

**City of Philadelphia
Municipal Retirement System**

**Experience Study Results
and Recommendations**

**For the period covering
July 1, 2008 – June 30, 2013**

Produced by [Cheiron](#)

March 2014

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LETTER OF TRANSMITTAL

March 27, 2014

City of Philadelphia Municipal Retirement System
Two Penn Center Plaza – 16th Floor
Philadelphia, PA 19102-1721

Dear Board Members:

At your request, we have completed an experience study of the City of Philadelphia Municipal Retirement System (Retirement System). Our study compares assumed versus actual experience with respect to all demographic and economic assumptions used in the preparation of the Actuarial Valuations for the five-year period from July 1, 2008 through June 30, 2013 in compliance with the Pennsylvania Municipal Pension Plan Funding Standard and Recovery Act (Act 205) Chapter 2, Section 2.01.


This report presents the results of our study as well as alternative assumptions for consideration to be employed for the July 1, 2014 Actuarial Valuation.

In preparing our report, we relied on information (some oral and some written) supplied by the System's staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice #23.

To the best of our knowledge, this report has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board, and that we meet the Qualification Standards, as defined by the American Academy of Actuaries, to render the opinion contained in this report.

This experience study report was prepared solely for the City of Philadelphia Municipal Retirement System for the purposes described herein. This actuarial valuation report is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

Sincerely,
Cheiron



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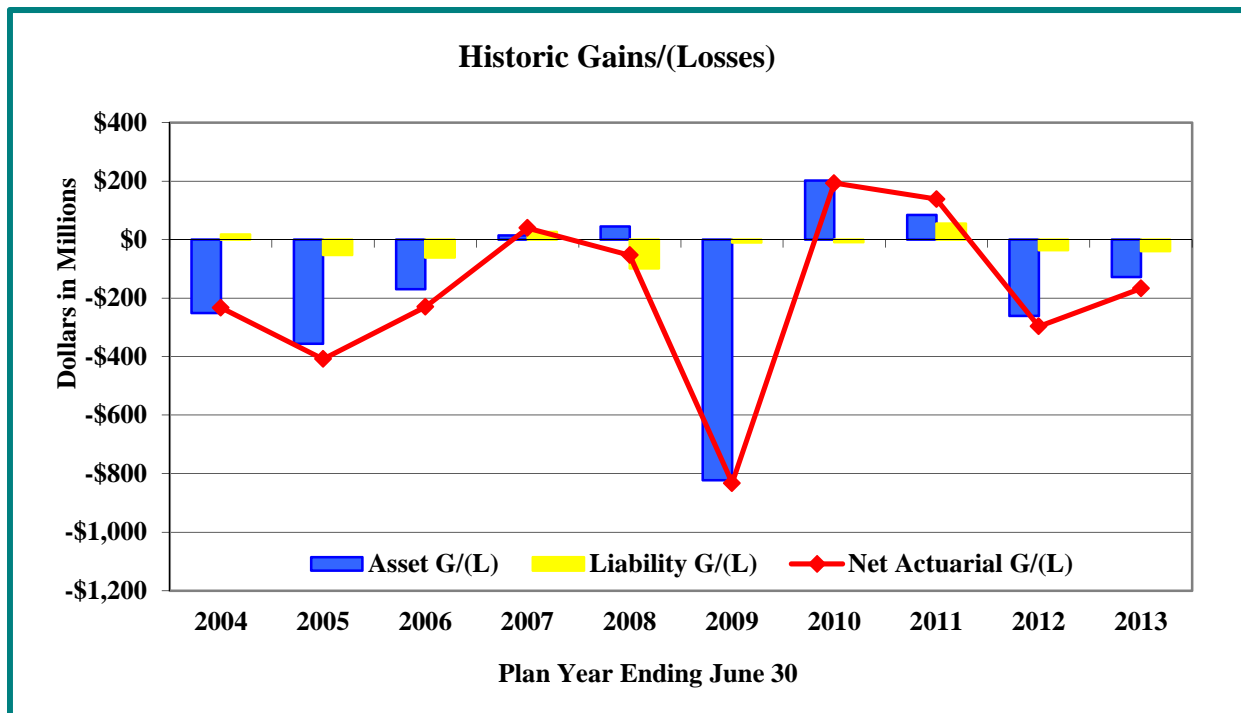
**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
EXPERIENCE STUDY RESULTS AND RECOMMENDATIONS
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**SECTION I
BOARD SUMMARY**

Cheiron has prepared this study of the actual versus expected liabilities and assets of the City of Philadelphia Municipal Retirement System (Retirement System). The study examines the System’s experience during the five-year period from July 1, 2008 through June 30, 2013, “The Study Period”. This report presents the results of our study as well as alternatives to several of the current actuarial assumptions for consideration, to be employed in future valuations of the Retirement System.

We studied the Retirement System’s experience with respect to both “demographic” and “economic” assumptions. Demographic assumptions deal with expected membership behavior. These include the retirement rates, termination rates, disability rates, and mortality rates. Economic assumptions deal with System wide elements such as investment returns, inflation, salary increase rate (salary scale) and administrative expenses. Salary increases can be considered either demographic (membership oriented) or economic (given the inflation component). For this study, we included salary experience under the economic portion of the study.

Before summarizing the key results of our experience study, we present in the graph below a historical review of the deviation of actual experience against anticipated experience based on the assumptions used in past actuarial valuations. The blue bars in the graph represent annual investment experience gains or losses (G/(L)), and the gold bars represent the annual liability experience gains or losses (G/(L)).



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In summary, the graph indicates that for seven out of ten years, the assumptions employed in each year's actuarial valuation produced a liability experience loss, which implies the current assumptions may understate liabilities. During the five years of our study the net gain/loss of liabilities relative to our assumptions was approximately \$40 million (on average, \$8 million per year) which would be considered immaterial to the aggregate liability during this period. However there are material and consistent gains and losses that have for the most part offset each other masking trends and the need for adjustment. For example there have been consistent material gains from lower than expected salary growth with could be anticipated from the economic period covered by this study. These gains offset higher than expected liabilities for retirees living longer than expected, also a trend we could anticipate. We can anticipate both of these trends may continue, more so with the mortality experience but also in the areas of salary growth. The average annual liability loss during this ten-year period shown on the graph was \$20.7 million or 0.24% of the average annual actuarial liability of \$8.7 billion over that period. While this level of loss could be considered immaterial relative to the total System liabilities, the consistency suggests more conservative assumptions would be appropriate.

On the investment side, the graph indicates that investment performance, based upon the smoothed actuarial value of assets, was less than the assumed rate of return in six of the ten years. The average annual investment loss over the ten-year period was \$164.2 million or 3.7% of the average annual market value of assets of \$4.4 billion over that ten-year period. The investment assumption has been reviewed and changed almost annually. The data supports this policy as well as continual review and reduction of the long-term investment/discount rate assumption.

Summary of principal experience study results and recommendations:

1. **Retirement** – Rates of retirement were higher than expected for Police, Fire and Municipal Plan 67. The rates of retirement were lower than expected for Police and Fire Plan 87 and mixed (depending upon the age) for the Municipal Plan 87. There could be a number of factors impacting members' behavior including the current economic environment and the cost of medical benefits subsequent to the five years of coverage provide by the City.

For the 67 plans as a greater number of these participants approach retirement, tightening this assumption is important as the anticipated future experience is likely to reflect recent experience. On the other hand, the 87 plans show lower than expected retirements.

The changes in retirement assumptions are supported when analyzing the total actual retirements versus expected number of retirements based upon the current assumptions over the five-year testing period. The ratio of actual divided by expected number of retirements during this period demonstrates how well the current assumptions meet the actual experience of the plan. Ideally, this ratio should be about 100% to show that the expected retirements approximately match the actual retirements. However, this ratio

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analysis must be balanced with the experience graphs (presented within the body of this report) and the data used to determine this ratio, because outlier age groups may skew this ratio accuracy.

Table I-1			
Plan	Actual Retirements	Expected Retirements	Ratio: Actual/ Expected
Uniform Plan 67	963	652	148%
Uniform Plan 87	377	1,034	36%
Municipal Plan 67	2,369	1,584	150%
Municipal Plan 87	1,151	1,544	75%

The alternative retirement tables suggested in this report increase the retirement assumptions for Plan 67 and decrease the retirement assumptions for Plan 87 overall.

2. **Termination** – This assumption becomes immaterial to Plan 67 members as we anticipate most of them will continue to work until retirement eligible. Therefore we are recommending that a combined table be created for the Municipal 67 and 87 Plan participants to measure the expectation of employment severance prior to retirement eligibility, consistent with the method used for the Uniform Plans.

Termination rates were significantly lower than expected for the Uniform Plans and Municipal 87 Plan. The current assumptions were exactly in line with the experience from the last experience study for Municipal 87. However, due to the economic downturn that coincided with this study measurement period and the City’s response to allow for workforce reductions through attrition, this trend in lower termination rates could be expected and to some degree can be anticipated to continue.

The table below shows how dramatic a decline in termination has occurred as it provides the actual versus expected terminations from the Police and Fire Division Plans and the Municipal Division Plans during the period studied.

Table I – 2			
	Actual Terminations	Expected Terminations	Ratio: Actual /Expected
Uniform Plans	263	528	50%
Municipal Plan 67	175	270	65%
Municipal Plan 87	3,640	5,972	61%

The alternative termination tables suggested in this report decrease the termination assumptions slightly.

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3. **Disability** – We continued to combine the males and females for the analysis of the Police and Fire Divisions. The actual rates of disability were higher than the expected rates of disability.

For the Municipal participants the rate of disability was higher than expected for females, and lower than expected for males.

The table below provides the actual versus expected disabled participants from the Police and Fire Division Plans and the Municipal Division Plans.

Table I – 3			
Plan	Actual Disabled Participants	Expected Disabled Participants	Ratio: Actual /Expected
Uniform Plans	185	107	173%
Municipal Plan Males	141	213	66%
Municipal Plan Females	130	139	94%*

* The ratio for Municipal Plan Females is partially skewed due to the 100% disability assumption for participants 55 - 59. Disregarding this data for disabled participants between 55 - 59, the ratio is 133%. See Section III for more details.

Based upon this information, we are providing alternative tables that increase the expected disability rates for the Police and Fire Division and Municipal Division female participants and decrease the expected rates for the Municipal Division male participants.

4. **Mortality** - The Retired Pensioners 2000 (RP 2000) table as published by the Society of Actuaries and in general use is currently being applied for all plans as the underlying measurement. For pre-retirement mortality, there is an adjustment of a five-year set back on females (which means female mortality experience is that of women five years younger) for the Municipal Division and a three-year set forward on females of the Police and Fire Division, with no adjustments for males of both divisions. For post-retirement mortality, there is an adjustment of a one-year set forward on males of the Police and Fire Division, a two-year set forward on males of the Municipal Division, and a two-year set forward on females from both divisions. These adjustments of setting back or forward ages, allows us to use a nationally accepted mortality table and modify its use to match the System’s experience. For post-disability mortality, 130% of the RP 2000 healthy mortality is used for the Police and Fire Division, and 95% of the RP 2000 Disability mortality is used for the Municipal Divisions.

The following table provides the actual versus expected deaths and the ratio of these values. For each of the separate incidents of mortality, when the ratio is less than 100% it means fewer deaths are occurring than expected and participants are living longer.

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Table I – 4				
Plan	Mortality Incidents	Actual Deaths	Expected Deaths	Ratio: Actual/Expected
Municipal Division	Pre-Retirement	94	193	49%
Municipal Division	Post-Retirement	3,881	4,369	89%
Municipal Division	Post-Disabled	394	469	84%
Uniformed Division	Pre-Retirement	47	60	78%
Uniformed Division	Post-Retirement	1,686	1,785	94%
Uniformed Division	Post-Disabled	388	356	109%

The alternative mortality tables suggested in this report are based on the same RP 2000 tables with different modifications to adjust the tables in response to the Retirement System experience.

5. **Salary Increase** - The salary increase rate represents the year over year increase in pay of continuing actives. The current assumption is an annual increase based on the participants' age.

Table I-5a below illustrates the five-year average rate of salary increases year over year by five-year age groups. The actual salary scale rates are significantly lower than the expected salary increase rates over the five-year period.

Table I-5a			
Average Salary Increases:			
Data from Fiscal Years 2009 through 2013			
Age	Actual	Expected	Delta
<20	12.92%	20.80%	-7.88%
20-24	8.64%	12.30%	-3.66%
25-29	5.18%	7.55%	-2.37%
30-34	3.41%	5.30%	-1.89%
35-39	2.71%	4.55%	-1.84%
40-44	2.33%	4.30%	-1.97%
45-49	1.80%	3.55%	-1.75%
50-54	1.43%	3.55%	-2.12%
55-59	1.49%	3.55%	-2.06%
60-64	0.95%	3.55%	-2.60%
65+	0.60%	3.55%	-2.95%

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However, due to the recession which impacted municipal budgets beginning in 2009, salary increases were significantly lower during fiscal years 2010 through 2012. If these years are excluded from the salary analysis as shown in Table I-5b, then the actual salary increases are still lower than expected, but not to the extent illustrated in Table I-5a. See Section II of this report for more details on this analysis.

Table I-5b			
Average Salary Increases:			
Data from Fiscal Years 2009 and 2013 only			
Age	Actual	Expected	Delta
<20	15.38%	20.80%	-5.42%
20-24	10.73%	12.30%	-1.57%
25-29	6.55%	7.55%	-1.00%
30-34	4.41%	5.30%	-0.89%
35-39	3.82%	4.55%	-0.73%
40-44	3.20%	4.30%	-1.10%
45-49	2.68%	3.55%	-0.87%
50-54	2.13%	3.55%	-1.42%
55-59	2.18%	3.55%	-1.37%
60-64	1.68%	3.55%	-1.87%
65+	1.08%	3.55%	-2.47%

In either case there is evidence to believe over the long-term salary growth rates will continue to be slower than previously expected. We provide alternatives to the current rates for consideration.

6. **Investment Return Assumption/Discount Rate** - The current investment return assumption is 7.85%. While this rate is within the range of a variety of acceptable investment return assumptions, it is appropriate to continue to look at decreasing this assumption as a basis for reducing investment risk and exposure to market volatility as reflected in the long-term discount rate for benefit cash flows and determination of the Retirement System’s liabilities. We support continual consideration of bringing this rate down thus reducing future relative risk of the Retirement System by increasing the liabilities and increasing the likelihood future investment returns will achieve the assumption.

7. **Inflation Assumption** – While this assumption does not have a direct impact on the valuation it is an underlying building block of the investment and salary scale assumptions and needs to be reviewed within this study. The current rate of 2.75% is still within the generally accepted range used by other public plans. Although this rate is

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higher than the recent experience, this can be anticipated to remain a reasonable estimate for the underlying building block for the other related economic assumptions.

8. **Payroll growth assumption** – At this point the payroll growth assumption only impacts the City’s Funding Policy contribution as the initial unfunded liabilities are being amortized as a level percent of payroll which is projected to grow at 3.3%. This assumption was changed in 2012 (along with the investment assumption) from 3.5% to reflect the short-term experience of workforce reductions within the City. It can be anticipated that if those reductions are done, the 3.3% trend of total payroll growth will continue into the future.

9. **Other Considerations** – One of the other sources for liability losses consistently occurs from participants who may be in transition of status in the month or so immediately preceding the cut-off date for data that is provided for the actuarial valuation each year. While these transition participants may not be many in number, if they get missed one year and show up the next with all their past benefits the additional liability can add up. As part of our valuation processing and data handling process, a data matching by participant class will be conducted and where a participant is missing in the current data from the prior year, their liabilities will be retained for one additional year to allow for the potential that they may have been one of these transition participants. The implications of this should be a one-year increase in liabilities by removing a source for systematic risk in the future.

The alternative assumptions that will ultimately be selected by the Retirement Board are anticipated to be measured for their financial impact and considered for implementation with the July 1, 2014 actuarial valuation which determines the June 30, 2016 fiscal year-end Minimum Municipal Obligation.

On the following page we present Table I-6 summarizing all keys findings and alternative assumptions arising from this study.

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Table I – 6 Possible Changes to Economic and Demographic Assumptions (All Municipal and Police and Fire Employees)		
	Current Assumption	Alternative Assumption
<u>Economic</u>		
Inflation	2.75%	No Change
Investment Return/Discount Rate	7.85%	Continue to review each year
Salary Increase Rate	Salary scale by age	Marginal decrease in assumptions by age
Payroll Growth	3.30%	No Change
Expenses	Increases annually by 3.3%	No Change
<u>Demographic</u>		
Retirement Rates	Retirement rates by age	Increases for the 67 Plans and decreases for the 87 Plans
Termination Rates	Termination Rates by Age	Use same rates for all Municipal, with some decrease in the rates for all Plans
Disability Rates	Disability Rates by age	Increase Police and Fire Disability Rates with some adjustments to the Municipal rates
Active Mortality Rates (Pre-Retirement)	RP 2000 with five-year set back for Municipal females, three-year set forward for Police and Fire females, no adjustment for males	RP 2000, five-year set back with 15 year mortality improvement projections for Municipal, and ten-year mortality improvement projections for Police and Fire
Healthy Retiree Mortality Rates (Post-Retirement)	RP 2000 with two-year set forward for all females and Municipal males, and one-year set forward for Police and Fire males	RP 2000 with five-year mortality improvement projections and one-year set forward for Municipal, Police and Fire.
Disabled Mortality Rates (Post-Disabled)	RP 2000 Disabled mortality table with a 5% downward adjustment for Municipal; RP 2000 Healthy mortality table with a 30% upwards adjustment for Police and Fire	RP 2000 Disabled mortality table with a 5% downward adjustment for Municipal with ten-year mortality improvement projection; RP 2000 Healthy mortality table with a 40% upwards adjustment for Police and Fire and five-year mortality improvement projection
<u>Miscellaneous Demographic</u>		
Marital Status	70% active/60% retirees with 50% J&S refund of contribution option	No Change
Transition Data	one-year retention of missing actives	No Change

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The financial implications of alternative assumptions will be provided following the Board's consideration and opportunity to reflect and weigh in regarding our observations and anticipated long-term trends to support the alternative assumptions suggested.

The balance of this report presents the rationale for the alternatives presented above. In Section II, we present detailed analysis and exhibits supporting the various economic assumption changes.

SECTION II
ANALYSIS OF ECONOMIC ASSUMPTIONS

Economic Assumptions

We considered the following to be "economic" assumptions in our analysis:

1. Inflation
2. Investment Return/Discount Rate
3. Salary Increase
4. Payroll Growth
5. Expenses

Both the investment and salary increase assumptions are interrelated with the inflation rate. The rate of investment return consists of two components; the "real rate" of return and the inflation component. Similarly, the rate of salary increase is separated into different components: the inflation rate, a merit increase (seniority) and sometimes there is a component set aside for "productivity" gains.

In developing recommendations for these assumptions, several factors are considered:

- historical data in general (i.e. the markets)
- historical experience of the plan
- outlook for the future
- assumptions used by other public sector plans.

1. Inflation

A. Current Assumptions

The inflation rate is an underlying aspect of all economic assumptions. The difference between other economic assumptions relative to the long-term underlying rate of inflation is an important measure. The current rate of inflation is 2.75%.

B. Experience

1. Historical Experience in General

Based on the Consumer Price Index for all Philadelphia-Wilmington-Atlantic City Urban Consumers, Table II-1 on the next page shows the inflation rates for the past 20 years. The current 2.75% rate of inflation exceeds the regional rate of inflation over the last five years (as shown in Table II-1) but it is generally accepted that this is a historically unusual period for this measurement.

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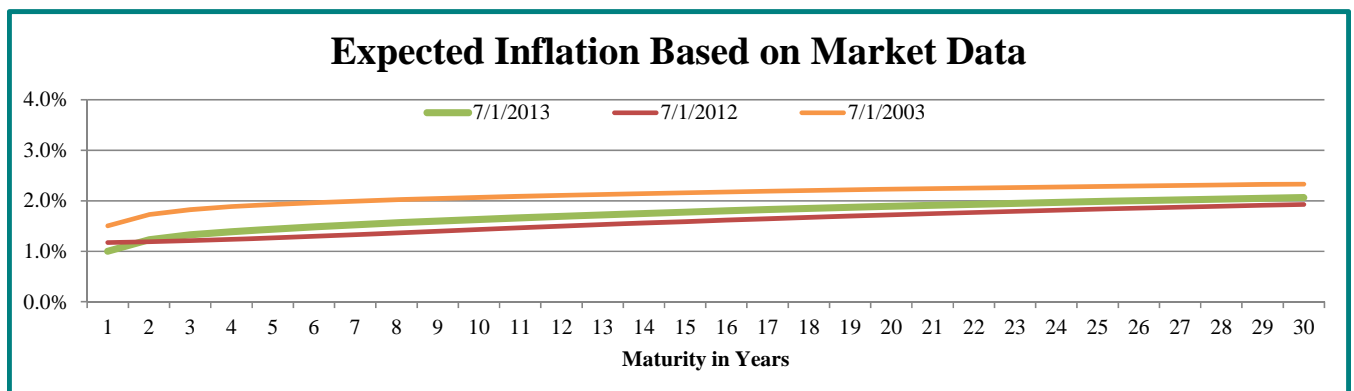
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Year Ending June 30,	Increase in CPI-U
1994	2.72%
1995	2.46%
1996	2.46%
1997	2.34%
1998	1.14%
1999	2.44%
2000	2.61%
2001	3.34%
2002	2.08%
2003	1.83%
2004	4.38%
2005	3.43%
2006	4.44%
2007	1.57%
2008	5.13%
2009	-2.01%
2010	1.91%
2011	2.80%
2012	1.25%
2013	1.51%
1994-2013	2.38%
2004-2013	2.42%
2009-2013	1.08%

The inflation rates have declined significantly over the past 20 years, especially in the past seven years due in part to the Federal Reserve’s decision to keep treasury rates low to stimulate the economy. However, there are indications that this rate will increase in the future.

2. Market Expectations

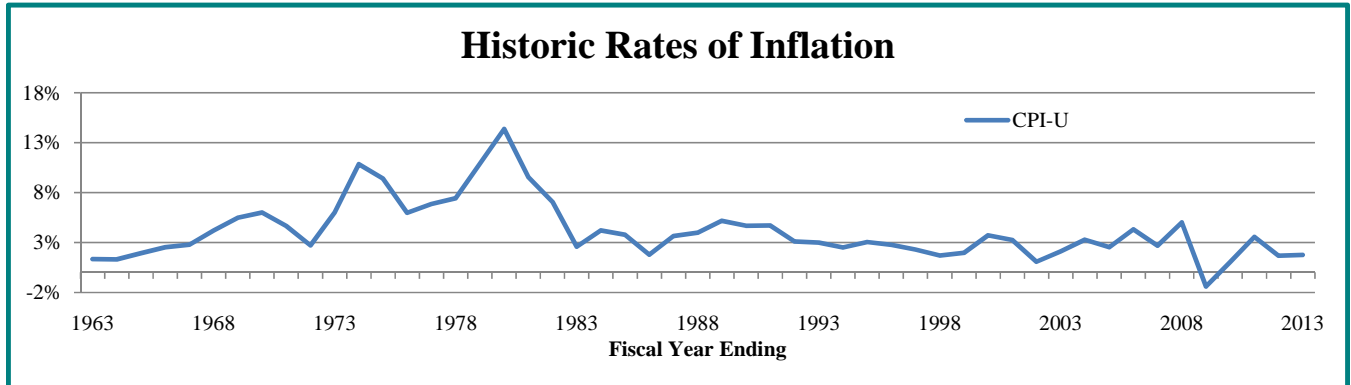
There are some who argue the market defines the underlying inflation when considering the spread between long terms bonds and inflation protected securities like tips.



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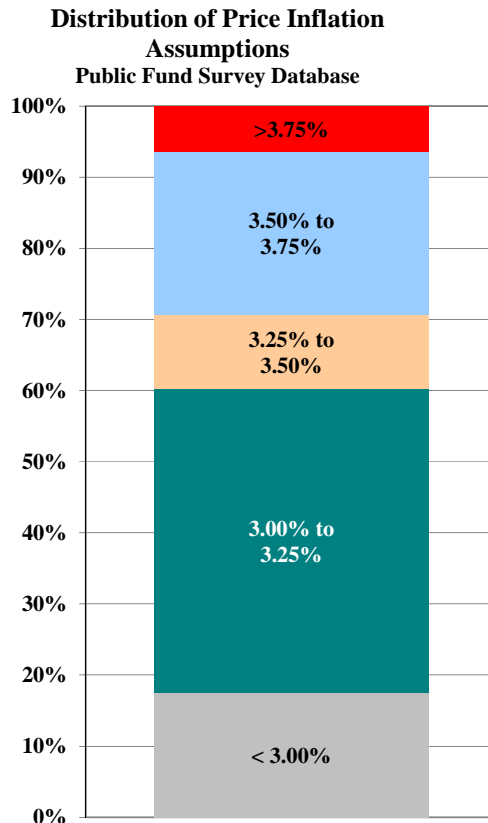
While the market data implies a lower rate the historic data shows much more volatility in the rates and continues to support the current assumption which is within the generally accepted ranges for retirement plans between 2.5% to 3.5%.



3. Other Public Sector Plans

Included in the National Association of State Retirement Administrators (NASRA) annual survey of public funds is data on inflation assumptions. Chart II-1 below shows the distribution of price inflation assumptions for the 126 systems in the public fund survey database.

Chart II-1



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The median assumption in the survey database is 3.00%, and in our experience, this represents a reduction in inflation assumptions over the last few years.

2. Investment Return/Discount Rate

A. Current Assumptions

All Municipal and Police and Fire Employees

The Retirement Systems’ assets are assumed to earn 7.85% net of expenses. This reflects the recent reduction from 7.95% to 7.85% adopted effective July 1, 2013.

B. Experience

1. Historical Experience in General

Table II-2 provides the rates of investment returns experienced by the Retirement System during the last ten fiscal years. Rates of return were computed as the ratio of the net investment earnings to market value of asset.

Current Assumption: 7.85% per annum

Table II-2	
Investment Returns on Market Value of Assets	
Year Ending June 30,	Return
2003	1.80%
2004	16.60%
2005	9.90%
2006	11.30%
2007	16.98%
2008	-4.53%
2009	-19.87%
2010	13.81%
2011	19.40%
2012	0.18%
2013	10.94%
Compounded Averages up to July 1, 2013	
Last 5 Years (2009 - 2013)	3.89%
Last 10 Years (2004 - 2013)	6.78%

The investment returns on a five- and ten-year basis are lower than the current assumption due to the financial market decline during 2008 and 2009. This is reflected in the difference between the five- and ten-year averages as of July 1, 2013.

However long-term investment return expectations on assets should not be the sole measure used in the determination of the value of liabilities under the Retirement System. The higher this

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assumption the greater the risk that the measure of liabilities could be understated and the Retirement System costs will increase in the future. Reducing the investment return/discount rate increases the liability measurement; reducing the risk of future Retirement System cost increases.

2. Other Public Sector Plans

The National Association of State Retirement Administrators (NASRA) conducts an annual survey of public funds. The Public Fund Survey covers 126 large retirement systems, including other Pennsylvania systems. The 2013 survey has not been released yet, but Chart II-2 on the following page shows the historical distribution of investment return assumptions for the last 12 years from the 2012 survey, and Chart II-3 shows the most recent information in the Public Fund Survey database.

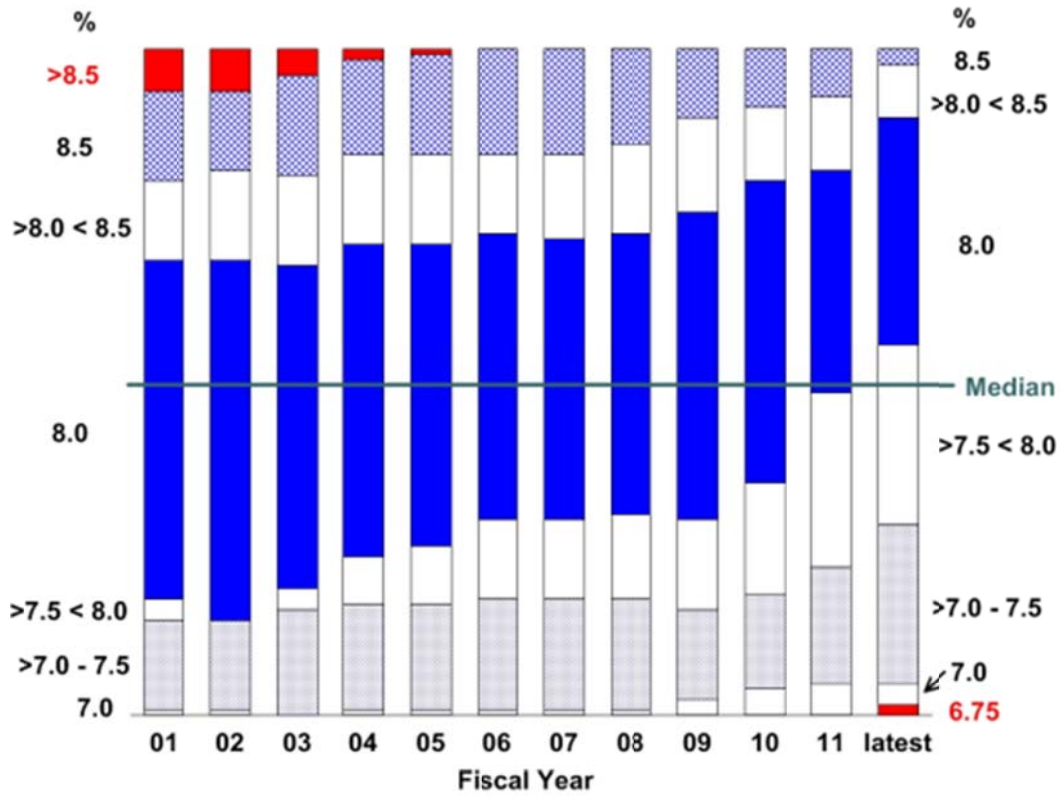
Over the period shown in the survey, there has been a pattern of reducing investment return assumptions, first reducing the highest assumptions to below 8.5% and more recently reducing assumptions below 8.0%. The 2012 survey was the first in which the median assumption was less than 8.0%, and the first in which a system had adopted an assumption less than 7.0%.

The most recent data shows a similar pattern with a median assumption of 7.9%. The survey is consistent with our experience that there has been a significant trend to reduce the discount rate in the last four years.

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Chart II- 2



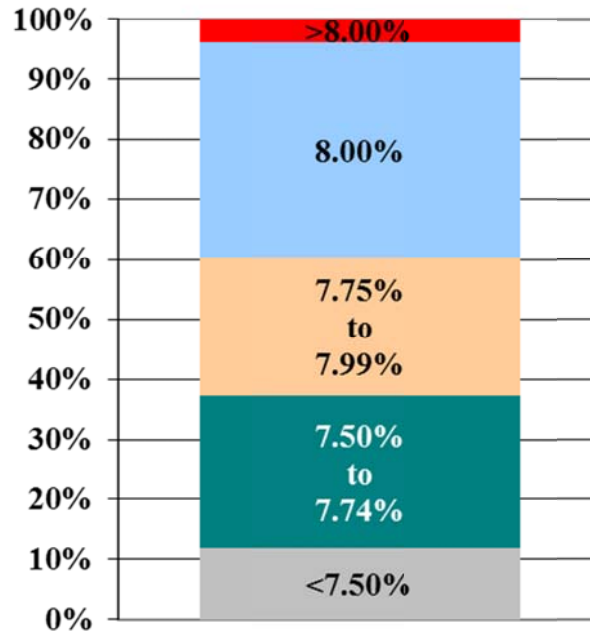
Public Fund Survey
 November 2012

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Chart II- 3

Distribution of Discount Rates
Public Fund Survey Database



C. Alternatives

All Municipal and Police and Fire Employees

Based on historical returns; both in the general markets and actual for the Retirement System, as well as other plans' assumptions, the Retirement System's current 7.85% assumption is not outside the range of acceptable investment return assumptions. Based on the Retirement System's investment return experience, this trend supports continued consideration to decrease the investment return/discount rate assumption.

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3. Salary Increase

A. Current Assumptions

All Municipal and Police and Fire Employees

The current salary increase assumption for all Municipal and Police and Fire employees is an age-based assumption.

B. Experience

All Municipal and Police and Fire Employees

The average salary increase over the testing period is 1.90% for Municipal and 3.79% for Police and Fire participants resulting in 2.60% combined rate. If we compare the salary increases of both divisions combined to the salary increase that we expected, we can see that the actual increase was significantly lower. The Table II-3a below shows the total salary increase rate experienced by the Retirement System during the five-year study period.

Table II-3a				
Average Salary Increases - Data from July 1, 2008 - June 30, 2013				
Age	Municipal	Police and Fire	Combined	Expected
<20	11.98%	14.71%	12.92%	20.80%
20-24	7.28%	10.32%	8.64%	12.30%
25-29	4.35%	6.21%	5.18%	7.55%
30-34	2.75%	4.17%	3.41%	5.30%
35-39	1.95%	3.46%	2.71%	4.55%
40-44	1.78%	2.98%	2.33%	4.30%
45-49	1.31%	2.79%	1.80%	3.55%
50-54	1.05%	2.70%	1.43%	3.55%
55-59	1.21%	2.75%	1.49%	3.55%
60-64	0.86%	2.35%	0.95%	3.55%
65+	0.56%	2.18%	0.60%	3.55%
<Total>	1.90%	3.79%	2.60%	NA

However, the salary data included in this five-year study period reflects low salary growth in 2010 through 2012 which may be due in part to the recession. If the data from Fiscal Year end 2010 through 2012 is disregarded, then the actual salary increases are not as significantly low when compared to the current assumptions, as illustrated in Table II-3b.

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Table II-3b				
Average Salary Increases - Data from Fiscal Years 2009 and 2013				
Age	Municipal	Police and Fire	Combined	Expected
<20	13.42%	18.05%	15.38%	20.80%
20-24	9.91%	11.91%	10.73%	12.30%
25-29	6.25%	6.89%	6.55%	7.55%
30-34	3.57%	5.37%	4.41%	5.30%
35-39	2.85%	4.82%	3.82%	4.55%
40-44	2.43%	4.16%	3.20%	4.30%
45-49	1.97%	4.09%	2.68%	3.55%
50-54	1.54%	4.03%	2.13%	3.55%
55-59	1.75%	4.07%	2.18%	3.55%
60-64	1.56%	3.61%	1.68%	3.55%
65+	1.02%	3.01%	1.08%	3.55%
<Total>	2.69%	4.98%	3.53%	NA

C. Recommendations

All Municipal and Police and Fire Employees

Actual increases have been significantly lower than the expected salary increase rate when the entire study period is included in this analysis. If the data excluding the salary increases during the height of the recession is reviewed, then there is smaller delta between the actual versus expected salary increases. Based upon the data, we recommend slightly lower salary increase rate assumptions to take into account a reversion to the expected norm for the salary increase rates in the future.

D. Results

The following Table II – 4a and corresponding graph shows the age-based salary increase rate that might be applied, analyzing the data over the entire study period. Table II – 4b and corresponding graph shows the same age-based salary increase rate that might be applied when analyzing the data only for Fiscal Years 2009 and 2013.

The graphs provide the average salary scale rate and the *confidence intervals* (see description below) associated with this average rate. The wider the confidence interval is, then the greater the variability of the data for the salary increase rates.

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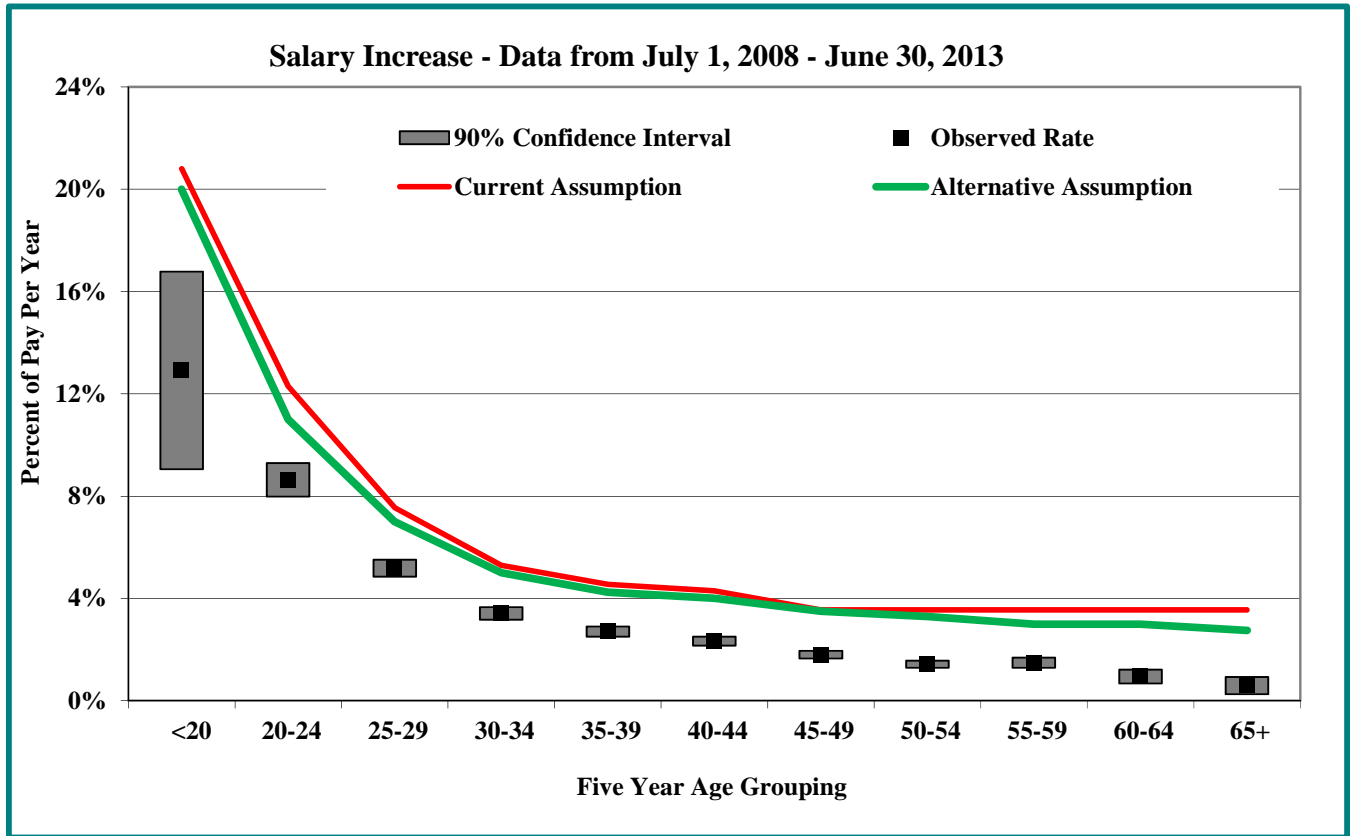
Confidence intervals – in any trend statistical analysis the question has to be considered is the experience sufficient to believe a true change is occurring over what was expected in the past. For example if you flipped a coin twice and both times it came up heads is that sufficient information to conclude both sides of the coin are heads. If you flipped it 100 times and they all came up heads you would have more confidence in believing both sides of the coin had heads on it. The more incidences that occur at any date point like an age, the greater the confidence that the experience is real and will continue to occur at the rate being observed. So we give more credence to high confidence intervals. The narrower the band shown in the graphs then the tighter the expectations and more reliable the data. The graphs within this study show 90% confidence intervals (grey bars). This implies a range where 90% of the time the actual experience is expected to fall within this range.

Appendix A provides more detailed information on the salary increase experience over the study period.

Table II-4a					
Average Salary Increases - Data from Fiscal Years 2009 through 2013					
Age	Municipal	Police and Fire	Combined	Expected	Alternative
<20	11.98%	14.71%	12.92%	20.80%	20.00%
20-24	7.28%	10.32%	8.64%	12.30%	11.00%
25-29	4.35%	6.21%	5.18%	7.55%	7.00%
30-34	2.75%	4.17%	3.41%	5.30%	5.00%
35-39	1.95%	3.46%	2.71%	4.55%	4.25%
40-44	1.78%	2.98%	2.33%	4.30%	4.00%
45-49	1.31%	2.79%	1.80%	3.55%	3.50%
50-54	1.05%	2.70%	1.43%	3.55%	3.30%
55-59	1.21%	2.75%	1.49%	3.55%	3.00%
60-64	0.86%	2.35%	0.95%	3.55%	3.00%
65+	0.56%	2.18%	0.60%	3.55%	2.75%
<Total>	1.90%	3.79%	2.60%	NA	NA

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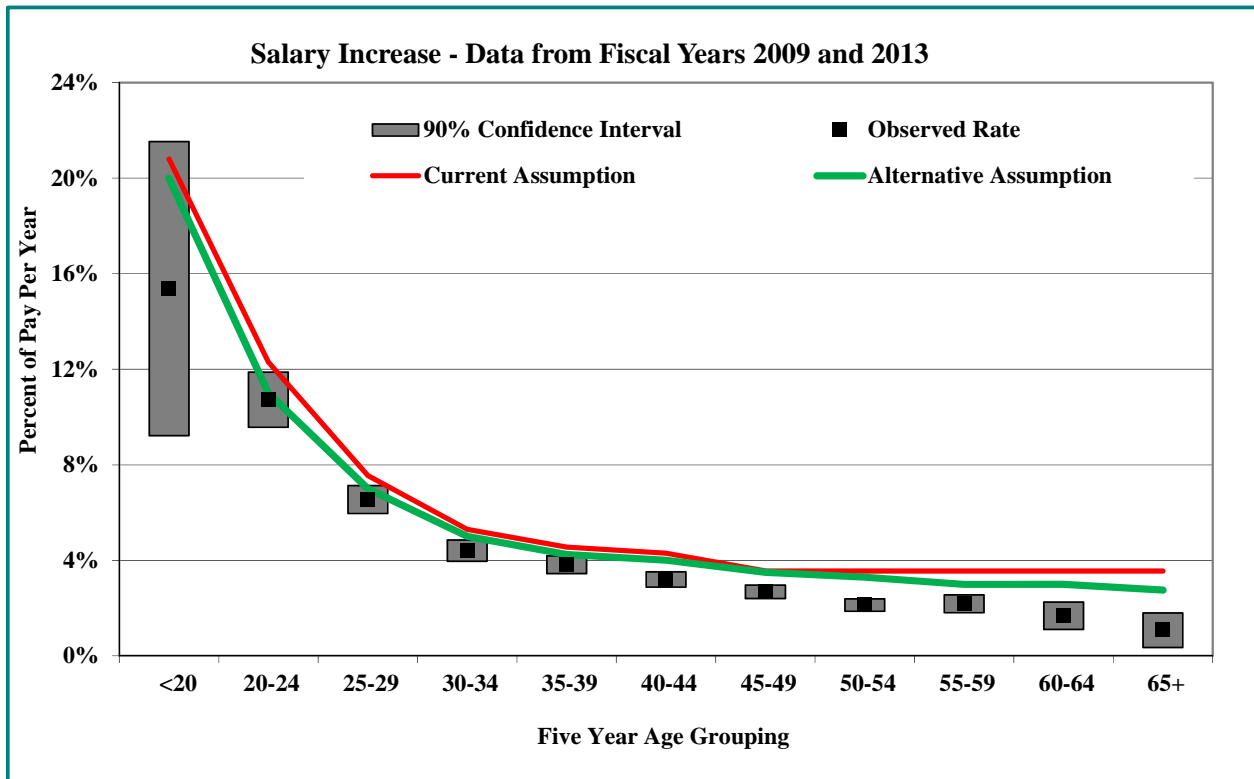
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Age	Municipal	Police and Fire	Combined	Expected	Alternative
<20	13.42%	18.05%	15.38%	20.80%	20.00%
20-24	9.91%	11.91%	10.73%	12.30%	11.00%
25-29	6.25%	6.89%	6.55%	7.55%	7.00%
30-34	3.57%	5.37%	4.41%	5.30%	5.00%
35-39	2.85%	4.82%	3.82%	4.55%	4.25%
40-44	2.43%	4.16%	3.20%	4.30%	4.00%
45-49	1.97%	4.09%	2.68%	3.55%	3.50%
50-54	1.54%	4.03%	2.13%	3.55%	3.30%
55-59	1.75%	4.07%	2.18%	3.55%	3.00%
60-64	1.56%	3.61%	1.68%	3.55%	3.00%
65+	1.02%	3.01%	1.08%	3.55%	2.75%
<Total>	2.69%	4.98%	3.53%	NA	NA



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4. Payroll Growth Rate

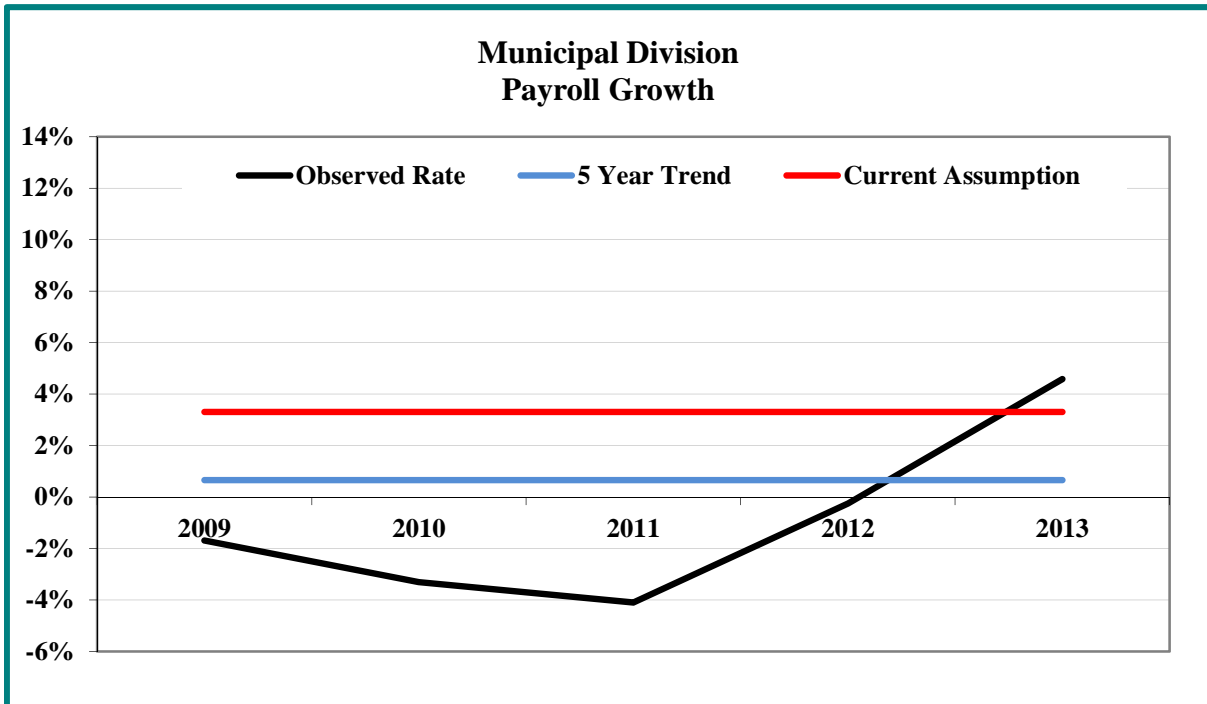
A. Current Assumptions

All Municipal and Police and Fire Employees

The Retirement Systems' total payroll growth assumption is currently 3.3%. This assumption represents the assumed growth in payroll, which includes not only the continuing active participants' year over year increases, but also the participants employed for only a short period of time. It is a reflection of both payroll growth and number of employees covered by the Retirement System.

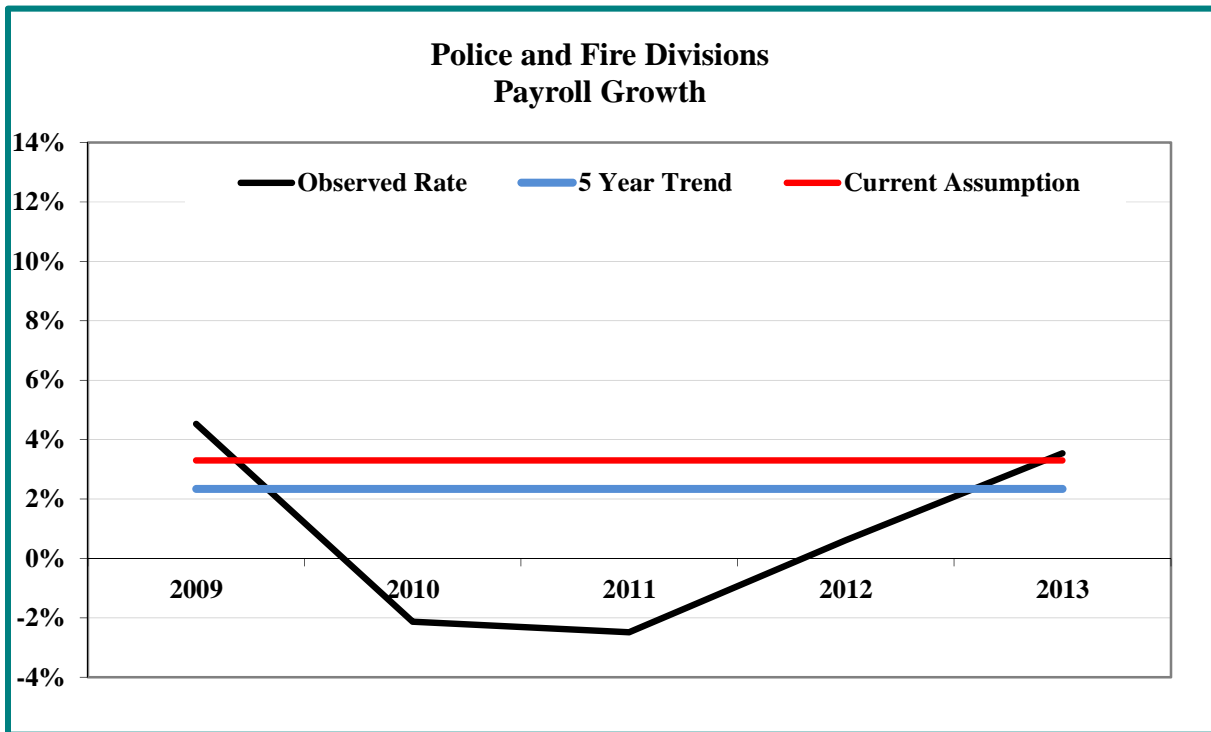
B. Experience

The Retirement Systems' total payroll growth since 2008 was less than expected. For the Municipal Division, the average of the five-year trend is about 0.65% while for the Police and Fire Divisions this is about 2.34%. The following graphs show the experience, the five-year trend, and the current assumption for Municipal and Police and Fire Divisions. A ten-year average of the five-year trends produces higher results of 1.11% of the Municipal Division and 2.92% for the Police and Fire Divisions.



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C. Recommendations

All Municipal and Police and Fire Employees

The current payroll growth assumption was actually decreased since the last experience study from 3.5% to 3.3% to reflect the City's expectation of slower growth. While it may still be high compared to the long-term averages it is a reflection of reductions in total workforce during the period which may be leveling off. At this time, we do not recommend changing this assumption because it should reflect long-term expectations of the City. This assumption only impacts the amortization of the initial unfunded liability base under the City's Funding Policy.

5. **Expenses**

A. Current Assumptions

The expense assumption is based upon the average of the administrative expenses from the past two years incurred by the plan. This amount is then rolled forward to the following year based upon the payroll growth assumption.

B. Recommendation

This assumption is reviewed and updated every year based upon the Plan's experience, thus no change is recommended at this time.

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Demographic Assumptions

In Section III we present similar information with respect to the demographic assumptions. We present the key findings of our experience review of the demographic assumptions used by the Retirement System, including alternative assumptions for consideration. The demographic assumptions included in this review are:

1. Retirement
2. Termination from Active Employment (Other than Death, Disability, or Retirement)
3. Disability
4. Mortality (Active, Retired Healthy, and Retired Disabled)
5. Joint and Survivor with Refund of Contributions Marriage Percentage

For each of the first four sets of assumptions noted above, we determined an actual to expected occurrence ratio at each age (sometimes further segregated by gender). For example, for Municipal Plan 67 there are 1,680 participants who were age 55 during the study period of which 773 retired. Based on the assumption in place during the study, 672 of the 1,680 participants were expected to retire. Therefore the ratio of actual to expect retirees is 115% (773 divided by 672). Another way to say this is, 15% more members retired than expected during the study period.

If the “actual to expected” ratio is greater than one, the assumption may be too low; if it is less than one, the assumption may be too high.

The tables and graphs in each section compare three items:

1. the number of people eligible to have the occurrence (such as retirement),
2. the number of people expected to have the occurrence (such as retire) based on the current assumptions (illustrated in red), and,
3. the number of people expected to have the occurrence based on the alternative assumptions (illustrated in green)
4. The “actual to expected” ratios for items 2 and 3.

The alternative assumptions bring the ratios closer to one, which means the number of people we expect for an occurrence under the alternative assumptions is closer to the actual number of people who had the occurrence. By using color shading of the ratio values, we illustrate when the ratios vary from 100%. The darkest cells illustrate when the ratios are greater from 100% for the assumptions. The lightest cells illustrate when the ratios are less than 100%.

In addition to reviewing the ratios of actual versus expected, the credibility of the data at each study period is also reviewed. The credibility of the data is illustrated by the *confidence interval* at each study period.

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The wider the confidence interval, then the analysis is less credible due to fewer participants exposed to the event being analyzed. The narrower the confidence interval, then the analysis is more credible due to more participants exposed to the event being analyzed.

In addition, we aggregate participants for the demographic assumption review when the data at individual ages is no longer credible. For example, for the retirement assumption review for Municipal 67, participants 70+ are aggregated because analyzing the retirement trends for active participants 70 and older at each age would not provide credible data. By aggregating the data at 70+, there are more participants in this group which creates a smaller confidence interval.

Typically, we would like the assumptions to fall within the confidence interval, especially if this confidence interval is narrow. At the same time, it is important not to change an assumption too much from the previous assumption because anomalies in the data that occurred for one or two years could skew the results. Therefore, suggested alternative assumptions are updated by reviewing the prior assumptions and the current confidence intervals as well as participant behavior that is believed to be inconsistent with the past and future behavior due to external factors at the time.

When applying the assumptions to the data at the end points (for example, age 70+ for Municipal 67 retirement assumption review), the current assumptions and alternative assumptions will often fall outside the confidence interval. This is to be expected due to the aggregation of the data at these points and is the one exception to the general goal of choosing assumptions that will be within the confidence interval.

1. Retirement

A. Current Assumptions

All Municipal Employees

Normal Retirement assumptions for City Municipal employees under Plan 67 start at age 55, regardless of service. Under Plan 87, Normal Retirement starts at age 60 with ten years of service with the exception of those in the Elected group, which start at age 55 with ten years of service.

All Police and Fire Employees

Normal Retirement assumptions for City Police and Fire employees under Plan 67 start at age 45, regardless of service. Under Plan 87, Normal Retirement starts at age 50 with ten years of service.

The current retirement rates for all employee groups vary based on age. Once a Municipal employee, or a Police and Fire employee, reaches age 70, we assume 100% probability of retirement.

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B. Experience

All Municipal, Police and Fire Employees

The current assumptions for all employee groups are based on age. Overall, for the Police and Fire employees in Plan 67, the actual retirements during the study period were higher than expected (see the Results section outlined in item D below). The experience shows higher ratios of actual to expected retirements at almost all ages for the Police and Fire employees in Plan 67. Alternatively, for the Police and Fire employees in Plan 87; the actual retirements during the study period were lower than expected, with the ratios at almost all ages less than 100%.

For the Municipal Division Plan 67, the rates were higher than expected at the all ages illustrated by ratios greater than 100%. For the Municipal Division Plan 87, the rates were higher than expected at some ages and lower at others.

C. Alternative

All Municipal, Police and Fire Employees

We propose increasing the rates for Police, Fire and Municipal Plan 67, lowering the rates for the Police and Fire Divisions Plan 87, and adjusting the rates slightly for Municipal Plan 87 accordingly.

The alternative retirement rates are provided in the next section.

D. Results

The following Table III - 1 provides the average age at retirement for those new retirees during the year by Division over the past five years. The average age for “All Retirements” is the average age at retirement for all retirees in the system as of July 1, 2013 (regardless of their date of retirement).

Table III-1			
Average Retirement Ages for New Retirees Each Year			
Year Ending	Municipal	Police and Fire	
June 30	Division	Division	Total
2009	59.3	52.2	57.9
2010	59.2	52.0	57.6
2011	59.3	52.7	57.8
2012	60.6	54.4	59.6
2013	60.4	57.3	59.3
All Retirements*	58.1	49.4	54.8

*Average retirement age for all retirees as of July 1, 2013

This table shows us that overall the average retirement ages are slowly increasing.

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The following tables and graphs compare three items; the number of people eligible for retirement, the number of people expected to retire based on the current assumptions, and the number of people expected to retire based on the alternative assumptions. They also illustrate how increasing the retirement assumptions for all participants in Plan 67, the assumptions are more in-line with the confidence intervals. For Plan 67, due to more retirement data, the confidence intervals are relatively narrow at most ages.

For Plan 87, there is less data on retirement behavior, as illustrated by the wider confidence intervals. However, by applying lower retirement assumptions for the Police and Fire Divisions for Plan 87 where the confidence intervals illustrate credible data (approximately from age 52 through 60), the assumptions are more in-line with the experience.

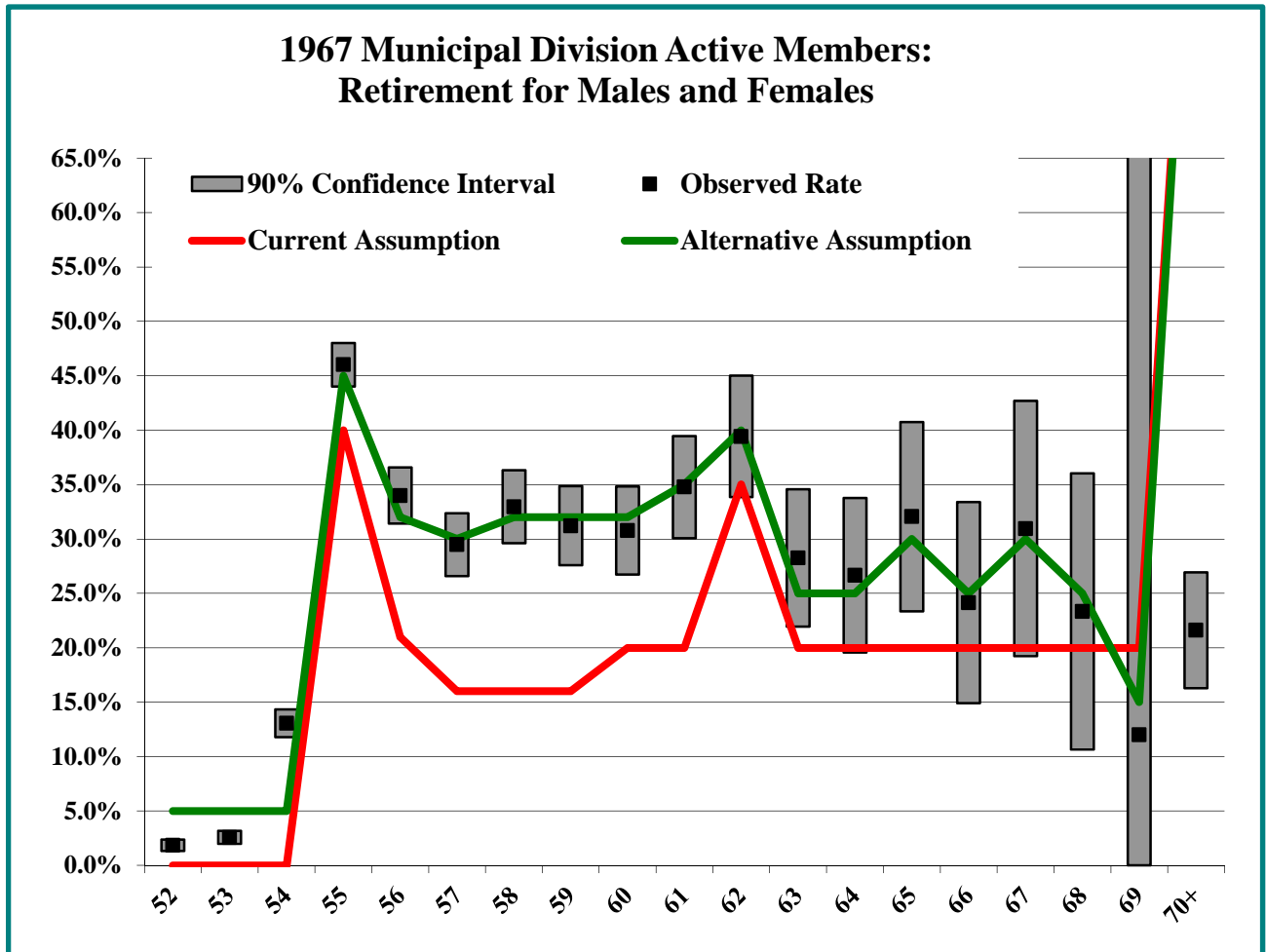
For this experience study period we have expanded the scope of our analysis to include active members who may be early retirement eligible, adding an assumption for participants retiring prior to normal retirement age.

**Table III - 2
1967 Municipal Division Active Members
Retirement for Males and Females**

Age	Exposed	Total Actual Retirements	Expected Retirements	Alternative Retirements	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
52	1,735	32	0	86.8	1.8%	0.0%	5.0%	0%	37%
53	1,825	47	0	91.3	2.6%	0.0%	5.0%	0%	52%
54	1,868	244	0	93.4	13.1%	0.0%	5.0%	0%	261%
55	1,680	773	672	756.0	46.0%	40.0%	45.0%	115%	102%
56	912	310	192	291.8	34.0%	21.0%	32.0%	161%	106%
57	675	199	108	202.5	29.5%	16.0%	30.0%	184%	98%
58	534	176	85	170.9	33.0%	16.0%	32.0%	207%	103%
59	439	137	70	140.5	31.2%	16.0%	32.0%	196%	98%
60	351	108	70	112.3	30.8%	20.0%	32.0%	154%	96%
61	279	97	56	97.7	34.8%	20.0%	35.0%	173%	99%
62	208	82	73	83.2	39.4%	35.0%	40.0%	112%	99%
63	138	39	28	34.5	28.3%	20.0%	25.0%	139%	113%
64	105	28	21	26.3	26.7%	20.0%	25.0%	133%	107%
65	78	25	16	23.4	32.1%	20.0%	30.0%	156%	107%
66	58	14	12	14.5	24.1%	20.0%	25.0%	117%	97%
67	42	13	8	12.6	31.0%	20.0%	30.0%	163%	103%
68	30	7	6	7.5	23.3%	20.0%	25.0%	117%	93%
69	25	3	5	3.8	12.0%	20.0%	15.0%	60%	80%
70+	162	35	162	162	21.6%	100.0%	100.0%	22%	22%
Total	11,144	2,369	1,584	2,411	21.3%	14.2%	21.6%	150%	98%

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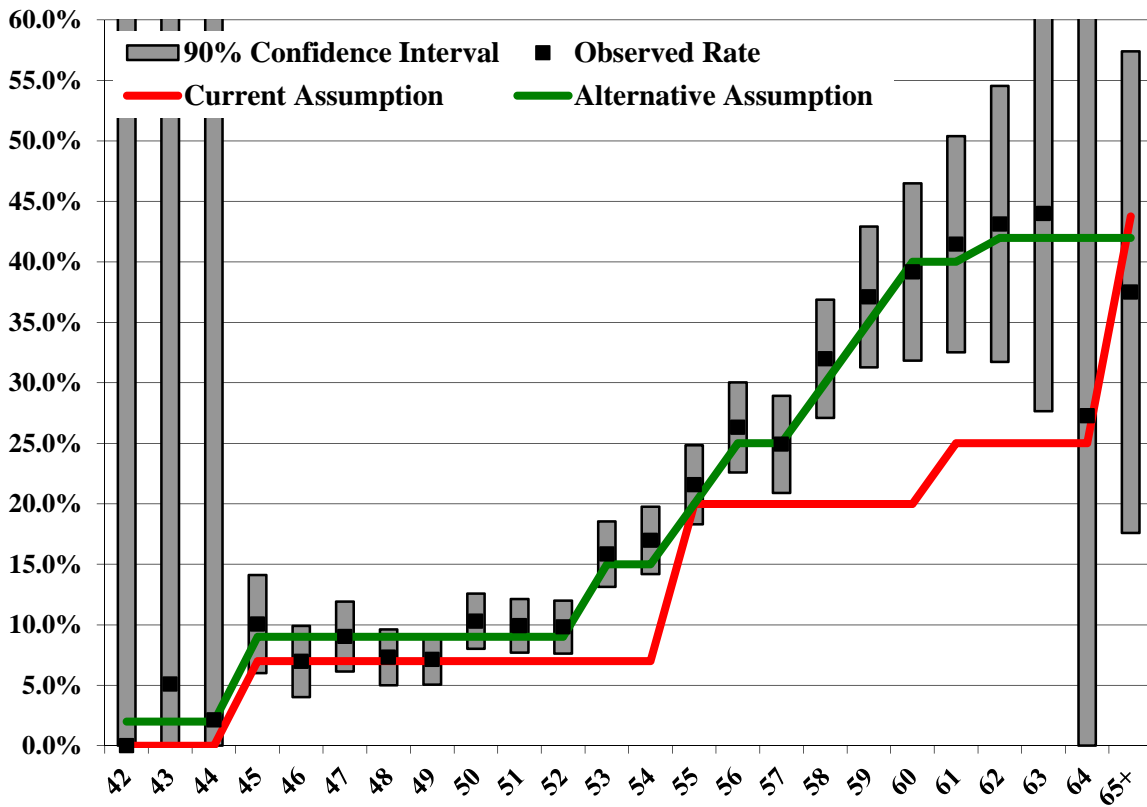
**Table III - 3
1967 Police and Fire Division Active Members
Retirement for Males and Females**

<u>Age</u>	<u>Exposed</u>	<u>Total Actual Retirements</u>	<u>Expected Retirements</u>	<u>Alternative Retirements</u>	<u>Actual Rates</u>	<u>Expected Rates</u>	<u>Alternative Rates</u>	Ratio: Actual over Expected	Ratio: Actual over Alternative
42	43	0	0	0.9	0.0%	0.0%	2.0%	0%	0%
43	59	3	0	1.2	5.1%	0.0%	2.0%	0%	254%
44	94	2	0	1.9	2.1%	0.0%	2.0%	0%	106%
45	149	15	10	13.4	10.1%	7.0%	9.0%	150%	112%
46	201	14	14	18.1	7.0%	7.0%	9.0%	100%	77%
47	266	24	19	23.9	9.0%	7.0%	9.0%	126%	100%
48	342	25	24	30.8	7.3%	7.0%	9.0%	104%	81%
49	421	30	29	37.9	7.1%	7.0%	9.0%	103%	79%
50	476	49	33	42.8	10.3%	7.0%	9.0%	148%	114%
51	494	49	35	44.5	9.9%	7.0%	9.0%	140%	110%
52	499	49	35	44.9	9.8%	7.0%	9.0%	140%	109%
53	492	78	34	73.8	15.9%	7.0%	15.0%	229%	106%
54	489	83	34	73.4	17.0%	7.0%	15.0%	244%	113%
55	431	93	86	86.2	21.6%	20.0%	20.0%	108%	108%
56	380	100	76	95.0	26.3%	20.0%	25.0%	132%	105%
57	313	78	63	78.3	24.9%	20.0%	25.0%	124%	100%
58	247	79	49	74.1	32.0%	20.0%	30.0%	161%	107%
59	186	69	37	65.1	37.1%	20.0%	35.0%	186%	106%
60	120	47	24	48.0	39.2%	20.0%	40.0%	196%	98%
61	82	34	21	32.8	41.5%	25.0%	40.0%	162%	104%
62	51	22	13	21.4	43.1%	25.0%	42.0%	169%	103%
63	25	11	6	10.5	44.0%	25.0%	42.0%	183%	105%
64	11	3	3	4.6	27.3%	25.0%	42.0%	100%	65%
65+	16	6	7	6.7	37.5%	43.8%	42.0%	86%	89%
Total	5,887	963	652	930	16.4%	11.1%	15.8%	148%	104%

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1967 Police and Fire Division Active Members:
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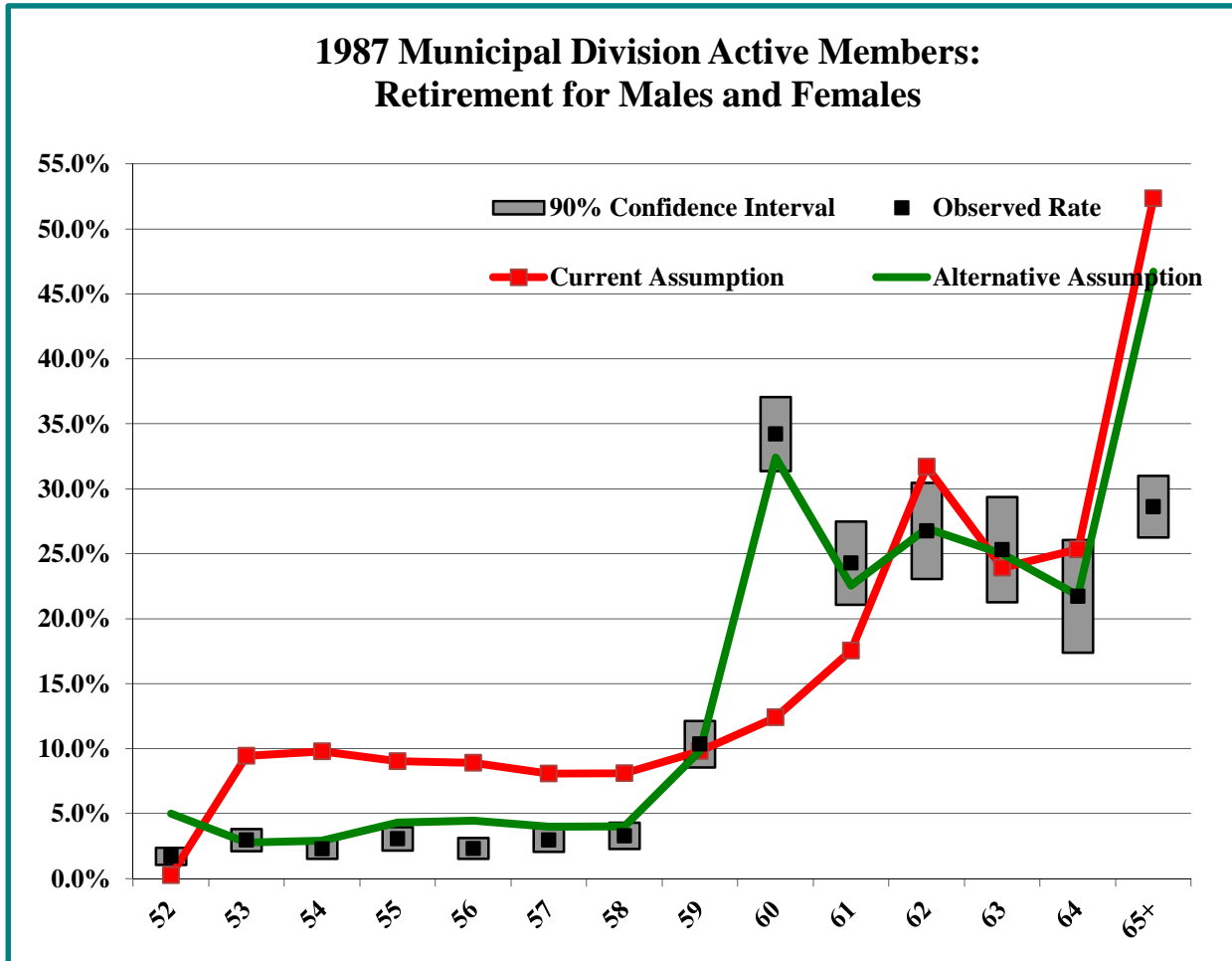
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Table III - 4
1987 Municipal Division Active Members
Retirement for Males and Females

<u>Age</u>	<u>Exposed</u>	<u>Total Actual Retirements</u>	<u>Expected Retirements</u>	<u>Alternative Retirements</u>	<u>Actual Rates</u>	<u>Expected Rates</u>	<u>Alternative Rates</u>	Ratio: Actual over Expected	Ratio: Actual over Alternative
52	1051	18	3	53	1.7%	0.3%	5.0%	600%	34%
53	1047	31	99	29	3.0%	9.5%	2.8%	31%	107%
54	1011	23	99	30	2.3%	9.8%	2.9%	23%	78%
55	981	30	89	42	3.1%	9.0%	4.3%	34%	71%
56	949	22	84	42	2.3%	8.9%	4.5%	26%	52%
57	907	27	73	36	3.0%	8.1%	4.0%	37%	74%
58	851	28	69	34	3.3%	8.1%	4.0%	41%	82%
59	783	81	77	77	10.3%	9.8%	9.8%	105%	105%
60	751	257	93	243	34.2%	12.4%	32.4%	276%	106%
61	486	118	85	110	24.3%	17.6%	22.6%	139%	108%
62	385	103	122	104	26.8%	31.7%	26.9%	84%	99%
63	312	79	75	78	25.3%	23.9%	25.0%	105%	101%
64	244	53	62	53	21.7%	25.3%	21.8%	85%	100%
65+	982	281	514	459	28.6%	52.3%	46.7%	55%	61%
Total	10,740	1,151	1,544	1,390	10.7%	14.4%	12.9%	75%	83%

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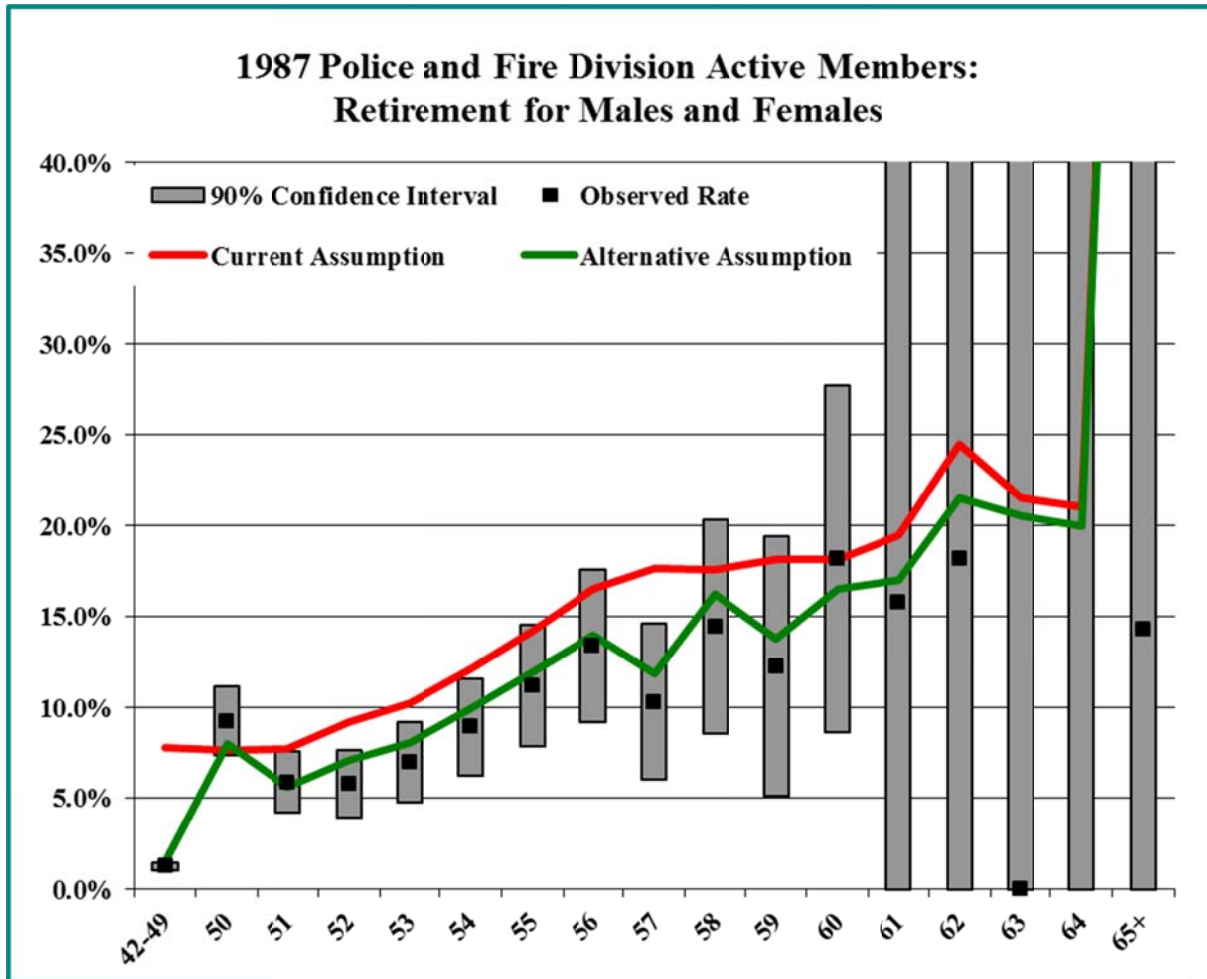
**SECTION III
ANYALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 5
1987 Police and Fire Division Active Members
Retirement for Males and Females**

<u>Age</u>	<u>Exposed</u>	<u>Total Actual Retirements</u>	<u>Expected Retirements</u>	<u>Alternative Retirements</u>	<u>Actual Rates</u>	<u>Expected Rates</u>	<u>Alternative Rates</u>	Ratio: Actual over Expected	Ratio: Actual over Alternative
42-49	8889	110	695	137	1.2%	7.8%	1.5%	16%	80%
50	637	59	49	51	9.3%	7.7%	8.0%	120%	115%
51	511	30	39	28	5.9%	7.6%	5.6%	77%	105%
52	417	24	38	29	5.8%	9.1%	7.1%	63%	82%
53	358	25	37	29	7.0%	10.3%	8.1%	68%	87%
54	303	27	37	30	8.9%	12.2%	10.0%	73%	89%
55	241	27	34	29	11.2%	14.1%	11.9%	79%	94%
56	179	24	30	25	13.4%	16.8%	14.0%	80%	96%
57	136	14	24	16	10.3%	17.6%	11.9%	58%	87%
58	97	14	17	16	14.4%	17.5%	16.2%	82%	89%
59	57	7	10	8	12.3%	17.5%	13.8%	70%	89%
60	44	8	8	7	18.2%	18.2%	16.5%	100%	110%
61	19	3	4	3	15.8%	21.1%	17.0%	75%	93%
62	11	2	3	2	18.2%	27.3%	21.5%	67%	85%
63	5	0	1	1	0.0%	20.0%	20.5%	0%	0%
64	4	2	1	1	50.0%	25.0%	20.0%	200%	250%
65+	7	1	7	7	14.3%	100.0%	100.0%	14%	14%
Total	11,915	377	1,034	420	3.2%	8.7%	3.5%	36%	90%

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The data is not credible at the older ages for the Police and Fire Plan 87 retirement assumptions, as illustrated by the wider confidence intervals. This also impacts the ratios and the subsequent colors associated with the ratios for ages 63 and 64, which should be disregarded due to insufficient data.

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ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

2. Termination from Active Employment

A. Current Assumptions

All Municipal, Police and Fire Employees

Current termination assumptions for all Municipal, Police and Fire employees are age based. Under Plan 67, the rates are set to zero at ages 55 and above for the Municipal Division reflecting the point in time when retirement assumptions are expected to take over for turnover. Under Municipal Plan 87, the rates are set to zero at ages 71 and above accounting for the service requirement for retirement under this plan for Municipal and Elected. Due to very limited termination data for the Police and Fire Division Plan 67 participants from the prior experience study, termination data for all Police and Fire Divisions was combined to determine one set of termination assumptions for this group.

B. Experience

All Municipal, Police and Fire Employees

Overall, the termination rates were lower for all ages than expected. In part, this may be due to the economic down-turn in 2008 and 2009, which led to fewer participants changing jobs during the recession that followed. Therefore, while some adjustments may be made to the termination assumptions, these adjustments should be tempered based upon the expected future behavior of the active participants.

In addition to overall lower termination rates, the actual termination experience for Police and Fire Division reflects a small number of participants at the later ages (50+).

For the Municipal Division Plan 67, the data is no longer credible. Therefore, it is recommended to combine the Municipal Division Plan 67 and Plan 87 data for review of the termination rates. Overall, the combined termination rates were lower than expected.

C. Alternative

All Municipal, Police and Fire Employees

Based on the limited credible data for the Municipal Division Plan 67, we recommend combining the data from these two groups to have one termination rate assumption for all Municipal members. The Municipal Division's current termination rates may be lowered to some extent, but we do not recommend a large change in the termination assumptions due to the likelihood that the financial down-turn in 2008 and 2009 may have played a part in the decreased termination rates. This is further supported by the fact that the termination rates for the Municipal Plan 87 were right in line with the assumptions under the prior experience study.

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For the Police and Fire Division, we recommend a slight lowering of the termination assumptions, especially at ages 25 – 29, but an increase in the termination assumption from 45 to 49.

The next section shows the proposed assumptions for both Municipal and Police and Fire employees over the study period.

D. Results

The following tables and graphs compare three items; the number of people eligible for the termination decrement, the number of people expected to terminate based on the current assumptions, and the number of people expected to terminate based on the alternative assumptions. For the Police and Fire Divisions, the alternative assumptions bring the ratios slightly closer to one, which implies the number of people we expect to terminate under the alternative assumptions is closer to the actual number of people who terminated.

For Municipal Plan 67, due to the small sampling size for this group, it is difficult to match the assumptions to the actual behavior. The Municipal Plan 87 is also provided below. The third table and graph below shows Municipal Plan 67 and Plan 87 combined as well as the alternative assumptions..

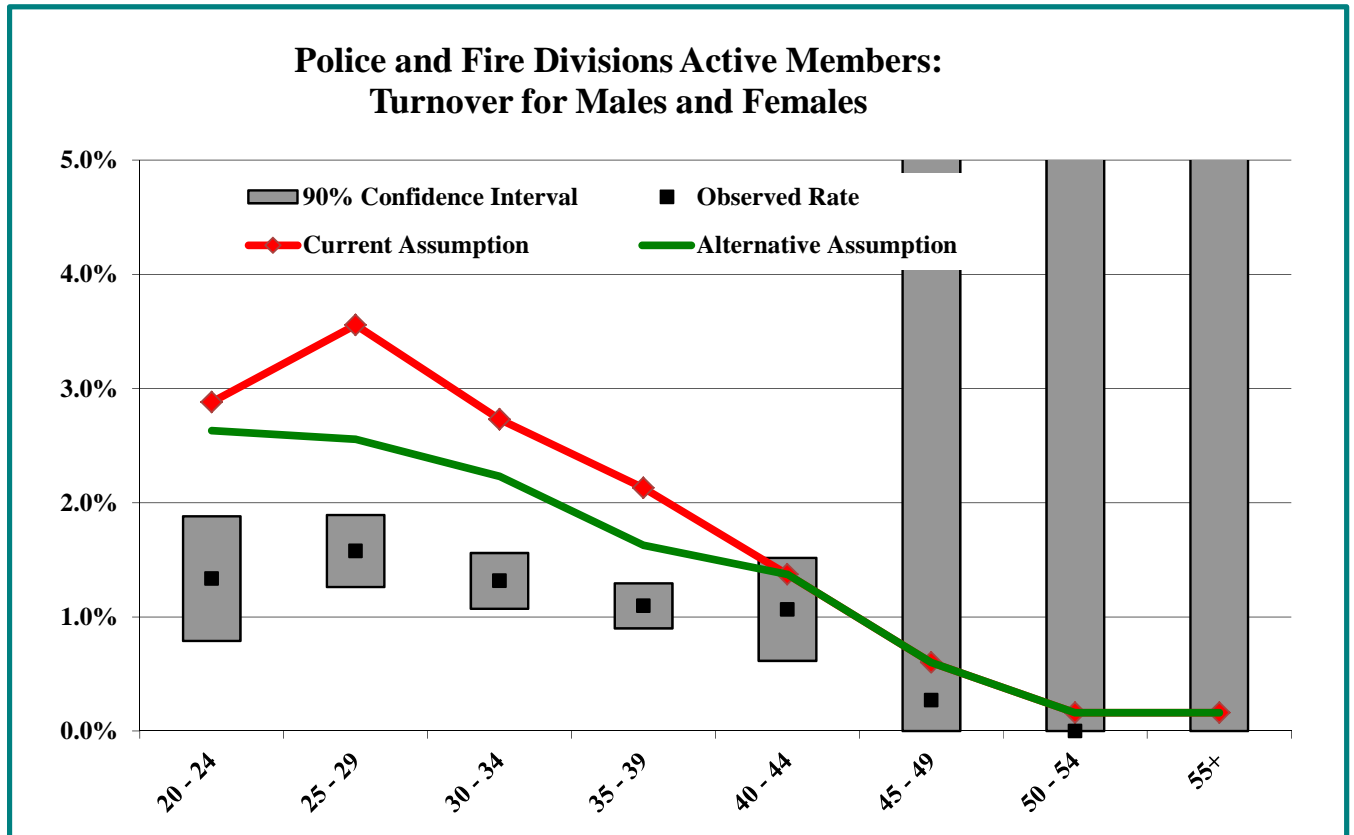
Furthermore, the alternative assumptions bring the rates either within the confidence intervals or closer to the confidence intervals on the graphs

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Table III - 6
Police and Fire Divisions Active Members
Terminations for Males and Females

Age	Exposed	Total Actual Terminations	Expected Terminations	Alternative Terminations	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
20 - 24	1,198	16	35	32	1.3%	2.9%	2.7%	46%	50%
25 - 29	4,249	67	151	109	1.6%	3.6%	2.6%	44%	61%
30 - 34	5,854	77	160	131	1.3%	2.7%	2.2%	48%	59%
35 - 39	7,570	83	161	123	1.1%	2.1%	1.6%	52%	67%
40 - 44	1,408	15	19	19	1.1%	1.3%	1.3%	79%	79%
45 - 49	370	1	2	2	0.3%	0.5%	0.5%	50%	50%
50 - 54	149	0	0	0	0.0%	0.0%	0.0%	0%	0%
55+	71	4	0	0	5.6%	0.0%	0.0%	0%	0%
Total	20,869	263	528	416	1.3%	2.5%	2.0%	50%	63%



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**Table III - 7
1967 Municipal Division Active Members
Terminations for Males and Females**

Age	Exposed	Total Actual Terminations	Expected Terminations	Alternative Terminations	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual	Ratio: Actual
								over Expected	over Alternative
20 - 24	7	6	1	1	85.7%	14.3%	14.3%	600%	600%
25 - 29	3	2	0	0	66.7%	0.0%	0.0%	0%	0%
30 - 34	9	3	1	1	33.3%	11.1%	11.1%	300%	300%
35 - 39	166	5	8	8	3.0%	4.8%	4.8%	63%	63%
40 - 44	1,563	30	54	54	1.9%	3.5%	3.5%	56%	56%
45 - 49	4,753	73	141	141	1.5%	3.0%	3.0%	52%	52%
50 - 54	3,079	56	65	65	1.8%	2.1%	2.1%	86%	86%
55+	0	0	0	0	0.0%	0.0%	0.0%	0%	0%
Total	9,580	175	270	270	1.8%	2.8%	2.8%	65%	65%

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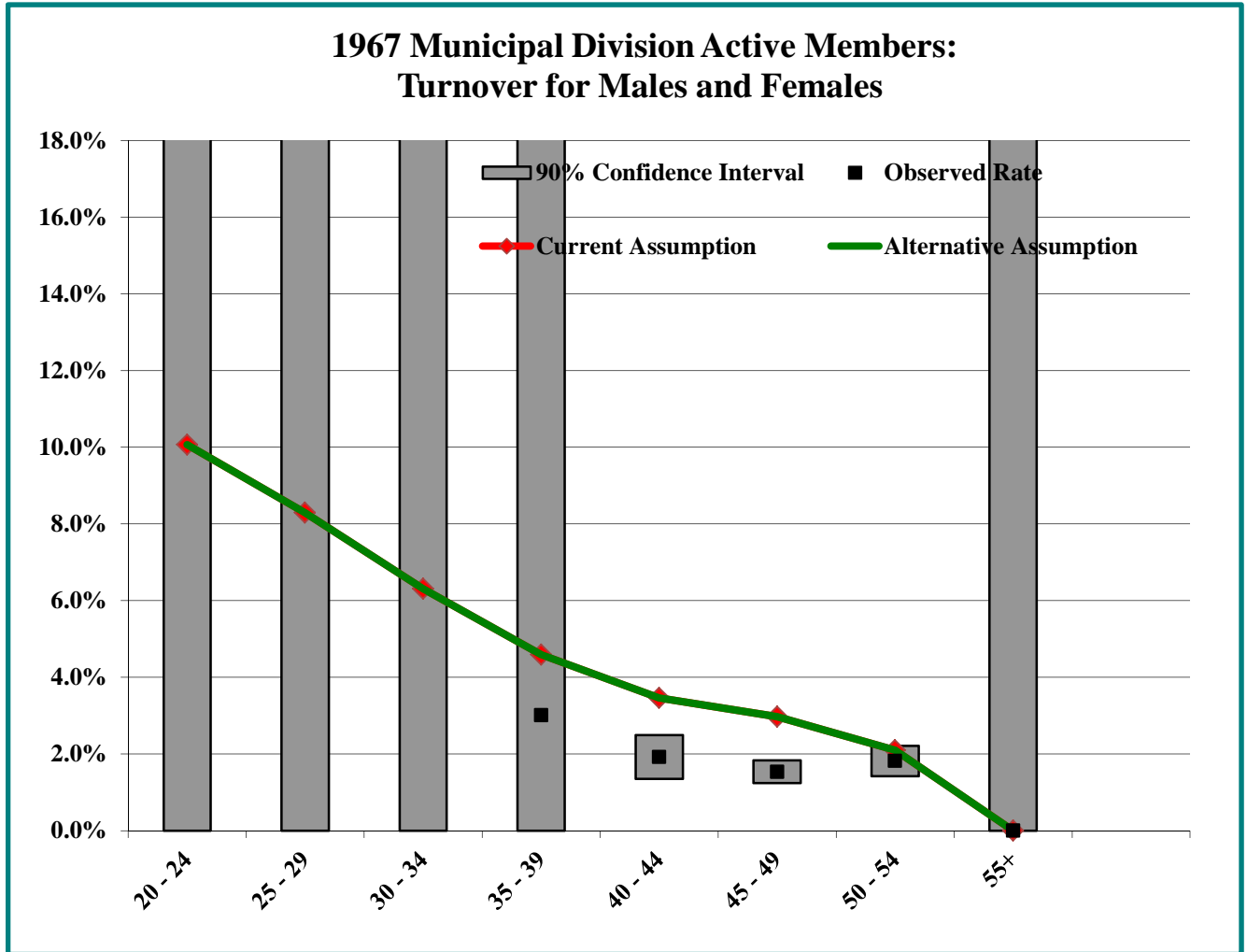


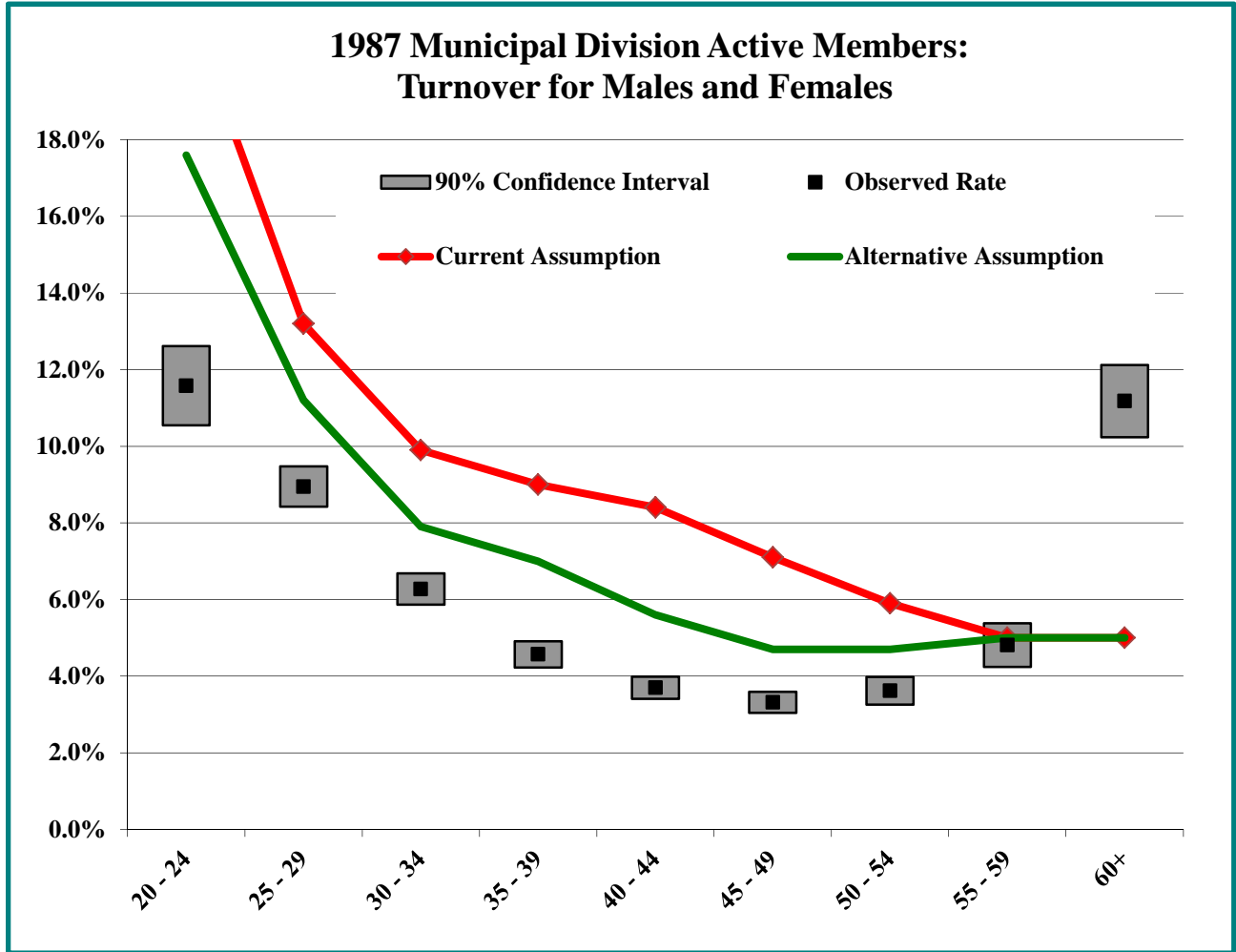
Table III - 8

1987 Municipal Division Active Members
 Terminations for Males and Females

Age	Exposed	Total Actual Terminations	Expected Terminations	Alternative Terminations	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
20 - 24	2,582	299	558	454	11.6%	21.6%	17.6%	54%	66%
25 - 29	7,991	715	1,055	895	8.9%	13.2%	11.2%	68%	80%
30 - 34	9,482	595	939	749	6.3%	9.9%	7.9%	63%	79%
35 - 39	10,047	459	904	703	4.6%	9.0%	7.0%	51%	65%
40 - 44	11,228	415	943	629	3.7%	8.4%	5.6%	44%	66%
45 - 49	11,351	376	806	533	3.3%	7.1%	4.7%	47%	71%
50 - 54	7,195	260	425	338	3.6%	5.9%	4.7%	61%	77%
55 - 59	3,825	184	191	191	4.8%	5.0%	5.0%	96%	96%
60+	3,014	337	151	151	11.2%	5.0%	5.0%	223%	223%
Total	66,715	3,640	5,972	4,643	5.5%	9.0%	7.0%	61%	78%

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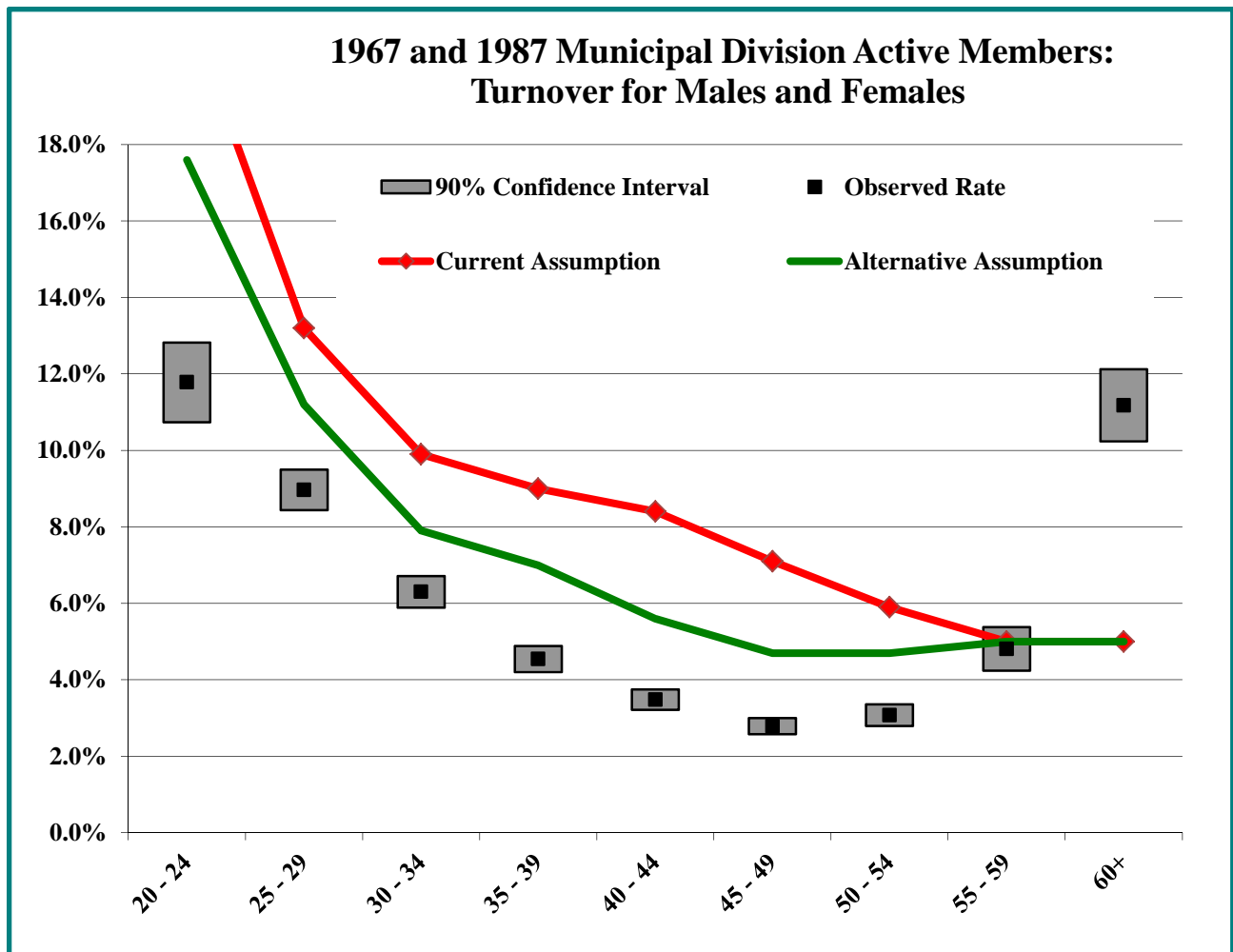
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Table III - 9

**1967 and 1987 Municipal Division Active Members
Terminations for Males and Females**

Age	Exposed	Total Actual Terminations	Expected Terminations	Alternative Terminations	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
20 - 24	2,589	305	559	456	11.8%	21.6%	17.6%	55%	67%
25 - 29	7,994	717	1,055	895	9.0%	13.2%	11.2%	68%	80%
30 - 34	9,491	598	940	750	6.3%	9.9%	7.9%	64%	80%
35 - 39	10,213	464	919	715	4.5%	9.0%	7.0%	50%	65%
40 - 44	12,791	445	1,074	716	3.5%	8.4%	5.6%	41%	62%
45 - 49	16,104	449	1,143	757	2.8%	7.1%	4.7%	39%	59%
50 - 54	10,274	316	606	483	3.1%	5.9%	4.7%	52%	65%
55 - 59	3,825	184	191	191	4.8%	5.0%	5.0%	96%	96%
60+	3,014	337	151	151	11.2%	5.0%	5.0%	223%	223%
Total	76,295	3,815	6,638	5,114	5.0%	8.7%	6.7%	57%	75%



SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

3. Disability

A. Current Assumptions

All Municipal, Police and Fire Employees

Current assumptions for all Municipal, Police and Fire employees are based on age. The rates are set to zero to reflect retirement eligibility at age 60 and above for all Municipal employees and at age 55 and above for all Police and Fire employees. This is done because the benefits for retirement and disability are equal.

B. Experience

All Municipal, Police and Fire Employees

The study shows that the actual number of participants becoming disabled for the Police and Fire Divisions was higher than expected. The actual number of male participants becoming disabled for the Municipal Division was less than expected. The actual number of female participants becoming disabled for the Municipal Division was greater than expected at later ages.

C. Alternative

All Municipal, Police and Fire Employees

We recommend increasing the assumptions for Police and Fire Division Plans and the females in the Municipal Plan except for a decrease at ages 55 - 59. We also recommend a slight decrease in assumptions for the males in the Municipal Plan.

D. Results

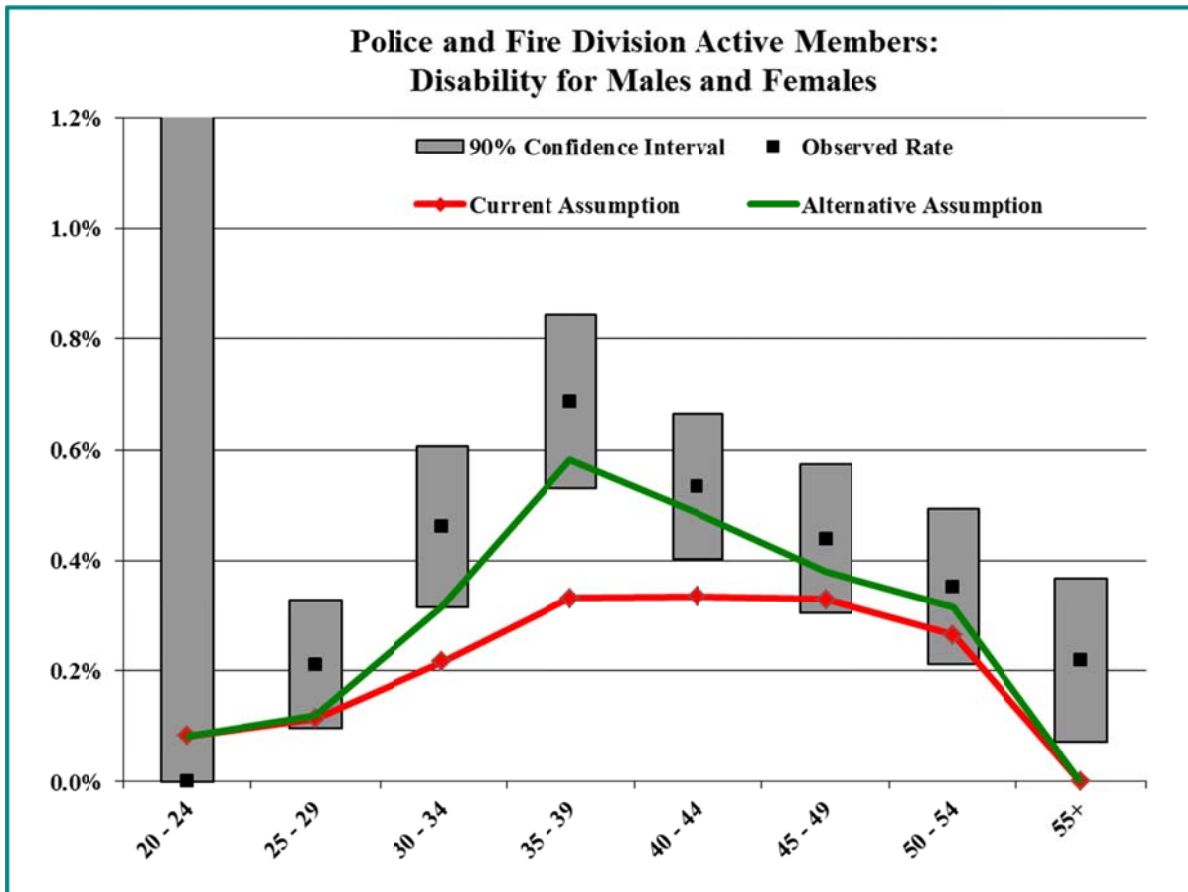
The following tables and graphs compare three things; the number of people eligible to become disabled, the number of people expected to become disabled based on the current assumptions, and the number of people expected to become disabled based on the alternative assumptions. The alternative assumptions bring the ratios closer to one, which implies the number of people we expect to become disabled is closer to the actual number of people who were disabled. The alternative assumptions bring the rates either within the confidence intervals or closer to the confidence intervals on the graphs.

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**Table III - 10
Police and Fire Division Active Members
Disability for Males and Females**

Age	Exposed	Total Actual Disabilities	Expected Disabilities	Alternative Disabilities	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual	Ratio: Actual
								over Expected	over Alternative
20 - 24	1,198	0	1	1	0.00%	0.08%	0.08%	0%	0%
25 - 29	4,249	9	5	5	0.21%	0.11%	0.12%	180%	178%
30 - 34	5,855	27	13	19	0.46%	0.22%	0.32%	208%	146%
35 - 39	7,573	52	25	44	0.69%	0.33%	0.58%	208%	118%
40 - 44	8,426	45	28	41	0.53%	0.33%	0.48%	161%	110%
45 - 49	6,599	29	22	25	0.44%	0.33%	0.38%	132%	116%
50 - 54	4,825	17	13	15	0.35%	0.27%	0.32%	131%	112%
55+	2,733	6	0	0	0.22%	0.00%	0.00%	0%	0%
Total	41,458	185	107	150	0.45%	0.26%	0.36%	173%	124%

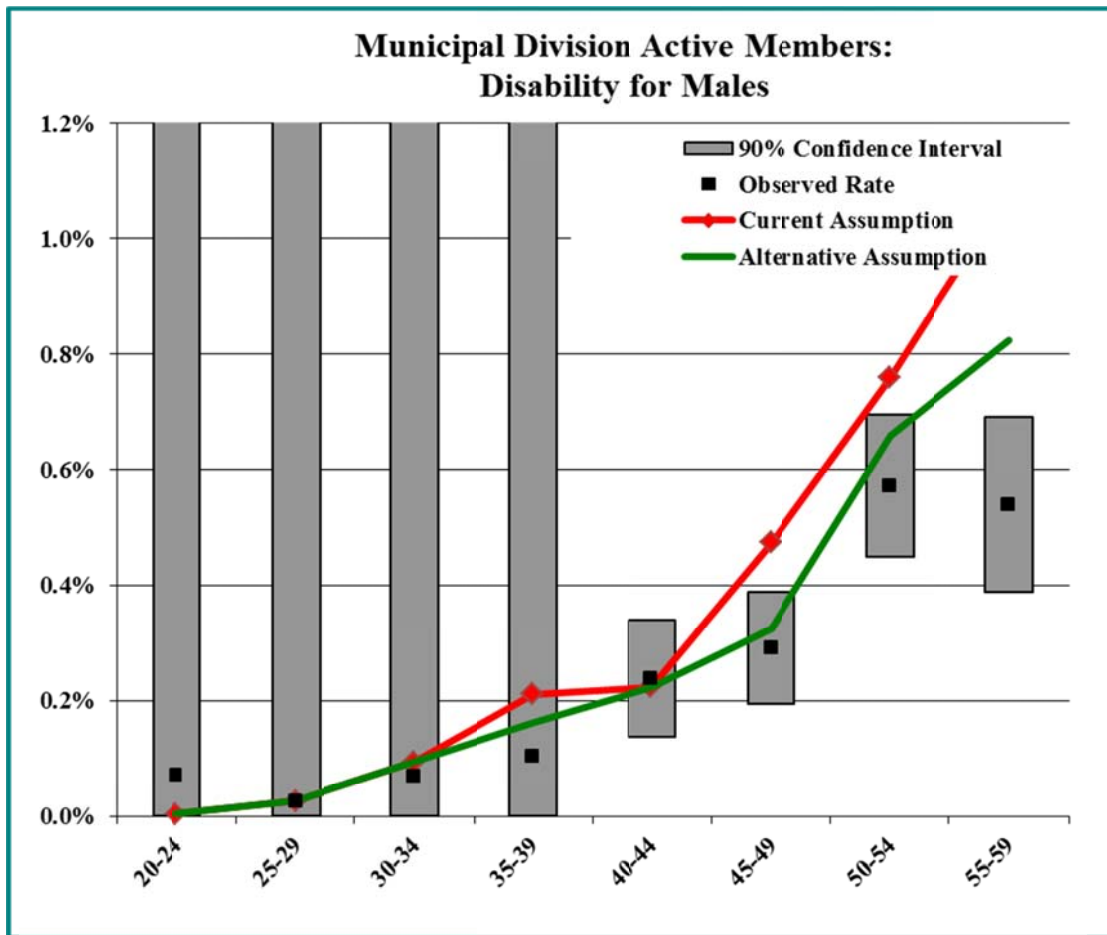


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**Table III - 11
Municipal Division Active Members
Disability for Males**

Age	Exposed	Total Actual Disabilities	Expected Disabilities	Alternative Disabilities	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	73	0	0	0	0.00%	0.00%	0.00%	0%	0%
20-24	1,419	1	0	0	0.07%	0.00%	0.00%	0%	0%
25-29	3,911	1	1	1	0.03%	0.03%	0.03%	100%	97%
30-34	4,320	3	4	4	0.07%	0.09%	0.09%	75%	74%
35-39	4,840	5	10	8	0.10%	0.21%	0.16%	50%	64%
40-44	6,301	15	14	14	0.24%	0.22%	0.22%	107%	107%
45-49	8,242	24	39	27	0.29%	0.47%	0.32%	62%	90%
50-54	10,120	58	77	67	0.57%	0.76%	0.66%	75%	87%
55-59	6,298	34	68	52	0.54%	1.08%	0.82%	50%	66%
Total	45,524	141	213	172	0.31%	0.47%	0.38%	66%	82%

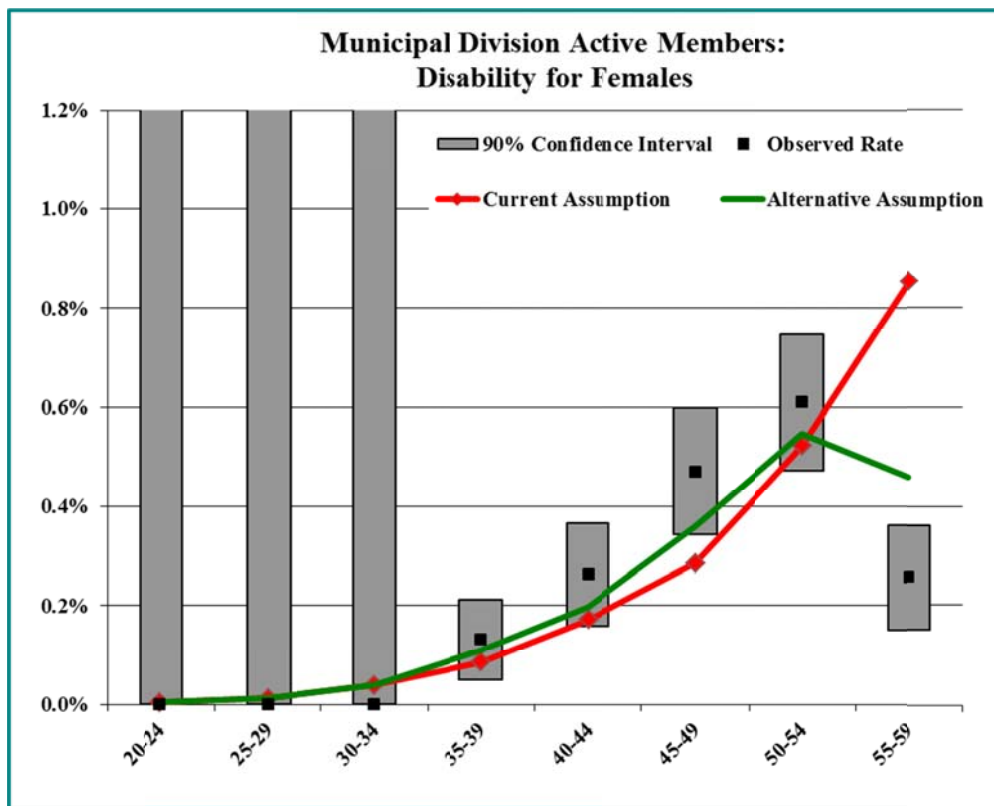


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**Table III - 12
Municipal Division Active Members
Disability for Females**

Age	Exposed	Total Actual Disabilities	Expected Disabilities	Alternative Disabilities	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	91	0	0	0	0.00%	0.00%	0.00%	0%	0%
20-24	1,170	0	0	0	0.00%	0.00%	0.00%	0%	0%
25-29	4,083	0	1	1	0.00%	0.01%	0.01%	0%	0%
30-34	5,171	0	2	2	0.00%	0.04%	0.04%	0%	0%
35-39	5,373	7	5	6	0.13%	0.08%	0.11%	140%	119%
40-44	6,491	17	11	13	0.26%	0.17%	0.20%	155%	133%
45-49	7,863	37	22	28	0.47%	0.28%	0.36%	168%	131%
50-54	8,696	53	45	48	0.61%	0.52%	0.55%	118%	111%
55-59	6,238	16	53	29	0.26%	0.85%	0.46%	30%	56%
Total	45,176	130	139	126	0.29%	0.31%	0.28%	94%	103%



SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

4. Mortality

A. Current Assumptions

All Municipal, Police and Fire Employees Active Lives

For all males the standard RP 2000 mortality table is used. For the Municipal females this table is used and set back five years, and the Police and Fire females use this table set forward three years.

All Municipal, Police and Fire Retired Healthy Lives

All Municipal healthy retirees use the RP 2000 Healthy Combined table, for both male and females.

The RP 2000 Healthy table set forward one year is used for Police and Fire Division. The RP 2000 Healthy Table set forward two years for all females, and also for Municipal males.

All Municipal, Police and Fire Retired Disabled Lives

The RP 2000 Healthy Combined table is used for both Police and Fire Divisions males and females, with a 30% adjustment factor to increase the mortality rates.

The RP 2000 Disabled Mortality table is used with a negative five-percent adjustment factor to decrease the mortality rates for males and females for the Municipal Division.

B. Experience

All Municipal, Police and Fire Employees Active Lives

Deaths among active lives are typically small and may not provide meaningful statistics on pre-retirement mortality in a five-year period broken out between males and females. However, for the Municipal Division, there were about 50,000 exposures for each gender which provides a large enough sampling to analyze each group separately. The actual mortality rates were less than the expected for both groups.

For the Police and Fire Divisions, the exposures were about 33,000 for males and only 8,000 for females. While the male group has a more sizable sample and is sufficient to complete analysis on the mortality rates, the female population is smaller. Nevertheless, both groups had lower mortality rates than expected.

Due to the lower death rates for the active females, for each division (Municipal Division or the Police and Fire Division) having similar modifications to the RP 2000 tables for the active male

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and female participants is reasonable if the analysis for both genders supports these similar modifications.

All Municipal, Police and Fire Retired Healthy Lives

Mortality for retirees and beneficiaries gives us a larger group to analyze actual versus expected experience. The tables in the next section, split by male and females, show actual and expected experience among members for retirees and beneficiaries combined. The actual mortality among retirees and beneficiaries (male and female) for Municipal, Police and Fire members is lower than expected.

All Municipal, Police and Fire Retired Disabled Lives

Mortality for disabled lives gives us an even smaller group to analyze actual versus expected experience. However, based upon the data, the actual mortality among disabled lives (male and female) for both Municipal and Police and Fire members was lower than expected.

C. Alternatives

All Municipal, Police and Fire Employees Active Lives

The active mortality measurement is too small statistically to create an entirely new mortality table. However, the data is large enough to use a current mortality table and adjust accordingly to the current mortality experience. We recommend continued use of the active mortality to the Society of Actuaries recently published RP 2000 table but modify the tables for expected longevity improvements.

The Municipal tables would have a 15-year mortality improvement projection (based upon the standard mortality improvement Scale AA table) applied to the standard RP 2000 mortality table, with a five-year set back. By applying the five-year set back, we are applying the mortality assumption for a person five years younger. For example, a 40 year old will have the assumed mortality rate as a 35 year old. This mortality improvement projection builds in the current improvements to the mortality as well as some expected future mortality improvements.

The Police and Fire Division tables would have a ten-year mortality improvement projection (using the same scale improvement table) applied to the standard RP 2000 mortality table. The proposed experience for all Municipal and Police and Fire active employees is shown in the next section.

All Municipal, Police and Fire Retired Healthy Lives

Because the current mortality assumptions are higher than actual experience, we provide alternative updated mortality tables with projections of future improvement and changes to match experience with the underlying national tables through the use of the setback/(forward) assumptions. The mortality rates for healthy lives for the Police and Fire Divisions versus the

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Municipal Division were relatively similar. While the mortality study for each division and gender was completed individually, ultimately the same table is being suggested for all healthy retirees. We suggest that the assumption for all Municipal and Police and Fire Division healthy retirees use the RP 2000 Healthy Combined table projected with mortality improvements for five years with a one-year set forward, for both male and females. By setting forward the table one year, a participant's mortality assumption will coincide with the mortality rate of a person one year older.

Below are the graphs for Municipal and Police and Fire members (male and female) that show how the proposed tables are more in line with actual experience.

All Municipal, Police and Fire Retired Disabled Lives

For the Police and Fire Divisions males and females, the 30% adjustment factor to increase the mortality rates for the RP 2000 mortality table appears to be under estimating the mortality rate. By applying a higher adjustment factor of 40% and in addition applying five years of projected mortality improvements, the assumptions are more in-line with the actual number of deaths.

For the Municipal disabled retirees, we recommend the RP 2000 Disabled Mortality tables with a 5% adjustment down and a ten-year mortality improvement projection applied to this table.

D. Results

The following tables and graphs compare three things; the number of people exposed to the mortality assumption, the number of people expected to die based on the current assumptions, and the number of people expected to die based on the alternative assumptions. As you can see, the alternative assumptions bring the ratios closer to 100% of the actual experience for the active and inactive mortality review.

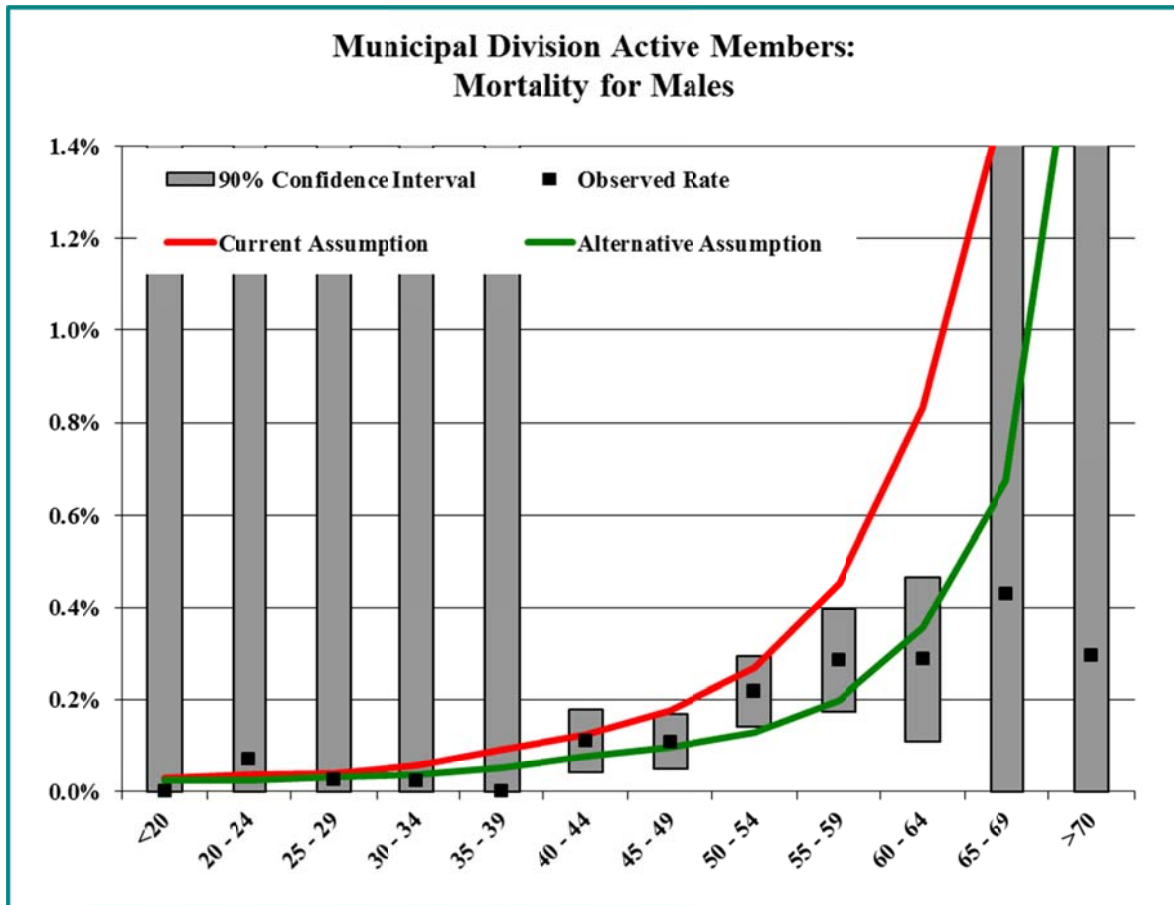
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Active Mortality Analysis

**Table III - 13
Municipal Division Active Members
Mortality for Males**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	73	0	0	0	0.0%	0.0%	0.0%	0%	0%
20 - 24	1,419	1	1	0	0.1%	0.0%	0.0%	191%	279%
25 - 29	3,911	1	2	1	0.0%	0.0%	0.0%	66%	77%
30 - 34	4,320	1	2	2	0.0%	0.1%	0.0%	41%	64%
35 - 39	4,840	0	4	3	0.0%	0.1%	0.1%	0%	0%
40 - 44	6,301	7	8	5	0.1%	0.1%	0.1%	90%	143%
45 - 49	8,242	9	14	8	0.1%	0.2%	0.1%	62%	111%
50 - 54	10,120	22	27	13	0.2%	0.3%	0.1%	81%	167%
55 - 59	6,298	18	29	13	0.3%	0.5%	0.2%	63%	144%
60 - 64	2,433	7	20	9	0.3%	0.8%	0.4%	35%	81%
65 - 69	698	3	11	5	0.4%	1.5%	0.7%	28%	64%
>70	339	1	13	7	0.3%	3.9%	1.9%	7%	15%
Total	48,994	70	131	64	0.1%	0.3%	0.1%	53%	109%

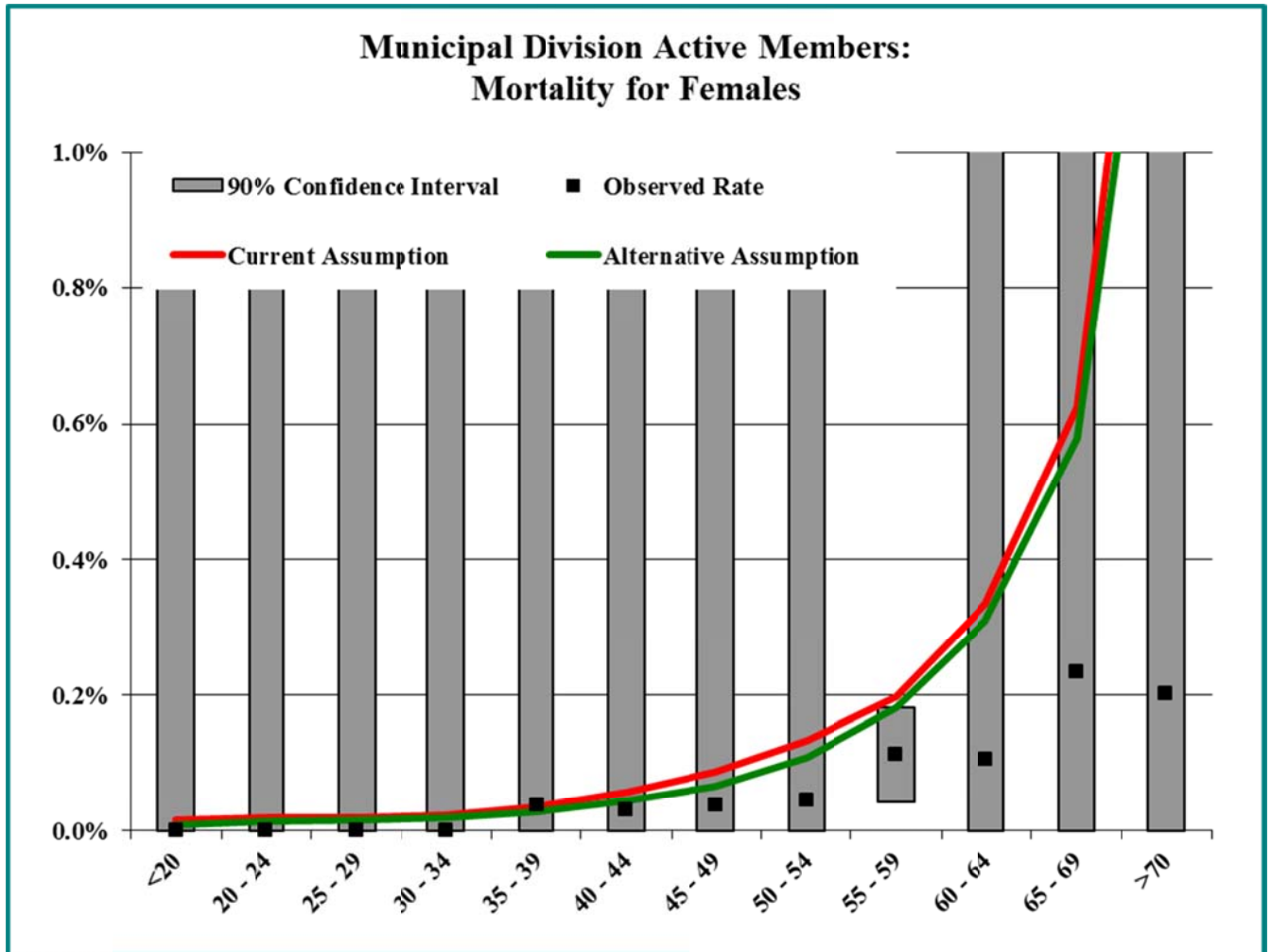


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 14
Municipal Division Active Members
Mortality for Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	148	0	0	0	0.0%	0.0%	0.0%	0%	0%
20 - 24	1,170	0	0	0	0.0%	0.0%	0.0%	0%	0%
25 - 29	4,083	0	1	1	0.0%	0.0%	0.0%	0%	0%
30 - 34	5,171	0	1	1	0.0%	0.0%	0.0%	0%	0%
35 - 39	5,373	2	2	2	0.0%	0.0%	0.0%	105%	129%
40 - 44	6,491	2	4	3	0.0%	0.1%	0.0%	55%	69%
45 - 49	7,863	3	7	5	0.0%	0.1%	0.1%	44%	58%
50 - 54	8,696	4	12	9	0.0%	0.1%	0.1%	34%	42%
55 - 59	6,238	7	12	11	0.1%	0.2%	0.2%	57%	62%
60 - 64	2,830	3	9	9	0.1%	0.3%	0.3%	32%	34%
65 - 69	855	2	5	5	0.2%	0.6%	0.6%	37%	40%
>70	495	1	8	8	0.2%	1.7%	1.5%	12%	13%
Total	49,413	24	62	54	0.0%	0.1%	0.1%	39%	45%

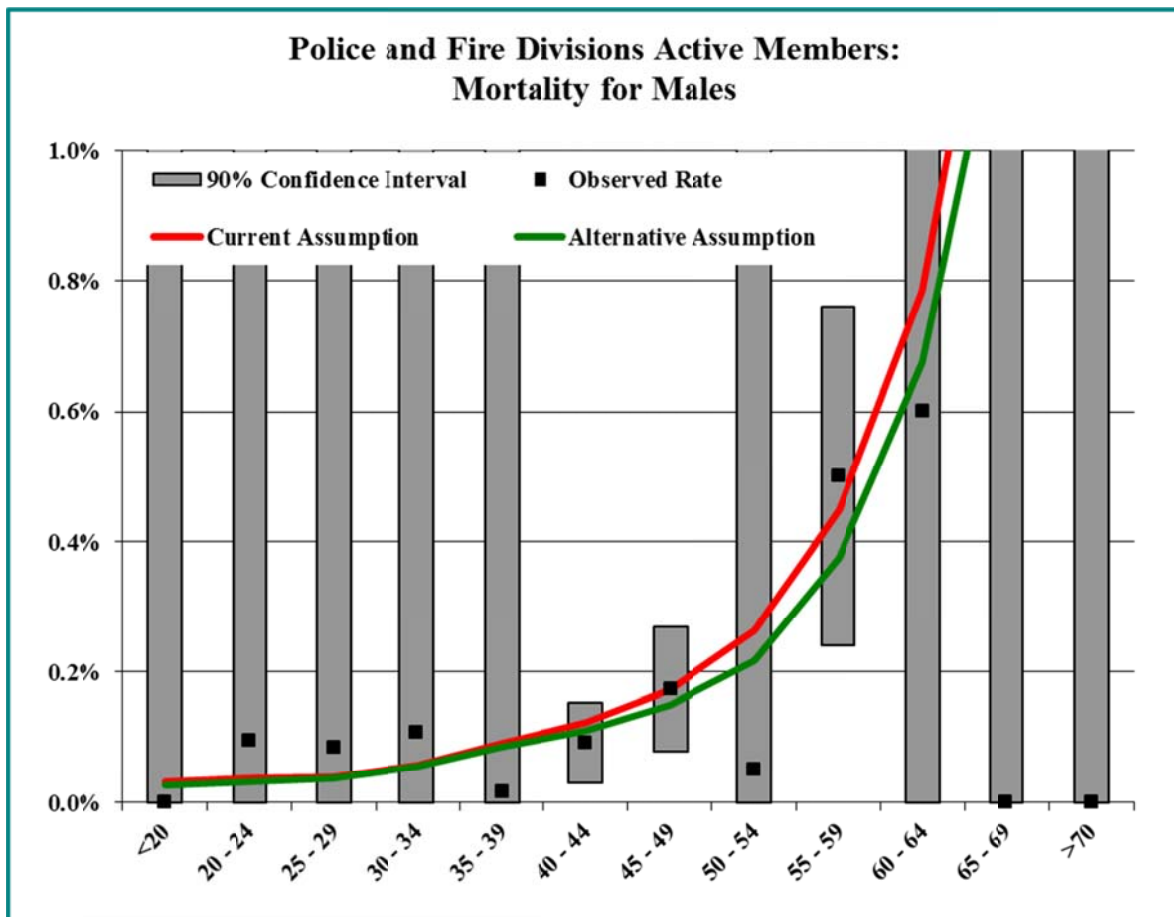


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 15
Police and Fire Divisions Active Members
Mortality for Males**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	3	0	0	0	0.0%	0.0%	0.0%	0%	0%
20 - 24	1,054	1	0	0	0.1%	0.0%	0.0%	256%	297%
25 - 29	3,576	3	1	1	0.1%	0.0%	0.0%	215%	229%
30 - 34	4,676	5	3	3	0.1%	0.1%	0.1%	187%	196%
35 - 39	5,885	1	5	5	0.0%	0.1%	0.1%	19%	20%
40 - 44	6,584	6	8	7	0.1%	0.1%	0.1%	75%	83%
45 - 49	5,190	9	9	8	0.2%	0.2%	0.1%	100%	116%
50 - 54	3,979	2	10	9	0.1%	0.3%	0.2%	19%	23%
55 - 59	1,995	10	9	8	0.5%	0.4%	0.4%	112%	133%
60 - 64	333	2	3	2	0.6%	0.8%	0.7%	76%	89%
65 - 69	18	0	0	0	0.0%	1.5%	1.3%	0%	0%
>70	4	0	0	0	0.0%	2.6%	2.2%	0%	0%
Total	33,297	39	49	43	0.1%	0.1%	0.1%	79%	91%

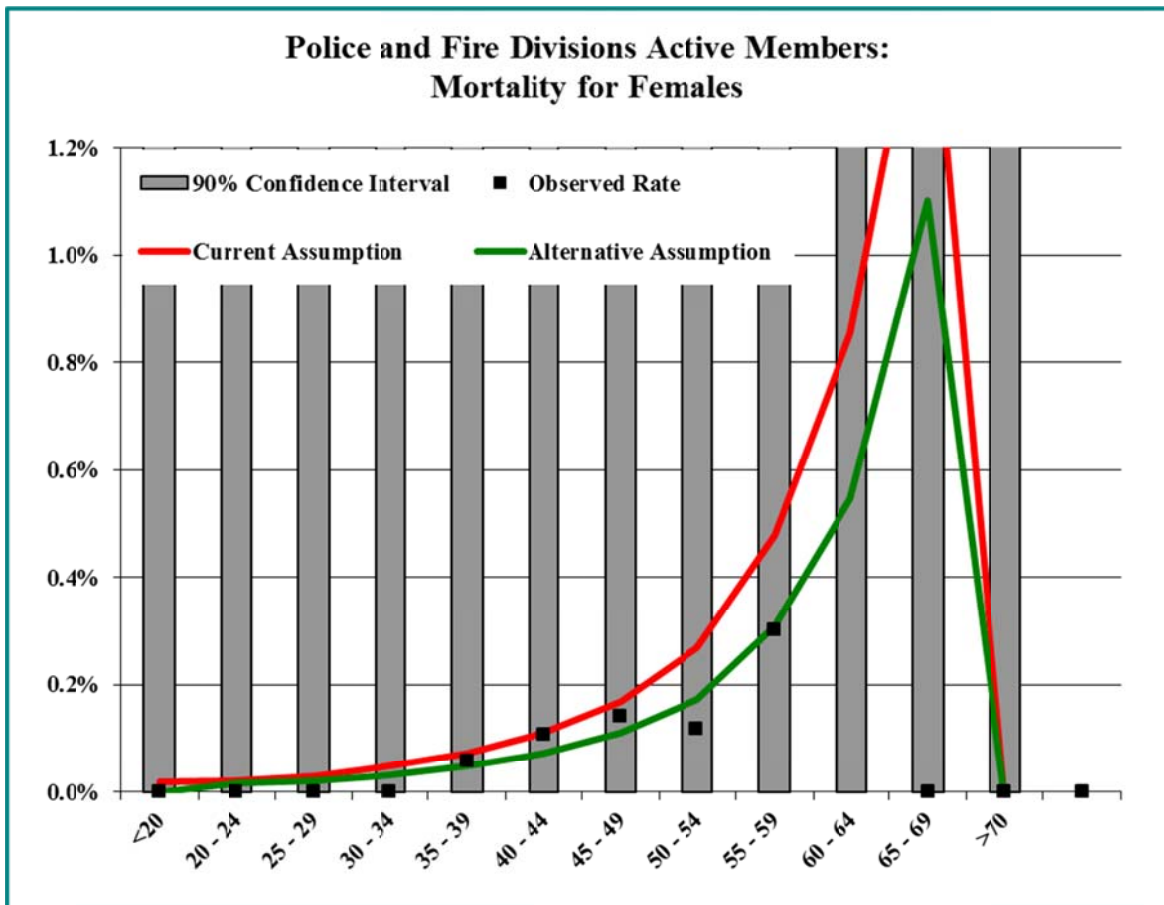


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 16
Police and Fire Divisions Active Members
Mortality for Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<20	3	0	0	0	0.0%	0.0%	0.0%	0%	0%
20 - 24	144	0	0	0	0.0%	0.0%	0.0%	0%	0%
25 - 29	673	0	0	0	0.0%	0.0%	0.0%	0%	0%
30 - 34	1,179	0	1	0	0.0%	0.0%	0.0%	0%	0%
35 - 39	1,688	1	1	1	0.1%	0.1%	0.0%	82%	120%
40 - 44	1,842	2	2	1	0.1%	0.1%	0.1%	97%	148%
45 - 49	1,409	2	2	2	0.1%	0.2%	0.1%	84%	129%
50 - 54	846	1	2	1	0.1%	0.3%	0.2%	44%	69%
55 - 59	331	1	2	1	0.3%	0.5%	0.3%	63%	98%
60 - 64	48	1	0	0	2.1%	0.9%	0.5%	244%	381%
65 - 69	4	0	0	0	0.0%	1.6%	1.1%	0%	0%
>70	0	0	0	0	0.0%	0.0%	0.0%	0%	0%
Total	8,167	8	11	7	0.1%	0.1%	0.1%	74%	113%



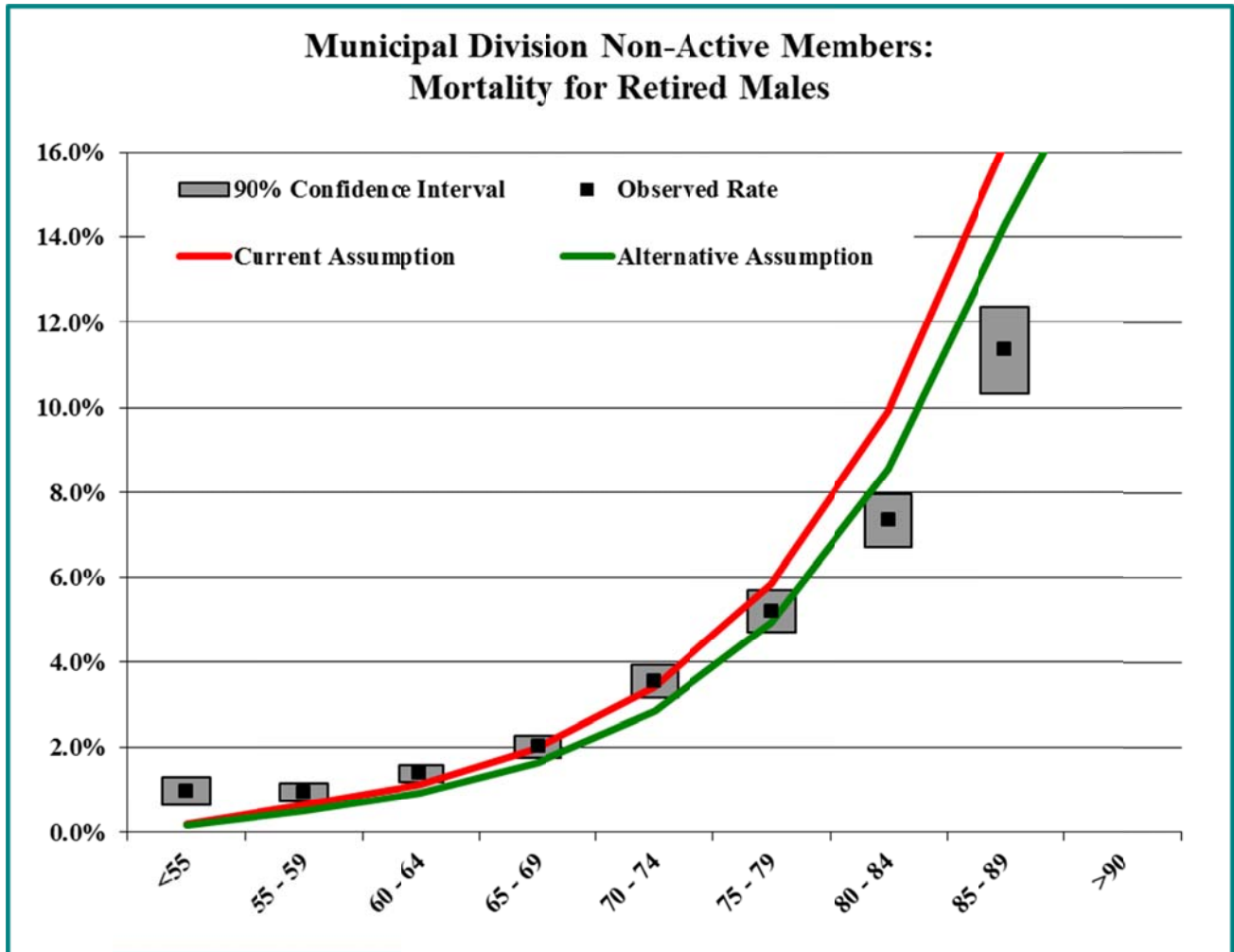
CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

Non-Active Mortality Analysis – Retired Participants

Table III - 17
Municipal Division Non-Active Members
Mortality for Retired Males

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<55	2446	24	4	4	1.0%	0.2%	0.2%	536%	636%
55 - 59	5,431	51	35	28	0.9%	0.6%	0.5%	146%	180%
60 - 64	10,144	142	117	96	1.4%	1.1%	0.9%	122%	149%
65 - 69	7,918	160	157	132	2.0%	2.0%	1.7%	102%	122%
70 - 74	6,405	227	219	182	3.5%	3.4%	2.8%	104%	125%
75 - 79	5,487	285	320	270	5.2%	5.8%	4.9%	89%	106%
80 - 84	4,600	337	456	393	7.3%	9.9%	8.5%	74%	86%
85 - 89	2,548	289	414	364	11.3%	16.3%	14.3%	70%	79%
>90	1,186	240	257	232	20.2%	21.7%	19.6%	93%	103%
Total	46,165	1,755	1,978	1,701	3.8%	4.3%	3.7%	89%	103%

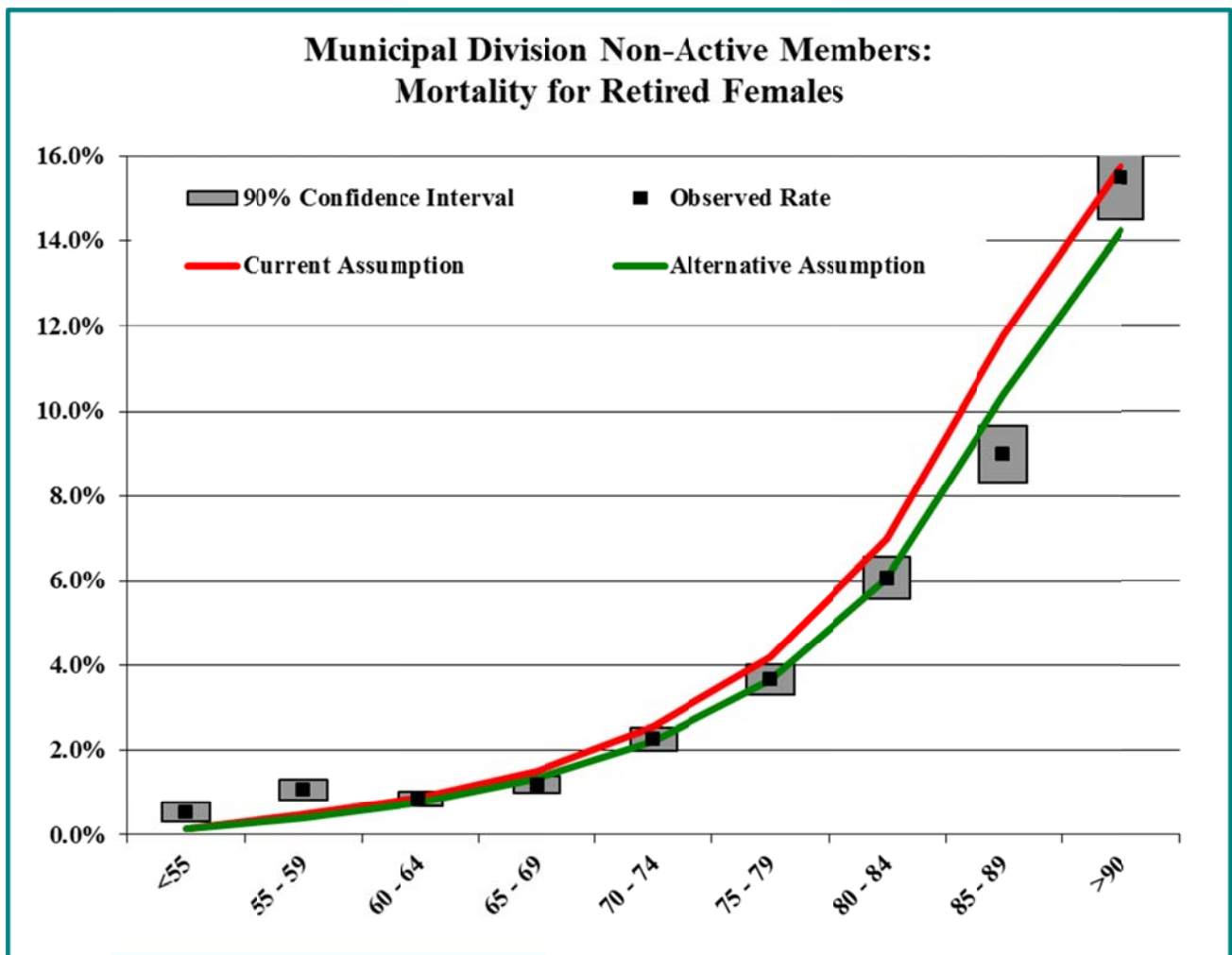


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 18
Municipal Division Non-Active Members
Mortality for Retired Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<55	2,990	16	4	4	0.5%	0.1%	0.1%	358%	423%
55 - 59	4,978	53	24	20	1.1%	0.5%	0.4%	223%	261%
60 - 64	8,689	74	76	66	0.9%	0.9%	0.8%	97%	112%
65 - 69	8,545	102	129	113	1.2%	1.5%	1.3%	79%	90%
70 - 74	8,018	181	204	179	2.3%	2.5%	2.2%	89%	101%
75 - 79	7,546	276	316	276	3.7%	4.2%	3.7%	87%	100%
80 - 84	6,694	406	467	406	6.1%	7.0%	6.1%	87%	100%
85 - 89	5,038	453	594	524	9.0%	11.8%	10.4%	76%	86%
>90	3,648	565	575	520	15.5%	15.8%	14.2%	98%	109%
Total	56,146	2,126	2,391	2,108	3.8%	4.3%	3.8%	89%	101%

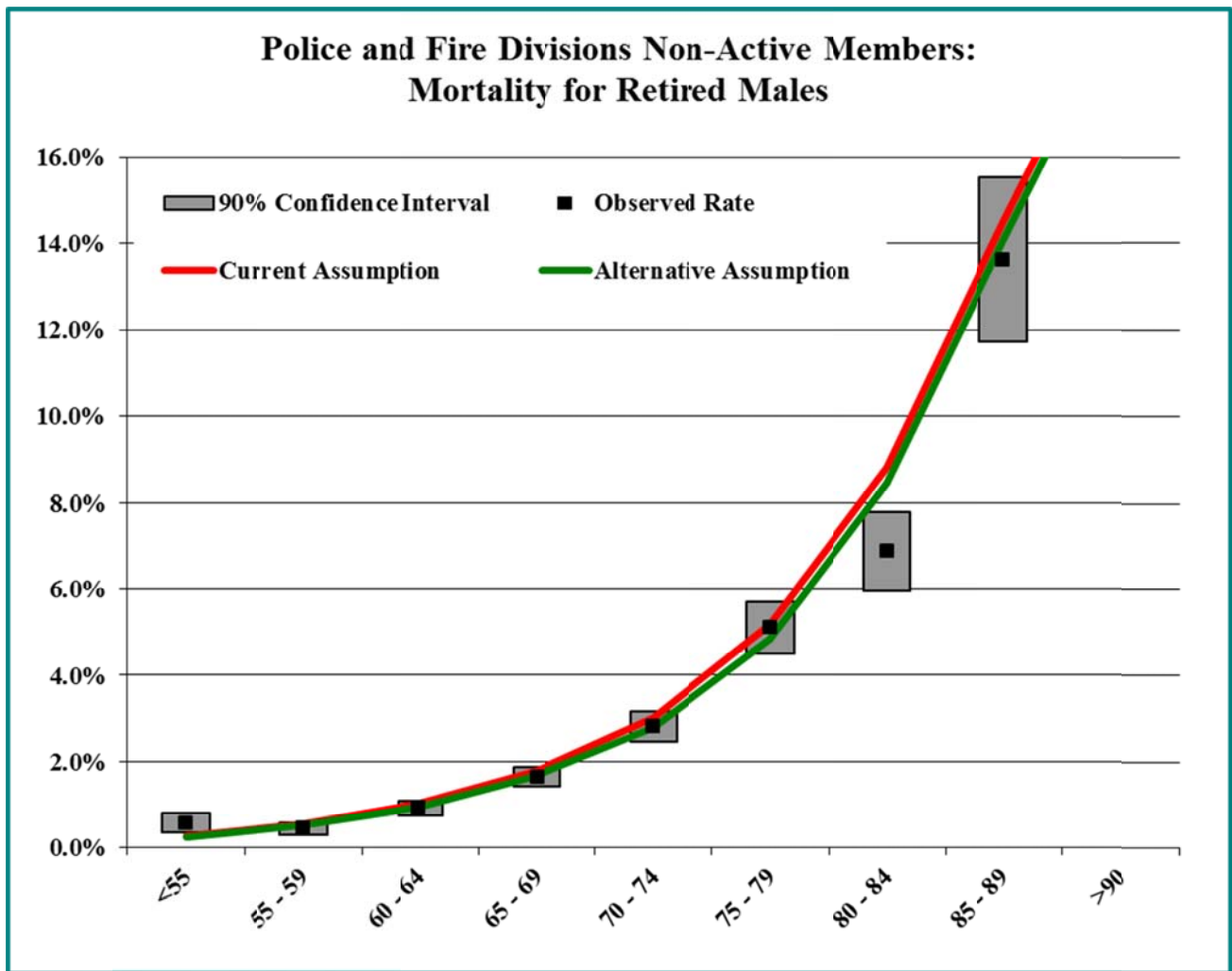


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 19
Police and Fire Divisions Non-Active Members
Mortality for Retired Males**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<55	3153	18	8	7	0.6%	0.3%	0.2%	224%	245%
55 - 59	5,442	24	30	28	0.4%	0.6%	0.5%	79%	86%
60 - 64	9,417	86	96	89	0.9%	1.0%	0.9%	90%	97%
65 - 69	8,857	145	159	148	1.6%	1.8%	1.7%	91%	98%
70 - 74	5,872	164	177	164	2.8%	3.0%	2.8%	93%	100%
75 - 79	3,489	178	180	169	5.1%	5.2%	4.8%	99%	105%
80 - 84	2,126	146	188	180	6.9%	8.8%	8.5%	78%	81%
85 - 89	873	119	127	123	13.6%	14.5%	14.1%	94%	97%
>90	409	96	82	80	23.5%	20.0%	19.6%	117%	120%
Total	39,638	976	1,046	988	2.5%	2.6%	2.5%	93%	99%

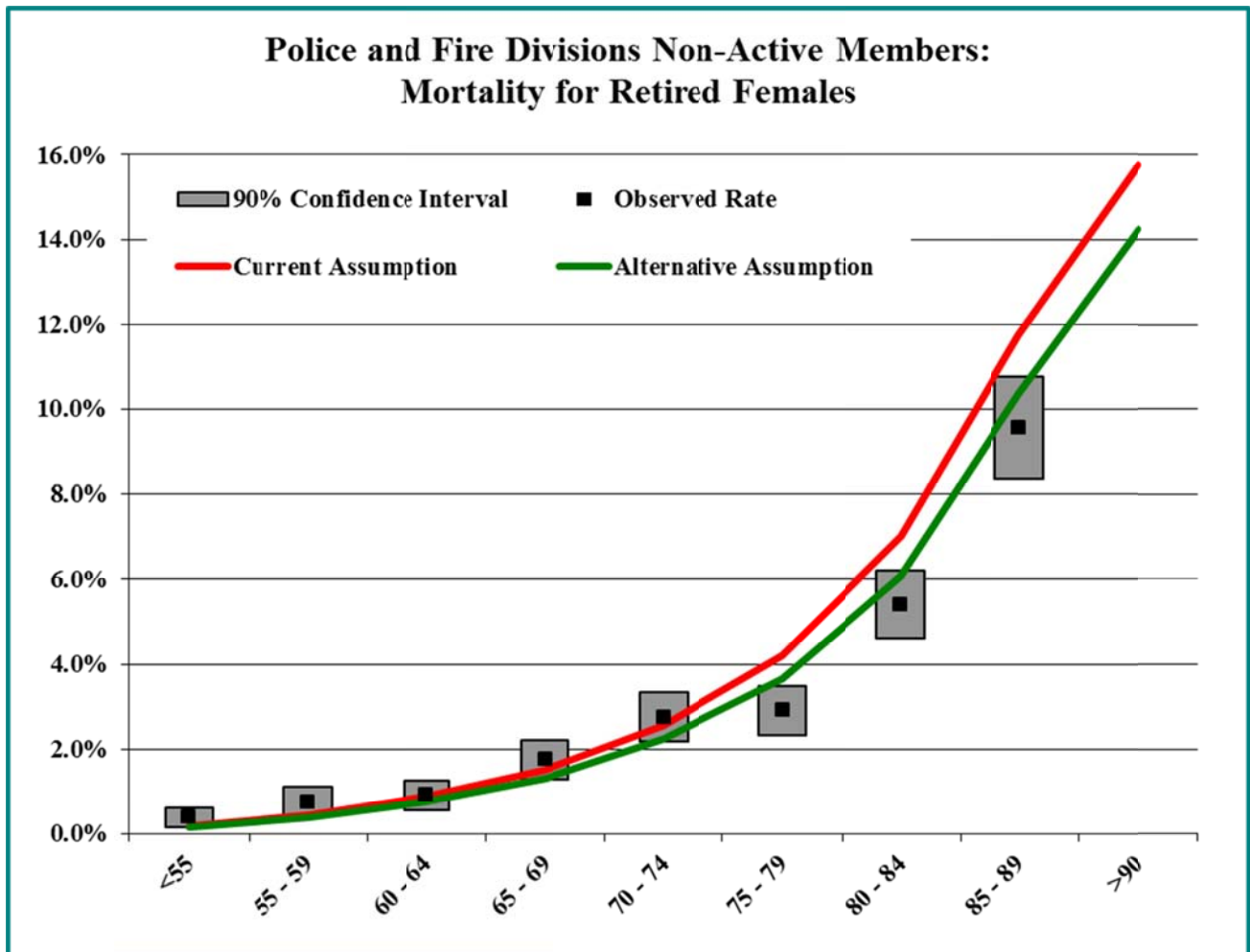


**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 20
Police and Fire Divisions Non-Active Members
Mortality for Retired Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<55	1998	8	4	3	0.4%	0.2%	0.2%	219%	260%
55 - 59	1,714	13	8	7	0.8%	0.5%	0.4%	165%	193%
60 - 64	2,078	19	18	16	0.9%	0.9%	0.8%	104%	121%
65 - 69	2,224	39	34	30	1.8%	1.5%	1.3%	116%	132%
70 - 74	2,138	59	55	48	2.8%	2.6%	2.2%	108%	123%
75 - 79	2,201	64	93	81	2.9%	4.2%	3.7%	69%	79%
80 - 84	2,128	115	149	129	5.4%	7.0%	6.1%	77%	89%
85 - 89	1,600	153	188	166	9.6%	11.7%	10.4%	81%	92%
>90	1,213	240	191	173	19.8%	15.8%	14.2%	126%	139%
Total	17,294	710	739	652	4.1%	4.3%	3.8%	96%	109%



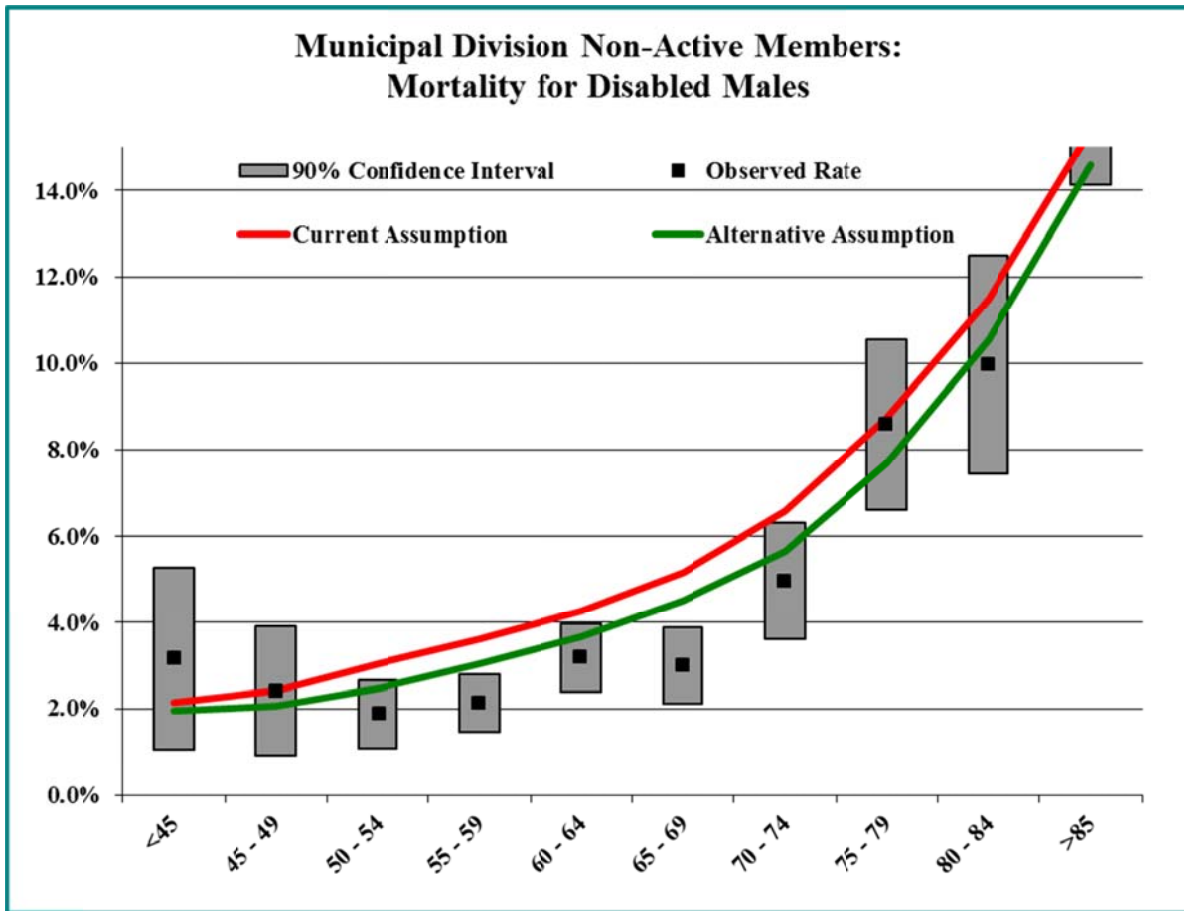
Non-Active Mortality Analysis – Disabled Participants

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

Table III - 21
Municipal Division Non-Active Members
Mortality for Disabled Males

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<45	189	6	4	4	3.2%	2.1%	2.0%	148%	162%
45 - 49	289	7	7	6	2.4%	2.4%	2.1%	99%	116%
50 - 54	795	15	24	20	1.9%	3.0%	2.5%	62%	76%
55 - 59	1,266	27	46	39	2.1%	3.6%	3.1%	59%	70%
60 - 64	1,346	43	57	49	3.2%	4.3%	3.7%	75%	87%
65 - 69	999	30	52	45	3.0%	5.2%	4.5%	58%	67%
70 - 74	705	35	46	40	5.0%	6.6%	5.6%	76%	88%
75 - 79	548	47	48	42	8.6%	8.7%	7.7%	98%	112%
80 - 84	381	38	44	40	10.0%	11.5%	10.6%	87%	94%
>85	254	46	39	37	18.1%	15.4%	14.6%	118%	124%
Total	6,772	294	367	322	4.3%	5.4%	4.8%	80%	91%

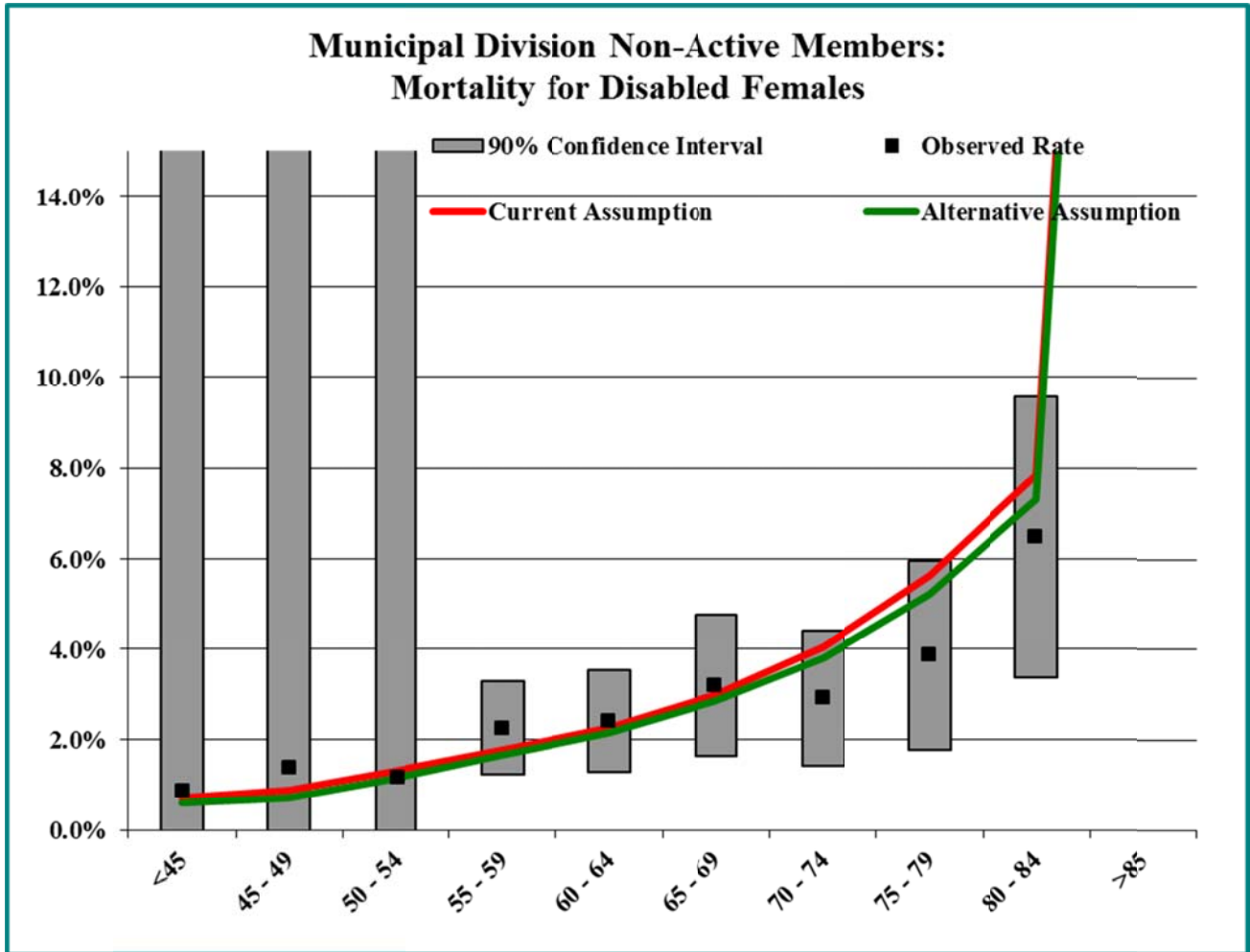


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 22
Municipal Division Non-Active Members
Mortality for Disabled Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<45	115	1	1	1	0.9%	0.7%	0.6%	123%	142%
45 - 49	218	3	2	2	1.4%	0.9%	0.7%	158%	188%
50 - 54	432	5	6	5	1.2%	1.3%	1.2%	88%	100%
55 - 59	575	13	10	10	2.3%	1.8%	1.7%	128%	135%
60 - 64	499	12	11	11	2.4%	2.3%	2.2%	106%	112%
65 - 69	344	11	10	10	3.2%	3.0%	2.9%	106%	112%
70 - 74	343	10	14	13	2.9%	4.0%	3.8%	72%	77%
75 - 79	233	9	13	12	3.9%	5.6%	5.2%	69%	74%
80 - 84	170	11	13	12	6.5%	7.8%	7.3%	82%	88%
>85	46	25	21	21	54.3%	46.4%	44.7%	117%	122%
Total	2,975	100	102	96	3.4%	3.4%	3.2%	98%	105%

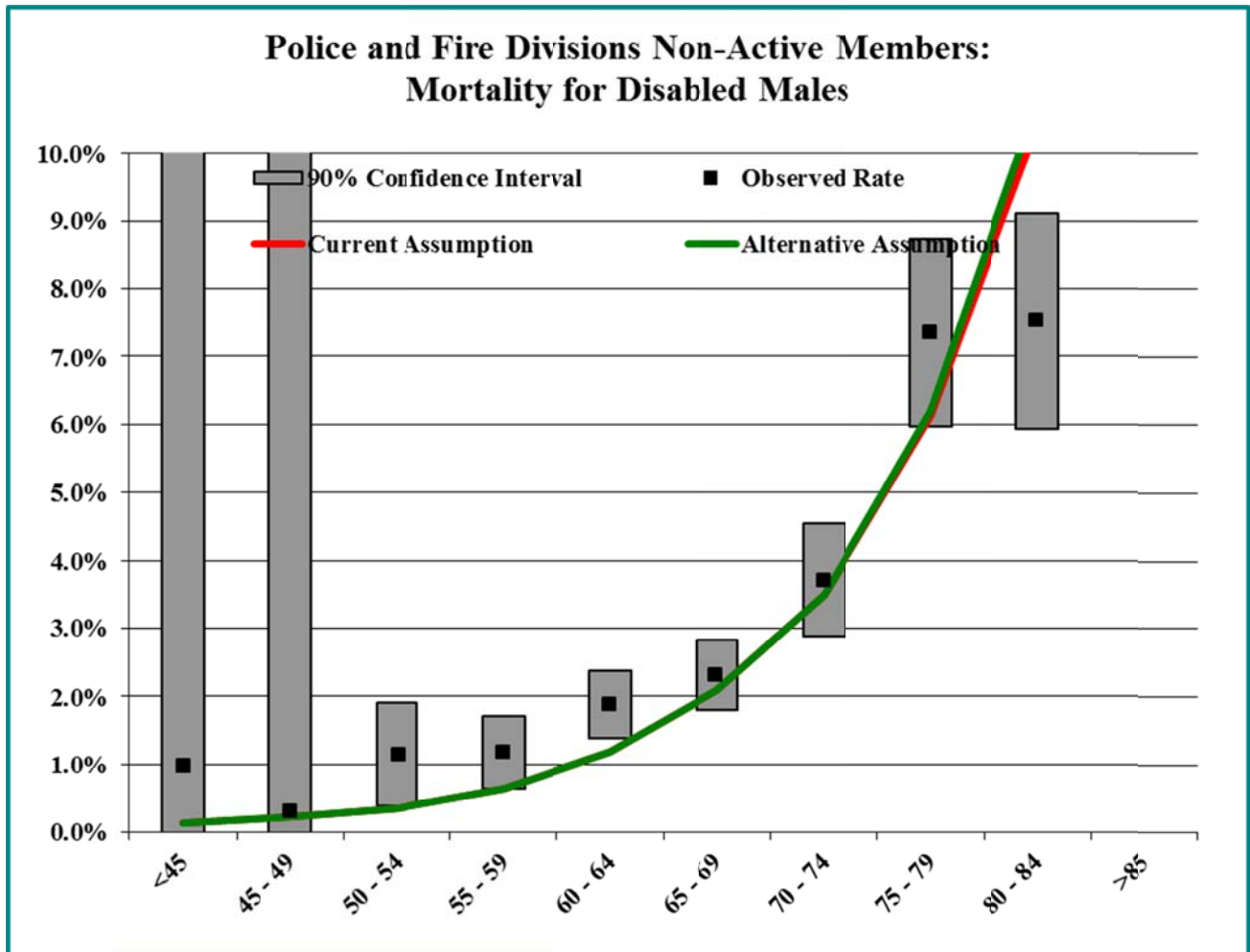


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 23
Police and Fire Divisions Non-Active Members
Mortality for Disabled Males**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<45	409	4	1	1	1.0%	0.1%	0.1%	713%	691%
45 - 49	320	1	1	1	0.3%	0.2%	0.2%	136%	136%
50 - 54	523	6	2	2	1.1%	0.4%	0.3%	323%	331%
55 - 59	1,102	13	7	7	1.2%	0.6%	0.6%	184%	186%
60 - 64	2,027	38	24	24	1.9%	1.2%	1.2%	159%	159%
65 - 69	2,332	54	49	49	2.3%	2.1%	2.1%	111%	111%
70 - 74	1,402	52	49	49	3.7%	3.5%	3.5%	106%	106%
75 - 79	966	71	59	60	7.3%	6.1%	6.2%	120%	119%
80 - 84	744	56	77	80	7.5%	10.4%	10.7%	72%	70%
>85	434	77	80	84	17.7%	18.5%	19.4%	96%	92%
Total	10,259	372	349	356	3.6%	3.4%	3.5%	107%	105%

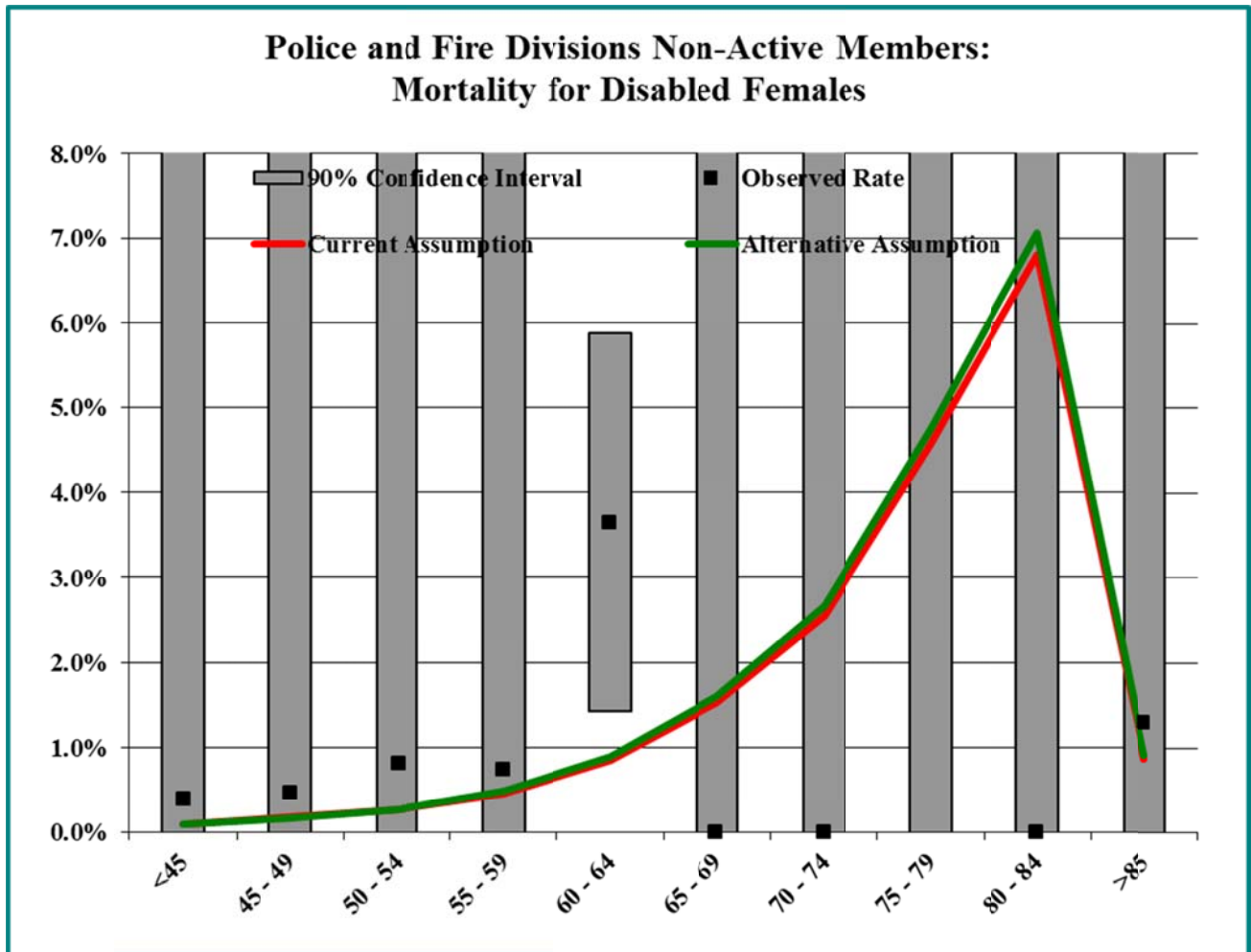


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**SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS**

**Table III - 24
Police and Fire Divisions Non-Active Members
Mortality for Disabled Females**

Age	Exposed	Total Actual Deaths	Expected Deaths	Alternative Deaths	Actual Rates	Expected Rates	Alternative Rates	Ratio: Actual over Expected	Ratio: Actual over Alternative
<45	253	1	0	0	0.4%	0.1%	0.1%	422%	421%
45 - 49	213	1	0	0	0.5%	0.2%	0.2%	267%	271%
50 - 54	245	2	1	1	0.8%	0.3%	0.3%	308%	306%
55 - 59	272	2	1	1	0.7%	0.5%	0.5%	161%	154%
60 - 64	192	7	2	2	3.6%	0.8%	0.9%	431%	410%
65 - 69	81	0	1	1	0.0%	1.5%	1.6%	0%	0%
70 - 74	20	0	1	1	0.0%	2.5%	2.7%	0%	0%
75 - 79	10	2	0	0	20.0%	4.6%	4.7%	437%	421%
80 - 84	5	0	0	0	0.0%	6.8%	7.1%	0%	0%
>85	77	1	1	1	1.3%	0.9%	0.9%	150%	141%
Total	1,368	16	7	8	1.2%	0.5%	0.6%	218%	210%



SECTION III
ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

5. Joint and Survivor Marriage Percentage

A. Current Assumptions

All Municipal and Police and Fire Employees

For pensioners under 50% J&S annuity with return of contributions option, 60% are assumed to be married. This assumption was analyzed for the 2013 valuation based upon data provided by the City as well as an improved understanding that many unmarried retirees elect this payment option,

B. Experience

All Municipal, Police and Fire Employees

The 36.6% of the deceased retirees that elected the 50% Joint and Survivor option had spouses upon their death. Assuming that slightly more than 50% of these deaths had spouses that deceased before the retiree, we are assuming that 60% of the retirees with this form of payment are married.

C. Alternative

All Municipal, Police and Fire Employees

There is no suggested alternative assumption.

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**APPENDIX A
CURRENT ACTUARIAL ASSUMPTIONS**

Appendix A contains additional tables to support the salary increase assumption with the five-year analysis.

Data Assumptions and Practices

In preparing our data, we relied, without audit, on information supplied by the City of Philadelphia Municipal Retirement System staff. This information includes, but is not limited to, plan provisions, employee data, and financial information. Our methodology for obtaining the data used for the valuation is based upon the following assumptions and practices:

- We exclude raw active records with dates of hire after the valuation date.
- We include terminated vested records in the valuation data, regardless of whether they have enough service for vesting.
- We delete terminated vested and retired records with values of zero in the benefit field.
- If a participant is found in multiple data files (e.g., both the active and retired data files), based on a match of both employee number and Social Security Number, we first attempt to identify the record with the most recent status change, and keep only that record. If it is not apparent which record is the most recent, we keep the record that generates the highest liability in our valuation system.
- If a participant is found multiple times in the same data file, based on a match of both employee number and Social Security Number, we keep the record that generates the highest liability in our valuation system.
- Valuation pay reflects a load of 4% of pay for police (stress pay) and firefighters (premium pay).
- The date of retirement for a terminated vested participant was set to the valuation date, if the given date was earlier.
- If the payment form field for pensioners is missing, we assume that 1967 Plan members receive a 50% J&S annuity with a return of contributions in excess of payments received upon death of the member, and we assume that Plan 87 members receive a life annuity, also with a return of contributions. However, if the pensioner is a beneficiary or survivor, we assume that they receive a life annuity only.
- For pensioners under the form of payment 50% J&S annuity with return of contributions, 60% are assumed to be married based upon data provided by the City. All other forms of payments are explicitly valued.
- Records with missing dates of birth have their data filled in based on the average for their plan.

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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- We assumed that all changes in participant data from last year to this year were valid unless indicated otherwise by System staff.
- DROP participants are assumed to begin payments immediately
- Service-connected disability benefits are increased by 2.9%
- For Municipal Plan 1967 participants pay was assumed to be below the Social Security Taxable Wage Base for purposes of determining the aggregate member contribution amount.

A. Actuarial Assumptions

1. Investment Return Assumption

7.85% compounded annually, net of expenses.

2. Salary Increase Rate

Age	Salary Increase Rate
<20	21.00%
20-24	12.50%
25-29	7.75%
30-34	5.50%
35-39	4.75%
40-44	4.50%
45-49	3.75%
50-54	3.75%
55-59	3.75%
60-64	3.75%
65+	3.75%

3. Total Annual Payroll Growth

3.30% per year.

4. Administration Expense

Annual expected expenses included in this report are \$8,616,253, increasing by 3.3% per year.

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
EXPERIENCE STUDY RESULTS AND RECOMMENDATIONS
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**APPENDIX A
CURRENT ACTUARIAL ASSUMPTIONS**

5. Rates of Termination

Age	1967 Plan			Plan 87	
	Municipal		Uniformed	Municipal and Elected Officials	Uniformed
	Male	Female	Unisex	Unisex	Unisex
20	0.100000	0.105319	0.030000	0.260000	0.030000
25	0.086000	0.096000	0.037800	0.150000	0.037800
30	0.072000	0.071562	0.029900	0.105000	0.029900
35	0.045000	0.056170	0.025200	0.090000	0.025200
40	0.035000	0.039379	0.015400	0.090000	0.015400
45	0.030000	0.035597	0.010000	0.075000	0.010000
50	0.020000	0.022400	0.001600	0.065000	0.001600
55	0.000000	0.000000	0.001600	0.050000	0.001600

6. Rates of Disability

Age	Municipal and Elected Officials		Uniformed
	Male	Female	Unisex
20	0.000025	0.000043	0.000795
25	0.000070	0.000061	0.000870
30	0.000557	0.000263	0.001668
35	0.001514	0.000620	0.002918
40	0.001800	0.001314	0.003184
45	0.003840	0.002359	0.003334
50	0.007600	0.004285	0.002654
55	0.008680	0.007088	0.000000

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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CURRENT ACTUARIAL ASSUMPTIONS**

7. Rates of Pre-Retirement Mortality (RP 2000 with five-year set back for Municipal females, three-year set forward for Police and Fire females, no adjustment for males)

Age	Municipal and Elected Officials		Uniformed	
	Male	Female	Male	Female
20	0.000345	0.000170	0.000345	0.000197
25	0.000376	0.000191	0.000376	0.000235
30	0.000444	0.000207	0.000444	0.000394
35	0.000773	0.000264	0.000773	0.000598
40	0.001079	0.000475	0.001079	0.000937
45	0.001508	0.000706	0.001508	0.001434
50	0.002138	0.001124	0.002138	0.002207
55	0.003624	0.001676	0.003624	0.003923
60	0.006747	0.002717	0.006747	0.007648
65	0.012737	0.005055	0.012737	0.013445

8. Rates of Post-Retirement Mortality

For Police and Fire, we assume that mortality for healthy inactive lives will follow RP 2000 with a one-year set forward for males and a two-year set forward for females. For Municipal and Elected officials, we assume that mortality for healthy inactive lives will follow RP 2000 with a two-year set forward for both males and females.

9. Rates of Post-Disability Mortality

For Police and Fire, we assume that mortality for disabled retirees follows RP 2000 Healthy mortality with a 30% upwards adjustment. For Municipal and Elected officials, we assume that mortality for disabled retirees follows RP 2000 Disabled mortality with a 5% downward adjustment.

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**APPENDIX A
CURRENT ACTUARIAL ASSUMPTIONS**

10. Rates of Retirement

Rates of Service Retirement - 1967 Plan		
	Municipal	Uniformed
Age		
45-54	-	0.07
55	0.40	0.20
56	0.21	0.20
57-59	0.16	0.20
60	0.20	0.20
61	0.20	0.25
62	0.35	0.25
63-69	0.20	0.25
70 and up	1.00	1.00

Rates of Service Retirement - Plan 87				
	Municipal and Elected Officials		Uniformed	
Age	First Year Eligible	Subsequent Years	First Year Eligible	Subsequent Years
40-51	-	-	0.200	0.075
52	0.450	0.060	0.200	0.090
53	0.420	0.060	0.200	0.100
54	0.390	0.060	0.200	0.120
55	0.360	0.060	0.200	0.140
56	0.330	0.060	0.200	0.165
57	0.300	0.060	0.200	0.175
58	0.300	0.060	0.200	0.175
59	0.300	0.080	0.200	0.180
60	0.300	0.100	0.200	0.180
61	0.350	0.150	0.200	0.195
62	0.430	0.300	0.200	0.245
63	0.500	0.187	0.200	0.215
64	0.500	0.199	0.200	0.210
65	0.600	0.309	0.200	1.000
66	0.600	0.232	-	-
67	0.600	0.214	-	-
68	0.600	0.214	-	-
69	0.600	0.238	-	-
70	0.600	1.000	-	-

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CURRENT ACTUARIAL ASSUMPTIONS**

12. Family Composition

70% of active members and 60% of non-active members are assumed to be married for retirees with the 50% J&S with return on contribution form of payment only. Male spouses are assumed to be four years older than female spouses.

APPENDIX A
CURRENT ACTUARIAL ASSUMPTIONS

B. Actuarial Methods

1. Actuarial Funding Method

The Entry Age Normal actuarial funding method was used for active employees, whereby the normal cost is computed as the level annual percentage of pay required to fund the retirement benefits between each member's date of hire and assumed retirement. The actuarial liability is the difference between the present value of future benefits and the present value of future normal cost. The unfunded actuarial liability is the difference between the actuarial liability and the actuarial value of assets.

2. Funding Methods

City's Funding Policy:

The initial July 1, 1985 UAL is amortized over 34 years ending June 30, 2019, with payments increasing at 4% per year, the assumed payroll growth. Other changes in the actuarial liability are amortized in level-dollar payments and in accordance with Act 205 provisions for defining the MMO as follows:

- Actuarial gains and losses – 20 years beginning July 1, 2009. Prior to July 1, 2009, gains and losses were amortized over 15 years
- Assumption changes – 20 years
- Plan changes for active members – 20 years
- Plan changes for inactive members – ten years

MMO:

For the purposes of the MMO under Act 205 reflecting the fresh start amortization schedule, the July 1, 2009 UAL is "fresh started" to be amortized over 30 years ending June 30, 2039. This is a level dollar amortization of the UAL. All future amortization periods will follow the City's Funding Policy as outlined above. Possible contribution deferrals for FY 2010 permitted under Act 44 were not reflected within this report.

3. Asset Valuation Method

The actuarial value of assets (AVA) is determined using an adjusted market value. Under this method, a preliminary AVA is determined as the market value of assets on the valuation date, minus the existing balance of the Pension Adjustment Fund (PAF) rolled forward at the current year's market rate of return, minus a decreasing fraction (4/5, 3/5, 2/5, 1/5) of the investment gain or loss in each of the preceding four years for gains and losses prior to July 1, 2009. Beginning July 1, 2009, investment gains and losses are recognized over a ten-year period prospectively, creating the decreasing fraction to be (9/10, 8/10, 7/10, etc.). The gain or loss for a given year is the difference between the actual investment return (on a market-to-market basis) and the assumed investment return based on the market value of assets at the beginning of the year and actual cash flow. The AVA is adjusted, if necessary, to remain between 80% and 120% of the market value net of the PAF. The final AVA is determined by subtracting the additional transfer amount (if any) to the PAF.

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**APPENDIX B
ALTERNATIVE ACTUARIAL ASSUMPTIONS**

1. Investment Return Assumption

7.85% compounded annually, net of expenses.

2. Salary Increase Rate

Age	Salary Increase Rate
<20	20.00%
20-24	11.00%
25-29	7.00%
30-34	5.00%
35-39	4.25%
40-44	4.00%
45-49	3.50%
50-54	3.30%
55-59	3.00%
60-64	3.00%
65+	2.75%

3. Total Annual Payroll Growth

3.30% per year.

4. Administration Expense

Annual expected expenses included in this report are \$8,616,253, increasing by 3.3% per year.

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**APPENDIX B
ALTERNATIVE ACTUARIAL ASSUMPTIONS**

5. Rates of Termination

Age	Municipal	Uniformed
20	19.00%	2.75%
25	13.00%	2.78%
30	8.50%	2.49%
35	7.00%	2.02%
40	7.00%	1.54%
45	4.50%	1.00%
50	5.00%	0.16%
55	5.00%	0.16%

6. Rates of Disability

Age	Municipal		Uniformed
	Males	Females	Unisex
20	0.0025%	0.0043%	0.0795%
25	0.0070%	0.0061%	0.0870%
30	0.0557%	0.0263%	0.2668%
35	0.1014%	0.0870%	0.5418%
40	0.1800%	0.1564%	0.4684%
45	0.2340%	0.3109%	0.3834%
50	0.6600%	0.4535%	0.3154%
55	0.7680%	0.7338%	0.0000%

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**APPENDIX B
ALTERNATIVE ACTUARIAL ASSUMPTIONS**

7. Rates of Pre-Retirement Mortality

RP 2000 with 15-year projection and a five-year setback for Municipal participants, RP 2000 with ten-year projection for Police and Fire females

Age	Municipal		Uniformed	
	Males	Females	Males	Females
20	0.0259%	0.0150%	0.0285%	0.0163%
25	0.0297%	0.0155%	0.0340%	0.0180%
30	0.0349%	0.0178%	0.0422%	0.0239%
35	0.0412%	0.0224%	0.0735%	0.0425%
40	0.0685%	0.0379%	0.0996%	0.0607%
45	0.0887%	0.0554%	0.1323%	0.0957%
50	0.1148%	0.0869%	0.1783%	0.1412%
55	0.1603%	0.1486%	0.2991%	0.2507%
60	0.2845%	0.2520%	0.5742%	0.4808%
65	0.5461%	0.4689%	1.1062%	0.9231%

8. Rates of Post-Retirement Mortality

For Municipal, Police and Fire, we assume that mortality for healthy inactive lives will follow RP 2000 with a one-year set forward and a five-year mortality improvement projection.

9. Rates of Post-Disability Mortality

For Police and Fire, we assume that mortality for disabled retirees follows RP 2000 Healthy mortality with a 40% upwards adjustment and a five-year mortality improvement projection. For Municipal and Elected officials, we assume that mortality for disabled retirees follows RP 2000 Disabled mortality with a 5% downward adjustment a ten-year mortality improvement projection.

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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**APPENDIX B
ALTERNATIVE ACTUARIAL ASSUMPTIONS**

10. Rates of Retirement

Rates of Service Retirements - 1967 Plan		
Age	Municipal	Uniformed
42-44	-	2.0%
45-51	-	9.0%
52	5.0%	9.0%
53	5.0%	15.0%
54	5.0%	15.0%
55	45.0%	20.0%
56	32.0%	25.0%
57	30.0%	25.0%
58	32.0%	30.0%
59	32.0%	35.0%
60	32.0%	40.0%
61	35.0%	40.0%
62	40.0%	42.0%
63	25.0%	42.0%
64	25.0%	42.0%
65	30.0%	42.0%
66	25.0%	42.0%
67	30.0%	42.0%
68	25.0%	42.0%
69	15.0%	42.0%
70+	100.0%	100.0%

**CITY OF PHILADELPHIA MUNICIPAL RETIREMENT SYSTEM
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**APPENDIX B
ALTERNATIVE ACTUARIAL ASSUMPTIONS**

Rates of Service Retirements - 1987 Plan				
Age	Municipal		Uniformed	
	First Year Eligible	Subsequent Years	First Year Eligible	Subsequent Years
40-49	-	-	3.0%	1.5%
50	-	-	10.0%	8.0%
51	-	-	10.0%	5.5%
52	5.0%	2.0%	10.0%	7.0%
53	10.0%	2.0%	10.0%	8.0%
54	10.0%	2.0%	10.0%	10.0%
55	25.0%	2.0%	10.0%	12.0%
56	25.0%	2.0%	10.0%	14.0%
57	25.0%	2.0%	10.0%	12.0%
58	25.0%	2.0%	10.0%	16.5%
59	30.0%	8.0%	10.0%	14.0%
60	50.0%	30.0%	10.0%	17.0%
61	40.0%	20.0%	10.0%	17.0%
62	40.0%	25.0%	10.0%	21.5%
63	50.0%	20.0%	10.0%	20.5%
64	30.0%	20.0%	10.0%	20.0%
65	60.0%	20.0%	10.0%	100.0%
66	60.0%	20.0%	-	-
67	60.0%	20.0%	-	-
68	60.0%	20.0%	-	-
69	60.0%	20.0%	-	-
70	10.0%	100.0%	-	-

13. Family Composition

70% of active members and 60% of non-active members are assumed to be married for retirees with the 50% J&S with return on contribution form of payment only. Male spouses are assumed to be four years older than female spouses.