

**CITY OF KNOXVILLE
PENSION SYSTEM
EXPERIENCE STUDY
2001-2006**

**Presented
December 14, 2006**



Bryan, Pendleton, Swats & McAllister, LLC
A Wells Fargo Company

December 14, 2006

City of Knoxville Pension Board
P.O. Box 1631
Knoxville, TN 37901

Dear Board Members:

Re: Experience Study

Each year the actuary for the Pension System prepares an actuarial valuation of the liabilities of the plan. The purpose of the valuation is to determine the amount of any employer contributions needed to adequately fund the plan, and to ensure that funds will be available to pay benefits to current and future retirees.

In valuing the liabilities, it is necessary to project future occurrences of mortality, disability, withdrawal, retirement, salary increases, investment earnings, and many other factors, in order to project the future benefits to be paid and determine the funding necessary to pay for those benefits.

The purpose of an experience study is to compare the actual experience of the plan over time with the projections that the actuary is using to estimate liabilities. If the actual experience is fairly close to the projections, then the projections can be considered validated. If actual experience varies significantly from projections, then the actuary may change the projections. The ultimate result of an experience study is a new set of projections, which actuaries generally refer to as “assumptions” with respect to future occurrences. Naturally, the new assumptions result in different funding requirements than the original assumptions.

The Pension Board commissioned BPS&M to prepare this experience study in connection with the 2006 valuation of the Plan. The attached exhibits show the results of our study.

Data for the study is based on actual records for employees and inactive participants in the Plan for the five year period July 1, 2001 through July 1, 2006. Actual rates of mortality, disability, withdrawal, retirement, and salary increases were measured for each age, and for each of three groups: Board of Education; Fire & Police (Division C and F); and General Government.

Because the Plan, divided into groups, is not a large plan, it was necessary to group certain parts of the data in order to produce “credible” (meaning statistically reliable) results. Thus, for certain purposes, age-based information was grouped into 5-year age brackets. Similarly, where the data suggested it was appropriate, we combined employee groups when measuring certain assumptions.

Not all actuarial assumptions are equal in their impact on the valuation, nor in the amount of data available to measure against. Certain assumptions have a large impact on funding requirements, and other assumptions have a very small impact. In performing this study, we focused on those assumptions that have a material impact on total plan funding requirements, and for which credible data is available. We recommend the following changes be adopted effective July 1, 2007. These assumptions are:

- ✓ **Mortality rates change for Fire & Police (Divisions C and F)**
- ✓ **Ultimate Withdrawal rates change for Division C ages 30-34**
- ✓ **Disability rates change to 100% Incurred In Line of Duty for Fire & Police**
- ✓ **Retirement rates updated for Fire & Police and General Government**
- ✓ **Transfer rates of 80% (G1 to G2)**

While these assumptions are recommended for valuations beginning July 1, 2007, we have shown the impact of these changes on the contribution requirement if we had used the revised assumptions as of July 1, 2006:

	Current	Recommended
Board of Education	\$356,000	\$356,000
General Government	7.15%	8.50%
Fire & Police *	17.26%	19.12%

* without banding

Once approved, these recommendations will take effect for the July 1, 2007 valuation, and the contribution levels produced will be in effect for the July 1, 2008 plan year.

We hope this information is helpful. We are available to answer questions or supplement this report as requested by the Board.

Sincerely,

Alan C. Pennington, F.S.A.

Alan C. Pennington, F.S.A.

Attachment

OVERVIEW

The purpose of this experience study is to review the actual experience over the past five years for assumptions like death, disability, withdrawal, salary scales and investment return, and compare the experience to the current assumptions. Where the experience is significantly different from the current assumptions, we have made recommendations for new assumptions that we believe will better predict future experience.

The volume of data available to evaluate any particular rate at a given age for a given group is referred to as the “exposure.” Exposure is measured by the number of people, or “lives,” that fall into that category for a one-year period. This study covers a five-year period, so it is possible for each participant to contribute up to five units of exposure in each assumption. Because the exposures are limited, the statistics, broken down into categories and sub-categories, show random fluctuations in addition to clear patterns.

In developing recommended assumptions, we mostly used established rate tables rather than constructing entirely new rate tables based on Knoxville experience. As a result, the recommended tables do not match actual experience exactly. In general, the difference between the recommended tables and the actual experience represent smoothing of data. Our objective was to select established tables that, as nearly as possible, matched the economic effect of the Plan’s actual experience. Greater importance is placed on matching data points where there is a greater amount of exposure, and where the liability associated with the exposed lives is greatest.

For example, employees aged 45 to 65 generally show a greater liability than employees aged 25 to 44, due to longer periods of service, higher salaries, greater likelihood of working until retirement, and shorter periods of time for interest discounts. Thus, we generally made a greater effort to match data points at ages 45 to 65 than at ages 25 to 44. Another example is mortality, where the different rate tables produce negligible differences in liability at lower ages, but significant differences in liability at higher ages. Therefore, in evaluating mortality, we matched against retired lives, but not active lives.

The graphs that follow show the current tables and the recommended tables. Also shown for each demographic assumption is the actual experience, measured by the number of occurrences. For example, for mortality, the number of actual occurrences is the number of deaths. In this graph the number of occurrences predicted by each table is also shown. Finally, the number of units of exposure, or “lives,” is shown.

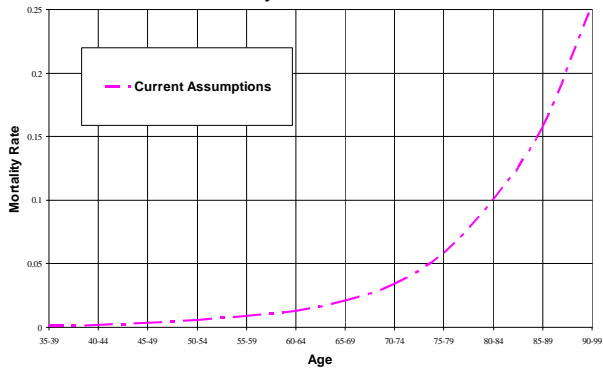
MORTALITY

Although mortality tables differ in rates at younger ages, all tables in current use show very low rates of mortality for active employees at ages below 65. Actual plan experience also shows very low mortality at lower ages. The differences in various tables show negligible differences in the resulting liability. Thus, in matching mortality tables to actual data, we focused on data for retired lives.

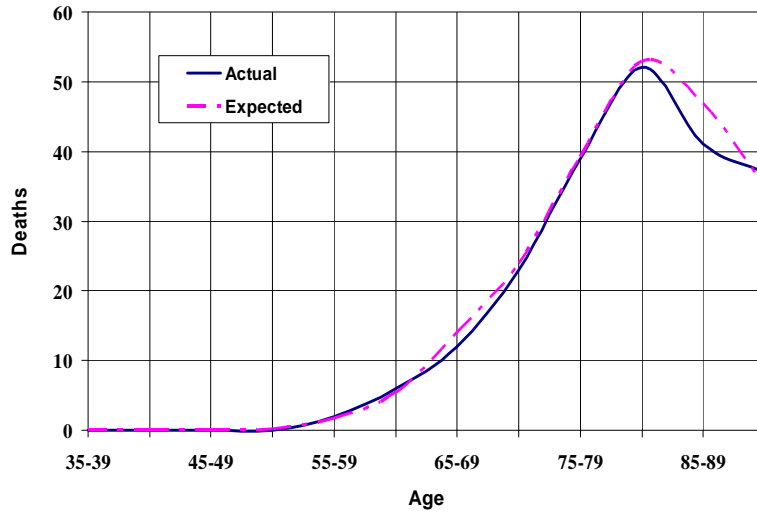
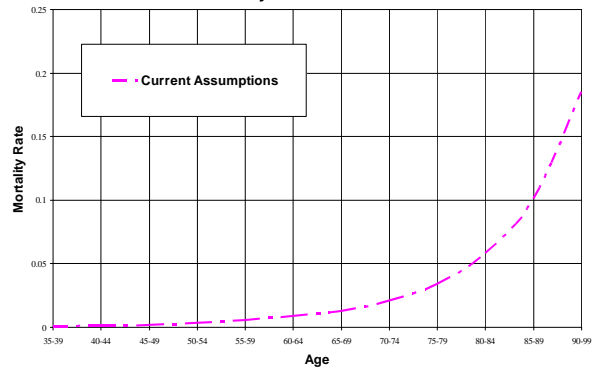
We are currently using different mortality tables for the Fire & Police group from those used for the General Government and Board of Education group. We found the current table to be a good match for the actual mortality experience of the General Government and Board of Education, but the mortality observed for the Fire & Police group was significantly lower than what the table predicts. We recommend keeping the current table for the General Government and Board of Education but changing the Fire & Police table to a blend of the GA-51 Projected to 1980 table and the currently used 1971 Group Annuity Mortality table.

We recommend a 75% 1971GAM / 25% GA-51 blend. This blended table has slightly lower mortality rates than the previous table and more closely resembles the trend of the Fire & Police group. There were 76 deaths in the Division C and Plan F combined during the last five years. We expected to have about 80.50 deaths. Under the new blended table, we would have expected 77.86 deaths.

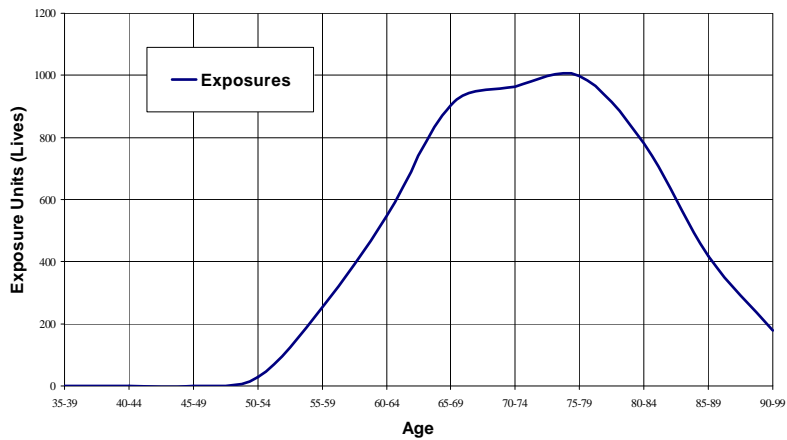
**Board of Education
Mortality Rate Tables - Male**



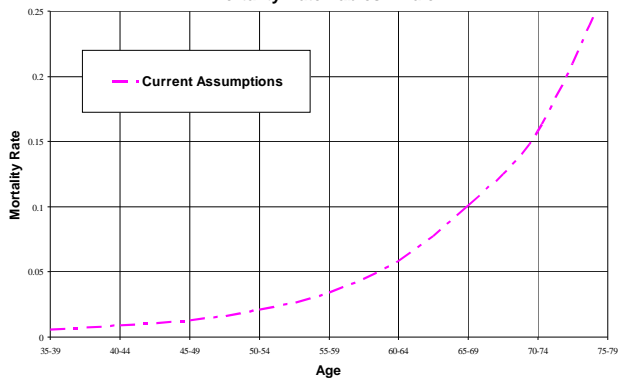
**Board of Education
Mortality Rate Tables - Female**



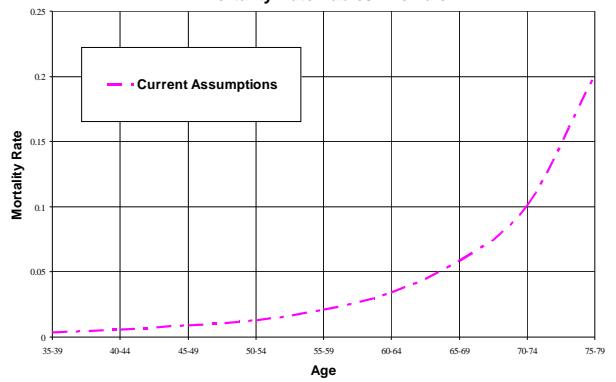
**Board of Education
Mortality Rate Exposure Units**



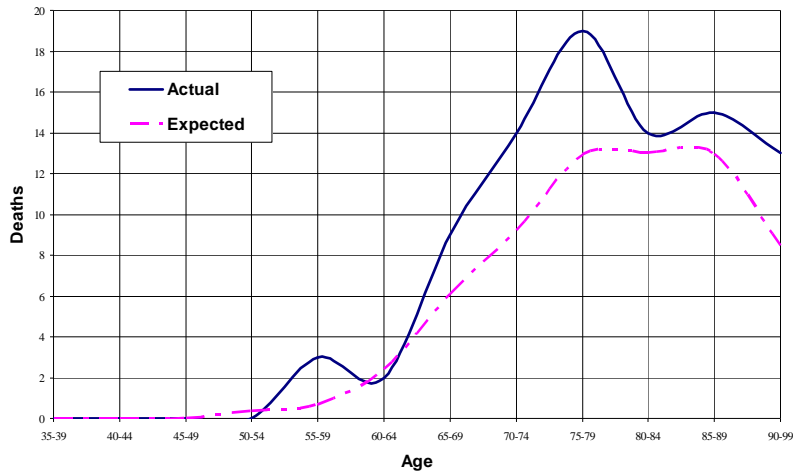
**General Government
Mortality Rate Tables - Male**



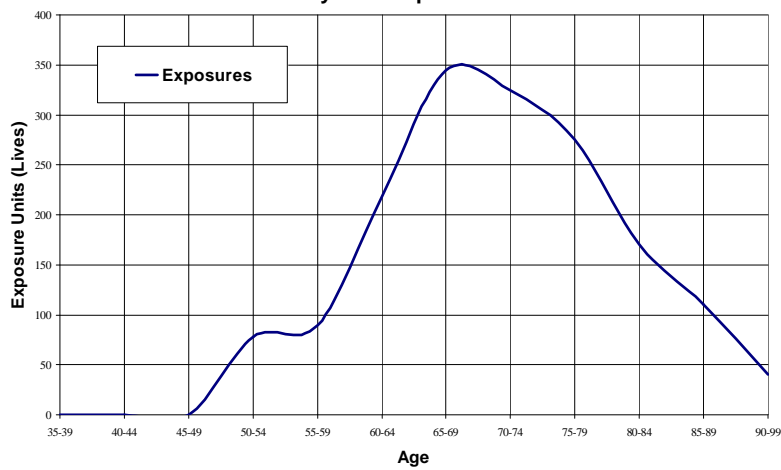
**General Government
Mortality Rate Tables - Female**

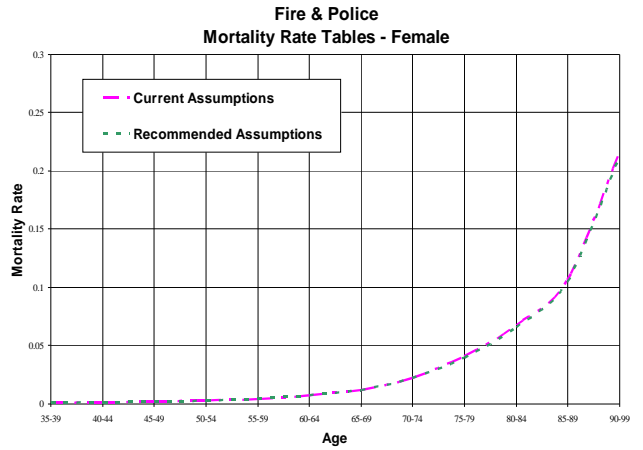
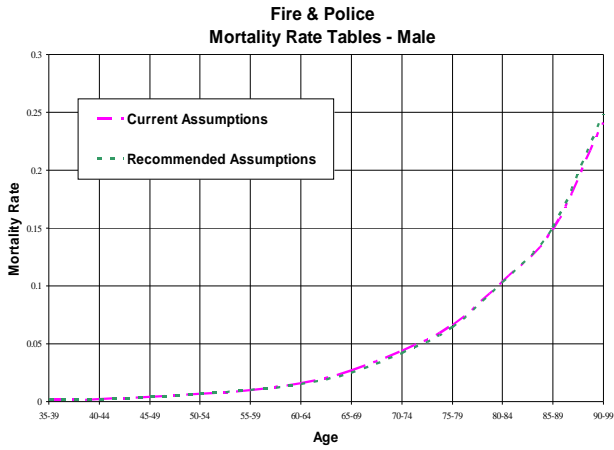


General Government Mortality

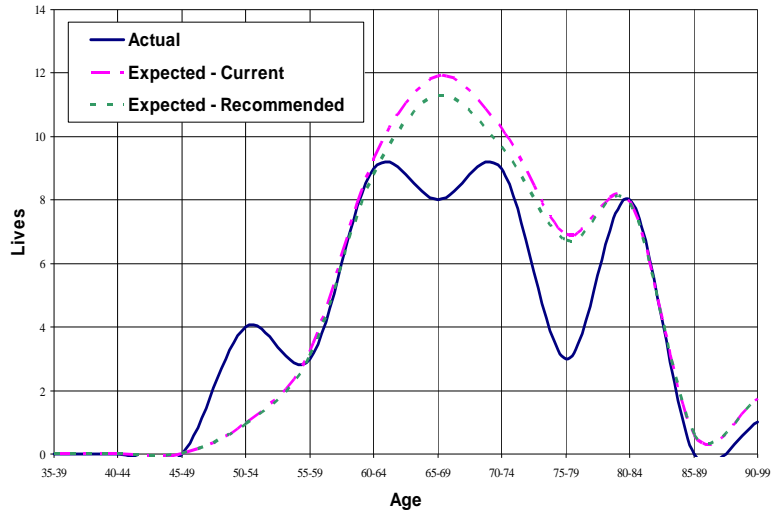


**General Government
Mortality Rate Exposure Units**

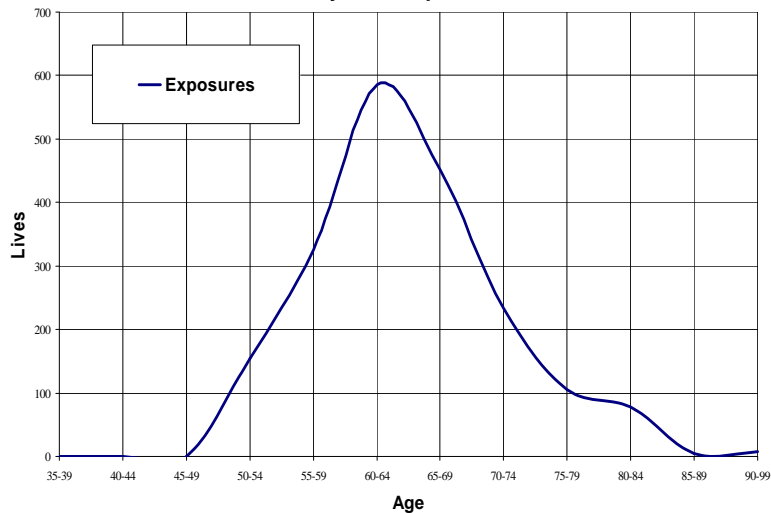


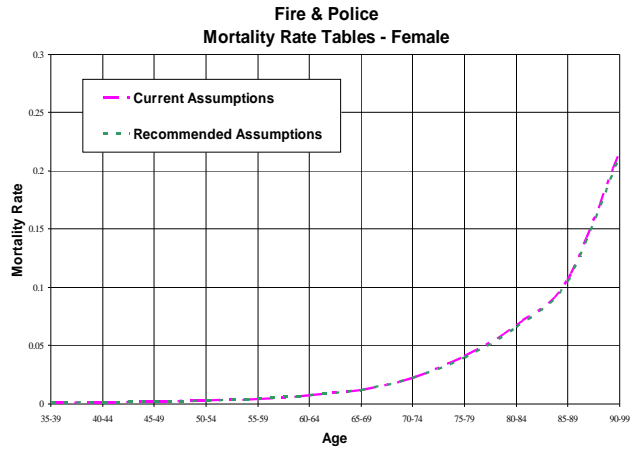
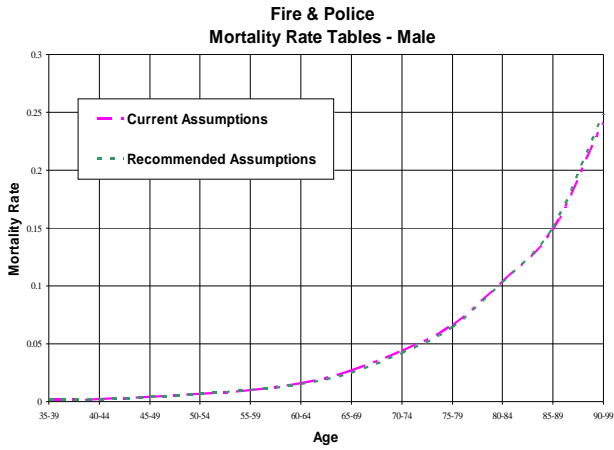


Fire & Police Non-Beneficiary Mortality

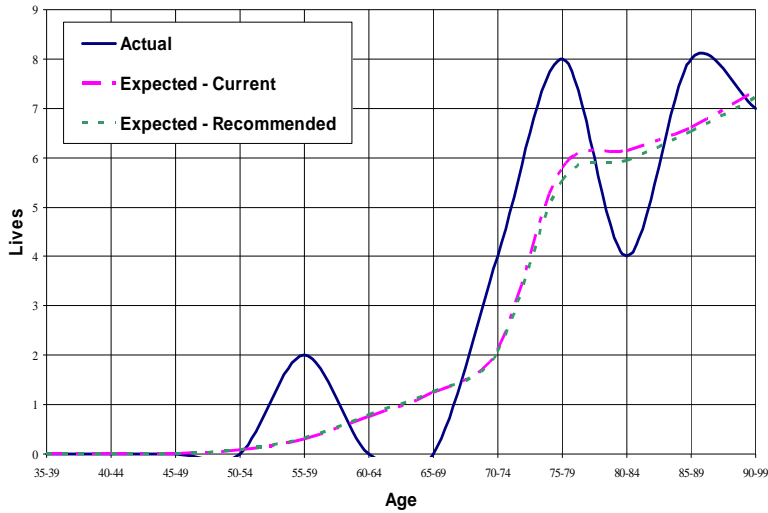


**Fire & Police Non-Beneficiary
Mortality Rate Exposure Units**

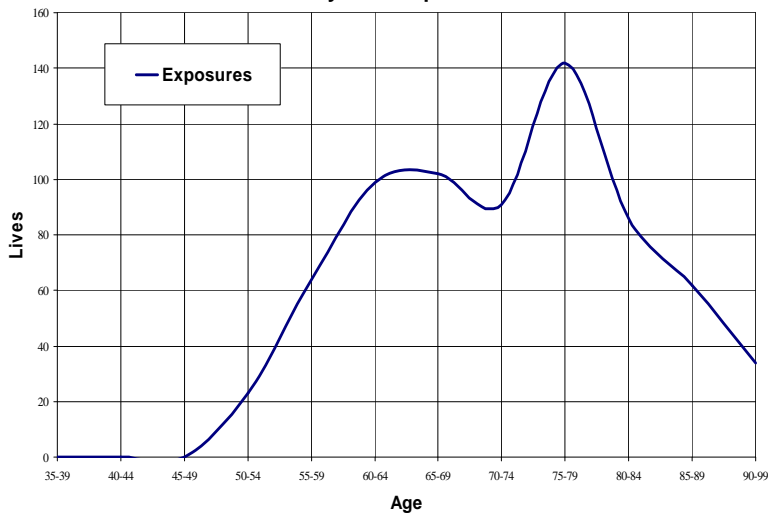




Fire & Police Beneficiary Mortality



**Fire & Police Beneficiary
Mortality Rate Exposure Units**



ULTIMATE WITHDRAWAL

Withdrawal refers to all terminations for reasons other than death, disability and retirement. In our valuation, we base the probability of withdrawal on age once an employee has completed two years of service. Separate rates are used for employees who are in their first or second year of employment. Thus, ultimate withdrawal refers to withdrawal rates for employees in their third or later year of employment.

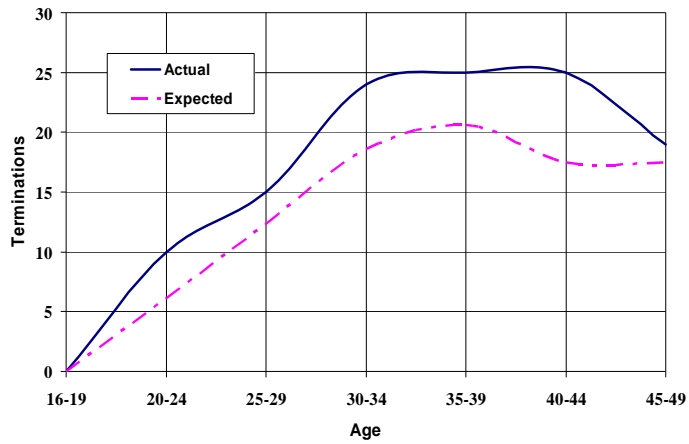
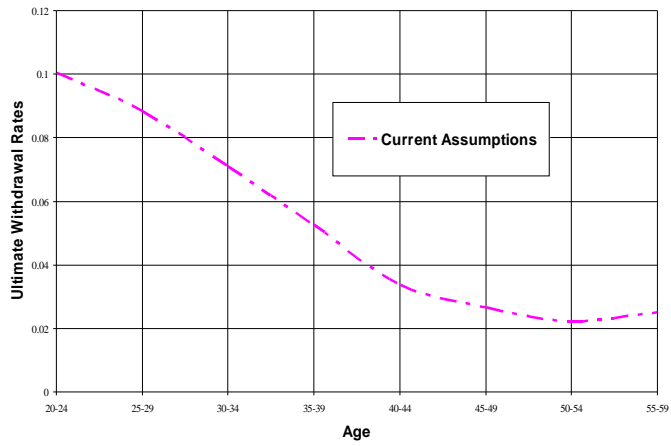
We decided not to review the first two years of “select” withdrawal because the exposure of lives was not sufficient to produce credible statistics and because the impact of these rates on the liability determination is relatively small. We also did not review the withdrawal rates for the Board of Education since so few members are still active.

In studying the ultimate withdrawal rates, we examined both the number of people withdrawing at each age and the amount of liability for each withdrawal. It is important to not only predict how many lives will withdraw from the plan, but also the amount of liability that corresponds to these withdrawals.

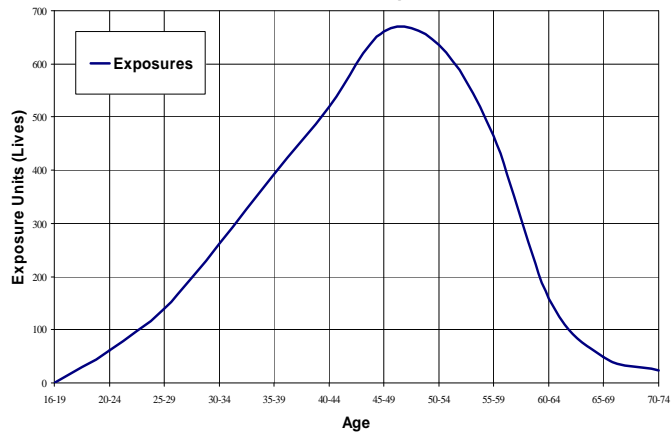
For the General Government group, the current table predicts a lower number of withdrawals than the observed data. However, when viewed on a liability-weighted scale the current table predicts a higher withdrawal liability than the observed liability of the withdrawals. After comparing both the number of withdrawals and the amount of liability for each withdrawal against the predictions of the current table, we found the current table to be a good match. Therefore, we recommend continued use of the current table.

For Fire & Police, the current table over-estimates withdrawal for the 30-34 age range. We adjusted the withdrawal rates for ages 30 to 34 to be the rate at age 35. This recommended table closely predicts both the number of withdrawals and the corresponding amount of liability.

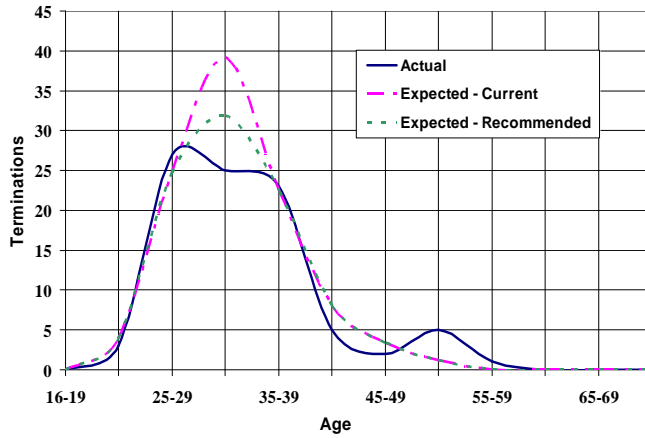
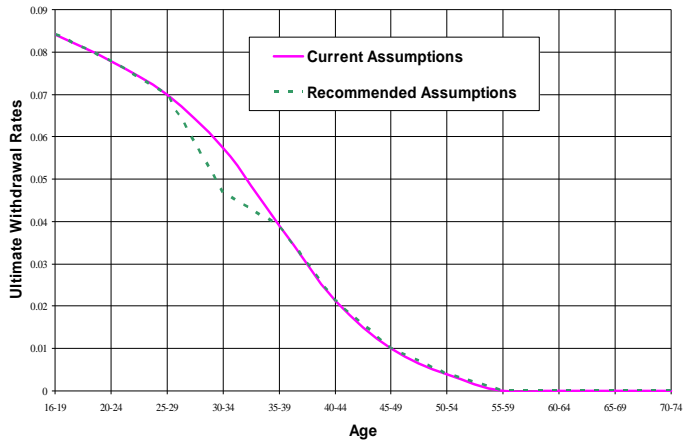
**General Government
Ultimate Withdrawal Rate Tables**



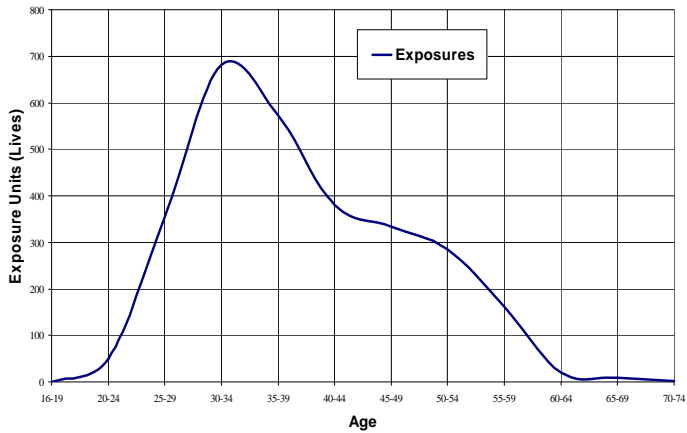
**General Government
Ultimate Withdrawal Exposure Units**



**Fire & Police
Ultimate Withdrawal Rate Tables**



**Fire & Police
Ultimate Withdrawal Exposure Units**

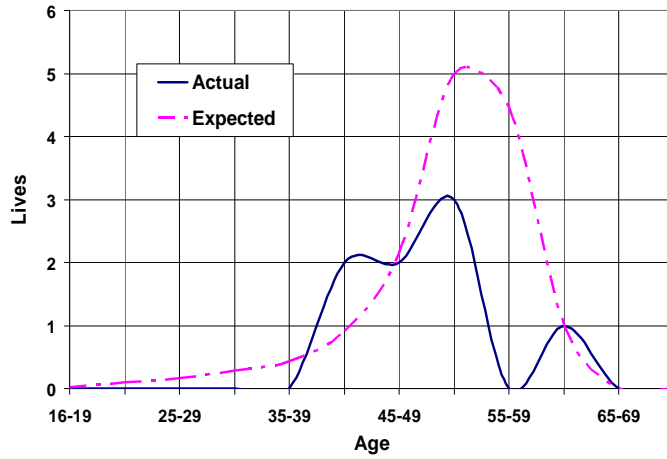
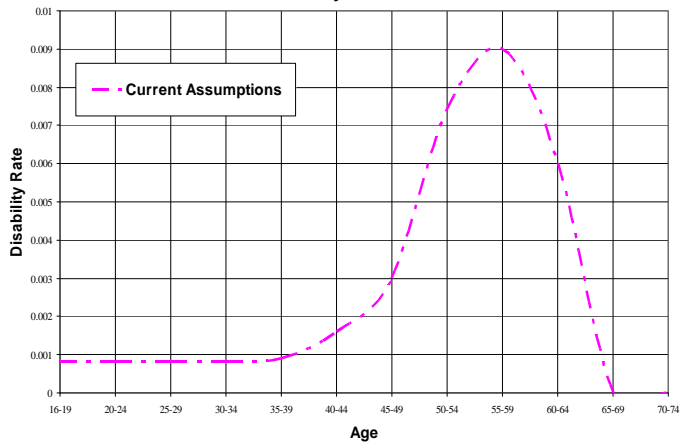


DISABILITY

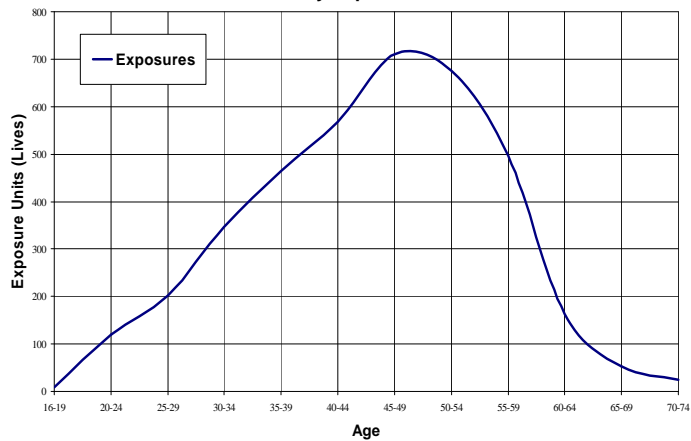
We studied the disability rates for the General Government group without including the Board of Education since there are very few active lives left in the Board of Education. As the graphs that follow show, the actual disability experience for General Government is fairly close to the table rates. Even so, the small amount of actual experience is not sufficient to warrant a change. Therefore, we recommend no change to the disability table for General Government.

Fire & Police tends to have higher rates of disability as reflected on the table we use in the valuation. The observed pattern of disability by age varies somewhat from the table; however, as mentioned before, since the number of disabilities is so small, the experience is not sufficient to warrant a change. We recommend no change to the disability table for Fire & Police which predicts the number of disabilities each year. However, we currently assume that of all new disabilities, in Line of Duty disabilities are 25% of the total and Other than in Line of Duty disabilities are 75%. The actual experience over the last five years shows nearly all disabilities are in Line of Duty. We are therefore recommending that this assumption be changed to assume all disabilities are in Line of Duty.

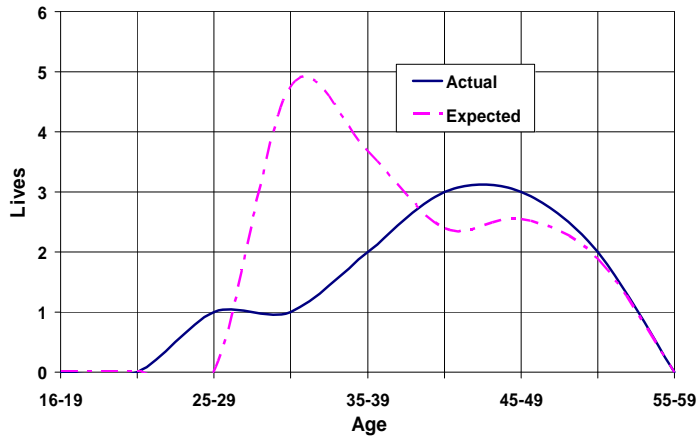
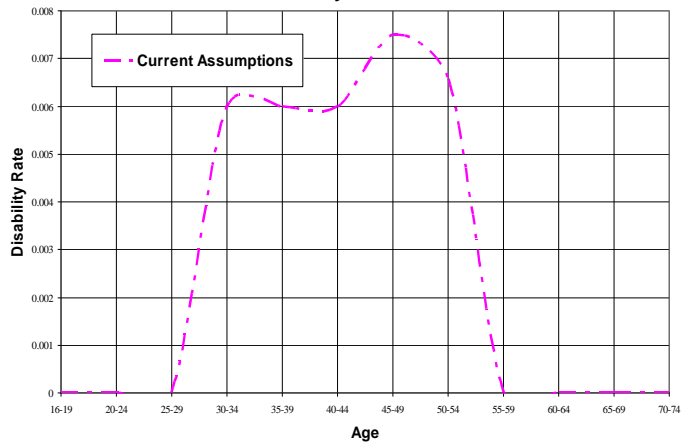
General Government Disability Rate Tables



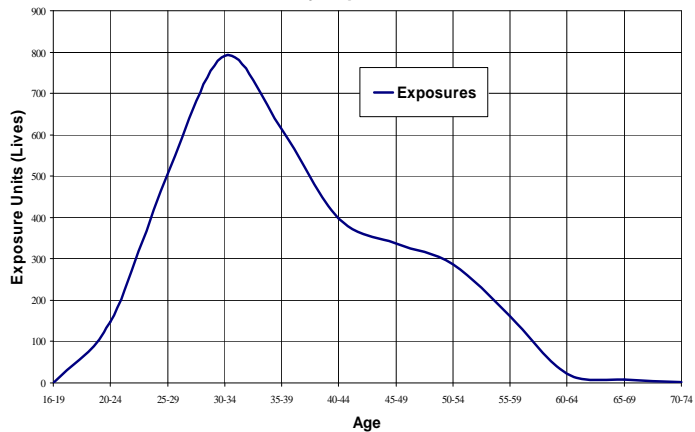
General Government Disability Exposure Units



Fire & Police Disability Rate Tables



Fire & Police Disability Exposure Units

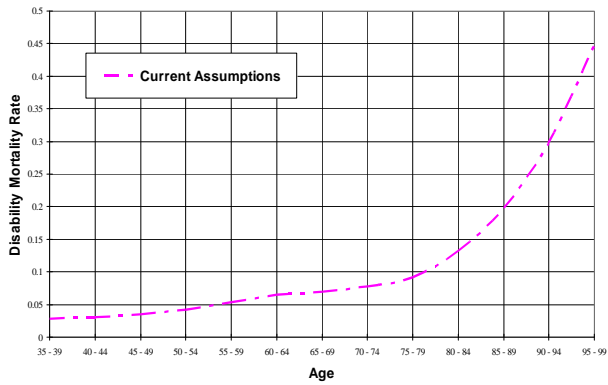


DISABILITY MORTALITY

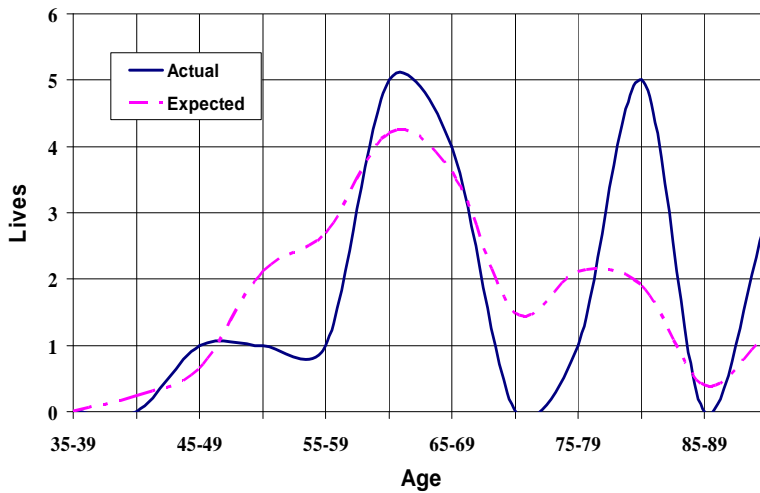
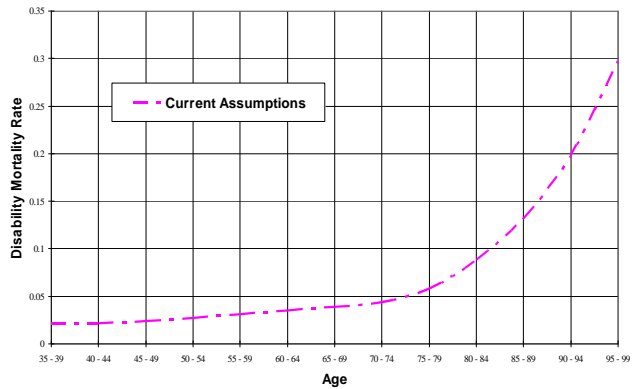
Disability Mortality refers to the likelihood of death among individuals who are already disabled. Since there are a relatively small number of disabled lives, the exposure levels for disability mortality are significantly lower than for other factors. This leads to a greater tendency for the observed rates to fluctuate away from a distinguishable pattern. While the observed data of Board of Education and General Government display this tendency to fluctuate, the overall rates of disability mortality were fairly close to the rates predicted by the current table. Therefore, we recommend continued use of this table.

The exposure level for Fire & Police over the past five years is too small to create a graph with statistical credibility. Given the low number of incidences and the small impact on liability, we recommend continued use of the current table.

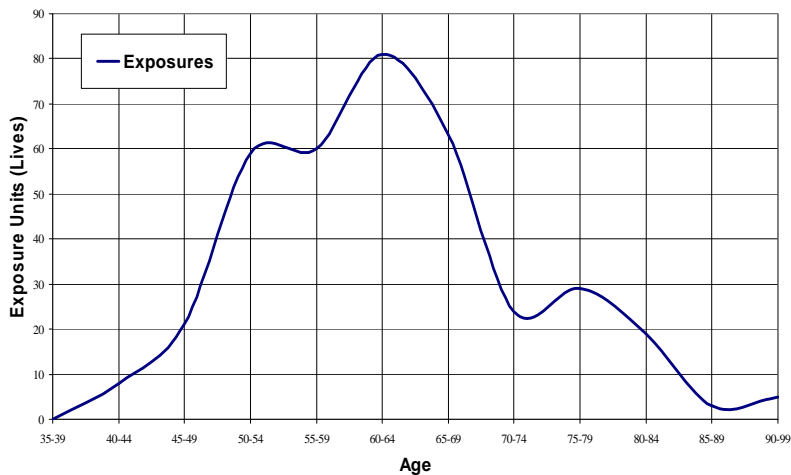
Board of Education and General Government
Disability Mortality Rate Tables - Male



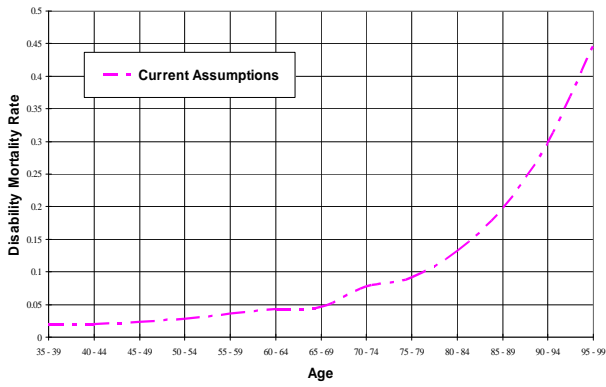
Board of Education and General Government
Disability Mortality Rate Tables - Female



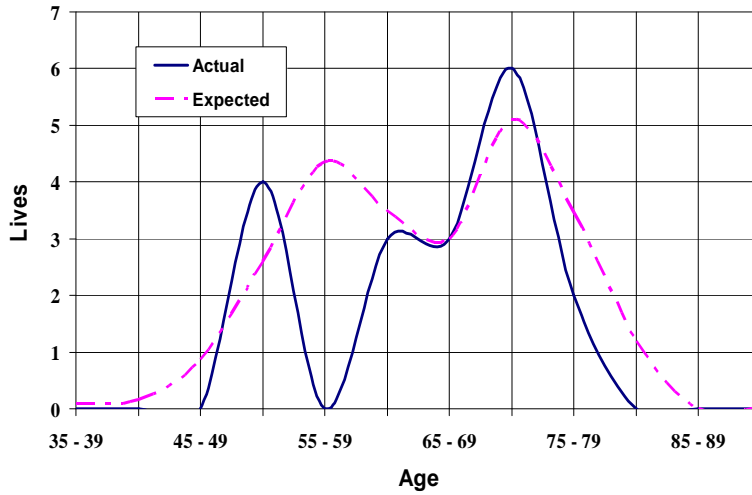
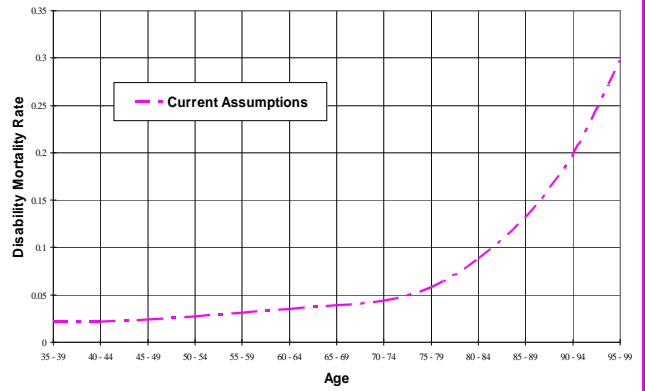
Board of Education and General Government
Disability Mortality Exposure Units



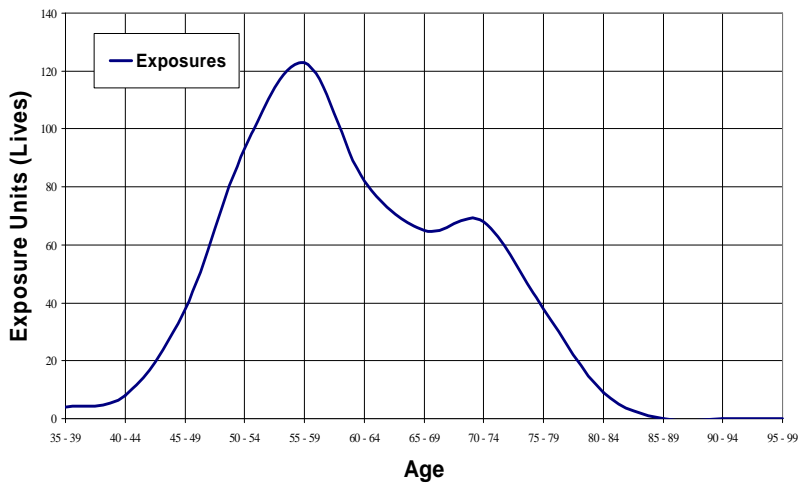
**Fire and Police
Disability Mortality Rate Tables - Male**



**Fire and Police
Disability Mortality Rate Tables - Female**



**Fire and Police
Disability Mortality Exposure Units**

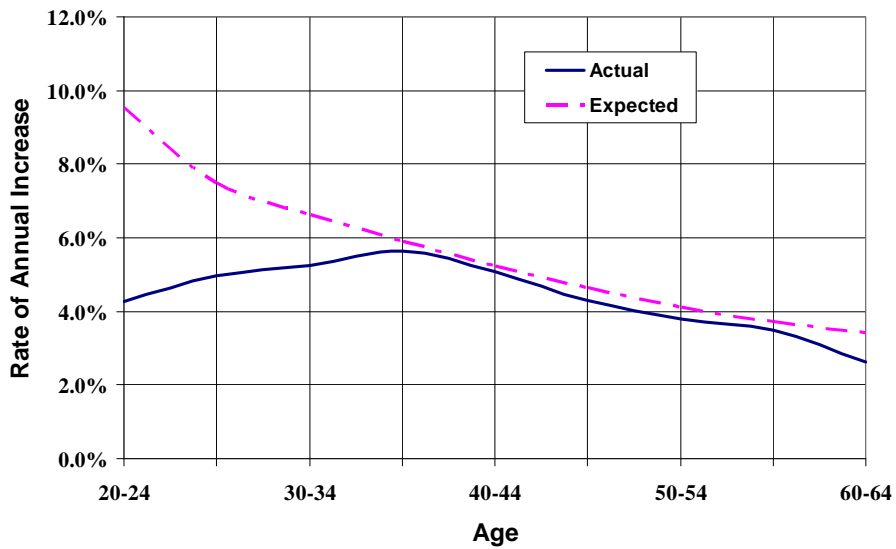
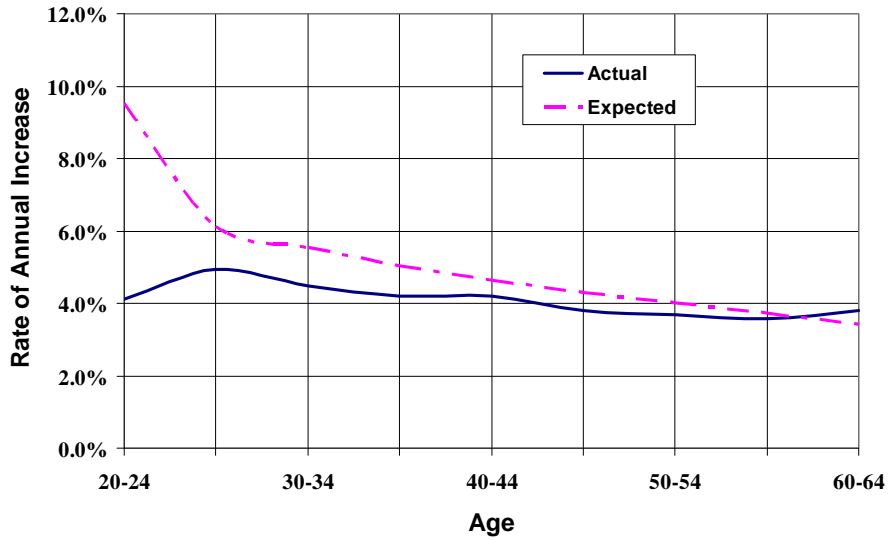


SALARY INCREASES

Since most members in the Board of Education group are no longer active, we did not study the salary increases for this group.

We looked at the General Government and the Fire & Police separately for this study. We found the salary increases for both groups to have slight fluctuations for certain age groups, but the overall trend is very close to the current table.

Salary increases at the lowest ages were lower than expected but after discussing this with the City we determined that this was not an identifiable trend and therefore, we recommend keeping the current table for both groups.



INVESTMENT RETURN

The assumed rate of investment return is the one actuarial assumption that is not subject to demographic factors. Recent past experience of the fund is also a poor predictor of future rates, as very good or very poor investment performance is often due to market factors which change over time. This is particularly true in periods of increasing or declining interest rates. When interest rates fall, the value of securities tends to rise, as current appreciation is realized at the expense of future yields. Thus, the same factor that produces high returns in one year may produce lower returns in subsequent years.

Nevertheless, the investment return has a greater impact on plan funding requirements than any other assumption. Thus, a set of recommended assumptions would be incomplete without a recommendation relating to the investment return assumption.

Our best estimate of investment return is based on the “building block” approach. We looked at the various asset classes in which the fund is invested and historical long-term “real” rates of return for those asset classes to produce an expected “real” rate of return. We then add an expected rate of inflation. Current long-term estimates of inflation are 3% to 3.5%. For estimating the investment return, we are assuming an expected long-term inflation of 3%. Since expenses have historically been paid from the assets of the trust, we are also subtracting an explicit expense assumption of 0.5%.

The key to this approach is to select the correct “real” rate of return for each asset class. We looked at historical rates of return as reported by the SBBI and averaged these with the rates of return projected by Summit Strategies. The rates of return shown below reflect these averaged rates.

INVESTMENT RETURN (CONT'D)

Asset Class	6-30-06 Allocation Percentage	Real Return of Asset Class	Contribution to Total Real Return
Equities			
- Small Cap Stocks	16.47%	7.50%	1.24%
- Mid Cap Stocks	0.00%	6.75%	0.00%
- Large Cap Stocks	20.01%	6.25%	1.25%
- S&P Fund	7.42%	7.00%	0.52%
- International	22.17%	8.25%	1.83%
Bonds			
- Core	9.09%	2.88%	0.26%
- Long	8.74%	3.50%	0.31%
Cash Equivalents	0.74%	0.50%	0.00%
Other			
- Convertibles	5.45%	4.25%	0.23%
- Real Estate	9.91%	4.25%	0.42%
Sub Total			6.06%
Plus Expected Inflation			3.00%
Minus Expected Expenses			(0.50%)
Total	100.00%	---	8.56%

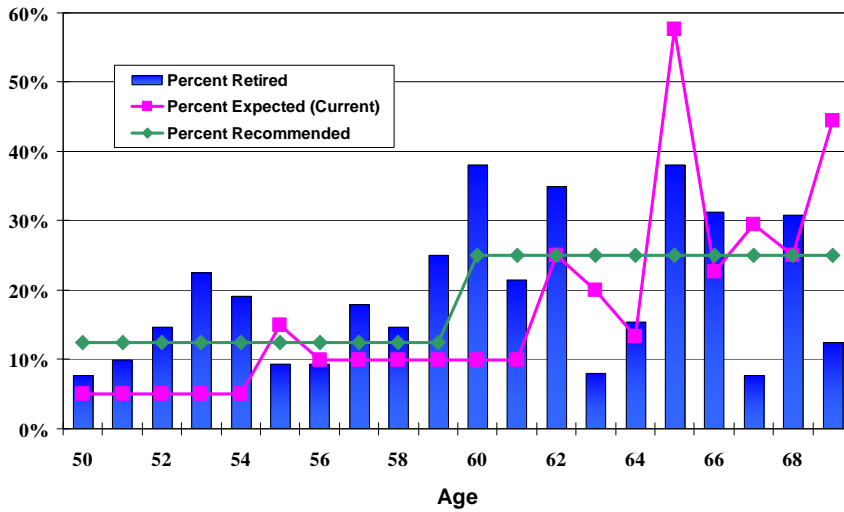
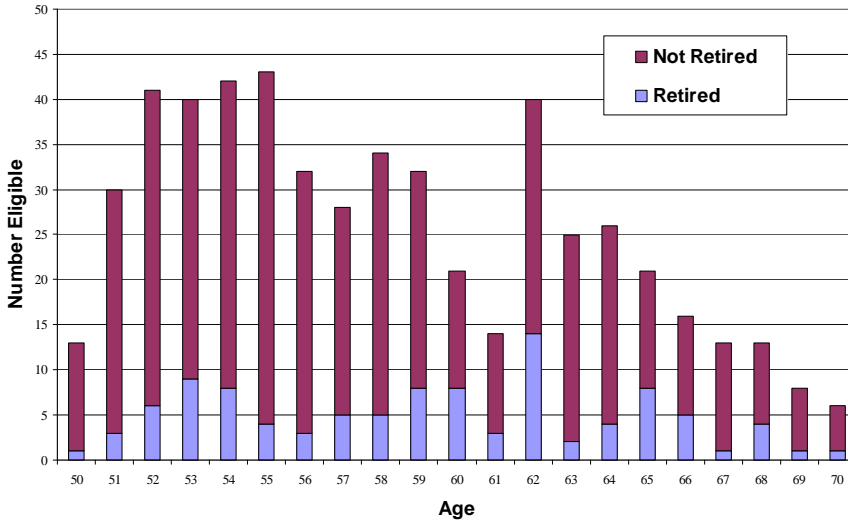
It has been the policy of the Board to select a rate of return assumption that leaves a cushion for adverse experience, recognizing that the risk of increasing contribution rates is more significant than the “risk” of declining contribution rates. Therefore, to leave a cushion for experience, we recommend that the investment return assumption be set at 8.00%.

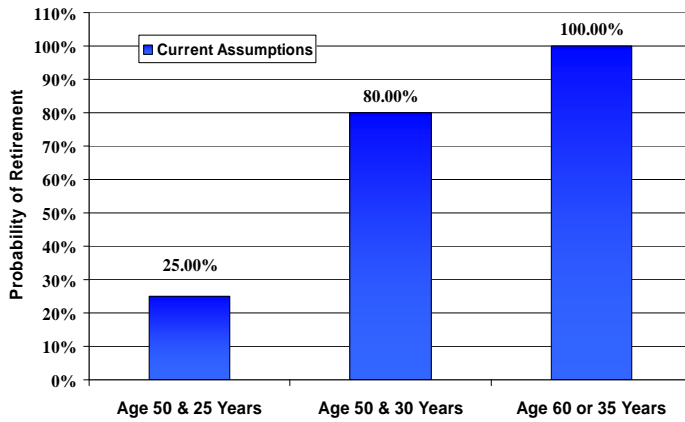
RETIREMENT

Observed retirement patterns for General Government showed a higher rate of retirement at earlier ages than was predicted by our current assumptions. Current assumptions for ages under age 62, which range from 5% to 15%, were significantly less than observed retirements (once a member is eligible for the Rule of 80). We have constructed a new set of assumptions based on actual experience. We recommend updating the retirement assumptions to 12.5% at each age from 50 to 59 and 25% at each age from 60 to 69, with everyone retiring by age 70. These adjustments will more accurately reflect the impact that the “Rule of 80” provision has on General Government retirement rates.

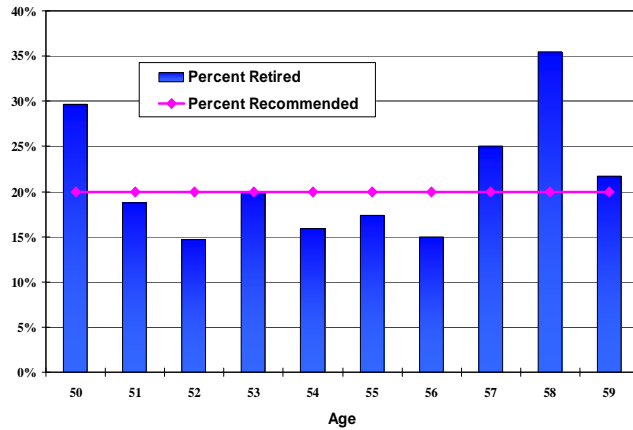
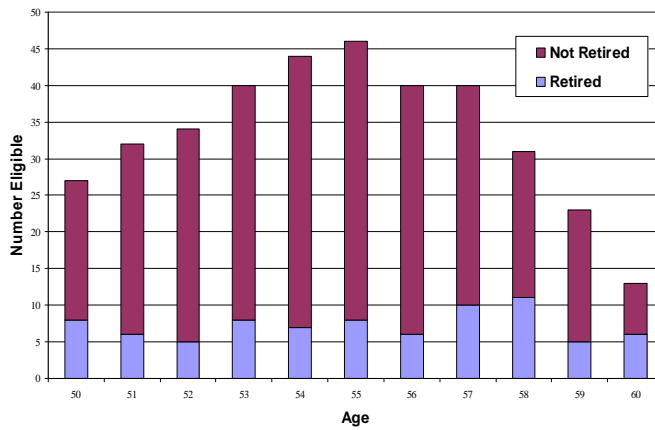
Our prior assumptions for Fire & Police retirement depended on years of service with peaks at ages 50 and 25 years, 50 and 30 years and 60 with 35 years. However, our observations over the past five years show a smoother pattern of retirements with few peaks and valleys between ages 50 and 60 (once a member has 25 years of service). Therefore, we recommend using a new table which assumes 20% retire at each age from 50 to 59 with everyone retiring by age 60. In any event, the retirement assumptions will not apply until a member is eligible for retirement at age 50 with 25 years of service.

General Government Eligible for Retirement by Age





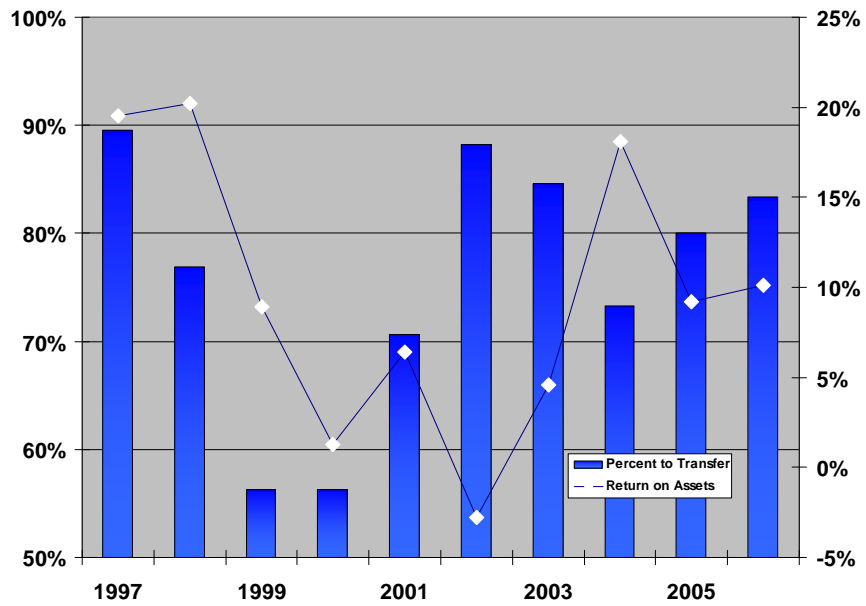
**Fire & Police
Eligible for Retirement by Age**



TRANSFERS FROM G1 TO G2

General Government employees begin participation in the G1 plan upon employment. The G1 plan is a defined benefit / defined contribution combination plan type. After ten years of employment, the participant has the option to remain in the G1 plan or move to the G2 plan, which is a defined benefit only plan with a higher multiplier than the G1 plan.

We have looked at the plan's experience over the last 10 years. During the last five years, it appears that approximately 80% of the G1 participants who are eligible to switch plans actually move to G2. Based on this, we recommend assuming that 80% of G1 members will elect to move to G2 once they have completed 10 years of service.



Appendix

Summary of Recommended Actuarial Assumption Changes –
 These changes are recommended for adoption beginning July 1, 2007.

	<u>Prior Assumption</u>	<u>Recommended Assumption</u>
Investment Return	8%	No change
Mortality Rates		
Divisions A, B and G (except Bd. of Ed.)	GA-51 Projected to 1980	No change
Divisions C and F	1971 Group Annuity Mortality	25% GA-51 Projected to 1980/ 75% 1971 GAM
Board of Education	GA-51 Projected to 1980	No change
Division B (actives)	GA-51 Projected to 1980	No change
Withdrawal Rates		
Divisions A, B and G (except Bd. of Ed.)	Based on prior experience	No change
Sample at ages 20, 35, 50	10.26%, 6.15%, 2.34%	
Division C	Based on prior experience	Based on revised experience
Sample at ages 20, 35, 50	9.60%, 4.604%, 0.60%	9.60%, 4.667%, 0.60%
Division F	N/A	N/A
Board of Education	Based on prior experience	No change
Sample at ages 20, 35, 50	5.28%, 2.99%, 1.92%	
Division B (actives)	Based on prior experience	No change
Salary Scale		
Divisions A, B and G (including Bd. of Ed.)	Based on prior experience	No change
Sample at ages 20, 35, 50	12%, 5.2%, 4.1%	
Division C	Based on prior experience	No change
Sample at ages 20, 35, 50	12%, 6.2%, 4.3%	
Disability Rates	Based on prior experience	No change
Rate of Death - Disabled Lives	Based on prior experience	No change
% of Disabled In Line of Duty	25%	100%
Rate of Transfer from G1 to G2	No assumption made	80%

Appendix

Rate of Normal Retirement – Prior Assumptions

Division A and B: Probability of Retirement:

<u>Age</u>	<u>Percent Retiring</u>	<u>Age</u>	<u>Percent Retiring</u>
53	2	62	35
54	2	63	10
55	2	64	5
56	3	65	8
57	3	66	5
58	5	67	2
59	5	68	2
60	5	69	1
61	5	70	0

Division C: Assume:
 25% retire at the later of age 50 and 25 years of Credited Service,
 60% retire at the later of age 50 and 30 years of Credited Service, and
 15% retire at the later of age 50 and 30 years of Credited Service
 but in no event later than age 60.

Division G: Rates of Retirement (developed in conjunction with the Rule of 80):

		Service								
		≤ 18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs	23 Yrs	24 Yrs	25 Yrs	≥ 26 Yrs
Age	≤ 54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
	55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00
	56	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	15.00
	57	0.00	0.00	0.00	0.00	0.00	15.00	15.00	15.00	15.00
	58	0.00	0.00	0.00	0.00	15.00	15.00	15.00	15.00	15.00
	59	0.00	0.00	0.00	15.00	15.00	15.00	15.00	15.00	15.00
	60	0.00	0.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	61	0.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	62	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
	63	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
64	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	
65	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	

Appendix

Rate of Normal Retirement – Recommended assumptions

Division A and B: no change

Division C: Assume:
20% retire at each age beginning with age 50 and 25 years of service,
but in no event later than age 60.

Division G: Assume:
12.5% retire at each age once the rule of 80 is met from age 50 to age 61,
25% retire at each age from 62 to 69
100% retire by age 70.

Spouse Frequency and Ages – no change

Assume 85% married, with husbands four years older than wives

Actuarial Valuation Method – no change

Aggregate with Supplemental Liability

Asset Valuation Method – no change

Market Value, adjusted for 5-year phase-in of each year's difference between actual and expected value.

Cost of Living Adjustment – no change

3.5% per annum
