withdrawal: Current rates are strictly age based. Proposed rates are strictly service based. The proposed rates decrease total plan cost.

Age	Current (age based)		Service	Proposed (service based)
20	.0210		0	.044
30	.0165		5	.037
40	.0056		10	.029
50	.0000		15	.022
60	.0000		20 +	.015

4. Rate of Salary Increase: The following table and graph compare current and proposed salary increase rates. The proposed rates are less than the current rate after 5 years of service. The proposed rates decrease total plan cost.

Service	Current	Proposed
0	6.00%	12.0%
1	6.00%	10.0%
2	6.00%	9.00%
3	6.00%	8.00%
4	6.00%	7.50%
5	6.00%	7.00%
6	6.00%	6.50%
7	6.00%	6.00%
8+	6.00%	5.50%



Effect of Proposed Assumptions

For illustration, the effect of the proposed salary scale and demographic assumption changes based on the January 1, 2000 valuation results is shown below. The January 1, 2001 valuation results will reflect the proposed assumptions as well as the actual investment return for 2000, gains or losses on plan liabilities, and the impact of recent legislation. In light of the common goal of addressing the pension funding of the Commonwealth in a disciplined and appropriate manner, it is recommended that no change in the existing funding schedule take place at this time that would reduce the current level of appropriation.

1. Number of Members:			
Active Members		85,572	
Inactive Members		2,986	
Retirees and Survivors		43,737	
Total		132,295	
2. Total Annual Regular Compensation		$3,471,633,269	
3. Average Annual Regular Compensation		$40,570	
Development of Total Cost (in thousands)	Current Assumptions	Proposed Assumptions	Increase/Decrease
4. Normal Cost			
a. Total Normal Cost	$488,747	$395,000	($93,747)
b. Employee Contributions	$273,714	$268,000	($5,714)
c. Net Normal Cost	$215,033	$127,000	($88,033)
5. Actuarial Accrued Liability			
a. Active Members	$8,153,972	$8,015,000	($138,972)
b. Vested Terminated Members	$248,415	$255,000	$6,585
c. Non-vested Terminated Members	$68,215	$68,215	$0
d. Retirees and Survivors	$5,667,291	$5,833,000	$165,709
e. Total Actuarial Liability	$14,137,893	$14,171,215	$33,322
6. Actuarial Value of Assets	$13,364,445	$13,364,445	$0
7. Unfunded Actuarial Liability: (5e)-(6)	$773,448	$806,770	$33,322
8. Funded Ratio: (6) / (5e)	94.5%	94.3%	(0.2%)
9. Amortization of unfunded liability (17 year level)	$79,641	$83,072	$3,431
10. Total Cost: (4c) + (9)	$294,674	$210,072	($84,602)

Our results are shown for comparison only and assume a 17 year level dollar schedule on a fresh start basis. The results of the State valuation represent only one of the components of the total Commonwealth obligation. The determination of the funding schedule for the Commonwealth would also include the results of the State Teachers' valuation, Boston teachers, and the local COLA liability.

Terms and Definitions

ACTUAL/EXPECTED (or A/E) RATIO The ratio of the actual number of occurrences of a particular decrement compared to the expected number of occurrences of that decrement, based upon the current set of assumptions and the applicable exposures.

ACTUARIAL ACCRUED LIABILITY That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

ACTUARIAL ASSUMPTIONS Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

ACTUARIAL GAIN OR LOSS (or EXPERIENCE GAIN or LOSS) A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

Note: The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or pension plan provisions would be described as such, not as an Actuarial Gain (Loss).

DECREMENTS The means by which a member changes status. For active members, the decrements are retirement, disability retirement, withdrawal and death. For retired members, the only decrement is death.

EXPOSURE The number of lives exposed to a given risk of decrement for a particular age (and/or service and gender). It represents the number of members who could have potentially retired, become disabled, withdrawn or died at that particular age.

NORMAL COST Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

RP-2000 Mortality tables recently published by the Society of Actuaries based on a study of uninsured pension plan mortality. The tables reflect data submitted from 100 large pension plans for the years 1990-1994, and the resulting table is projected to the year 2000.

UNFUNDED ACCRUED LIABILITY The excess of the Actuarial Accrued Liability over the Assets.

Appendix

Retirement Assumptions - Proposed Rates

	Group 1		Group 2	Group 3	Group 4
	Male	Female			
45	0.000	0.000	0.000	0.020	0.030
46	0.000	0.000	0.000	0.020	0.030
47	0.000	0.000	0.000	0.050	0.030
48	0.000	0.000	0.000	0.050	0.030
49	0.000	0.000	0.000	0.050	0.030
50	0.015	0.030	0.020	0.050	0.100
51	0.010	0.030	0.020	0.075	0.050
52	0.010	0.030	0.020	0.075	0.100
53	0.015	0.025	0.040	0.075	0.100
54	0.020	0.035	0.050	0.075	0.150
55	0.040	0.050	0.100	0.110	0.300
56	0.035	0.060	0.100	0.150	0.150
57	0.040	0.055	0.100	0.110	0.200
58	0.045	0.070	0.100	0.110	0.150
59	0.050	0.090	0.130	0.110	0.250
60	0.080	0.080	0.150	0.100	0.300
61	0.100	0.100	0.150	0.100	0.150
62	0.160	0.160	0.150	0.250	0.250
63	0.160	0.160	0.150	0.250	0.150
64	0.160	0.160	0.200	0.250	0.150
65	0.250	0.250	0.200	0.500	0.500
66	0.250	0.250	0.200	0.500	0.500
67	0.250	0.250	0.200	0.500	0.500
68	0.250	0.250	0.200	0.500	0.500
69	0.250	0.250	0.200	0.500	0.500
70	1.000	1.000	1.000	1.000	1.000

Appendix (continued)

Disability Assumptions - Proposed Rates

Age	Group 1	Group 2	Group 3	Group 4
< 20	0.00030	0.00060	0.00100	0.00400
20	0.00030	0.00060	0.00100	0.00410
21	0.00030	0.00065	0.00100	0.00420
22	0.00030	0.00065	0.00100	0.00430
23	0.00030	0.00070	0.00100	0.00440
24	0.00030	0.00070	0.00100	0.00450
25	0.00030	0.00070	0.00110	0.00460
26	0.00030	0.00075	0.00120	0.00470
27	0.00030	0.00075	0.00130	0.00473
28	0.00031	0.00075	0.00140	0.00484
29	0.00032	0.00080	0.00150	0.00494
30	0.00033	0.00080	0.00160	0.00504
31	0.00034	0.00082	0.00170	0.00515
32	0.00035	0.00092	0.00180	0.00525
33	0.00037	0.00101	0.00189	0.00536
34	0.00044	0.00110	0.00269	0.00546
35	0.00052	0.00120	0.00350	0.00556
36	0.00060	0.00129	0.00431	0.00567
37	0.00067	0.00138	0.00511	0.00577
38	0.00075	0.00148	0.00592	0.00588
39	0.00083	0.00157	0.00672	0.00598
40	0.00091	0.00166	0.00753	0.00608
41	0.00098	0.00176	0.00834	0.00619
42	0.00106	0.00185	0.00914	0.00629
43	0.00114	0.00194	0.00995	0.00640
44	0.00121	0.00204	0.01075	0.00650
45	0.00129	0.00213	0.01156	0.00660
46	0.00137	0.00222	0.01236	0.00671
47	0.00144	0.00232	0.01317	0.00681
48	0.00152	0.00241	0.01398	0.00692
49	0.00160	0.00250	0.01478	0.00702
50	0.00168	0.00260	0.01559	0.00712
51	0.00175	0.00269	0.01639	0.00723
52	0.00183	0.00278	0.01720	0.00733
53	0.00191	0.00287	0.01800	0.00744
54	0.00198	0.00290	0.01881	0.00754
55	0.00206	0.00300	0.01962	0.00764
56	0.00210	0.00310	0.02000	0.00770
57	0.00220	0.00320	0.02000	0.00770
58	0.00230	0.00330	0.02000	0.00770
59	0.00240	0.00340	0.02000	0.00780
60	0.00250	0.00350	0.02000	0.00780
61	0.00260	0.00360	0.02000	0.00780
62	0.00270	0.00370	0.02000	0.00790
63	0.00280	0.00380	0.02000	0.00790
64	0.00290	0.00390	0.02000	0.00790
65	0.00300	0.00400	0.02000	0.00800

Appendix (continued)

Turnover Assumptions - Proposed Rates (Groups 1 & 2 only)

Age	Service										
	0	1	2	3	4	5	6	7	8	9	10+
< 21	0.180	0.180	0.180	0.130	0.130	0.100	0.100	0.080	0.080	0.080	0.045
21	0.180	0.180	0.180	0.130	0.130	0.100	0.100	0.080	0.080	0.080	0.045
22	0.180	0.180	0.180	0.130	0.130	0.100	0.100	0.080	0.080	0.080	0.045
23	0.180	0.180	0.180	0.130	0.130	0.100	0.100	0.080	0.080	0.080	0.045
24	0.170	0.170	0.170	0.125	0.130	0.100	0.100	0.080	0.080	0.080	0.045
25	0.170	0.170	0.170	0.125	0.125	0.100	0.090	0.080	0.080	0.080	0.045
26	0.160	0.160	0.160	0.120	0.125	0.100	0.090	0.080	0.080	0.080	0.045
27	0.160	0.160	0.160	0.120	0.125	0.100	0.090	0.080	0.080	0.080	0.044
28	0.160	0.150	0.150	0.120	0.120	0.090	0.080	0.080	0.080	0.080	0.043
29	0.150	0.140	0.140	0.115	0.120	0.090	0.080	0.080	0.075	0.075	0.042
30	0.150	0.140	0.130	0.115	0.120	0.090	0.080	0.080	0.075	0.070	0.041
31	0.150	0.130	0.130	0.115	0.110	0.090	0.080	0.075	0.075	0.065	0.040
32	0.140	0.130	0.130	0.110	0.110	0.090	0.075	0.075	0.065	0.060	0.039
33	0.140	0.120	0.120	0.110	0.110	0.080	0.075	0.070	0.065	0.055	0.038
34	0.140	0.120	0.120	0.110	0.100	0.080	0.075	0.070	0.065	0.050	0.037
35	0.140	0.110	0.110	0.100	0.100	0.080	0.070	0.070	0.065	0.045	0.036
36	0.135	0.110	0.110	0.100	0.100	0.080	0.070	0.065	0.060	0.044	0.035
37	0.135	0.110	0.105	0.100	0.090	0.080	0.070	0.065	0.060	0.043	0.034
38	0.130	0.105	0.105	0.100	0.090	0.075	0.070	0.065	0.060	0.042	0.033
39	0.130	0.105	0.105	0.095	0.090	0.075	0.065	0.064	0.060	0.041	0.032
40	0.125	0.105	0.105	0.090	0.085	0.070	0.065	0.062	0.060	0.040	0.031
41	0.120	0.100	0.100	0.090	0.085	0.070	0.062	0.060	0.058	0.039	0.030
42	0.115	0.095	0.095	0.085	0.075	0.070	0.060	0.057	0.055	0.038	0.029
43	0.115	0.095	0.095	0.080	0.075	0.065	0.058	0.054	0.052	0.037	0.028
44	0.110	0.090	0.090	0.080	0.070	0.065	0.055	0.052	0.050	0.036	0.027
45	0.110	0.090	0.085	0.075	0.070	0.062	0.052	0.050	0.048	0.035	0.026
46	0.105	0.085	0.085	0.070	0.065	0.060	0.050	0.048	0.046	0.034	0.025
47	0.105	0.085	0.085	0.070	0.065	0.058	0.049	0.045	0.044	0.033	0.024
48	0.105	0.085	0.080	0.065	0.065	0.055	0.048	0.042	0.042	0.032	0.023
49	0.100	0.085	0.080	0.065	0.060	0.053	0.047	0.040	0.040	0.031	0.022
50	0.100	0.075	0.075	0.065	0.060	0.048	0.045	0.040	0.039	0.030	0.021
51	0.095	0.075	0.075	0.060	0.060	0.045	0.045	0.040	0.038	0.029	0.020
52	0.095	0.075	0.075	0.060	0.060	0.042	0.042	0.040	0.037	0.028	0.021
53	0.090	0.075	0.070	0.060	0.060	0.040	0.041	0.040	0.036	0.027	0.022
54	0.090	0.075	0.070	0.060	0.060	0.040	0.040	0.040	0.035	0.026	0.023
55	0.085	0.075	0.070	0.060	0.060	0.039	0.039	0.039	0.034	0.025	0.024
56	0.085	0.075	0.065	0.055	0.055	0.038	0.038	0.038	0.033	0.024	0.025
57	0.085	0.075	0.065	0.055	0.055	0.037	0.037	0.037	0.032	0.023	0.025
58	0.085	0.075	0.065	0.050	0.050	0.036	0.036	0.036	0.031	0.022	0.025
59	0.080	0.075	0.065	0.045	0.045	0.035	0.035	0.035	0.030	0.021	0.025
60	0.080	0.075	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050
61	0.100	0.100	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050
62	0.100	0.100	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050
63	0.100	0.100	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050
64	0.100	0.100	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050
65	0.100	0.100	0.075	0.075	0.075	0.050	0.050	0.050	0.050	0.050	0.050

Appendix (continued)

Turnover Assumptions - Proposed Rates

Service	Group 3	Group 4
0	0.008	0.044
1	0.008	0.042
2	0.008	0.041
3	0.008	0.039
4	0.008	0.038
5	0.008	0.037
6	0.008	0.035
7	0.008	0.034
8	0.008	0.032
9	0.008	0.031
10	0.009	0.029
11	0.009	0.028
12	0.009	0.026
13	0.009	0.025
14	0.009	0.024
15	0.009	0.022
16	0.009	0.021
17	0.009	0.019
18	0.009	0.018
19	0.009	0.016
20+	0.009	0.015

Appendix (continued)

Salary Increase Assumption - Proposed Rates

Years of Service	Group 1	Group 2	Group 3	Group 4
0	8.50%	8.50%	9.50%	12.00%
1	8.00%	8.00%	9.00%	10.00%
2	7.50%	7.50%	8.50%	9.00%
3	7.00%	7.00%	8.00%	8.00%
4	6.50%	6.50%	7.50%	7.50%
5	6.00%	6.00%	7.00%	7.00%
6	5.50%	5.50%	6.75%	6.50%
7	5.00%	5.00%	6.50%	6.00%
8	4.75%	4.75%	6.25%	5.50%
9	4.75%	4.75%	6.00%	5.50%
10	4.75%	4.75%	5.75%	5.50%
11+	4.75%	4.75%	5.50%	5.50%