Gabriel Roeder Smith & Company
Consultants & Actuaries

NEW YORK CITY RETIREMENT SYSTEMS

ACTUARIAL EXPERIENCE INVESTIGATION FOR THE FOUR-YEAR AND TEN–YEAR PERIODS ENDING JUNE 30, 2013

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Gabriel, Roeder, Smith & Company (GRS) was retained by the Comptroller to serve as Independent Actuary under Section 96 of the New York City Charter and provide other services related to the review of the funding of the following five actuarial pension funds (collectively NYCRS or the Systems):

- New York City Employees' Retirement System (NYCERS);
- Teachers' Retirement System of the City of New York (TRS);
- Board of Education Retirement System of the City of New York (BERS);
- New York City Police Pension Fund (POLICE); and
- New York Fire Department Pension Fund (FIRE).

GRS was required to conduct two consecutive biennial actuarial engagements, encompassing the following:

- Biennial Contribution Audits of the computed employer contributions for each System in NYCRS for fiscal years 2012 and 2014 (including an audit of actuarial accrued liabilities and actuarial valuation of assets);
- Biennial Experience Studies for the periods ending June 30, 2011 and June 30, 2013, for each System in NYCRS;
- Two Administrative Reviews of the data gathering and maintenance practices of the Office of the Actuary (OA) and each System in NYCRS (one review corresponding with each Contribution Audit); and
- Two Independent Actuarial Statements (one for each engagement); GRS, as the independent actuarial auditor, will submit a statement that will briefly describe the scope of the entire engagement, will review the entire engagement and comment on the financial condition and financing progress and policies of each System, and certify that the Systems are being funded on a sound actuarial, financial, and legal basis.

This report constitutes the deliverable with respect to the Experience Study for the second engagement. The purpose of this study is to:

- Update the Experience Study database with membership data as of June 30, 2012 and June 30, 2013;
- Mature the database with status changes;
- Review actual experience for the four-year period ending June 30, 2013 and compare with assumed experience;
- Review actual experience for the ten-year period ending June 30, 2013 and compare with assumed experience; and
- Indicate areas where experience deviated from current assumptions to an extent the Actuary can investigate and modify the current assumption, if appropriate.

Specific detail on each System is provided throughout the report. In general, we have the following initial comments:

- We find the current inflation, wage inflation and investment return assumption reasonable. However, we recommend the OA consider lowering the investment return assumption based on the current market expectations and investment policies of the Systems.
- Longevity continues to improve for the NYCRS plans and the country as a whole. The experience for NYCRS has outpaced the current assumptions and thus the post-retirement mortality assumptions needs to be updated for new information and expectations. This is the most material finding from this report.

ORGANIZATION OF REPORT

Section II contains documentation on our processes and procedures. Section III contains an analysis on the economic assumptions, including inflation, wage inflation, and investment return. Section IV contains an aggregate analysis on post-retirement mortality. Section V contains five subsections for a summary of the results for each System, including an illustrative impact on the costs and liabilities if the proposed recommendations were adopted. Finally, Section VI provides the reconciled data for each group for each assumption by age and/or service compared to the current assumptions.

This study was conducted in accordance with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The undersigned all have extensive experience providing actuarial and consulting services to large public retirement systems. Joseph Newton and Danny White are Members of the American Academy of Actuaries (M.A.A.A.) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We wish to thank the Office of the Actuary ("OA") for their assistance in providing data and support information for this study.

Respectfully Submitted,

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10/23/2015
Date

SECTION II

KEY METHODOLOGIES AND PROCEDURES

KEY METHODOLOGIES AND PROCEDURES

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of a Retirement System. Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

The purpose of this report is to measure actual experience and provide our best estimate recommendations for assumptions going forward. An assumption that differs from our best estimate recommendation may still be reasonable. The fact that our best estimate recommendation is different than an assumption currently in use is not an indication of whether or not the current assumption is reasonable. There are many reasonable actuarial assumption sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs. For example, while our analysis may conclude that a generational approach to mortality projections is appropriate, others might argue that a different approach is also reasonable. The Actuarial Audit of Employer Contributions discussed the reasonableness of the current assumptions. That report states that methods and assumptions in use for the Fiscal Year 2014 employer contribution determination (June 30, 2012 Lag Valuation) are reasonable.

SUMMARY OF PROCESS

In determining liabilities and contribution recommendations for retirement plans, actuaries must make assumptions about the future. The assumptions that must be made include:

- Retirement probabilities
- Mortality probabilities
- Turnover probabilities
- Disability probabilities
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the mortality probabilities, past experience provides important evidence about the future. For others, such as the investment return assumption, the link between past and future results is much weaker. In either case, actuaries should review the plan's assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. It is known, for example, that the health of the general economy can impact salary and withdrawal behavior. Using results gathered during a short-term boom or bust may not be representative of the long-term trends in these assumptions. Also, the adoption of legislation, such as plan improvements or changes in salary schedules, will sometimes cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a dearth of retirements for the following two-to-four years. Using a longer period prevents giving too much weight to such short-term effects. On the other hand, using a much longer period may suppress the ability to identify or adjust for real changes in patterns that may be occurring, such as mortality improvement or a change in the ages at which members retire. In our view, using a four- to ten-year period is reasonable. In a few instances, we chose to use a longer period in order to further increase the soundness of our conclusions.

The last actuarial experience investigation was performed as of June 30, 2009. For the current experience study, we have added four new years of experience data. Note that the remainder of the data overlaps with prior experience studies.

If the data leads an actuary to conclude that new tables are needed, an actuary may "graduate" or smooth the results, since the raw results can be quite uneven from age to age or from service to service.

Sources of Data

For each System, we received the experience study database that was developed by the prior actuarial auditor, referred to in this document as the "Historical Database." GRS also received the source valuation files for the June 30, 2010 through June 30, 2013 valuation dates from the OA.

The Historical Database, consisting of data from June 30, 2001 through June 30, 2009, was rolled forward to June 30, 2013 using the same status-assignment methodology as the prior actuarial auditor.

Social Security Numbers (SSN) were used as the Unique Identifier in this database. Any record without an SSN was removed. If two (or more) records contained identical Social Security Numbers, the record(s) carrying less liability was (were) removed. Additionally, if a record had statuses associated with those of a deceased member or a beneficiary for the entire experience study period, the record was removed.

When statuses were initially assigned to the database for years June 30, 2001 to June 30, 2013, GRS determined the statuses taken together were not yet an accurate reflection of how members progress through the Retirement System. GRS then matured the database by applying certain

business rules. This is the process of updating past and current status fields in the experience study database, based on the more recent source data. For example, based on the timing of the data file, a member could be active in year 1, filed for disability retirement late during year 1, was being processed as the data file for year 2 was created and thus showed up in year 2 as a termination or a service retirement, received approval for disability during year 2 and thus showed up as a disability in the year 3 data file. For the valuation process, this member should be treated as a disability retirement from year 2 (the initial decrement year). The maturation process would reset the status in year 2 to be a disability retirement. In Section V, we show the business rules used for the maturation process and the changes that resulted from application of the business rules for each System individually. All business rules were applied to mature the database so that all members appear to have a more reasonable progression of statuses. The specific business rules for each System are described in Section V.

We observed a significant number of disabled members who are not initially classified as a disabled retiree and reclassified two or three years later. In addition, certain members who terminate service are classified as active-inactive, with some returning to work and some not. As a result, we have excluded the un-matured reconciliations for fiscal years 2012 and 2013 in the experience study analysis for the withdrawal and disability assumptions because information from the fiscal year 2014 and 2015 data will be needed to complete the process. In other words, the recent period analysis is for the four-year period ending June 30, 2011 and the longer-term experience period is for the eight-year period ending June 30, 2011 for these two assumptions (withdrawal and disability). We believe this adjustment significantly improves the credibility of the experience for reviewing these particular assumptions as it is likely that the experience from those two years will be modified in a future maturation process.

The data was then exported from the database and run through GRS' experience study software. The results of all valuation runs were imported into a single workbook. This workbook was used to complete the analysis of the different decrements and prepare all tables for the report.

Data Elements and Application

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number of "expected" decrements is determined by multiplying the probability of the occurrence at the given age/service by the "exposures" at that same age/service. The number of exposures can only be those members eligible for the given decrement at that time. Thus they are considered "exposed" to that assumption. Finally, we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect," the A/E ratio would be 100%. When the A/E ratio varies much from 100%, it is a sign that new assumptions may be needed. However, it is important to consider the number of "lives" exposed before drawing conclusions. The smaller the exposure, the less likely the A/E ratio will be close to 100% (except by coincidence) even for an assumption that does not need to be changed. In addition, in some cases it may be preferred to produce an A/E ratio a little above or below 100% to introduce some

conservatism. Of course, we not only look at the assumptions as a whole, but we also review how well they fit the actual results by gender, by age, and by service. Section V details how we determined the status for each individual member for each year.

Determining Exposures

First, for each fiscal year included in the study, we tested each record on the experience study data file that had a status code (i.e., each record for which the applicable status code was non-blank) as of the beginning of the fiscal year to determine whether the record (member) met the exposure criteria to be counted as an exposure for that year for that decrement. That is, to study the experience of fiscal year X, we tested the status field corresponding to fiscal year X-1, which is the status as of June 30, X-1. If the exposure criteria were met, the exposure count was increased by 1 for the age/service/gender node for that decrement. If the exposure criteria were not met, that member was not counted as an exposure.

The OA currently utilizes the nearest age and service at the beginning of the year to index the assumption tables and determine eligibilities for specific decrements. For example, for the June 30, 2010 valuation (Fiscal Year 2011 experience), all members with birthdates from January 1, 1960 through December 31, 1960 will be grouped together and treated as if they are age 50 for that year. This is a common approach to determine the age and/or service for a given exposure period. However, we believe this approach has drawbacks and can be improved. For example, members in several of the groups have retirement eligibilities (either reduced or unreduced) once the member attains age 55. Based on the current methodologies of determining the age for eligibilities, many members are not exposed to retirement in the year they actually turn 55. Take a member in the June 30, 2009 valuation data born on March 31, 1955. This member has an exact age of 54.25 as of the valuation date and the current procedures would group this member into the age 54 bucket for eligibilities for fiscal year 2010. Based on this approach, the model would not expose this member to retirement. However, the member will turn 55 in March of the fiscal year and thus in reality will be eligible to retire. Using the current procedures, there are large groups of members who are not exposed to retirement in the valuation (and experience study reconciliation) but who do show up as retired by the end of the year. In fact, roughly half of the members who actually retire at age 55 fall into this scenario.

We discussed an alternative model with the OA that would determine eligibilities (ages and services) as of the decrement time, or middle of the year. This is similar to using what age and service the member will attain during the next fiscal year. This would reconcile active members decrementing out even though they were not exposed to the given decrement. We performed the second engagement experience study using this alternative model and recommend the OA adopt this change in methodology in their valuations going forward.

Counting Actual Occurrences

Next, for each member we tested the status code as of the end of the fiscal year to determine whether the member should be treated as an actual for that decrement. If the actual occurrence

criteria were met, the actual occurrence count was increased by 1. Since the demographic actuarial assumptions being studied (all of which come from the tables of actuarial assumptions currently being utilized by the OA for their annual actuarial valuations) are based upon either the member's age (which is the case for all the demographic assumptions other than the active member withdrawal assumptions) or the member's years of service (which is the case for only the active member withdrawal assumptions), the counts of exposures/occurrences were subdivided into counts based upon the member's age or years of service in the fiscal year of the exposure/occurrence. Depending upon the System and the specific assumption being studied, further sub counts were determined by gender, tier, or other member criteria.

We treated the member as an actual whether the model had exposed the member to the probability or not. We believe this is important as otherwise the number of expected will be understated in the valuation. Using the age 55 example above, let us assume that a group has 400 members who fell into the scenario above and retired while rounding to age 54 at the beginning of the year and another 400 who were age 55 at the beginning of the year and retired. As of the beginning of the year, assume there were 2,000 members who rounded to age 55 and thus were exposed to retirement. If only the 400 who were originally exposed were included as actuals, then the probability of retirement would be 400/2,000 = 20%. However, at the end of the year, there will actually be 800 members who show up retired with age 55 and the probability used in the model should be 800/2,000 = 40%. We recommend a method change because it is important for the model to treat actuals and expecteds consistently.

To accomplish this, when determining actuals for retirement, we categorized members based on the age and service the member had on their retirement date and rounded to the nearest integer. Utilizing this approach, we were able to eliminate most of the members who showed to be an actual for a decrement but were not yet exposed.

Active-Inactive Status

Prior to the 2008 data, members who terminated from service were classified into status codes that fairly clearly meant the member had terminated from service and were reconciled in the process as a termination. Beginning in 2008, members who terminated, still have a member account balance but have not retired nor completed terminated vested paperwork began to be coded as an "F" status, which is defined as "Active-Inactive." In the valuation process, the OA values these members as terminated participants. However, in prior experience studies, these members were reconciled as if they were still active.

To study the active-inactive status, we first measured how many of the June 30, 2007 members switched to status "F" (active-inactive) as of June 30, 2008. For these individuals, we found that 43% had an active status as of June 30, 2013. Of those who returned to active status, 66% returned within one year of inactivity and 84% had returned by two years of inactivity.

Thus, as part of our maturation process, members who were active, went into an F status, and then returned to work were not included as a termination. In addition, any member who had been an F in three straight years was included as a termination.

Developing Expected Occurrences

For the demographic assumption studies, counts of expected numbers of occurrences were developed by multiplying the appropriate age-based (or service-based) probabilities times the corresponding age-based (or service-based) counts of exposures, as determined following the rules/procedures described above. Again, depending upon the System and the specific assumption being studied, additional counts of "expected" were determined based upon member gender, tier, and/or other member criteria.

Probabilities Versus Rates

All assumptions were analyzed as if the assumption was a “probability” rather than a “rate.” This is consistent with how the assumptions are utilized in the valuation. For the remainder of this report, the terms “probabilities” and “rates” can be used interchangeably to mean “probabilities” in this context.

Validation of Historical Database

To verify the reliability of the prior actuary’s database, which included data through June 30, 2009, GRS developed and matured a separate database using the OA’s valuation data from June 30, 2001 to June 30, 2013. For consistency, the Historical Database was also rolled forward to June 30, 2013 using OA valuation data from June 30, 2010 through June 30, 2013. Both databases were setup using the same status-assignment methodology as the prior actuary.

As an additional source of comparison, GRS looked at the June 30, 2013 valuation data from the OA.

GRS found that, for all decrements except termination, actual counts between the actual June 30, 2013 OA Valuation data file and the Historical Database were reasonably consistent. Based on this analysis, GRS concluded it is acceptable to rely on the Historical Database. However, the termination assumption could not be confirmed by this process and it appears members marked as Active-Inactive were treated as active members in the prior study. Based on how these members are used in the actuarial valuation, these members should be treated as a terminated (non-active) member. We have made the adjustments for past periods accordingly.

SECTION III

ANALYSIS OF GENERAL ECONOMIC ASSUMPTIONS

INFLATION AND INVESTMENT RETURN ASSUMPTIONS

Actuarial Standards of Practice (ASOP) No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations for defined benefit plans. ASOP No. 27 was revised by the Actuarial Standards Board and effective for actuarial work products with a measurement date after October 1, 2014. Our recommended economic assumptions are intended to comply with this revised practice standard.

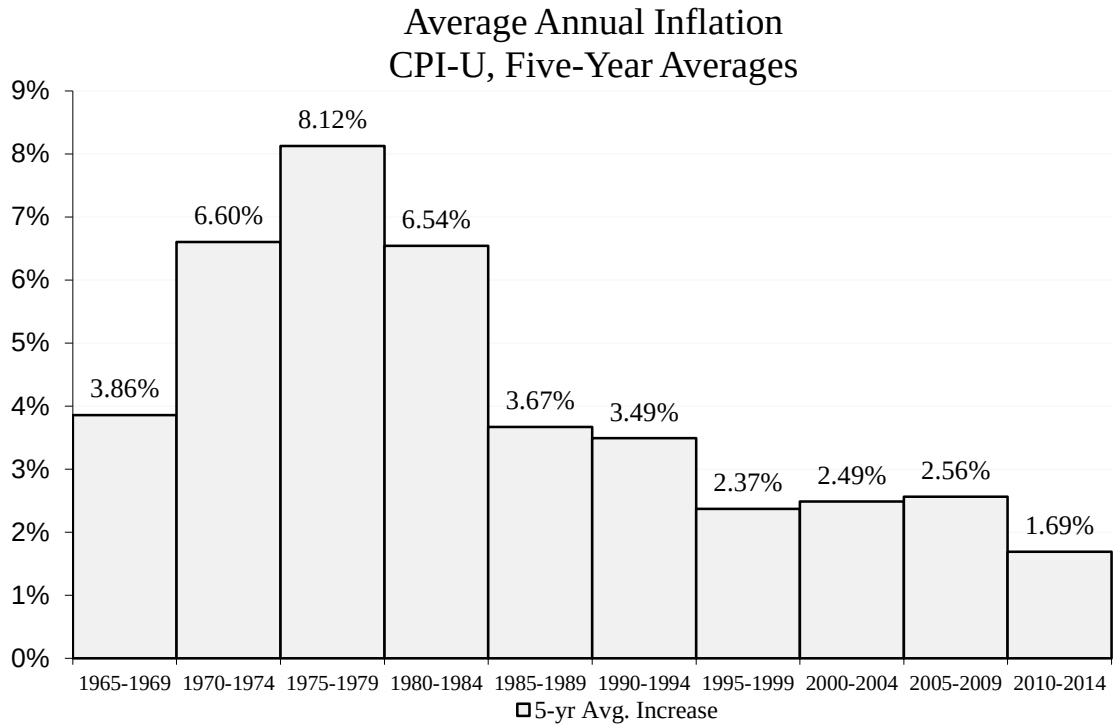
As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. A reasonable assumption is one that is appropriate for the purpose of the measurement, reflects the actuary's professional judgment, takes into account historical and current economic data that is relevant as of the measurement date, is an estimate of future experience; an observation of market data; or a combination thereof, and has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included. However, the standard explicitly advises an actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

INFLATION ASSUMPTION

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It impacts investment return, salary increases for individual members, overall payroll growth, and cost-of-living increases. The current annual inflation assumption is 2.50%.

The chart on the following page shows the average annual inflation, as measured by the increase in the Consumer Price Index (CPI-U) in each of the ten consecutive five-year periods over the last fifty years.



Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted, Calendar Years

The table below shows the average inflation over various periods, ending December 2014.

Periods Ending Dec. 2014	Average Annual Increase in CPI-U
Last five (5) years	1.69%
Last ten (10) years	2.12%
Last fifteen (15) years	2.25%
Last twenty (20) years	2.28%
Last twenty-five (25) years	2.52%
Last thirty (30) years	2.71%
Since 1913 (first available year)	3.17%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

As you can see, inflation has been relatively low over the last twenty years. Even over a period of 30 or more years, inflation has averaged below 3% per year. It is hard to ignore the relatively steady inflation statistics over the last 25 years shown in the charts above.

Most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 2.50%. We examined the 2015 capital market assumption sets for seven investment consulting firms: BNY Mellon, Hewitt EnnisKnupp, JP Morgan,

Mercer Consulting, Pension Consulting Alliance (PCA), New England Pension Consulting (NEPC), and RV Kuhns. The average assumption for inflation was 2.30%, with a range of 2.11% to 2.50%.

In the Social Security Administration's 2014 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.70% under the intermediate cost assumption. (The low cost assumption was 2.00% and the high cost assumption was 3.40%.) The Chief Actuary for the Social Security Administration reduced this assumption from the prior year from 2.80%.

Another source of information about future inflation is the market for U.S. Treasury bonds. The December 31, 2014 yield for a 20-year inflation indexed Treasury bond (20-year TIPS) was 0.68% plus actual inflation. The yield for a 20-year non-indexed U.S. Treasury bond was 2.47%. This means the bond market was predicting that inflation over the next twenty years would average 1.78% [(1 + 2.47%) / (1 + 0.68%) - 1] per year. One year earlier, as of December 31, 2013, the spread between the 20-year inflation indexed and constant maturity bonds was noticeably higher, with a difference of 2.33%, so there has been a noticeable change in this expectation. The imputed 30-year inflation level is close to the 20-year level, being 1.90% and 2.28% at December 31, 2014 and December 31, 2013, respectively.

Also, the Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (first quarter of 2015) predicts inflation over the next ten years (2015 to 2024) will average 2.1% per year. The survey forecasts have also remained relatively stable over the last few years.

Since the Retirement Systems provide a cost-of-living adjustment that is tied to the increase in CPI (i.e. 50% of the increase in CPI-U, subject to a minimum/maximum annual COLA of 1.00%/3.00%), there is some risk to selecting an inflation assumption that is too low. As a result, we recommend continued use of the 2.50% inflation assumption, which is in line, but slightly higher, than many of the benchmarks discussed.

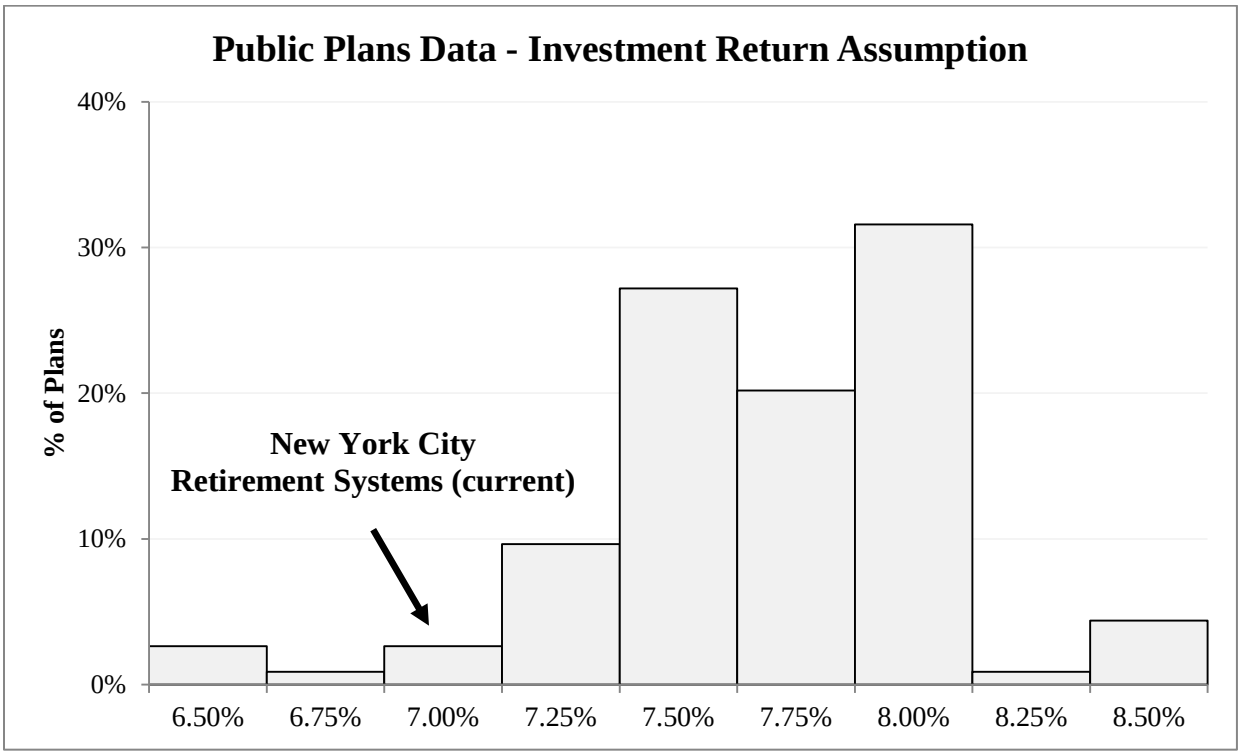
INVESTMENT RETURN ASSUMPTION

The investment return assumption is one of the principal assumptions used in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. Currently, it is assumed that future investment returns will average 7.00% per year, net of investment expenses. The current assumption assumes inflation of 2.50% per annum and an annual real rate of return of 4.50%, net of investment expenses.

Similar to the inflation assumption, past performance is not a reliable indicator of future performance, even when averaged over a long time period. Also, the actual asset allocation of the

trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful.

The Public Plans Data as of May 7, 2015 (the most current version of the Public Fund Survey) shows that the median investment return assumption for large public plans is 7.75%. Subtracting the rate of inflation assumed for each plan gives a median real rate of return of 4.50%, which is consistent with the current real rate of return assumption for the New York City Retirement Systems. While we do not recommend the selection of an assumption based on prevalence information, it is still informative to identify where the New York City Retirement Systems are compared to their peers. Here is a chart showing the distribution of the investment return assumptions in the Public Plans Data:



Source: Public Plans Database (n=114). Median investment return assumption: 7.75% nominal return.

We believe a more appropriate approach to selecting an investment return assumption is to identify expected returns given the funds' asset allocation mapped to forward-looking capital market assumptions. Since each Retirement System has a slightly different investment policy, we performed this analysis on each System based on the target asset allocation provided to GRS by the Comptroller's Office.

Below is a summary of the asset allocations for each System that was used in the analysis.

ASSET CLASS	NYCERS	TRS	BERS	POLICE	FIRE
Domestic Equities	33%	31%	35%	34%	29%
International Equities	17%	17%	22%	16%	17%
Private Equity	7%	6%	6%	7%	7%
Real Assets and Real Estate	6%	9%	7%	6%	8%
Hedge Funds	4%	0%	0%	5%	5%
Fixed Income	33%	37%	30%	32%	34%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Where available, investments in these asset classes were split into subgroups to refine the analysis. For example, when identifiable, the domestic equities were classified as large cap, or small/mid cap securities and fixed income were classified into core, high yield, mortgage-backed securities, TIPS, etc., as appropriate.

Because GRS is a benefits consulting firm and does not develop or maintain our own capital market assumptions, we utilized the forward-looking return expectations developed by the following investment consulting firms:

- BNY Mellon
- JP Morgan
- Mercer Consulting
- RV Kuhns
- Hewitt EnnisKnupp
- New England Pension Consultants (NEPC)
- Pension Consulting Alliance (PCA)

These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward-looking adjustments to better reflect near-term expectations. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. The investment return expectations for the alternative asset class such as private equity and hedge funds are also net of investment expenses. Therefore, we did not make any adjustments to account for investment related expenses.

Some of the Retirement Systems may also employ active management investment strategies that result in higher investment expenses compared to strategies that invest in passive index funds. We have assumed that active management strategies would result in the same returns, net of investment expenses, as passive management strategies.

Also, since the Retirement Systems explicitly charge employers for administrative related costs, it is not necessary to adjust the investment return assumption to account for future administrative expenses.

Given the plan's current asset allocation and the investment consultant's capital market assumptions, the development of the average nominal return, net of investment expenses, is provided in the following tables.

The forward-looking return expectations were mapped to each System's target asset class allocation. During our analysis, we recognized that the actual asset allocation as of December 31, 2014 was somewhat different than the policy target. Based on information provided by the investment team in the Comptroller's Office, we understand the differences in the asset allocations are primarily due to short-term tactical strategies and assets not yet allocated to new target asset classes, such as emerging market debt. Since we are establishing a long-term assumption, we are disregarding these short-term deviations from the policy target in our analysis.

The following table provides the average rates of arithmetic return for each of the Retirement Systems.

Expected Nominal Return Based on Short-Term Capital Market Assumptions
(Return Expectations for the Next 7 to 10 Years)

RETIREMENT SYSTEM	NYCERS	TRS	BERS	POLICE	FIRE
Average Expected Return	7.04%	6.99%	7.27%	7.05%	6.96%

The average expected return for BERS is slightly higher than the other Systems because the investment policy for that that System is slightly different. Specifically, according to the adjusted investment policy, they have a higher percentage of assets allocated to equities and a slightly lower percentage of assets invested in fixed income securities.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and to understand the range of net returns that could be produced by the investment portfolio. The table below provides the 40th, 50th, and 60th percentiles of the 10-year geometric average of the expected nominal return, net of investment expenses, as well as the probability of exceeding the current 7.00% assumption.

Expected Annual Geometric Returns and Return Probabilities
(Based on Intermediate-Term Capital Market Assumptions)

RETIREMENT SYSTEM	NYCERS	TRS	BERS	POLICE	FIRE
60th Percentile	7.04%	7.00%	7.22%	7.05%	6.99%
50th Percentile	6.39%	6.35%	6.51%	6.39%	6.36%
40th Percentile	5.73%	5.70%	5.80%	5.73%	5.73%
Probability of Exceeding 7.00%	41%	40%	43%	41%	40%

Clearly, the forward-looking expectation is more likely than not to achieve an investment return that is less than the 7.00% assumption over the intermediate term. Also, these expectations have lowered materially in the past 12-18 months, mainly due to continued decreases in bond yields. For example, this same exercise last year based on the NYCERS portfolio yielded a 6.60% expected return and 46% probability of achieving 7.00%. The decrease was driven primarily by a drop in the average forward-looking bond return from 3.63% to 3.13% across all of the consulting firms. We consider a 5% decrease in the probability to be meaningful.

The capital market assumptions provided by the investment consultants and used in the analysis above are based on a 7- to 10-year investment horizon. Investment consultants develop their forecast assumptions with this time horizon in part because most pension investment management teams use this time period for developing and monitoring their investment strategies.

On the other hand, the investment return assumption used in the actuarial valuation has a longer investment horizon. Therefore, it is necessary to identify and reflect differences in the economy and financial markets over the short-term and long-term time horizon.

Expected investment returns can be thought of as the sum of a risk-free rate of return and a risk premium. This is the fundamental premise in the Capital Asset Pricing Model (CAPM) that is used in Modern Portfolio Theory. Riskier investments have a higher risk premium to compensate the investor for the increased uncertainty. Generally, the risk premium for each asset class is constant over long periods of time. But there can be differences in the risk-free return, depending on the investor's time horizon. We define a risk-free investment as one where the expected return is known with absolute certainty. This also means that the risk-free investment has no default and reinvestment risk. Based on this definition, we believe it is reasonable to benchmark a risk-free rate using zero coupon U.S. Treasury securities. Thus a 10-year risk-free rate is equal to the current yield of a 10-year zero coupon U.S. Treasury bond, and a 20-year zero coupon U.S. Treasury bond is the risk-free rate for a 20-year time horizon. For the longer-term point, we have chosen the 20-year yield because it is close to an approximation of the duration of the liabilities of the Systems, meaning the average, interest-discounted benefit payment is expected to be paid 20 years from the valuation date (assuming an open group). As of May 9, 2015, the yields of the 10-year and 20-year zero coupon Treasury bonds were 2.62% and 3.12%, respectively. Therefore, it is reasonable to assume that as the investment time horizon expands from 10 years to 20 years, the risk-free rate of return and corresponding expected nominal return on the portfolios would be 0.50% higher over the longer, 20-year time horizon.

The table on the following page restates the 40th, 50th, and 60th percentiles of the 20-year geometric average of the expected nominal return, net of investment expenses, as well as the probability of exceeding the current 7.00% assumption, based on the same short-term capital market assumptions adjusted to reflect the different risk-free returns due to the different

investment time horizons. Please note that if this process has a bias, it is likely to be to overstate long-term return expectations.

Expected Annual Geometric Returns and Return Probabilities
(Based on Intermediate-Term Capital Market Assumptions Adjusted by GRS to Reflect a 20-Year Investment Horizon)

RETIREMENT SYSTEM	NYCERS	TRS	BERS	POLICE	FIRE
60th Percentile	7.55%	7.51%	7.72%	7.56%	7.50%
50th Percentile	6.89%	6.85%	7.01%	6.89%	6.86%
40th Percentile	6.23%	6.20%	6.30%	6.24%	6.23%
Average Probability of Exceeding 7.00%	49%	48%	50%	49%	48%

Based on an arithmetic mean of approximately 7.00% for each of the Systems, we find the current 7.00% reasonable.

However, even after adjusting for time horizon, the results show that the probability of the investment return exceeding the 7.00% return assumption are slightly less than 50%. While there is nothing certain in these probabilities as they are also based on assumptions, based on this analysis and the current investment portfolios we recommend the OA consider lowering the assumed investment return. While the likelihood of attaining a 7.00% investment return is closer to 50% over the next longer term, the probabilities over the next decade are much lower. If the returns over this period do in fact underperform, it would lead to actuarial losses and increased employer contributions. For illustrative purposes, we have shown the financial impact of a 6.75% assumption for each System in the impact section.

We believe this recommendation satisfies the reasonable assumption requirement under ASOP No. 27 as revised and adopted in September 2013. Also, this recommendation is consistent with the recommendations regarding the use of an investment return assumption that is estimated to be realizable at least 50% of the time from a report released by the Society of Actuaries Blue Ribbon Panel on public pension plan funding in February 2014.

General Wage Inflation

The OA currently assumes that General Wage Inflation will be 0.50% above price inflation. The 0.50% represents the real wage growth over time.

Historically, General Wage Inflation almost always exceeds price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to wages. For the last 10 years, for the economy as a whole, wage inflation has outpaced price inflation by about 0.45%, and for the last 20 years, wage inflation has exceeded price

inflation by about 0.85%. Since 1951, wage inflation has been about 1.00% larger than price inflation each year.

The current assumption is consistent with national trends. It is reasonable to expect more pressure on depressing the rate of future salary increases due to projected increases in the cost of providing employee retirement and healthcare benefits.

Individual Salary Increase Rates

In order to project future benefits, an actuary must project future salary increases. Employees receive salary increases for a variety of reasons:

- Across-the-board increases for all employees;
- Across-the-board increases for a given group of employees;
- Increases to a minimum salary schedule;
- Additional pay for additional duties;
- Step or service-related increases;
- Increases for acquisition of advanced degrees or specialized training;
- Promotions; or
- Merit increases, if available.

The salary increase assumption used in an actuarial valuation is meant to reflect all of these types of increases.

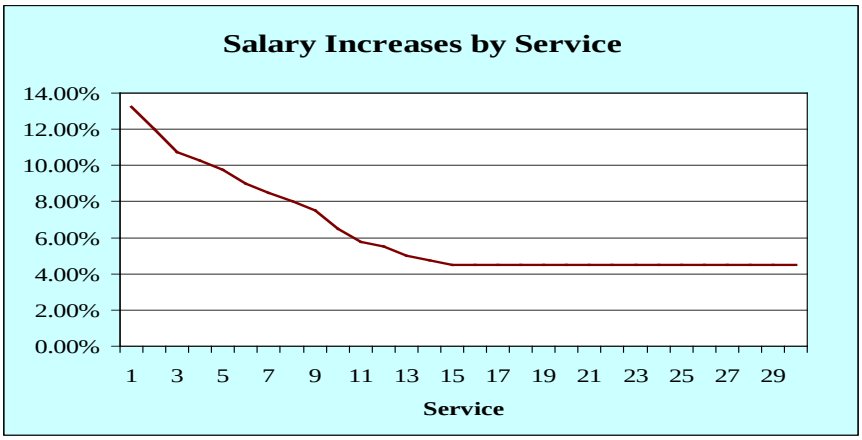
An actuary should not look at the overall increases in payroll in setting this assumption because payroll can grow at a rate different from the average pay increase for individual members. To analyze salary increases, we examine the actual increase in salary for each member who is active in two consecutive fiscal years.

Salary increases for governmental employees can vary significantly from year to year. When the employer's tax revenues stall or increase slowly, salary increases often are small or nonexistent. During good times, salary increases can be larger. Also, the pattern of contracts being negotiated with retroactive provisions can cause volatile patterns. Our experience across many governmental plans shows several occasions in which salary increases will be low for a period of several years followed by a significant increase in one year. Therefore, we prefer to use data over a longer period in establishing these assumptions.

Most actuaries recommend salary increase assumptions that depend on the member's age or service, especially for large, public retirement systems. It is typical to assume larger pay increases for younger or shorter-service employees. This reflects pay increases that accompany step increases, changes in job responsibility, promotions, demonstrated merit, etc. The experience shows salaries have been more closely correlated to service (rather than age), as promotions and productivity increases tend to be greater in the first few years of a career, even if the new employee is older than the average new hire.

We analyzed the salary increases based on the change in the member's reported pay from one year to the next. That is, we looked at each member who appeared as an active member in two consecutive valuations individually, and measured his/her salary increase. Then we grouped the increases for all members with the same service, and determined their average increase.

If we graph the increases by service, we usually get a graph where the increases are larger for shorter service employees and then level out at a lower level after a period that may be ten to twenty-five years. It might look like this, although in practice not this smooth:



Therefore, we divide the salary increase assumption into two pieces:

1. Determining the assumption for long-service employees; and
2. Determining the additional increases to be applied to shorter-service employees.

Salary Increase Assumptions for Long-Service Employees

Many of the factors that result in pay increases are largely inapplicable or have diminished importance for longer-service employees. Step or service-related increases have stopped or are minimal. Promotions occur with less frequency. Additional training or acquisition of advanced degrees usually occurs early in the career. In theory, then, salary increases for longer-service employees are almost entirely driven by wage inflation and only a minimal amount of merit should be assumed. The Actuary currently utilizes this two-component salary assumption, assuming long-service employees will have salary increases equal to General Wage Inflation (3.00% above) plus a small factor for merit.

We agree that this approach is reasonable.

However, in this type of analysis, when there is a merit assumption for the long-term members, it is difficult to separate where the General Wage Inflation ends and where the merit begins for those members. For example, if the actual inflation was exactly 2.50% and the actual increase for the long-term members was 3.50%, how would one differentiate how much of the additional 1.00% was a general increase and how much was merit?

In an attempt to separate the two items, we collected data providing the negotiated across-the-board salary increases during the study period. The negotiated increases should represent the general wage increase, and then any increase received by long-service members above this amount would be the additional merit. There were enough inconsistencies between the negotiated increases and the actual increases seen in the valuation data, in amount and timing, that we did not feel a direct comparison would be credible enough to provide a meaningful merit assumption.

Thus, for the merit analysis, we have categorized all increases above inflation for long-service employees as the General Increase over Inflation (assuming the general wage increase will be 1.00% above inflation in the example above). The analysis for each System is provided in Section V.

Overtime Assumptions

For NYCERS, POLICE, and FIRE, members can include overtime in their pensionable earnings. For all groups, the amount of actual overtime worked during the experience period has been materially higher than the current assumptions, especially in the period just before retirement that would be included in their pension benefit calculation. We understand the City is implementing several strategies to curtail the amount of overtime going forward for most groups, including adding additional members, and that may be taken into account for setting the prospective assumption. However, in our experience with similar situations with other clients, curtailing the amount of overtime, especially during the final averaging period, has proven to be difficult. We have provided recommendations for these assumptions, but the OA will have more detail on the specific strategies being implemented and be in a better position to make the final decision on the new assumptions.

SECTION IV

ANALYSIS OF POST-RETIREMENT MORTALITY

ANALYSIS OF POST-RETIREMENT MORTALITY

The issue of future mortality improvement is one that the governing bodies of our profession have increasingly become more focused on studying and ensuring that the actuarial profession remains on the forefront of this issue. This has resulted in recent changes to the relevant Actuarial Standard of Practice, ASOP 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations, and published practice notes. This ASOP now requires pension actuaries to make and disclose an assumption as to expected mortality improvement after the valuation date. The following are excerpts directly from the Standard:

"As mortality rates have continued to decline over time, concern has increased about the impact of potential future mortality improvements on the magnitude of pension commitments. Section 3.5.3 of current ASOP No. 35 lists "the likelihood and extent of mortality improvement in the future" as a factor for the actuary to consider in selecting a mortality assumption. In the view of many actuaries, the guidance regarding mortality assumptions should more explicitly recognize estimated future mortality improvement as a fundamental and necessary assumption, and the actuary's provision for such improvement should be disclosed explicitly and transparently."

*"**The resources reviewed by the Pension Committee showed that demographers generally expect that mortality will continue to improve**. These resources noted that some scientists argue that human life has biological limits, and that the rate of mortality improvement could slow as a result of obesity or other emerging health issues, but that such limits and countervailing factors do not alter the scientific consensus of likely continuing improvements in mortality."*

"The actuary should consider the effect of mortality improvement both prior to and subsequent to the measurement date. With regard to mortality improvement, the actuary should do the following:

- *i.* ***adjust mortality rates to reflect mortality improvement prior to the measurement date**. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the actuary's professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.*
- *ii.* ***include an assumption as to expected mortality improvement after the measurement date**. This assumption should be disclosed in accordance with Section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in Section 3.1. **Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.**"*

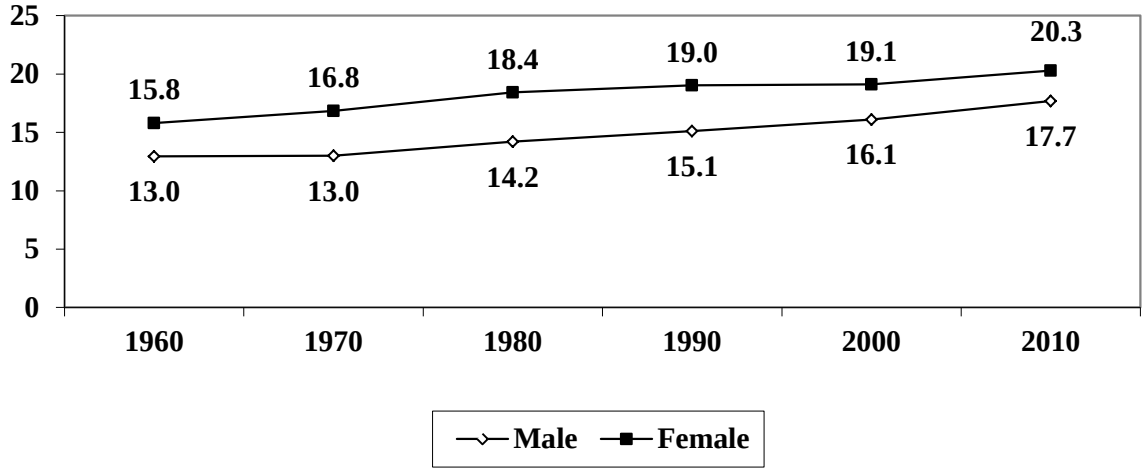
As you will note, we have highlighted the above sentences we feel need to be emphasized. To meet this standard, a recent trend in actuarial models is to use mortality tables that explicitly

incorporate projected mortality improvements over time. This type of table (or series of tables) is called "generational mortality." Historically, actuarial models have been constrained to static mortality tables due to two primary reasons: (1) a general belief that there was a limit on the ultimate longevity and (2) the added complexity of a generational mortality type model and limitations in computational power. A static mortality table would be used and updated with each experience study to reflect the most recent mortality. Historically, this would almost always result in adoption of lower mortality rates creating losses for plans and unfunded past service liabilities.

With advances in computing power, it has become a more mainstream practice to incorporate generational mortality models. The idea behind adopting a generational mortality model is to avoid the experience study "correction" factor. While minor adjustments may need to be made in the future, the constant bias towards needing to reduce mortality rates is avoided.

The expectation of continued increases in longevity is supported by national trends. The following graph provides the expected remaining lifetime in years for a 65-year old retiree measured beginning in 1960. Notice the recent uptrend in female longevity after almost two decades of relatively minimal improvement. This significant change in pattern (most of which has occurred since 2004) has led most of the actuarial profession to agree that future improvements will likely continue.

Life Expectancy in Years, Current Age 65



National Vital Statistics Reports, Vol 58, No 21, June 2010

National Vital Statistics Reports, Vol 60, No 4, January 2011

The most current mortality tables and improvement assumptions have recently been published in a report by the Society of Actuaries' Retirement Plans Experience Committee's (RPEC) in October of 2014. The following are excerpts from the Society of Actuaries Report on their mortality improvement scale, referred to as MP-2014:

"In late 2009, RPEC initiated a comprehensive analysis of pension plan mortality experience in the United States. At an early stage of its analysis, the Mortality Improvement subcommittee of RPEC noticed that mortality improvement experience in the United States since 2000 was clearly different from that anticipated by Scale AA. In particular, there was a noticeable degree of mismatch between the Scale AA rates and actual mortality experience for ages under 50, and the Scale AA rates were lower than the actual mortality improvement rates for most ages over 55. Given that the full Pension Mortality Study was still many months from completion at that time, the SOA decided to publish interim mortality improvement Scale BB, which provided pension actuaries with a more up-to-date alternative to Scale AA for the projection of base mortality rates beyond calendar year 2000."

RPEC recognizes that there is a wide range of opinion with respect to future levels of mortality and that the assumptions underlying mortality improvement reflect some degree of subjectivity. RPEC characterized the assumptions that underpin Generational Scale BB (including a 1.0% long-term rate of mortality improvement and limited cohort effects) as a temporary projection scale to overcome perceived short-comings of Scale AA (noted above) until RPEC could finalize an updated generational mortality assumption, which they now refer to as MP-2014.

Based on the recent strengthening of the Standards of Practice, GRS has been increasingly recommending our clients use a fully generational approach for mortality assumptions, and almost all of them have accepted the new projection method. By doing this, future mortality rates will be projected to continually decrease each year. Therefore, the life expectancy at age 60 for someone reaching 60 now will not be as long as the life expectancy for someone reaching 60 in 2020, and their life expectancy will not be as long as someone reaching 60 in 2040, etc. For illustrative purposes, the following table provides the life expectancy for individuals retiring in future years, based on the recently published Retirement Pensioners 2014 (RP-2014) healthy annuitant mortality tables, with full generational projection using the Society of Actuaries mortality improvement scale MP-2014.

Proposed Life Expectancy for an Age 60 Retiree in Years					
Gender	**Year of Retirement**				
	2010	2015	2020	2025	2030
Male	25.6	26.1	26.5	27.0	27.4
Female	28.1	28.5	29.0	29.4	29.8

Because of this assumption of continuous improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees. The improvement over time is built into the projections for individual members.

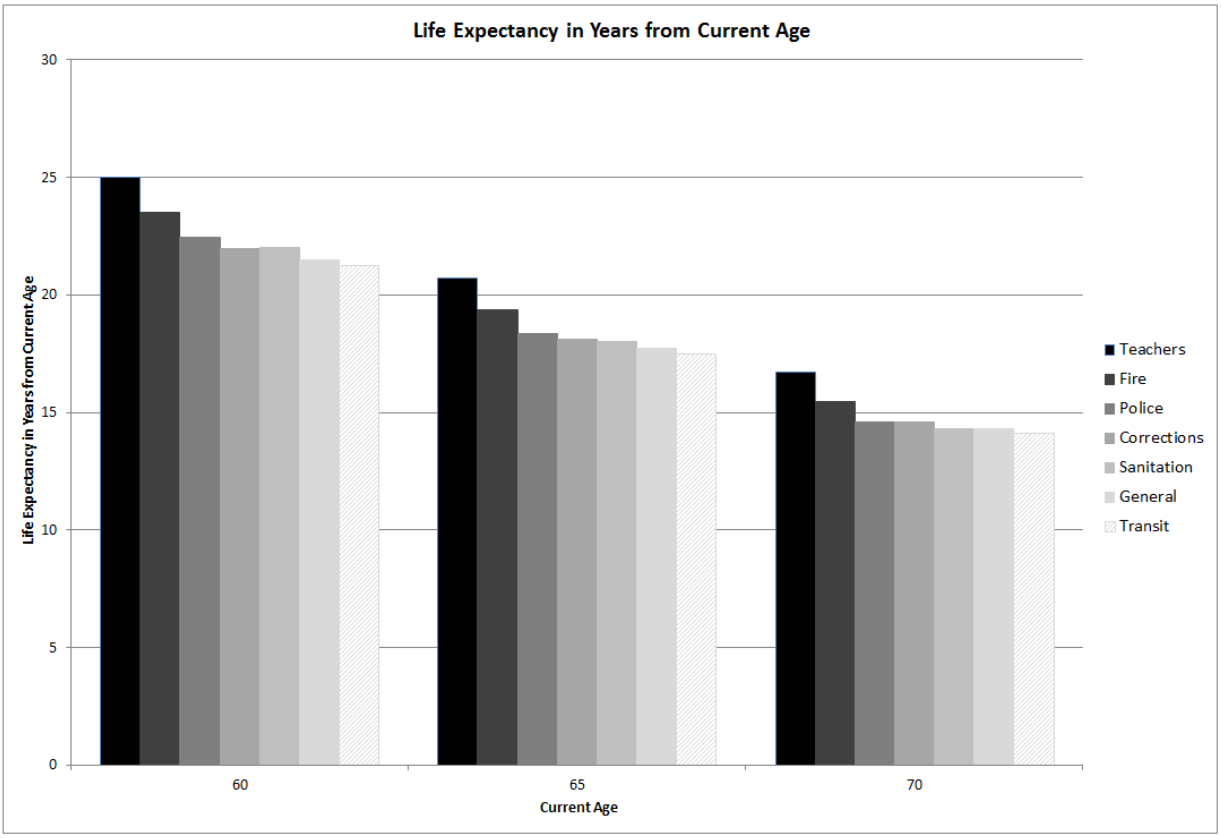
It is important to note that the liabilities and costs for the current valuation would be equal under a static or generational approach to mortality improvement if the static tables are set properly. It is the systematic inclusion of continuous improvement that will impact future valuations and experience studies.

NYCRS SPECIFIC ANALYSIS

NYCRS' actuarial liabilities and retirement contribution rates depend in part on how long retirees live. If members live longer, benefits will be paid for a longer period of time and the liability and ultimate employer contribution rates will be larger.

Based on experience observed in prior experience studies, the OA currently has separate mortality tables for all five individual Systems. This is a fairly common practice and is appropriate because individual employee groups may have measurably different rates of mortality.

The following graphic provides the life expectancy, in years, from a given age for each classification of retiree. These values are based on the actual data, not on the current assumption.



As shown, the life expectancy for retirees in TRS is substantially larger than the life expectancy of the retirees in the other Systems. Retirees in FIRE have the second highest life expectancy, followed by retirees in POLICE. The other classifications are under NYCERS and currently share the same mortality table. This experience supports the use of slightly different mortality assumptions (e.g., different multipliers, age set-backs, or different versions of base tables) for the Systems with materially different mortality expectations.

Currently, the OA has "Base" tables and "Valuation" tables. The Base tables represent the fit to the data as of the end of the prior experience study, June 30, 2009. The Valuation tables are the Base tables projected forward to account for future improvements in mortality using Scale AA.

When choosing an appropriate mortality assumption, actuaries typically use standard mortality tables, unlike when choosing other demographic assumptions. They may choose to adjust these standard mortality tables, however, to reflect various characteristics of the covered group, and to provide for expectations of future mortality improvement (both up to and after the measurement date). If the plan population has sufficient credibility to justify its own mortality table, then the use of such a table also could be appropriate. Factors that may be considered in selecting and/or adjusting a mortality table include the demographics of the covered group, the size of the group, the statistical credibility of its experience, and the anticipated rate of future mortality improvement.

The mortality tables currently used in the annual valuation for non-disabled retirees and for beneficiaries receiving benefits are System specific tables, projected using scale AA and based on the individual experience of each group. The tables have separate rates for males and females. The current application is what we refer to as a "static" table. The mortality rate for a 65-year-old male is projected to be the same in 30 years as it is today, with no accommodations for *continued* mortality improvements expected over time.

We first measured the credibility of the dataset to determine whether standard, unadjusted tables should be used or if statistical analysis of NYCRS specific data was warranted. Based on a practice note issued by the American Academy of Actuaries in the Fall of 2011, a dataset needs 96 expected deaths for each gender to be within +/- 20% of the actual pattern with 95% confidence. We believe +/- 20% is a rather large range to be considered fully credible. Other sources state higher requirements, such as 1,000 deaths per gender. The following table gives the number of deaths needed by gender to have a given level of confidence that the data is +/- X% of the actual pattern.

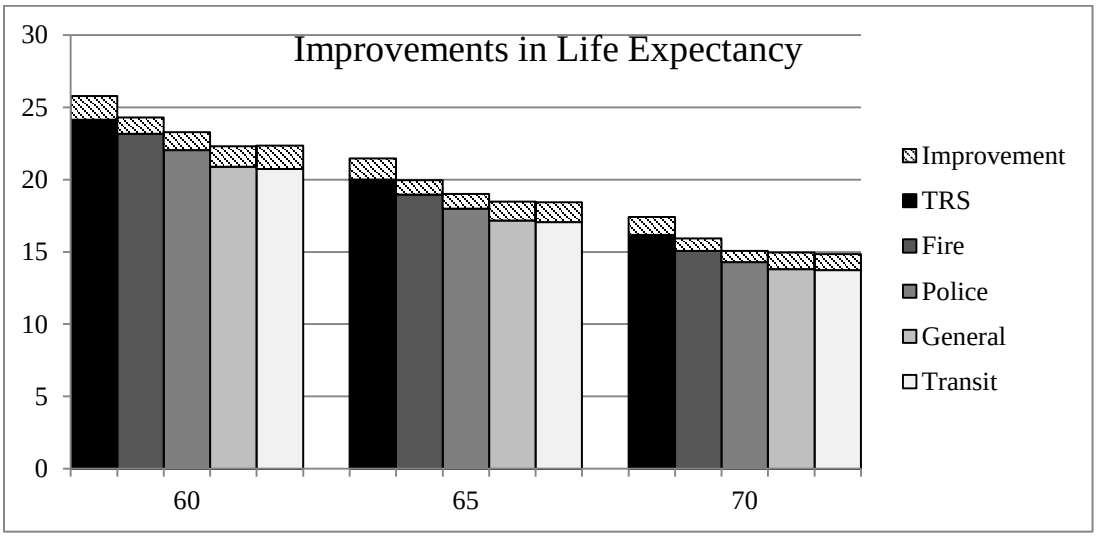
Standard Score	Confidence	99% – 101%	97% – 103%	95% – 105%	90% – 110%	80% – 120%
0.674	75%	4,543	505	182	45	11
1.282	80%	16,435	1,826	657	164	41
1.645	90%	27,060	3,007	1,082	271	68
1.96	95%	38,416	4,268	1,537	384	96
2.576	99%	66,358	7,373	2,654	664	166

Using this information, 1,082 deaths are needed by gender to have 90% confidence that the data is within +/- 5% of the actual pattern. NYCERS General had 12,721 male deaths during the 10-year period, clearly indicating they are a fully credible group. Other groups are smaller, but even the 10-year data for FIRE had 1,970 male deaths, indicating very high credibility. Based on this level

of credibility, we conclude it is appropriate for the Systems to use non-standard, System specific mortality tables.

We begin by determining the expected number of deaths in each year at each age for males and females. Then we compare the actual number to the expected number. The ratio of the actual deaths to the expected deaths (the A/E ratio) tells us whether the assumptions are reasonable. When using a static mortality table, an A/E ratio between 110% and 120% has traditionally been desired for conservatism and includes a margin for continued future improvements in mortality rates. Thus, the desired A/E level is 110% - 120% when compared to the *Valuation* tables. 100% A/E would be desired for comparison to the *Base* tables.

The results by individual System are provided in Section V. As shown, the current assumption for some groups falls into the desired range. For others, the experience has overtaken a large portion, if not all, of the margin for future mortality improvements. The mortality improvement can be easily identified when you compare the four-year experience ending June 30, 2005 to the four-year experience ending June 30, 2013. The following chart illustrates these mortality improvements by comparing the life expectancies during these two periods. The colored bar is the actual life expectancy for the four-year period ending 2005 and the shaded area on top is the amount of improvement when compared to the four-year period ending 2013:



GRS' Recommendation

Based on our observations regarding the rate of improvement in mortality, we recommend the Actuary change the method currently used to anticipate future mortality improvement. Rather than using a static table with built-in margin at the valuation date, we recommend the use of a base mortality table, based on the System's experience, and a separate, explicit assumption for continual improvement in the rates of mortality in the future. We will discuss this in two parts, the

recommended base mortality assumption, and the recommended mortality improvement assumption.

Recommended Base Mortality Assumption

Since each of the Systems has enough experience to credibly model post-retirement mortality, we have developed and recommended base mortality assumptions that are specific to each Retirement System. Due to the lack of female retirees in POLICE and FIRE, male-only mortality assumptions were developed for these two Systems. For the female assumptions in these two Systems, we started with the female assumption for NYCERS and made an adjustment based on the difference between the male assumption for NYCERS and the male assumption for the specific System. The adjustment factor was calculated as the quotient of the averaged proposed mortality rates from ages 65 to 75 for each of the Systems.

The mortality assumption for each System, except FIRE, is based on the System's experience for the four-year period ending June 30, 2013 to ensure that the most recent improvement is reflected. Since the retiree population for FIRE is smaller than the other groups, it was necessary to use the experience for the ten-year period ending June 30, 2013 for this System to have sufficient credibility to develop a mortality assumption based on this System's experience. We intentionally used a four-year period for developing a mortality assumption because this is the most recent experience and reflects the most recent improvements in longevity. Using a larger experience period would temper real changes that have occurred in the mortality assumption due to real changes, or improvements, observed in this assumption.

The process used to develop the recommended mortality assumptions is generally the same for each System. Mortality rates for the core ages of retirees, beyond age 60, are based on the System's experience, using an exponential model to provide a smooth fit to the midpoint of the experience. Mortality rates for the outlier ages, ages under 50, are equal to a multiple of the most recently published RP-2014 mortality assumptions (adjusted back to the central point of the experience period using projection scale MP-2014). Finally, the mortality rates for the transitional age ranges, ages 50 to 59, were developed using a cubic spine method to orderly transition between the mortality rates between the core and outlier age ranges.

The final step in the creation of the base mortality assumption was to project the preliminary table from the center point of the analysis period (i.e., the year 2008 for FIRE, and the year 2011 for all other Systems) to the year 2014 using the mortality improvement scale MP-2014.

Recommended Mortality Improvement Assumption

There are currently three commonly discussed mortality improvement assumptions used by pension actuaries for valuing pension plan liabilities, each released by the Society of Actuaries. These mortality improvement assumptions include: Scale AA, Scale BB, and Scale MP-2014.

Scale AA is based upon a blend of mortality improvement trends among Civil Service Retirement System (CSRS) and Social Security Administration participants between 1977 and 1993. Since its official release in 1995, it has become the most widely adopted improvement scale for use by both public and private institutions within the United States. Scale AA is the one used in the current assumption set and was the only scale available when the current assumption set was developed.

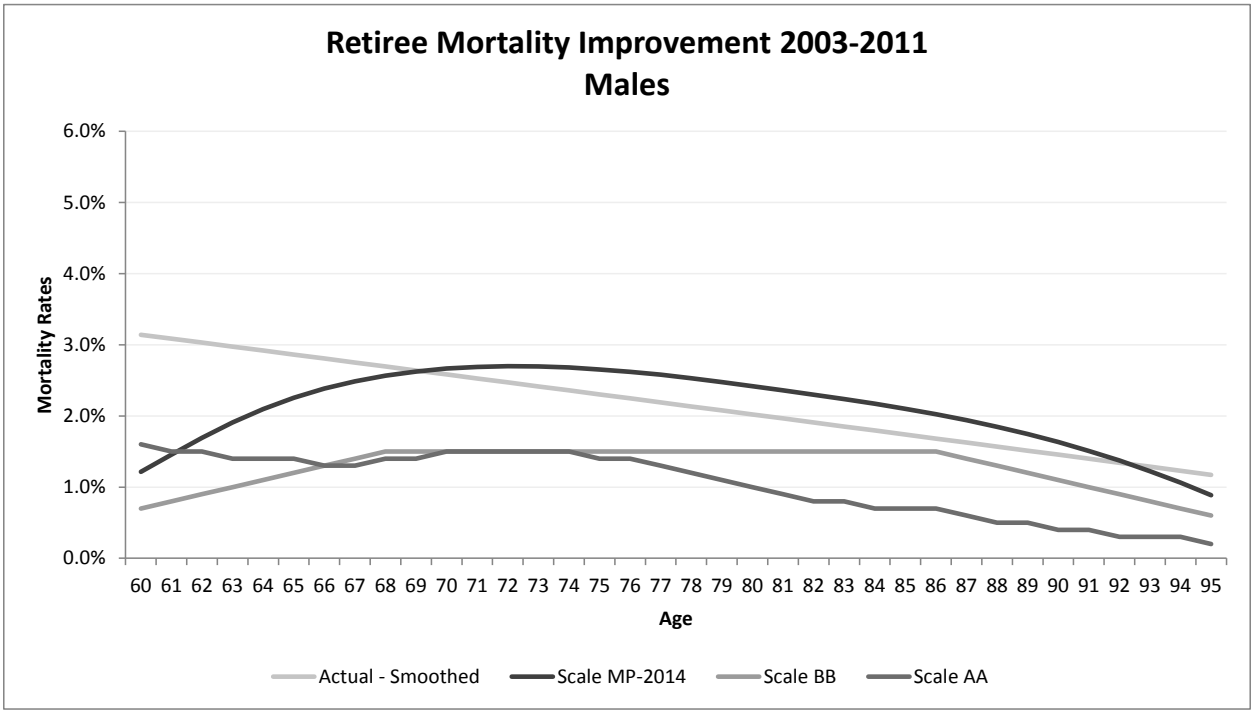
The Society of Actuaries' Retirement Plans Experience Committee (RPEC) initiated a pension mortality study in 2010. At an early stage of its analysis, RPEC noticed that mortality experience since 2000 has improved at a faster rate than anticipated by Scale AA. As a result, RPEC issued another mortality improvement scale, Scale BB, in the year 2012 as an alternative mortality improvement assumption for pension actuaries to use.

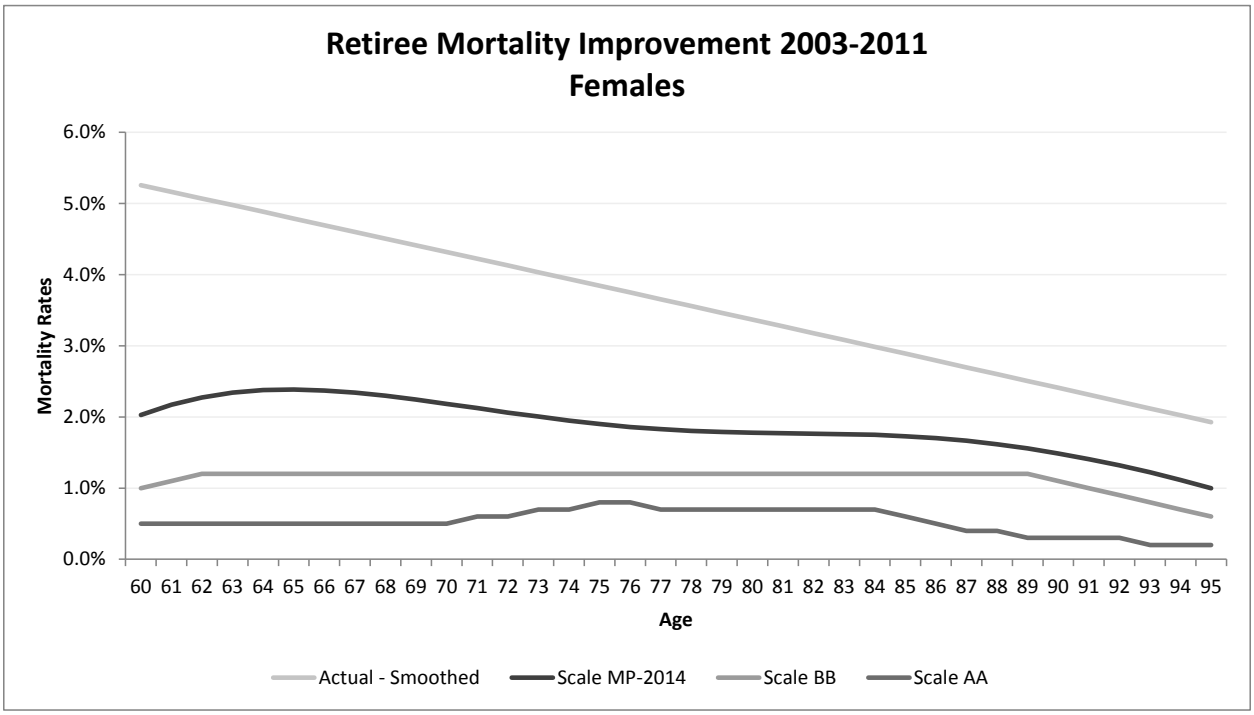
In October 2014, RPEC issued final reports of the mortality study that was originally initiated in 2010. These final reports included the release of another mortality improvement assumption, Scale MP-2014, which represents the Committee's current best estimate of future mortality improvement in the United States.

The graphs on the following page compare the rate of mortality improvement actually experienced by the New York City Retirement Systems (all Systems combined) to the mortality improvement assumptions Scale AA, Scale BB, and Scale MP-2014. To identify the rate of mortality improvement experienced by the Retirement Systems, we compared the crude mortality rates for the years 2001 through 2005 (i.e., a midpoint year of 2003) to the crude mortality rates for the years 2009 through 2013 (i.e., a midpoint year of 2011).

MP-2015

Just prior to the publication of this report, the SOA issued a new projection scale named MP-2015 that included updates for actual improvement experience through 2011. This new scale shows that the rate of increase during the 2010 and 2011 was slightly slower than the previous MP-2014 anticipated. The impact on contributions between using MP-2014 or MP-2015 would not be large, but it would be reasonable for the OA to consider MP-2015 when selecting the final assumption set for recommendations.





As the first table shows, the actual rate of mortality improvement for males was reasonably close to the MP-2014 improvement assumption. The data showed that the actual rate of improvement was much higher than each of the mortality assumptions for females. We believe that some of this apparent improvement is attributable to the quality of the data for the years 2001 through 2005,

which as discussed in previous sections, was not as reliable as data after the OA changed some of its internal processes. Therefore, we believe that the actual mortality improvement of female retirees is somewhat lower than illustrated in the graph, but likely still higher than improvement scale MP-2014.

In our opinion, mortality improvement assumptions Scale BB and Scale MP-2014 are preferable over Scale AA since they are based on more current data (Scale BB and Scale MP-2014 are based on the same historical data) and more consistently model actual historical experience. A significant difference between improvement Scale MP-2014 and Scale BB is Scale MP-2014 is a two-dimensional improvement assumption that is a function of the age and calendar year, whereas Scale BB is only a function of age. While the improvement scale MP-2014 is a more complex assumption to incorporate into the valuation program (due to its two-dimensional design), Scale MP-2014 is a closer fit to the actual experience for the plans than Scale BB.

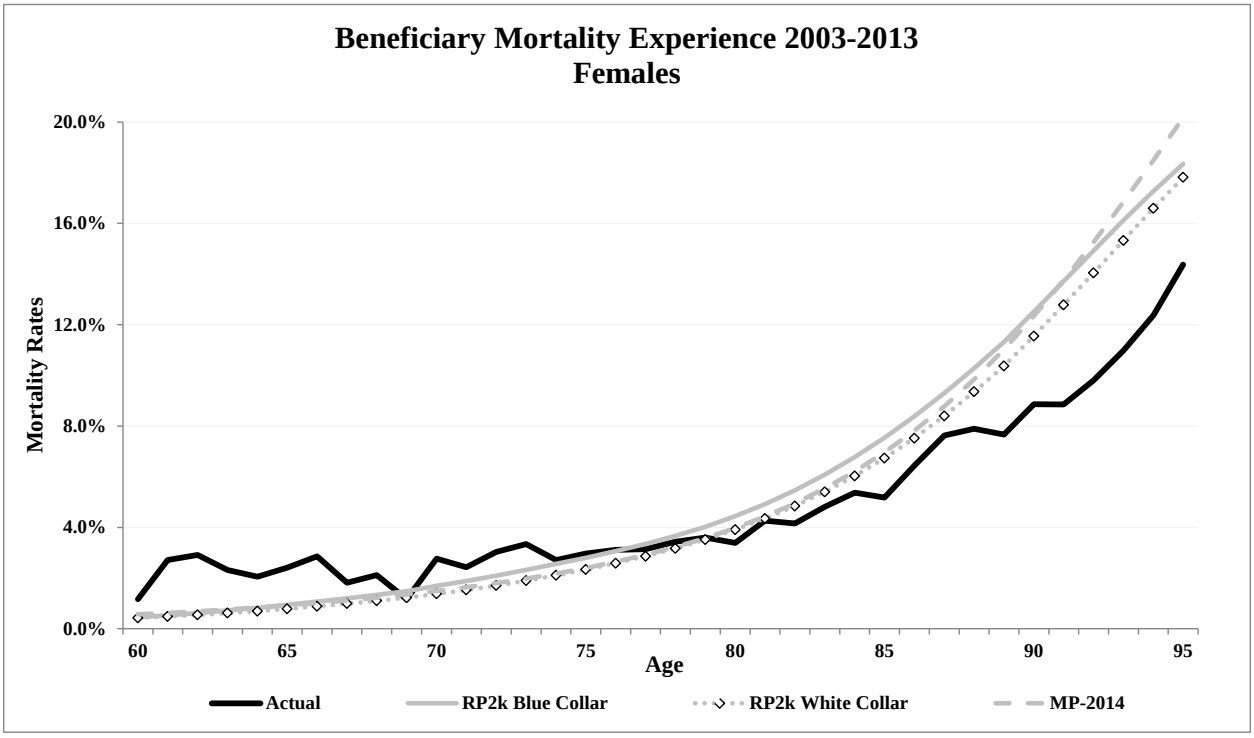
We also believe that Scale MP-2014 will more closely model the future mortality improvement that the NYCRS will experience in future years. For these reasons, we recommend the NYCRS use mortality improvement Scale MP-2014 in their respective actuarial valuations.

Finally, we have confirmed that ProVAL, the valuation system used by the OA to calculate the liabilities and costs of the Retirement Systems, is currently capable of using this more complex mortality improvement assumption.

BENEFICIARY MORTALITY ASSUMPTION

We also analyzed the mortality experience for the beneficiaries in each of the Systems. There was significantly more experience for beneficiary females than beneficiary males with 8,572 and 633 deaths, respectively, for the ten-year period ending June 30, 2013.

The graph on the following page compares the actual rate of mortality experienced by the New York City Retirement Systems (all Systems combined) for female beneficiaries, to certain other published mortality tables.



As the graph shows, the mortality experience is very different than standard tables. In particular, the significantly higher rate of mortality at the younger ages has us questioning the credibility of the data and the lower rate of mortality at the higher ages, above age 85, is very likely attributable to survivor bias.

Given these uncertainties in the underlying experience data, we recommend the OA either (1) adopt the retiree mortality assumptions for the given group as the mortality assumption for the beneficiary as well or (2) adopt the retiree mortality assumptions (male and female) used in the valuation of NYCERS for the beneficiary mortality assumption for all Systems, including TRS, BERS, POLICE and FIRE.

DISABILITY MORTALITY ASSUMPTION

The mortality assumption for disabled retirees is less significant than the mortality assumption for healthy retirees because the number of disabled retirees and their liability is much smaller compared to healthy retirees. However, this assumption is even more System-specific than the healthy assumption because the definition of disability dictates how impaired the mortality will be.

Even though this assumption is less material than the mortality assumption for healthy retirees, we recommend updating this assumption to reflect observed improvements in life expectancy and adding an explicit assumption for continued improvement in mortality (i.e., a generational mortality assumption).

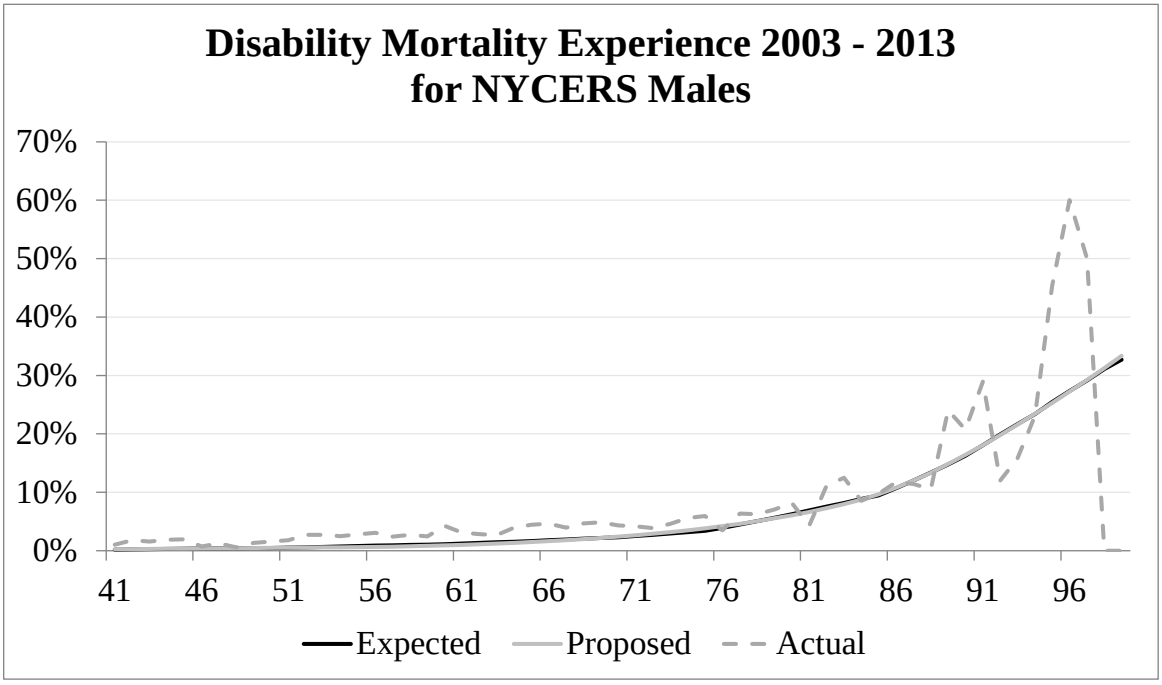
The life expectancy for disabled retirees varies by System. Below is a table with observed life expectancy by System.

Male Life Expectancy for Disabled Retirees with 60 Years of Age for the 10-Year Period Ending June 30, 2013

Retirement System	NYCERS General	TRS	POLICE	FIRE
Observed Life Expectancy	17.1	21.7	21.7	22.9

Disabled retirees in POLICE and FIRE have a longer life expectancy, on average, than disabled retirees in NYCERS. This is not surprising as many members in POLICE and FIRE retire as a result of work-related injuries. We have observed these relative differences in life expectancy in other large retirement systems with public safety and general employee members.

The table below shows the mortality experience for the largest group of disabled retirees, disabled male retirees in NYCERS, for the 10-year period ending June 30, 2013. The purpose of this exhibit is to show that there is significant volatility in the actual mortality experience across the age spectrum. Much of this volatility is due to the inherent variability in experience associated with this assumption as well as the smaller pool of experience (for instance, NYCERS has 3,075 disability deaths for the 10-year period ending June 30, 2013).



The observed variation in the mortality rates is much higher in the other Systems since there is even less experience to observe. This was especially true when reviewing the assumption for disabled retirees in BERS and disabled female retirees in POLICE and FIRE.

However, using the same methodologies as healthy retirees except using 10 years of data in all Systems, we have developed System-specific tables for this assumption. Even though there is not as much credibility, we believe the table created based on the NYCRS data is more appropriate, and provided a much better fit, than the recently published RP-2014 tables.

We also recommend using the same mortality improvement assumption used to project mortality improvement for healthy retirees, Scale MP-2014.

SECTION V

SUMMARY RESULTS BY SYSTEM

The results of each System of the NYCERS Retirement System are quantified in this section.

For each System, the following Business Rules were applied:

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

See the summary results of the individual System to determine which Business Rules were implemented.

Business Rule 1: Death Reclassification

Description:	Example:		2006	2007	2008	2009
For a member who shows as a death in a given data file and shows a date of death in an earlier period, the death status was filled backwards until the fiscal year associated with the death date.	A member is identified as a death status in the 6/30/2009 data file with a Date of Death of 7/2/2006. The member's 6/30/2007 status and all future statuses are updated to reflect the new Date of Death.	**Initial**	R	R	R	R
		⬇		⬇	⬇	⬇
		Matured	R	D	D	D

Business Rule 2: Accidental Disability Reclassification

Description:	Example:		2002	2003	2004	2005
For members reclassifying to Accidental Disability (status code 'J'), either after service retirement or after termination, GRS changed the record as though the member immediately retired under Accidental Disability.	An active member retires 8/22/2002 and is reclassified to Accidental Disability as of 6/30/2005. The statuses for FYE 2003 and 2004 are changed to Accidental Disability.	**Initial**	A	R	R	J
		⬇		⬇	⬇	
		Matured	A	J	J	J

Business Rule 3: Ordinary Disability Reclassification

Description:	Example:		2001	2002	2003	2004
For members retiring under Ordinary Disability (status code 'I'), either after service retirement or after termination, GRS changed the record as though the member immediately retired under Ordinary Disability.	An active member retires 4/23/2002 and is reclassified to ordinary disability in FYE 2004. The statuses for FYE 2002 and 2003 are changed to Ordinary Disability.	**Initial**	A	R	R	I
		⬇		⬇	⬇	
		Matured	A	I	I	I

Business Rule 4: Status Continuity

Description:	Example:		2004	2005	2006	2007
In any three year period, if the first and last year's status matched, the middle year was also changed to be consistent. This rule was applied to statuses A, I, J, and R.	A record shows ordinary disability in 6/30/2004 and 6/30/2006 but beneficiary in 6/30/2005. The 6/30/2005 status is changed to ordinary disability.	**Initial**	I	B3	I	I
		⬇				
		Matured	I	I	I	I

Business Rule 5: Active-Inactive Reclassification #1

Description:	Example:		2008	2009	2010	2011
Status B was introduced to differentiate active-inactive members that returned to service. Any active member that becomes active-inactive for a period and eventually returns to active service will have all active-inactive statuses changed to B.	An active member as of 6/30/2008 becomes Active-Inactive as of 6/30/2009. When the member returns to active status in 6/30/2011, all prior active-inactive years are changed to B.	**Initial**	A	F	F	A
		⬇		⬇	⬇	
		Matured	A	B	B	A

Business Rule 6: Active-Inactive Reclassification #2

Description:	Example:		2010	2011	2012	2013
Status C was introduced to differentiate active-inactive members in the final two years of the experience period. Any active member that becomes active-inactive during this period will have all active-inactive statuses changed to C.	An active member as of FYE 2011 becomes Active-Inactive as of FYE 2012. Based on this Rule, the member's status for FYE 2012 and 2013 is changed to C.	**Initial**	A	A	F	F
		⬇			⬇	⬇
		Matured	A	A	C	C

Status B&C were added to classify members as active in the reconcilation process but not include them in the salary analysis.

Business Rule 7: Service Retirement Adjustment

Description:	Example:		2004	2005	2006	2007
If MSTATC for any currently active member indicated they retired (code 90, 91, 92, or 93), that member's status was changed to retirement, unless the status was disabled. This rule was only applied to the last four years of data (2010, 2011, 2012, and 2013) and has priority over Rule 8.	A record shows ordinary disability in 6/30/2004 and 6/30/2006 but beneficiary in 6/30/2005. The 6/30/2005 status is changed to ordinary disability.	**Initial**	I	B3	I	I
		⬇				
		Matured	I	I	I	I

Business Rule 8: Eligibility Adjustment

Description:	Example:		2004	2005	2006	2007
If an active member's status indicated they decremented out under a decrement they were not eligible for, they were assumed to have terminated. Additionally, if a member was eligible for retirement but their status indicated they terminated, the member's status was changed to retirement.	An active member is shown to have terminated as of the 6/30/2006 data and was eligible to retire based on their service. The member's status was changed to retirement.	**Initial**	A	A	T	T
		⬇			⬇	⬇
		Matured	A	A	R	R

SECTION V

SUMMARY RESULTS BY SYSTEM: NYCERS

NYCERS

Findings

The results of the four-year and ten-year experience studies are shown in Appendices I - VI. We have quantified the differences between actual experience and current actuarial assumptions as well as provided illustrative proposed assumptions we believe would be appropriate and reasonable. The tables on the page following our summary of recommendations provide a summary of the reconciliation in comparison to the current assumptions.

The following business rules were applied to the NYCERS data. A general description of each rule may be found at the beginning of Section V.

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

Based on our analysis of NYCERS, GRS recommends consideration of the following changes for future valuations:

1. **Post-Retirement Mortality:** For this analysis and for recommendations, all employee classifications under NYCERS were grouped together except for HPTP, which was compared to the recommended assumptions for Police. We recommend updating the base mortality table to a System-specific mortality table developed using NYCERS' actual experience. We also recommend using a full generational mortality assumption using projection scale MP-2014. A new table based on the results of this study and the application of MP-2014 is provided in the Appendix.

2. **Salary and Overtime Assumptions:** For the General group, the general wage increase portion of the salary scale has been lower than currently assumed and we believe a decrease in this assumption is appropriate. For most of the other groups, the general wage increase portion of the salary scale has been higher than currently assumed, but the merit portion has been materially flatter than currently assumed, and we have recommended an adjustment to both.

However, a new labor contract provides material increases over the next several years, including retroactive increases. Thus, it is unlikely the rate of salary increases the members experienced over the last ten years is representative of the rate of salary increases that will be provided in future years. We believe the OA is better positioned to reflect these factors in the development of the updated assumption as it best fits their model.

3. **Withdrawal Assumption:** The number of actual withdrawals has been consistently higher than expected by the current assumption. We have recommended a higher termination schedule that moves more than halfway to the experience. Further movement will likely be needed in the next study.

4. **Disability Assumption:** We have made minor recommendations as necessary by group.

5. **Retirement Patterns:** Beginning with the June 30, 2010 data, the OA began to include an indicator in the retiree data that identified whether the member was a reduced retirement, a retirement in the first year eligible, in the second year, or after. This indicator greatly increased the credibility and reliability of the reconciliation process, especially for reduced retirement. Consistent with national trends, members have been deferring retirement. We have made recommendations based on the trend as a whole and based on behavior at specific ages.

The cost estimates shown below are illustrative only and are based on the change in normal cost plus a 19-year amortization of the change in AAL as if all recommendations in this report were adopted. As discussed on Page II-1, there are always a range of reasonable assumptions and thus actual costs will be determined by the OA once the OA and the Board finalize the assumption changes.

Illustrative Cost Estimates

	FY14 results (June 30, 2012 lag valuation)		
	AAL ($ Millions)	Normal Cost ($Millions)	Employer Contribution ($ Millions)
Base Results (current Assumptions)	$66,629	$1,468	$3,040
Estimated Change for changes in			
Mortality Assumptions	$2,027	$92	$282
Overtime Assumptions	$1,191	$59	$170
Other pay related and demographic assumptions	-$315	-$62	-$91
Sub Total	$69,532	$1,557	$3,401
Estimated Change for ¼% decrease in investment return assumption	$1,877	$111	$239
Total	$71,409	$1,668	$3,640

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – GENERAL
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Service Retiree Mortality						The proposed assumption is based on actual plan experience. Future
1A	Men	93%	1237	97%	97%	1265	mortality improvements will be projected using scale MP-2014. The
1B	Women	93%	1321	97%	99%	1336	following NYCERS groups were combined for this study: General,
1C	Men & Women	93%	2557	97%	98%	2601	Transit, Sanitation, Corrections, and TBTA.
1D	By Year						
	Disabled Retiree Mortality						The proposed assumption is based on actual plan experience. Future
2A	Men	93%	126	95%	108%	123	mortality improvements will be projected using scale MP-2014. The
2B	Women	116%	94	119%	101%	88	following NYCERS groups were combined for this study: General,
2C	Men & Women	102%	219	104%	105%	211	Transit, Sanitation, Corrections, and TBTA.
2D	By Year						
	Active Member Withdrawals						Actual experience is higher than expected. We recommend raising the
3A	Men	131%	1385	132%	114%	1393	current assumption.
3B	Women	140%	2047	139%	120%	1994	
3C	Men & Women	136%	3432	136%	118%	3387	
3D	By Year						
	Active Member Service Retirements						Unreduced retirements were expected to roughly double over the
	In 1st Year of Eligibility						period. Generally, members have been delaying retirements,
4A	Total	68%	844	82%	83%	908	consistent with national trends. Consider extending maximum
4B	Elected	76%	182	70%	79%	151	retirement age from 70 to 75.
4C	Mandated	66%	662	84%	84%	757	
	In 2nd Year of Eligibility						
5A	Total	68%	387	75%	75%	360	
5B	Elected	80%	63	75%	75%	50	
5C	Mandated	66%	325	75%	75%	310	
	After 2nd Year of Eligibility						
6A	Total	51%	1830	49%	49%	1414	
6B	Elected	81%	191	77%	77%	120	
6C	Mandated	49%	1639	47%	47%	1295	
6D	By Year						
	Reduced Service Retirements						There were more reduced retirements than expected. We recommend
7A	Total	167%	755	91%	67%	383	raising the current assumption.
7B	By Year						

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – GENERAL
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Active Member Ordinary Mortality						Mortality was lower than expected. We recommend lowering the current rates.
8A	Men	81%	108	95%	108%	119	
8B	Women	80%	84	95%	106%	94	
8C	Men & Women	80%	192	95%	107%	213	
8D	By Year						
	Active Member Ordinary Disability						The current assumption is reasonable.
9A	Men	84%	170	88%	88%	171	
9B	Women	89%	179	89%	89%	167	
9C	Men & Women	86%	348	88%	88%	338	
9D	By Year						
	Active Member Accidental Disability						Minor assumption. Actuals appears to be trending down and may warrant an assumption change if this trend continues.
10A	Men	73%	17	99%	99%	22	
10B	Women	86%	12	98%	98%	14	
10C	Men & Women	78%	29	99%	99%	36	
10D	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Merit looks reasonable. Actual experience is lower than expected, largely due to productivity component (which is trending further downward). Recommend lowering ultimate assumption by 0.25%.
11A	Total	4.98%	2.03%	5.00%	4.47%	3.91%	
11B	Merit Only	1.98%	1.75%	2.00%	1.72%	1.76%	
	General Increase over Inflation	1.50%	-0.57%	0.50%	0.25%	-0.23%	
11C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Actual overtime has been higher than expected assumption. Recommend higher assumption.
12A	For All Years	4.00%	12.21%	4.00%	8.00%	12.05%	
12B	In Year Before Service Retirement	4.00%	12.46%	4.00%	8.00%	12.11%	
12C	In Year Before Disability Retirement	4.00%	10.52%	4.00%	8.00%	9.98%	
12D	By Year						

** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – TRANSIT
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Service Retiree Mortality						The proposed assumption is based on actual plan experience. Future
1A	Men	96%	817	98%	99%	828	mortality improvements will be projected using scale MP-2014. The
1B	Women	100%	68	101%	103%	64	following NYCERS groups were combined for this study: General,
1C	Men & Women	96%	884	99%	107%	892	Transit, Sanitation, Corrections, and TBTA.
1D	By Year						
	Disabled Retiree Mortality						The proposed assumption is based on actual plan experience. Future
2A	Men	94%	66	100%	113%	70	mortality improvements will be projected using scale MP-2014. The
2B	Women	98%	12	89%	75%	10	following NYCERS groups were combined for this study: General,
2C	Men & Women	95%	78	98%	107%	79	Transit, Sanitation, Corrections, and TBTA.
2D	By Year						
	Active Member Withdrawals						The current assumption is reasonable.
3A	Men	99%	287	114%	114%	329	
3B	Women	170%	94	165%	165%	92	
3C	Men & Women	110%	381	122%	122%	421	
3D	By Year						
	Active Member Service Retirements						Actual experience has outpaced the current assumptions. Consider
	In 1st Year of Eligibility						extending maximum retirement age from 70 to 75.
4A	Total	53%	342	50%	60%	264	
4B	Elected	66%	206	55%	65%	126	
4C	Mandated	40%	136	46%	57%	137	
	In 2nd Year of Eligibility						
5A	Total	55%	141	66%	74%	141	
5B	Elected	79%	74	88%	88%	63	
5C	Mandated	41%	67	55%	66%	78	
	After 2nd Year of Eligibility						
6A	Total	54%	557	59%	60%	485	
6B	Elected	104%	221	105%	105%	133	
6C	Mandated	41%	336	50%	57%	352	
6D	By Year						
	Reduced Service Retirements						
7A	Total	268%	1	47%	35%	1	Due to limited experience, we recommend using the NYCERS
7B	By Year						General group's reduced retirement proposed assumption.

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – TRANSIT
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Active Member Ordinary Mortality						Minor Assumption. The current assumption is reasonable.
8A	Men	107%	53	120%	120%	57	
8B	Women	168%	6	192%	192%	7	
8C	Men & Women	112%	59	125%	125%	64	
8D	By Year						
9A	Active Member Accidental Mortality	14%	1	11%	45%	0	Minor Assumption. We recommend a lower assumption.
9B	By Year						
	Active Member Ordinary Disability						We recommend raising Ordinary Disability rates for Women.
10A	Men	93%	98	93%	93%	94	
10B	Women	239%	40	215%	153%	34	
10C	Men & Women	113%	138	110%	104%	128	
10D	By Year						
	Active Member Accidental Disability						Minor Assumption. We recommend lowering Accidental Disability rates for Men.
11A	Men	8%	1	34%	69%	2	
11B	Women	23%	0	104%	104%	1	
11C	Men & Women	10%	1	45%	78%	3	
11D	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
12A	Total	4.19%	3.41%	4.32%	4.32%	3.90%	Overall, experience has slightly outpaced assumption, especially when adjusted for actual versus expected inflation.
12B	Merit Only	0.69%	0.70%	0.82%	0.82%	0.78%	
	General Increase over Inflation	1.00%	0.37%	1.00%	1.00%	0.78%	
12C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
13A	For All Years	8.00%	9.21%	8.00%	8.00%	8.22%	Experience has been close to the expected assumption. Members are working less Overtime before becoming disabled.
13B	In Year Before Service Retirement	8.00%	7.62%	8.00%	8.00%	7.01%	
13C	In Year Before Disability Retirement	8.00%	5.24%	8.00%	8.00%	5.04%	
13D	By Year						

** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – SANITATION
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Service Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
1A	Men	96%	279	98%	101%	284	
1B	Women	113%	1	88%	93%	1	
1C	Men & Women	96%	280	98%	101%	285	
1D	By Year						
	Disabled Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
2A	Men	92%	68	93%	75%	68	
2B	Women	150%	0	181%	105%	0	
2C	Men & Women	92%	69	94%	75%	68	
2D	By Year						
	Active Member Withdrawals						The current assumption is reasonable. No change is recommended.
3A	Men	94%	44	112%	112%	56	
3B	Women	128%	2	116%	116%	2	
3C	Men & Women	95%	45	113%	113%	57	
3D	By Year						
	Active Member Service Retirements						Experience has been consistently lower than expected. In certain places, the current assumption should be lowered to match experience.
	In 1st Year of Eligibility						
4A	Total	48%	67	49%	58%	92	
4B	Elected	74%	48	49%	54%	71	
4C	Mandated	25%	19	50%	80%	21	
	In 2nd Year of Eligibility						
5A	Total	97%	48	120%	120%	63	
5B	Elected	108%	42	114%	114%	51	
5C	Mandated	58%	6	156%	156%	12	
	After 2nd Year of Eligibility						
6A	Total	63%	125	79%	94%	131	
6B	Elected	71%	119	76%	96%	105	
6C	Mandated	19%	6	90%	90%	26	
6D	By Year						
	Reduced Service Retirements						Due to limited experience, we recommend using the NYCERS General group's reduced retirement proposed assumption.
7A	Total	93%	1	72%	72%	1	
7B	By Year						

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – SANITATION
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Active Member Ordinary Mortality						Minor Assumption. Experience has been trending below current assumption.
8A	Men	69%	7	115%	115%	11	
8B	Women	0%	0	131%	131%	0	
8C	Men & Women	68%	7	115%	115%	11	
8D	By Year						
9A	Active Member Accidental Mortality	71%	1	82%	82%	1	Minor Assumption. The current assumption is reasonable.
9B	By Year						
	Active Member Ordinary Disability						Minor Assumption. The proposed assumption is 75% of the current assumption.
10A	Men	61%	14	63%	84%	15	
10B	Women	120%	1	132%	176%	1	
10C	Men & Women	62%	14	64%	86%	15	
10D	By Year						
	Active Member Accidental Disability						The proposed assumption is based on an exponential fit of actual data for Men and is 120% of the current assumption for Women.
11A	Men	138%	38	136%	120%	38	
11B	Women	138%	1	111%	93%	1	
11C	Men & Women	138%	39	135%	119%	39	
11D	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
12A	Total	7.70%	5.17%	7.70%	7.86%	6.96%	General increases and merit are slightly lower than expected.
12B	Merit Only	4.20%	3.44%	4.20%	3.86%	3.46%	
	General Increase over Inflation	1.00%	-1.09%	1.00%	1.50%	1.60%	
12C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
13A	For All Years	12.00%	12.16%	12.00%	12.00%	12.45%	Experience has been close to the Expected assumption. Members are working less overtime before becoming disabled.
13B	In Year Before Service Retirement	12.00%	11.63%	12.00%	12.00%	13.55%	
13C	In Year Before Disability Retirement	12.00%	4.41%	12.00%	12.00%	4.80%	
13D	By Year						

* *Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

** *For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – CORRECTIONS
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Service Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
1A	Men	76%	61	84%	90%	58	
1B	Women	91%	11	96%	99%	9	
1C	Men & Women	78%	72	85%	92%	68	
1D	By Year						
	Disabled Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
2A	Men	72%	18	76%	59%	17	
2B	Women	70%	4	108%	61%	5	
2C	Men & Women	72%	22	81%	81%	22	
2D	By Year						
	Active Member Withdrawals						Recent experience has been volatile, but is in line with the current assumption. No change is recommended.
3A	Men	113%	56	121%	121%	59	
3B	Women	98%	41	115%	115%	48	
3C	Men & Women	106%	97	118%	118%	107	
3D	By Year						
	Active Member Service Retirements						Generally, members have been delaying retirements, consistent with national trends. The current assumption reflects long-term anticpated retirement patterns.
	In 1st Year of Eligibility						
4A	Total	49%	164	63%	74%	257	
4B	Elected	48%	96	36%	42%	93	
4C	Mandated	50%	68	107%	129%	165	
	In 2nd Year of Eligibility						
5A	Total	82%	68	146%	156%	101	
5B	Elected	92%	51	153%	154%	80	
5C	Mandated	63%	17	123%	165%	21	
	After 2nd Year of Eligibility						
6A	Total	58%	157	64%	88%	100	
6B	Elected	64%	137	66%	90%	81	
6C	Mandated	36%	20	57%	80%	20	
6D	By Year						
	Reduced Service Retirements						Due to limited experience, we recommend using the NYCERS General group's reduced retirement proposed assumption.
7A	Total	0%	0	1250%	833%	0	
7B	By Year						

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – CORRECTIONS
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Active Member Ordinary Mortality						Minor Assumption. Experience appears to be less than the assumptions.
8A	Men	74%	5	67%	67%	4	
8B	Women	67%	2	80%	80%	2	
8C	Men & Women	72%	7	71%	71%	7	
8D	By Year						
9A	Active Member Accidental Mortality	0%	0	0%	0%	0	Minor Assumption. There were no deaths over the measured period.
9B	By Year						
	Active Member Ordinary Disability						Minor Assumption. Experience has been trending below current assumption.
10A	Men	27%	4	46%	46%	6	
10B	Women	76%	7	98%	98%	9	
10C	Men & Women	48%	11	67%	67%	16	
10D	By Year						
	Active Member Accidental Disability						The proposed assumption is 115% of the current assumption for Men and 0.20% at all ages for women.
11A	Men	133%	28	127%	110%	28	
11B	Women	35%	6	38%	77%	6	
11C	Men & Women	90%	34	89%	102%	35	
11D	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
12A	Total	7.45%	6.61%	6.93%	7.06%	6.79%	Merit increases are lower than expected, though this is offset by greater observed productivity.
12B	Merit Only	3.95%	3.20%	3.43%	3.06%	2.84%	
	General Increase over Inflation	1.00%	0.84%	1.00%	1.50%	1.70%	
12C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
13A	For All Years	11.59%	15.67%	11.44%	13.00%	13.17%	Experience has been close to the expected assumption. Members are working less overtime before becoming retired or disabled.
13B	In Year Before Service Retirement	14.80%	15.41%	14.37%	14.00%	12.51%	
13C	In Year Before Disability Retirement	12.20%	7.82%	11.86%	13.00%	6.38%	
13D	By Year						

** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – TBTA
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Service Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
1A	Men	83%	21	94%	97%	22	
1B	Women	128%	3	99%	104%	2	
1C	Men & Women	86%	23	94%	97%	24	
1D	By Year						
	Disabled Retiree Mortality						The proposed assumption is based on actual plan experience. Future mortality improvements will be projected using scale MP-2014. The following NYCERS groups were combined for this study: General, Transit, Sanitation, Corrections, and TBTA.
2A	Men	108%	5	85%	102%	4	
2B	Women	114%	1	74%	61%	0	
2C	Men & Women	108%	5	84%	97%	4	
2D	By Year						
	Active Member Withdrawals						Actual withdrawals are considerably outpacing the expectations. We recommend a higher assumption.
3A	Men	151%	19	161%	127%	21	
3B	Women	391%	13	301%	243%	11	
3C	Men & Women	203%	32	192%	152%	32	
3D	By Year						
	Active Member Service Retirements						Very small data set, no credibility. Due to limited experience, we recommend using the General group's reduced retirement proposed assumption.
	In 1st Year of Eligibility						
4A	Total	116%	16	74%	74%	9	
4B	Elected	145%	9	74%	74%	5	
4C	Mandated	91%	7	73%	73%	4	
	In 2nd Year of Eligibility						
5A	Total	74%	3	135%	135%	7	
5B	Elected	45%	1	126%	126%	3	
5C	Mandated	84%	3	142%	142%	4	
	After 2nd Year of Eligibility						
6A	Total	80%	15	99%	99%	17	
6B	Elected	127%	6	151%	151%	7	
6C	Mandated	66%	9	77%	77%	9	
6D	By Year						
	Reduced Service Retirements						
7A	Total	390%	14	406%	406%	13	
7B	By Year						

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – TBTA
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	Active Member Ordinary Mortality						Very small data set, no credibility.
8A	Men	60%	1	82%	82%	1	
8B	Women	112%	0	94%	94%	0	
8C	Men & Women	66%	1	83%	83%	2	
8D	By Year						
9A	Active Member Accidental Mortality	0%	0	0%	0%	0	Very small data set, no credibility.
9B	By Year						
	Active Member Ordinary Disability						Very small data set, no credibility.
10A	Men	85%	2	105%	105%	3	
10B	Women	41%	0	117%	117%	1	
10C	Men & Women	76%	2	107%	107%	3	
10D	By Year						
	Active Member Accidental Disability						Very small data set, no credibility.
11A	Men	0%	0	40%	73%	0	
11B	Women	342%	0	169%	169%	0	
11C	Men & Women	24%	0	49%	85%	1	
11D	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
12A	Total	4.70%	2.78%	5.23%	5.07%	4.46%	Overall, expected general increases have slightly outpaced experience. Merit increases have been lower than expected.
12B	Merit Only	1.20%	0.72%	1.73%	1.32%	1.10%	
	General Increase over Inflation	1.00%	-1.68%	1.00%	1.25%	1.28%	
12C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	
13A	For All Years	20.00%	18.64%	20.00%	20.00%	20.80%	Experience has been close to the Expected assumption. Members are working less Overtime before becoming disabled.
13B	In Year Before Service Retirement	20.00%	17.64%	20.00%	22.00%	27.08%	
13C	In Year Before Disability Retirement	20.00%	12.45%	20.00%	20.00%	14.47%	
13D	By Year						

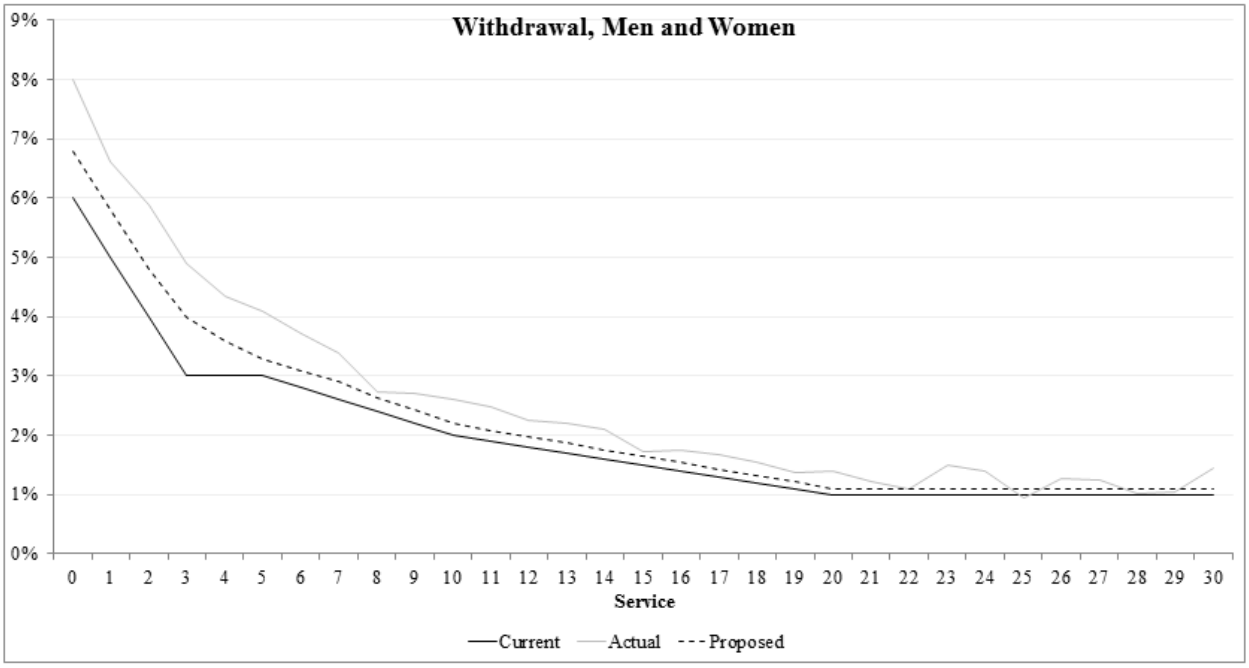
* *Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

** *For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

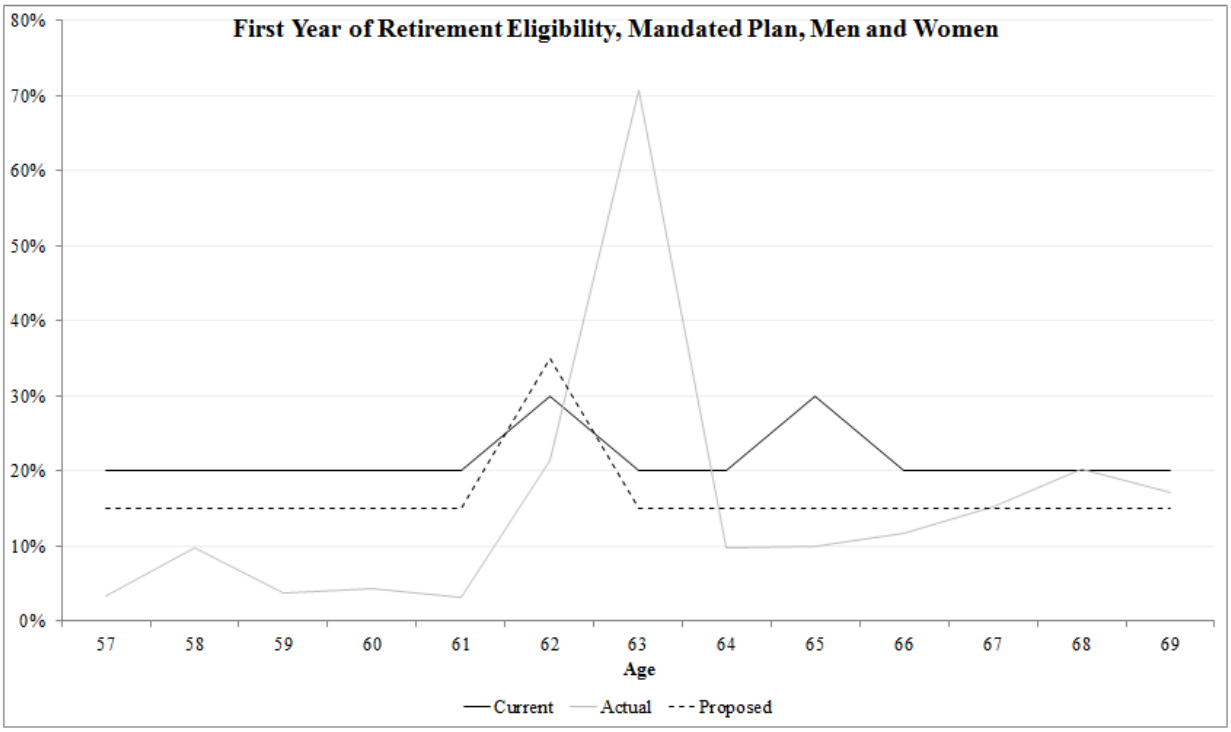
NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – HP TP
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013		10-YEAR PERIOD ENDING 6/30/2013			GRS' Ideal A/E Range	Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year		
	Service Retiree Mortality						98-103%	The proposed assumption is equivalent to the proposed assumption for the Police System.
1A	Men	102%	61	101%	106%	56		
1B	Women	283%	1	208%	124%	0		
1C	Men & Women	102%	61	102%	106%	56		
1D	By Year							
	Disabled Retiree Mortality						98-103%	The proposed assumption is equivalent to the proposed assumption for the Police System.
2A	Men	94%	28	95%	100%	26		
2B	Women	0%	0	56%	33%	0		
2C	Men & Women	93%	28	95%	99%	26		
2D	By Year							

NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – GENERAL
WITHDRAWAL ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



NEW YORK CITY EMPLOYEES' RETIREMENT SYSTEM – GENERAL
RETIREMENT ASSUMPTIONS AND EXPERIENCE
FOR THE FOUR-YEAR PERIOD ENDING 6/30/2013



GRS' APPROACH TO ASSIGNING STATUSES FOR NYCERS ACTIVE TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*
A	Active		10, 20, or 60	10
B	Active-Inactive, Adjusted	Withdrawal		20
B1	Beneficiary of Retiree	Beneficiary		
B2	Beneficiary of Ordinary Death	Beneficiary		
B3	Beneficiary of Accidental Death	Beneficiary		
B4	Beneficiary of Ordinary Disability	Beneficiary		
B5	Beneficiary of Accidental Disability	Beneficiary		
C	Active-Inactive, Adjusted	Withdrawal		20
D	Deceased	Ordinary Mortality	10, 20, or 60	60
D1	Ordinary Death w/o Ben	Ordinary Mortality	not 81 or 82	60
D2	Accidental Death w/o Ben	Accidental Mortality		61
F	Active-Inactive	Withdrawal		20
I	Ordinary Disability	Ordinary Disability		70
J	Accidental Disability	Accidental Disability		71
L	Lump Sum	Withdrawal		
P	Duplicate			
R	Service Retirement Year 1	Retirement		90
R	Service Retirement Year 2	Retirement		91
R	Service Retirement Year Ultimate	Retirement		92
R	Reduced Service Retirement	Retirement		93
S	Retiree from Vested	Retirement		
T	Terminated Non-Vested	Withdrawal		80
U	5-Year Out	Withdrawal		
V	Deferred Vested	Withdrawal		81 or 82
WI	Missing Ordinary Disability	Ordinary Disability		
WJ	Missing Accidental Disability	Accidental Disability		
WR	Missing Services Retirement	Retirement		
WS	Missing Retirement from Vested	Retirement		
Z	Refunded	Withdrawal		

GRS' APPROACH TO ASSIGNING STATUSES FOR NYCERS PENSIONER TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*	RetCause**	PayeePen
A	Active					
B	Active-Inactive, Adjusted	Withdrawal				
B1	Beneficiary of Retiree	Beneficiary			0 or 3	not 0,1 or 1
B2	Beneficiary of Ordinary Death	Beneficiary			7	not 0,1 or 1
B3	Beneficiary of Accidental Death	Beneficiary			4	not 0,1 or 1
B4	Beneficiary of Ordinary Disability	Beneficiary			2	not 0,1 or 1
B5	Beneficiary of Accidental Disability	Beneficiary			1	not 0,1 or 1
C	Active-Inactive, Adjusted	Withdrawal				
D	Deceased	Mortality*		60		
D1	Ordinary Death w/o Ben	Mortality*				
D2	Accidental Death w/o Ben	Mortality*				
F	Active-Inactive	Withdrawal				
I	Ordinary Disability	Ordinary Disability			2	0, 1, or 6
J	Accidental Disability	Accidental Disability			1 or 6	0, 1, or 6
L	Lump Sum	Withdrawal				
P	Duplicate					
R	Service Retiree	Retirement			3	0, 1, or 6
S	Retiree from Vested	Retirement			0	0, 1, or 6
T	Terminated Non-Vested	Withdrawal		80		
U	5-Year Out	Withdrawal				
V	Deferred Vested	Withdrawal	70	10	0	
WI	Missing Ordinary Disability	Ordinary Disability	70	10	2	0, 1, or 6
WJ	Missing Accidental Disability	Accidental Disability	70	10	1 or 6	0, 1, or 6
WR	Missing Services Retirement	Retirement	70	10	3	0, 1, or 6
WS	Missing Retirement from Vested	Retirement				
Z	Refunded	Withdrawal				

* *The mortality decrements are determined by the member's status in the previous year. For example, a disability retiree's mortality decrement would be Disabled Mortality.*

** *For all Tier 6 disabilities, indicated by RetCause equal to 6, members were classified as Ordinary Disabilities.*

Status Changes Due to Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	-1,006	-1,430	-2,023	-2,085	-2,196	-2,288	-2,392	-40,967	-46,016	-50,936	-55,200	**-206,539**
A	-12	-2	-1	-2	0	-2	-2	-63	-60	-58	-53	**-255**
B	315	321	333	684	540	789	2,390	2,681	2,577	1,897	0	**12,527**
B1	-13,117	-13,031	-12,883	-12,742	-12,463	-12,369	-12,287	-11,472	-11,331	-11,308	-11,175	**-134,178**
B2	0	0	0	0	0	0	0	0	0	0	0	**0**
B3	-103	-103	-103	-102	-101	-99	-101	-1,572	-1,652	-1,613	-2,241	**-7,790**
B4	-1,406	-1,502	-1,553	-1,602	-1,638	-1,670	-1,687	-996	-984	-961	-934	**-14,933**
B5	-123	-127	-127	-134	-133	-138	-138	-174	-175	-195	-197	**-1,661**
C	0	0	0	0	0	0	0	0	0	3,176	8,860	**12,036**
D	17,236	17,586	17,575	17,878	18,103	18,669	19,050	55,810	60,809	66,012	70,236	**378,964**
D1	-282	-298	-1	-17	-24	-20	-29	-322	-96	-93	-15	**-1,197**
D2	0	0	0	0	0	0	0	0	0	0	-1	**-1**
F	-391	-370	-383	-885	-951	-1,531	-4,369	-4,770	-4,763	-6,703	-8,878	**-33,994**
I	52	73	85	68	97	171	419	296	267	255	-14	**1,769**
J	121	113	117	121	129	137	168	158	172	33	-4	**1,265**
L	0	0	0	-260	-496	-920	-1,122	0	0	0	0	**-2,798**
P	-9	-9	-9	-9	-9	-9	-9	0	0	0	0	**-63**
R	-189	-203	-164	-193	-231	-259	-315	-135	-134	-303	-133	**-2,259**
S	-3	-4	-3	-3	-4	-4	-4	-6	-8	-19	-14	**-72**
T	-275	-238	-13	-3	-4	-18	-29	-75	-330	-442	-192	**-1,619**
U	-790	-744	-789	-828	-883	-938	-992	0	0	0	0	**-5,964**
V	6	-13	-14	150	321	549	1,503	1,610	1,727	1,264	-44	**7,059**
WI	0	0	0	0	0	0	0	-3	-2	-6	0	**-11**
WJ	0	0	-2	-2	-2	-2	-2	0	0	0	0	**-10**
WR	-3	-3	-8	-3	-3	-3	-4	0	-1	0	-1	**-29**
WS	0	0	0	0	0	0	0	0	0	0	0	**0**
Y	-21	-16	-34	-31	-52	-45	-48	0	0	0	0	**-247**
Z	0	0	0	0	0	0	0	0	0	0	0	**0**
Total												**0**

Status Counts after Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	118,062	111,986	107,449	94,826	82,379	69,630	58,599	86,726	83,692	73,224	65,198	**951,771**
A	177,013	176,709	179,086	181,304	182,751	185,497	186,209	184,919	181,961	187,056	185,918	**2,008,423**
B	315	321	333	684	540	789	2,390	2,681	2,577	1,897	0	**12,527**
B1	31	51	65	218	344	304	189	5	3	3	7	**1,220**
B2	0	0	0	10	10	12	12	0	0	0	0	**44**
B3	6	7	5	5	4	4	3	1	1	1	171	**208**
B4	12	11	2	9	14	7	3	0	0	0	0	**58**
B5	2	2	0	0	1	0	0	1	0	0	12	**18**
C	0	0	0	0	0	0	0	0	0	3,176	8,860	**12,036**
D	26,268	31,440	36,052	40,581	45,717	50,723	55,516	60,423	65,447	69,958	74,547	**556,672**
D1	415	338	472	773	905	1,054	1,568	111	31	85	90	**5,842**
D2	0	0	0	1	1	1	1	2	1	0	1	**8**
F	2,323	2,482	2,607	22,622	23,586	19,674	17,110	14,562	14,206	9,650	7,604	**136,426**
I	8,207	8,483	8,528	8,654	8,796	8,973	9,145	9,282	9,510	9,662	9,585	**98,825**
J	4,250	4,294	4,300	4,368	4,398	4,438	4,447	4,384	4,400	4,412	4,366	**48,057**
L	0	0	0	47	353	220	279	0	0	0	0	**899**
P	15	12	10	10	10	10	10	0	0	0	0	**77**
R	99,726	100,241	98,927	99,513	99,809	100,740	100,404	100,809	103,397	105,123	106,266	**1,114,955**
S	1,370	1,375	1,319	1,359	1,408	1,356	1,305	2,646	2,883	3,292	3,701	**22,014**
T	27,511	28,491	27,330	10,946	13,305	21,261	26,949	6,061	4,377	5,470	6,771	**178,472**
U	7,738	6,567	6,159	6,116	6,059	6,000	5,940	0	0	0	0	**44,579**
V	8,227	8,504	8,953	9,442	9,934	9,694	10,357	10,584	10,707	10,181	10,089	**106,672**
WI	2	0	1	1	1	1	0	0	0	0	6	**12**
WJ	2	0	3	3	3	3	3	0	0	1	1	**19**
WR	34	15	77	80	77	80	77	2	6	8	6	**462**
WS	1	1	0	0	0	0	0	0	0	0	0	**2**
Y	1,619	1,837	1,492	1,627	2,794	2,728	2,683	0	0	0	0	**14,780**
Z	0	0	0	0	0	0	0	0	0	0	0	**0**
Total												**5,315,078**

SECTION V

SUMMARY RESULTS BY SYSTEM: TRS

TRS

Findings

The results of the four-year and ten-year experience studies are shown in Appendix VII. We have quantified the differences between actual experience and current actuarial assumptions as well as provided illustrative proposed assumptions we believe would be appropriate and reasonable. The tables on the page following our summary of recommendations provide a summary of the reconciliation in comparison to the current assumptions.

The following business rules were applied to the TRS data. A general description of each rule may be found at the beginning of Section V.

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

Based on our analysis of TRS, GRS recommends consideration of the following changes for future valuations:

1. **Post-Retirement Mortality:** We recommend updating the base mortality table to a System-specific mortality table developed using TRS' actual experience. We also recommend using a full generational mortality assumption using projection scale MP-2014. A new table based on the results of this study and the application of MP-2014 is provided in the Appendix.

2. **Salary and Overtime Assumptions:** Over the shorter and longer observation periods, the across-the-board increases have been much lower than the current assumption, and in fact, have been in pace with the increase in inflation. Based on the historical data alone, a recommendation could be made to lower the general wage increase portion of the salary scale.

   However, a new labor contract provides material increases over the next several years, including retroactive increases. Thus, it is unlikely the rate of salary increases the members experienced over the last ten years is representative of the rate of salary increases that will be

provided in future years. We believe the OA is better positioned to reflect these factors in the development of the updated assumption as it best fits their model. For these reasons, we do not have a proposed assumption that is different than the current general wage increase assumption.

The merit portion of the scale has had a very close fit between the assumption and the expectation. We are also not recommending a change to this component of the compensation assumption.

While members of TRS are not eligible for overtime, there are other sources of additional pensionable earnings that could be increased to cause a "spike" at the end of the member's career. We recommend additional data be collected in the next experience study to attempt to capture any such pattern of increase at the end of the career.

3. **Withdrawal Assumption:** The number of actual withdrawals has been consistently higher than expected by the current assumption. We have recommended a higher termination schedule that moves more than halfway to the experience. Further movement will likely be needed in the next study.

4. **Disability Assumption:** Experience indicates the OA should substantially increase the rates of disability for both ordinary and accidental.

5. **Retirement Patterns:** Beginning with the June 30, 2010 data, the OA began to include an indicator in the retiree data that identified whether the member was a reduced retirement, a retirement in the first year eligible, in the second year, or after. This indicator greatly increased the credibility and reliability of the reconciliation process. As such, we have given more weight to the 4-year period than the 10-year analysis. Consistent with national trends, members have been deferring retirement. We have made recommendations based on the trend as a whole and based on behavior at specific ages.

The cost estimates shown below are illustrative only and are based on the change in normal cost plus a 19-year amortization of the change in AAL as if all recommendations in this report were adopted. As discussed on Page II-1, there are always a range of reasonable assumptions and thus actual costs will be determined by the OA once the OA and the Board finalize the assumption changes.

Illustrative Cost Estimates

	FY 14 results (June 30, 2012 lag valuation)		
	AAL ($ Millions)	Normal Cost ($Millions)	Employer Contribution ($ Millions)
Base Results (current Assumptions)	$58,046	$1,066	$2,895
Estimated Change for changes in			
Mortality Assumptions	$2,238	$71	$281
Overtime Assumptions	$0	$0	$0
Other pay related and demographic assumptions	$463	$12	$55
Sub Total	$60,747	$1,149	$3,231
Estimated Change for ¼% decrease in investment return assumption	$1,505	$86	$185
Total	$62,252	$1,235	$3,415

TEACHERS' RETIREMENT SYSTEM OF THE CITY OF NEW YORK
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
	Service Retiree Mortality						The proposed assumption is a based on actual plan experience.
1A	Men	82%	532	84%	98%	503	Future mortality improvements will be projected using scale MP-
1B	Women	93%	1044	99%	101%	1037	2014.
1C	By Year						
	Disabled Retiree Mortality						The proposed assumption is a based on actual plan experience.
2A	Men	76%	20	91%	92%	25	Future mortality improvements will be projected using scale MP-
2B	Women	106%	68	105%	96%	68	2014.
2C	By Year						
3A	Active Member Withdrawals	119%	4223	126%	112%	4537	Actual withdrawal experience appears to be higher than expected.
3B	By Year						The proposed assumption is based on actual experience.
	Active Member Service Retirements						Generally, members have been delaying retirements, consistent with
	In 1st Year of Eligibility						national trends. Consider extending maximum retirement age from 70
	Total						to 75.
4A	Men	67%	127	100%	86%	167	
4B	Women	60%	398	80%	68%	451	
	Elected						
4C	Men	92%	62	70%	66%	26	
4D	Women	84%	218	63%	65%	88	
	Mandated						
4E	Men	54%	65	109%	91%	141	
4F	Women	44%	180	86%	69%	363	
	In 2nd Year of Eligibility						
	Total						
5A	Men	134%	132	149%	84%	127	
5B	Women	118%	386	134%	74%	361	
	Elected						
5C	Men	124%	41	101%	96%	17	
5D	Women	114%	145	92%	88%	59	
	Mandated						
5E	Men	139%	92	161%	83%	110	
5F	Women	120%	241	147%	71%	302	

TEACHERS' RETIREMENT SYSTEM OF THE CITY OF NEW YORK
EXPERIENCE STUDY RESULTS
OVERVIEW

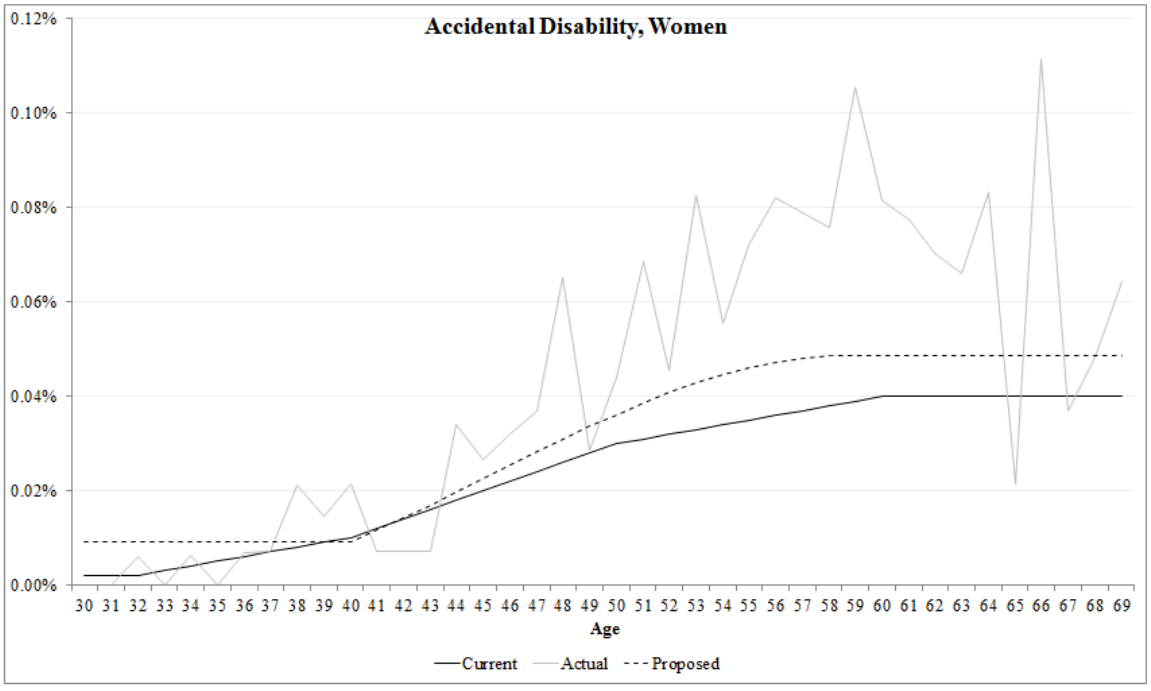
Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013* Expected	4-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Expected	10-YEAR PERIOD ENDING 6/30/2013* Ratio of Actual to Proposed	10-YEAR PERIOD ENDING 6/30/2013* Average Number of Decrements per Year	Comments
	After 2nd Year of Eligibility						
	Total						
6A	Men	64%	358	83%	76%	402	
6B	Women	76%	1270	83%	76%	1164	
	Elected						
6C	Men	91%	59	84%	81%	24	
6D	Women	98%	246	90%	87%	100	
	Mandated						
6E	Men	60%	299	83%	76%	378	
6F	Women	72%	1024	83%	75%	1064	
6G	By Year						
	Reduced Service Retirements						Last 4 years has higher credibility based on maturation process. Recent experience resembles current assumption and is trending downward. The proposed assumption is 120% for males and 110% for females of the current assumption.
	Total						
7A	Men	164%	122	205%	170%	136	
7B	Women	133%	388	164%	149%	424	
7C	By Year						
	Active Member Ordinary Mortality						Recent experience is consistent with current assumption. There may be data issues in earlier years.
8A	Men	93%	31	109%	109%	36	
8B	Women	103%	59	136%	136%	74	
8C	By Year						
	Active Member Ordinary Disability						Actual experience appears higher than current assumption. The proposed assumption is 175% for males and 155% for females of the current assumption.
9A	Men	195%	29	207%	135%	30	
9B	Women	145%	93	172%	111%	107	
9C	By Year						
	Active Member Accidental Disability						Actual experience appears higher than current assumption. The proposed assumption is 135% of the current assumption for males and rates exponentially-fitted to actual data for females.
10A	Men	135%	8	163%	121%	9	
10B	Women	177%	30	181%	137%	30	
10C	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Merit component appears appropriate based on experience. Productivity component has been significantly lower than expected, but will need to be examined in comparison to new contracts which include retrospective increases.
11A	Total	6.56%	2.94%	6.72%	6.72%	4.94%	
11B	Merit Only	3.56%	2.40%	3.72%	3.72%	0.41%	
	General Increase over Inflation	0.50%	-1.18%	0.50%	0.50%	2.54%	
11C	By Year						

* *Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

** *For Salary Increases, average annual percentage increase in salary is shown.*

TEACHERS' RETIREMENT SYSTEM OF THE CITY OF NEW YORK
ORDINARY DISABILITY ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011

TEACHERS' RETIREMENT SYSTEM OF THE CITY OF NEW YORK
ACCIDENTAL DISABILITY ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



GRS' APPROACH TO ASSIGNING STATUSES FOR TRS ACTIVE TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*
A	Active			10
B	Active-Inactive, Adjusted	Withdrawal		20
B1	Beneficiary of Retiree	Beneficiary		
B2	Beneficiary of Ordinary Death	Beneficiary		
B3	Beneficiary of Accidental Death	Beneficiary		
B4	Beneficiary of Ordinary Disability	Beneficiary		
B5	Beneficiary of Accidental Disability	Beneficiary		
C	Active-Inactive, Adjusted	Withdrawal		20
D	Deceased	Ordinary Mortality		
D1	Ordinary Death w/o Ben	Ordinary Mortality		60
D2	Accidental Death w/o Ben	Accidental Mortality		61
F	Active-Inactive	Withdrawal		20
I	Ordinary Disability	Ordinary Disability		70
J	Accidental Disability	Accidental Disability		71
L	Lump Sum	Withdrawal		
P	Duplicate			
R	Service Retirement Year 1	Retirement		90
R	Service Retirement Year 2	Retirement		91
R	Service Retirement Year Ultimate	Retirement		92
R	Reduced Service Retirement	Retirement		93
S	Retiree from Vested	Retirement		
T	Terminated Non-Vested	Withdrawal		80
U	5-Year Out	Withdrawal		
V	Deferred Vested	Withdrawal		81
WI	Missing Ordinary Disability	Ordinary Disability		
WJ	Missing Accidental Disability	Accidental Disability		
WR	Missing Services Retirement	Retirement		
WS	Missing Retirement from Vested	Retirement		
Z	Refunded	Withdrawal		

GRS' APPROACH TO ASSIGNING STATUSES FOR TRS PENSIONER TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*	RetCause**	PayeePen
A	Active					
B	Active-Inactive, Adjusted	Withdrawal				
B1	Beneficiary of Retiree	Beneficiary			0 or 3	not 0 or 1
B2	Beneficiary of Ordinary Death	Beneficiary			7	not 0 or 1
B3	Beneficiary of Accidental Death	Beneficiary			4	not 0 or 1
B4	Beneficiary of Ordinary Disability	Beneficiary			2	not 0 or 1
B5	Beneficiary of Accidental Disability	Beneficiary			1	not 0 or 1
C	Active-Inactive, Adjusted	Withdrawal				
D	Deceased	Mortality*		60		
D1	Ordinary Death w/o Ben	Mortality*				
D2	Accidental Death w/o Ben	Mortality*				
F	Active-Inactive	Withdrawal				
I	Ordinary Disability	Ordinary Disability			2	0 or 1
J	Accidental Disability	Accidental Disability			1	0 or 1
L	Lump Sum	Withdrawal				
P	Duplicate					
R	Service Retiree	Retirement			3	0 or 1
S	Retiree from Vested	Retirement			0	0 or 1
T	Terminated Non-Vested	Withdrawal		80		
U	5-Year Out	Withdrawal				
V	Deferred Vested	Withdrawal	70	10	0	
WI	Missing Ordinary Disability	Ordinary Disability	70	10	2	0 or 1
WJ	Missing Accidental Disability	Accidental Disability	70	10	1	0 or 1
WR	Missing Services Retirement	Retirement	70	10	3	0 or 1
WS	Missing Retirement from Vested	Retirement				
Z	Refunded	Withdrawal				

* *The mortality decrements are determined by the member's status in the previous year. For example, a disability retiree's mortality decrement would be Disabled Mortality.*

** *For all Tier 6 disabilities, indicated by RetCause equal to 6, members were classified as Ordinary Disabilities.*

Status Changes Due to Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	-2,446	-2,668	-2,949	-3,050	-3,134	-3,248	-3,362	-31,138	-32,542	-34,368	-36,127	**-155,032**
A	-41	-38	-3	-2	-3	-4	0	-1	-3	0	0	**-95**
B	124	122	172	420	755	1,937	1,835	1,577	1,332	970	0	**9,244**
B1	-2,698	-2,794	-2,894	-2,881	-3,000	-3,111	-3,189	-2,920	-2,933	-2,991	-3,060	**-32,471**
B2												**0**
B3								-53	-451	-505	-520	**-1,529**
B4	-279	-283	-298	-308	-311	-320	-317	-241	-234	-229	-221	**-3,041**
B5	-9	-10	-10	-10	-11	-9	-12	-9	-33	-27	-39	**-179**
C	0	0	0	0	0	0	0	0	0	2,337	4,986	**7,323**
D	5,935	6,262	6,649	6,804	7,013	7,771	8,287	35,125	36,664	38,729	40,232	**199,471**
D1	-6	-8	-25	-105	-210	-319	-452	-98	-97	-53	0	**-1,373**
D2												**0**
F	-181	-174	-218	-652	-1,135	-2,533	-2,934	-2,782	-2,796	-4,054	-4,986	**-22,445**
I	18	21	60	29	92	116	175	140	128	73	-2	**850**
J	4	5	13	6	7	14	49	57	44	11	0	**210**
L						-295	-501					**-796**
P	-26	-30	-48	-7	-7	-7	-7					**-132**
R	-199	-204	-176	-251	-128	-250	-224	-235	-241	-173	-34	**-2,115**
S	-3	-5	-8	-2	-7	-7	-5	-5	-8	-2	-1	**-53**
T	-138	-97	-116	-117	-198	-209	-270	-435	-110	-367	-227	**-2,284**
U	-16	-9	-10	-2	-2	-2	-2					**-43**
V	-35	-73	-111	145	296	493	946	1,030	1,307	649	-1	**4,646**
WI	-2	-8	-19	-13	-13	-13	-13	-8	-20			**-109**
WJ								-4	-7		0	**-11**
WR	-2	-9	-9	-3	-3	-3	-3	0	0	0	0	**-32**
WS												**0**
Y	0	0	0	-1	-1	-1	-1					**-4**
Z									0			**0**
Total												**0**

Status Counts after Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	111,144	97,976	89,518	78,225	69,023	58,070	50,663	70,487	65,865	58,743	54,406	**804,120**
A	99,244	106,755	107,243	111,363	110,631	112,387	113,056	111,529	109,627	112,460	112,481	**1,206,776**
B	124	122	172	420	755	1,937	1,835	1,577	1,332	970	0	**9,244**
B1	116	115	116	114	105	95	87	59	57	60	59	**983**
B2	0	0	0	0	0	0	0	0	0	0	0	**0**
B3	0	0	0	0	0	0	0	0	5	4	10	**19**
B4	16	16	16	16	16	15	14	16	14	12	12	**163**
B5	2	2	2	2	2	2	1	1	1	1	1	**17**
C	0	0	0	0	0	0	0	0	0	2,337	4,986	**7,323**
D	23,298	25,170	26,985	28,893	31,372	33,248	35,117	36,236	38,196	40,017	41,670	**360,202**
D1	8	14	37	74	99	117	119	10	10	65	141	**694**
D2	0	0	0	0	0	0	0	0	0	0	0	**0**
F	451	544	737	4,424	4,226	4,174	5,645	8,021	8,142	5,635	1,697	**43,696**
I	1,842	1,896	2,013	2,030	2,097	2,141	2,154	2,203	2,261	2,315	2,297	**23,249**
J	464	485	525	543	588	608	641	672	707	721	711	**6,665**
L	0	0	0	0	0	380	826	0	0	0	0	**1,206**
P	557	367	366	3	3	3	3	0	0	0	0	**1,302**
R	50,173	54,395	56,548	58,373	59,236	60,351	61,259	62,316	63,610	65,993	67,440	**659,694**
S	2,132	2,351	2,493	2,519	2,552	2,509	2,481	3,082	3,275	3,301	3,489	**30,184**
T	9,422	8,917	12,030	11,196	17,326	21,195	22,957	560	2,608	2,880	5,752	**114,843**
U	347	277	220	148	148	146	146	0	0	0	0	**1,432**
V	5,618	5,967	6,363	7,072	7,245	8,052	8,427	9,267	10,308	10,528	10,891	**89,738**
WI	3	2	3	2	2	1	1	0	0	0	0	**14**
WJ	0	0	0	0	0	0	0	0	0	0	1	**1**
WR	366	143	176	175	173	170	169	24	41	18	16	**1,471**
WS	0	0	0	0	0	0	0	0	0	0	0	**0**
Y	733	546	497	468	461	459	459	0	0	0	0	**3,623**
Z	0	0	0	0	0	0	0	0	1	0	0	**1**
Total												**3,366,660**

SECTION V

SUMMARY RESULTS BY SYSTEM: BERS

BERS

Findings

The results of the four-year and ten-year experience studies are shown in Appendix VIII. We have quantified the differences between actual experience and current actuarial assumptions as well as provided illustrative proposed assumptions we believe would be appropriate and reasonable. The tables on the page following our summary of recommendations provide a summary of the reconciliation in comparison to the current assumptions.

The following business rules were applied to the BERS data. A general description of each rule may be found at the beginning of Section V.

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

Based on our analysis of BERS, GRS recommends consideration of the following changes for future valuations:

1. **Post-Retirement Mortality:** Historically, based on the size of the group, members of BERS were valued using the same assumptions as NYCERS. Based on consistent data from previous and this experience studies, we are recommending a change to use the same assumptions used for TRS to be used for BERS.

2. **Salary Assumptions:** Over the shorter and longer observation periods, the across the board compensation increases have been much lower than the current assumption, and in fact, have been in step with the rate of increase in inflation. Based on the historical data alone, a recommendation could be made to lower the general wage increase portion of the salary scale.

   However, a new labor contract provides material increases over the next several years, including retroactive increases. Thus, it is unlikely the rate of salary increases the members experienced over the last ten years is representative of the rate of salary increases that will be

provided in future years. We believe the OA is better positioned to reflect these factors in the development of the updated assumption as it best fits their model. For these reasons, we do not have a proposed assumption that is different than the current general increase assumption.

The current merit portion of the scale shows declines fairly quickly for the first five years of service, with smaller merit increases for the members for service years 6 through 25. We propose decreasing the select period for this assumption from 25 years to 10 years, with smaller merit increases for years 6 through 10.

3. **Withdrawal Assumption:** The number of actual withdrawals has been consistently higher than currently assumed. We are recommending a proposed assumption with higher termination rates. Due to the size of the group, we do not believe the experience provides complete credibility, the proposed assumption does not fully reflect the actual experience during the observation. Therefore, additional increases to the termination rates may be necessary in the next experience study if future experience is consistent with historical experience.

4. **Retirement Patterns:** Beginning with the census data as of June 30, 2010, the OA began to include an indicator in the retiree data that identified whether the member was a reduced retirement, a retirement in the first year eligible, in the second year, or after. This indicator greatly increased the credibility and reliability of the reconciliation process. As such, we have given more weight to the four-year period than the ten-year analysis. Consistent with national trends, members have been deferring retirement. We have made recommendations based on the trend as a whole and based on behavior at specific ages.

The cost estimates shown below are illustrative only and are based on the change in normal cost plus a 19-year amortization of the change in AAL as if all recommendations in this report were adopted. As discussed on Page II-1, there are always a range of reasonable assumptions and thus actual costs will be determined by the OA once the OA and the Board finalize the assumption changes.

Illustrative Cost Estimates

	FY 14 results (June 30, 2012 lag valuation)		
	AAL ($ Millions)	**Normal Cost ($Millions)**	**Employer Contribution ($ Millions)**
Base Results (current Assumptions)	$3,730	$121	$216
Estimated Change for changes in			
Mortality Assumptions	$297	$13	$41
Overtime Assumptions	NA	N/A	NA
Other pay related and demographic assumptions	-$29	-$18	-$20
Sub Total	$3,998	$116	$237
Estimated Change for ¼% decrease in investment return assumption	$116	$9	$17
Total	$4,114	$125	$254

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
				Ratio of Actual to			
		Expected	Average Number of Decrements per Year	Expected	Proposed	Average Number of Decrements per Year	
	Service Retiree Mortality						The proposed assumption is based on actual TRS experience. Future mortality improvements will be projected using scale MP-2014.
1A	Men	76%	76	82%	104%	77	
1B	Women	73%	231	84%	96%	233	
1C	By Year						
	Disabled Retiree Mortality						The proposed assumption is equal to the proposed TRS Disabled Retiree Mortality assumption.
2A	Men	107%	9	100%	97%	8	
2B	Women	99%	15	101%	101%	12	
2C	By Year						
	Active Member Withdrawals						Actual withdrawal experience appears to be higher than expected. The proposed assumption is 125% for males and females of the current assumption.
3A	Men	132%	179	155%	124%	207	
3B	Women	144%	476	167%	133%	568	
3C	By Year						
	Active Member Service Retirements						Actual experience appears lower than the current assumption for unreduced retirements. Maximum retirement age of 70 may need to be increased as there are a material number of exposures in excess of 70.
	In 1st Year of Eligibility						
4A	Total	25%	67	38%	44%	94	
4B	Elected	32%	4	35%	47%	4	
4C	Mandated	25%	63	38%	44%	90	
	In 2nd Year of Eligibility						
5A	Total	72%	111	74%	74%	86	
5B	Elected	110%	6	98%	98%	5	
5C	Mandated	71%	105	73%	73%	81	
	After 2nd Year of Eligibility						
6A	Total	44%	421	44%	90%	354	
6B	Elected	106%	16	100%	100%	10	
6C	Mandated	43%	406	43%	90%	343	
6D	By Year						
	Reduced Service Retirements						
7A	Total	262%	166	252%	184%	235	Reduced retirement actuals are outpacing what is expected, though actual experience is trending towards the current assumption.
7B	By Year						

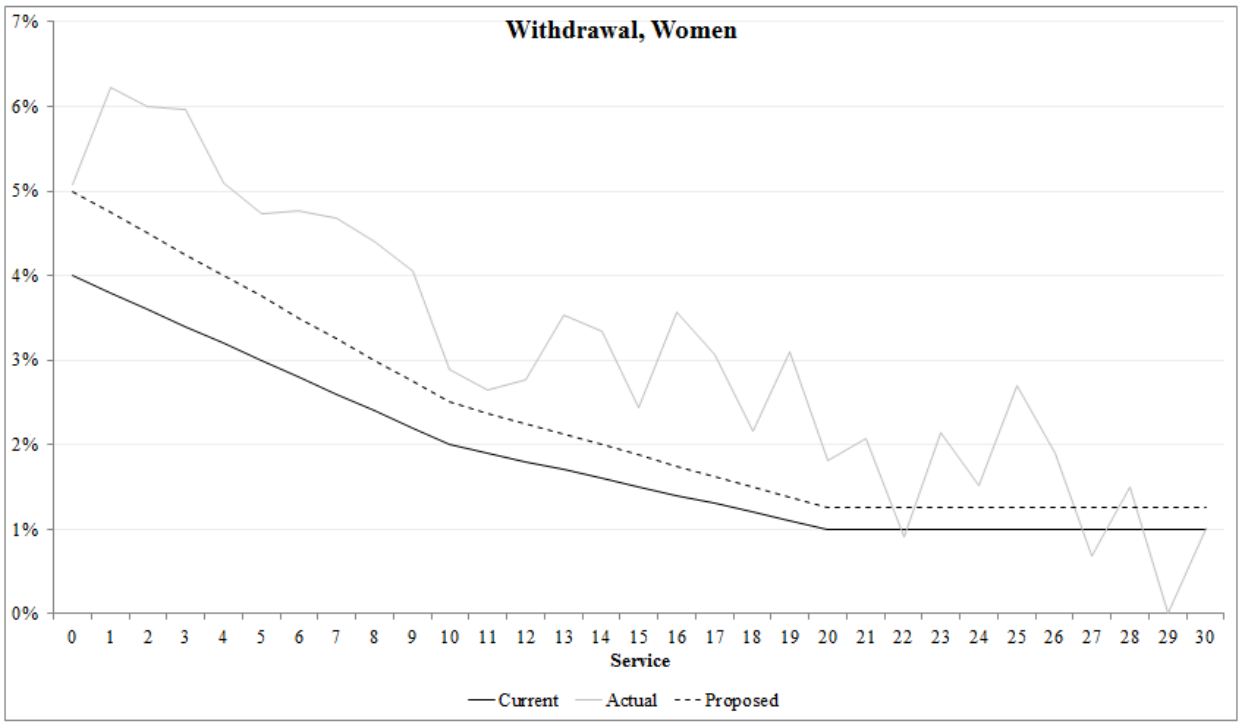
NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
	Active Member Ordinary Mortality						Experience has been volatile, but appears to be consistently lower than the current assumption.
8A	Men	59%	7	82%	82%	9	
8B	Women	41%	13	66%	66%	19	
8C	By Year						
	Active Member Ordinary Disability						Ordinary Disability experience appears lower than the current assumption. The proposed assumption is 85% for males and 70% females of the current assumption.
9A	Men	42%	9	58%	68%	11	
9B	Women	39%	27	49%	69%	32	
9C	By Year						
	Active Member Accidental Disability						Volatile experience with insufficient actuals to determine if changing the assumption is appropriate. The current assumption appears reasonable given the data over the experience period.
10A	Men	37%	1	96%	96%	2	
10B	Women	129%	5	130%	130%	5	
10C	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Merit component is slightly higher than actual experience. Productivity component has been significantly lower than expected and may need adjustment.
11A	Total	5.21%	1.53%	5.20%	4.37%	3.74%	
11B	Merit Only	2.21%	0.68%	2.20%	1.37%	1.54%	
	General Increase over Inflation	0.50%	-0.86%	0.50%	0.50%	-0.23%	
11C	By Year						

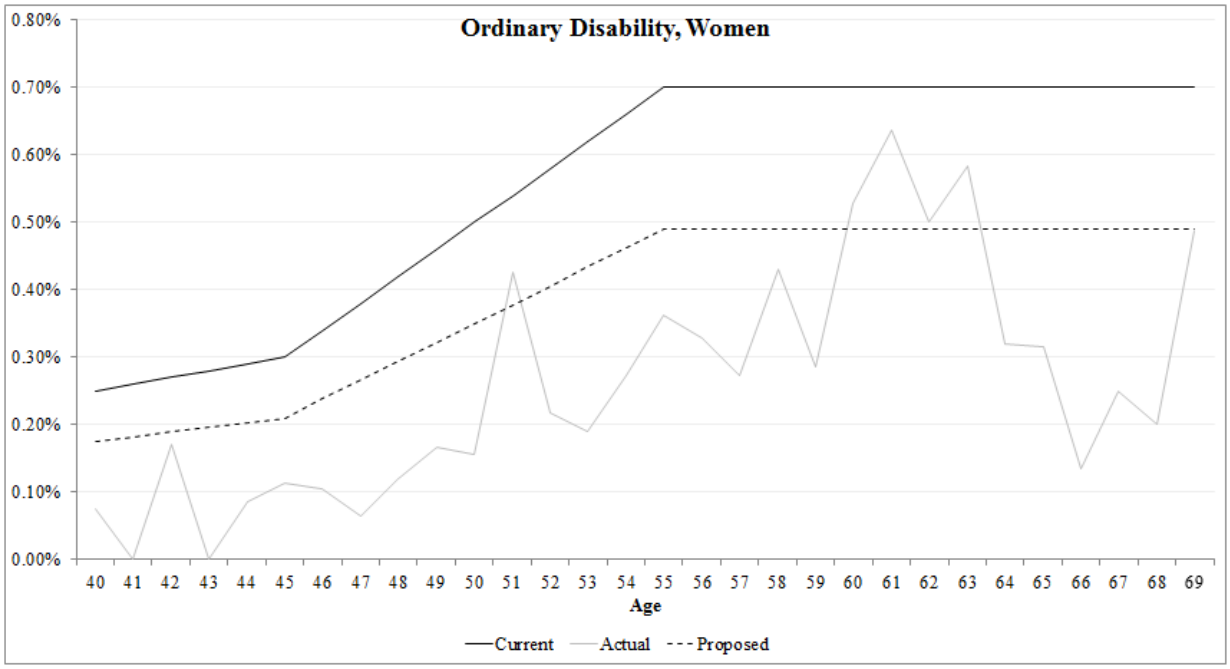
** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown.*

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM
WITHDRAWAL ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM
ORDINARY DISABILITY ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



GRS' APPROACH TO ASSIGNING STATUSES FOR BERS ACTIVE TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*
A	Active			10
B	Active-Inactive, Adjusted	Withdrawal		20
B1	Beneficiary of Retiree	Beneficiary		
B2	Beneficiary of Ordinary Death	Beneficiary		
B3	Beneficiary of Accidental Death	Beneficiary		
B4	Beneficiary of Ordinary Disability	Beneficiary		
B5	Beneficiary of Accidental Disability	Beneficiary		
C	Active-Inactive, Adjusted	Withdrawal		20
D	Deceased	Ordinary Mortality		
D1	Ordinary Death w/o Ben	Ordinary Mortality		60
D2	Accidental Death w/o Ben	Accidental Mortality		
F	Active-Inactive	Withdrawal		20
I	Ordinary Disability	Ordinary Disability		70
J	Accidental Disability	Accidental Disability		71
L	Lump Sum	Withdrawal		
P	Duplicate			
R	Service Retirement Year 1	Retirement		90
R	Service Retirement Year 2	Retirement		91
R	Service Retirement Year Ultimate	Retirement		92
R	Reduced Service Retirement	Retirement		93
S	Retiree from Vested	Retirement		
T	Terminated Non-Vested	Withdrawal		80
U	5-Year Out	Withdrawal		
V	Deferred Vested	Withdrawal		81
WI	Missing Ordinary Disability	Ordinary Disability		
WJ	Missing Accidental Disability	Accidental Disability		
WR	Missing Services Retirement	Retirement		
WS	Missing Retirement from Vested	Retirement		
Z	Refunded	Withdrawal		

GRS' APPROACH TO ASSIGNING STATUSES FOR BERS PENSIONER TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*	RetCause**	PayeePen
A	Active					
B	Active-Inactive, Adjusted	Withdrawal				
B1	Beneficiary of Retiree	Beneficiary			0 or 3	not 0 or 1
B2	Beneficiary of Ordinary Death	Beneficiary				
B3	Beneficiary of Accidental Death	Beneficiary			4	not 0 or 1
B4	Beneficiary of Ordinary Disability	Beneficiary			2	not 0 or 1
B5	Beneficiary of Accidental Disability	Beneficiary			1	not 0 or 1
C	Active-Inactive, Adjusted	Withdrawal				
D	Deceased	Mortality*		60		
D1	Ordinary Death w/o Ben	Mortality*				
D2	Accidental Death w/o Ben	Mortality*				
F	Active-Inactive	Withdrawal				
I	Ordinary Disability	Ordinary Disability			2 or 6	0 or 1
J	Accidental Disability	Accidental Disability			1	0 or 1
L	Lump Sum	Withdrawal				
P	Duplicate					
R	Service Retiree	Retirement			3	0 or 1
S	Retiree from Vested	Retirement			0	0 or 1
T	Terminated Non-Vested	Withdrawal		80		
U	5-Year Out	Withdrawal				
V	Deferred Vested	Withdrawal	70	10	0	
WI	Missing Ordinary Disability	Ordinary Disability	70	10	2	0 or 1
WJ	Missing Accidental Disability	Accidental Disability	70	10	1	0 or 1
WR	Missing Services Retirement	Retirement	70	10	3	0 or 1
WS	Missing Retirement from Vested	Retirement				
Z	Refunded	Withdrawal				

* *The mortality decrements are determined by the member's status in the previous year. For example, a disability retiree's mortality decrement would be Disabled Mortality.*

** *For all Tier 6 disabilities, indicated by RetCause equal to 6, members were classified as Ordinary Disabilities.*

Status Changes Due to Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	0	-1	0	0	0	0	0	-3	0	0	-2	**-6**
A	0	0	0	0	0	0	0	0	0	0	0	**0**
B	9	8	0	17	59	88	243	254	231	190	0	**1,099**
B1	0	0	0	0	0	0	0	0	0	0	0	**0**
B2	0	0	0	0	0	0	0	0	0	0	0	**0**
B3	0	0	0	0	0	0	0	0	0	0	0	**0**
B4	0	0	0	0	0	0	0	0	0	0	0	**0**
B5	0	0	0	0	0	0	0	0	0	0	0	**0**
C	0	0	0	0	0	0	0	0	0	601	2,253	**2,854**
D	0	0	0	0	0	0	0	0	0	0	0	**0**
D1	0	0	0	0	0	0	0	0	0	0	0	**0**
D2	0	0	0	0	0	0	0	0	0	0	0	**0**
F	-9	-9	0	-29	-133	-184	-464	-383	-461	-998	-2,253	**-4,923**
I	0	0	0	0	0	0	-1	0	0	0	0	**-1**
J	0	1	0	3	0	0	15	6	7	7	0	**39**
L	0	0	0	0	0	0	0	0	0	0	0	**0**
P	0	0	0	0	0	0	0	0	0	0	0	**0**
R	0	0	0	0	0	0	-1	0	-1	0	0	**-2**
S	0	0	0	0	0	0	0	0	0	0	0	**0**
T	0	0	0	0	0	0	0	3	0	0	2	**5**
U	0	0	0	0	0	0	0	0	0	0	0	**0**
V	0	1	0	9	74	96	208	124	224	200	0	**936**
WI	0	0	0	0	0	0	0	0	0	0	0	**0**
WJ	0	0	0	0	0	0	0	-1	0	0	0	**-1**
WR	0	0	0	0	0	0	0	0	0	0	0	**0**
WS	0	0	0	0	0	0	0	0	0	0	0	**0**
Y	0	0	0	0	0	0	0	0	0	0	0	**0**
Z	0	0	0	0	0	0	0	0	0	0	0	**0**
Total												**0**

Status Counts after Maturation

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status	27,195	32,913	32,355	30,104	28,461	26,383	24,761	41,169	40,847	36,070	36,403	**356,661**
A	22,494	21,419	23,098	23,379	22,434	23,206	23,299	23,324	23,131	27,840	25,848	**259,472**
B	9	8	0	17	59	88	243	254	231	190	0	**1,099**
B1	517	533	550	584	606	599	623	545	556	538	640	**6,291**
B2	0	1	0	0	0	0	0	0	0	0	0	**1**
B3	4	3	3	3	3	3	3	50	31	98	54	**255**
B4	45	55	65	70	71	73	79	75	76	73	79	**761**
B5	6	6	7	7	9	11	9	13	6	11	5	**90**
C	0	0	0	0	0	0	0	0	0	601	2,253	**2,854**
D	2,815	3,165	3,530	3,761	4,061	4,346	4,627	255	400	288	175	**27,423**
D1	138	121	61	123	179	210	218	10	54	35	33	**1,182**
D2	0	0	0	0	0	0	0	0	0	0	0	**0**
F	74	77	62	2,615	2,999	3,067	3,201	3,278	2,984	2,307	1,874	**22,538**
I	436	483	516	546	583	589	588	669	703	731	790	**6,634**
J	120	130	130	132	145	140	149	138	144	155	153	**1,536**
L	0	0	0	157	408	523	705	0	0	0	0	**1,793**
P	5	2	0	0	0	0	0	0	0	0	0	**7**
R	10,012	10,261	10,528	10,961	11,341	11,610	11,813	11,963	12,362	12,698	13,074	**126,623**
S	271	273	276	273	279	276	271	371	388	411	457	**3,546**
T	6,870	6,661	5,728	4,361	5,435	5,973	6,456	940	1,041	930	1,330	**45,725**
U	365	264	300	299	298	297	297	0	0	0	0	**2,120**
V	293	315	325	382	401	381	437	327	425	407	200	**3,893**
WI	0	1	8	1	1	1	1	0	1	0	0	**14**
WJ	0	0	0	0	1	0	0	0	0	0	0	**1**
WR	22	152	240	11	16	16	15	4	5	2	17	**500**
WS	0	0	0	0	0	0	0	0	0	0	0	**0**
Y	11,694	6,542	5,603	5,599	5,595	5,592	5,590	0	0	0	0	**46,215**
Z	0	0	0	0	0	0	0	0	0	0	0	**0**
Total												**917,234**

SECTION V

SUMMARY RESULTS BY SYSTEM: POLICE

POLICE

Findings and Recommendations

The results of the four-year and ten-year experience studies are shown in Appendix IX. We have quantified the differences between actual experience and current actuarial assumptions as well as provided proposed assumptions we believe would be appropriate and reasonable. The tables on the page following our summary of recommendations provide a summary of the reconciliation in comparison to the current assumptions.

The following business rules were applied to the POLICE data. A general description of each rule may be found at the beginning of Section V.

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

Based on our analysis of POLICE, GRS recommends consideration of the following changes for future valuations:

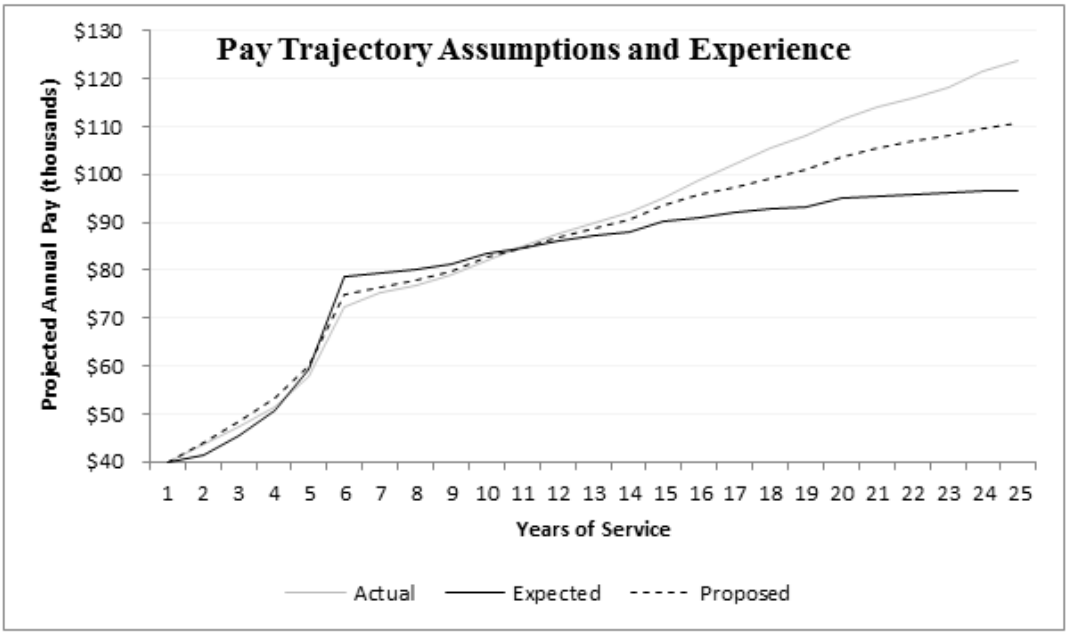
1. **Post-Retirement Mortality:** We recommend updating the base mortality table to a System-specific mortality table developed using POLICE's actual experience. We also recommend using a full generational mortality assumption using projection scale MP-2014. A new table based on the results of this study and the application of MP-2014 is provided in the Appendix.

2. **Salary and Overtime Assumptions:** While there is a large amount of variation in the average salary increase from year to year, the actual average salary increases for individual members over the observation period have been higher than expected based on the current assumptions. As a result, we recommend the OA increase the rates of the merit component of the salary increase assumption, especially for members with more than five-years of service.

The following table gives the average actual increase and the average expected increase by category:

	4-Year Period Ending FY2013		10-Year Period Ending FY2013	
	Expected	**Actual**	**Expected**	**Actual**
Inflation	2.50%	2.00%	2.50%	2.43%
General Increase above Inflation	1.00%	-0.47%	1.00%	0.73%
Average Additional Merit	4.04%	6.68%	3.87%	4.91%
Total Average Salary Increase	7.54%	8.21%	7.37%	8.07%
Baseline Overtime	14.76%	16.92%	14.84%	17.23%
Dual Service Overtime	14.03%	21.12%	14.42%	23.89%
Overtime "Spike"	-0.71%	4.20%	-0.42%	6.66%

As shown, for the four and ten-year period, the actual merit increases were noticeably higher than assumed. The following graph shows the growth of salary for a new member hired with a hypothetical $40,000 salary receiving only the merit portion of the salary schedule during their career. As shown, the actual experience has materially outpaced the assumption.



Due to external factors (such as 9/11 and contract negotiations), it is unlikely the rate of salary increases the members experienced over the last ten years is representative of the rate of salary increases that will be provided in future years. That said, we are recommending an increase to the assumed rate of merit increases, especially for members with more than five years of service, and have provided a revised assumption in the Appendix. Since the rate of compensation increases is very dependent on several external factors which include contract agreements and current human capital philosophies, we believe the OA is better positioned to reflect these factors in the development of the updated assumption.

Experience also shows there is a behavior for members to incur additional overtime to increase their compensation in the year prior to retirement. This is most likely attributable to the member intentionally increasing their final compensation, or "spiking," for purposes of increasing the amount of their retirement benefit. Since "spiking" is a behavioral measure that is permitted by plan design and less related to compensation structure, we are recommending updating the assumption to a constant 22% Overtime Pay Assumption for members eligible for a service retirement benefit, which equates to an approximate average 6% overtime "spiking" assumption. Since it is more difficult for Tier 6 members to spike their overtime based on their averaging period, a lower assumption is likely more appropriate for this group.

It is our understanding that management is aware of an increase in overtime for the City's uniformed forces in recent years. To address the situation for Police, the City has implemented an overtime reduction consistent with the Police Commissioner's commitment to reduce such expenditures going forward. Overtime expenditure levels will be strictly monitored by the Police Department and by the Office of Management and Budget to ensure they do not exceed budgeted overtime amounts. The OA should monitor this assumption for changes in behavior to reflect in future valuations.

These recommendations, if incorporated by the OA in their assumption updates, would increase the liability and contribution requirements.

3. **Withdrawal Assumption:** The number of actual withdrawals has been on a steady decline over the last eight years for the period ending June 30, 2011. However, we are not recommending a change at this time. The experience has been lower than the assumption for the short term but higher over the longer term. We do recommend the OA continue to monitor this assumption as a reduction may be appropriate in the future.

4. **Disability Assumption:** Experience indicates the OA could substantially reduce the rates of disability for members who are eligible for WTC benefits. We recommend the OA adopt new assumptions that move at least halfway toward the experience from current expectations. However, the OA purposefully uses higher rates of disability than actual experience to reflect members who would have qualified for disability, but instead chose normal retirement because they would be eligible for a VSF benefit. Thus, we are

recommending lower probabilities but not reflecting as large an adjustment as the experience would suggest.

The cost estimates shown below are illustrative only and are based on the change in normal cost plus a 19-year amortization of the change in AAL as if all recommendations in this report were adopted. As discussed on Page II-1, there are always a range of reasonable assumptions and thus actual costs will be determined by the OA once the OA and the Board finalize the assumption changes.

Illustrative Cost Estimates

	FY 14 results (June 30, 2012 lag valuation)		
	AAL ($ Millions)	**Normal Cost ($Millions)**	**Employer Contribution ($ Millions)**
Base Results (current Assumptions)	$42,463	$1,242	$2,262
Estimated Change for changes in			
Mortality Assumptions	$870	$25	$107
Overtime Assumptions	$557	$62	$114
Other pay related and demographic assumptions	$576	-$49	$6
Sub Total	$44,466	$1,280	$2,488
Estimated Change for ¼% decrease in investment return assumption	$1,226	$68	$157
Total	$45,692	$1,348	$2,645

NEW YORK CITY POLICE PENSION FUND
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
	Service Retiree Mortality						The proposed assumption is a based on actual plan experience.
1A	Men	96%	520	97%	97%	503	Future mortality improvements will be projected using scale MP-
1B	By Year						2014.
	Disabled Retiree Mortality						The proposed assumption is a based on actual plan experience.
2A	Men	89%	311	88%	94%	286	Future mortality improvements will be projected using scale MP-
2B	By Year						2014.
3A	Active Member Withdrawals	82%	318	137%	137%	537	Actual experience has been trending downward. Recommend no
3B	By Year						change at this time as different timeframes provide different results.
	Active Member Service Retirements						Recent experience has been consistent with OA assumption.
4A	In 1st Year of Eligibility	71%	602	97%	97%	886	
4B	In 2nd Year of Eligibility	136%	140	114%	114%	104	
4C	After 2nd Year of Eligibility	101%	382	88%	88%	239	
4D	By Year						
	Active Member Ordinary Mortality						Actual experience has been consistent with current assumption, with
5A	Men	76%	14	94%	94%	16	trend lowering recently. We recommend no change.
5B	By Year						
6A	Active Member Accidental Mortality	45%	3	61%	76%	4	Actual experience appears lower than current assumption. We
6B	By Year						recommend a lower assumption.

NEW YORK CITY POLICE PENSION FUND
EXPERIENCE STUDY RESULTS

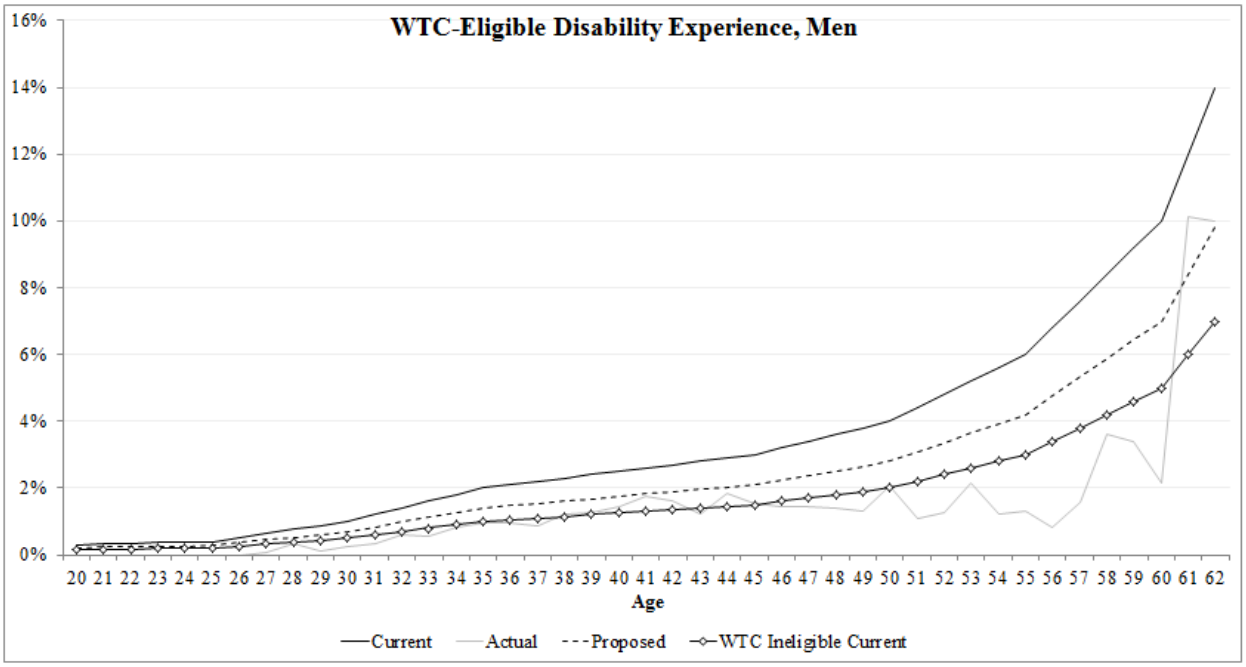
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
7A	Active Member Ordinary Disability	95%	51	118%	118%	63	Recent experience has been consistent with OA assumption.
7B	By Year						
	Active Member Accidental Disability						Actual experience has been lower than current assumption. Members
8A	WTC Eligible	54%	241	49%	76%	226	that are and are not eligible for WTC benefits appear to have similar
8B	WTC Ineligible	67%	91	105%	104%	134	actual experience. New rates, exponentially-fitted to actual data, are
8C	By Year						proposed for both those eligible and not eligible for WTC Disability.
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Overall, salary experience has outpaced the assumption. We
9A	Total	7.54%	8.21%	7.37%	6.35%	8.07%	recommend a higher merit portion of the salary scale.
9B	Merit Only	4.54%	6.68%	4.37%	2.35%	3.21%	
	General Increase over Inflation	0.50%	-0.47%	0.50%	0.50%	0.62%	
9C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Recommend a flat assumption for OT and OT in year before
10A	For All Years	14.76%	16.92%	14.84%	16.00%	17.23%	disability. Recommend a higher OT assumption before retirement.
10B	In Year Before Service Retirement	14.03%	21.12%	14.42%	22.00%	23.89%	Members are working less Overtime before becoming disabled.
10C	In Year Before Disability Retirement	14.73%	11.13%	14.75%	16.00%	11.54%	
10D	By Year						

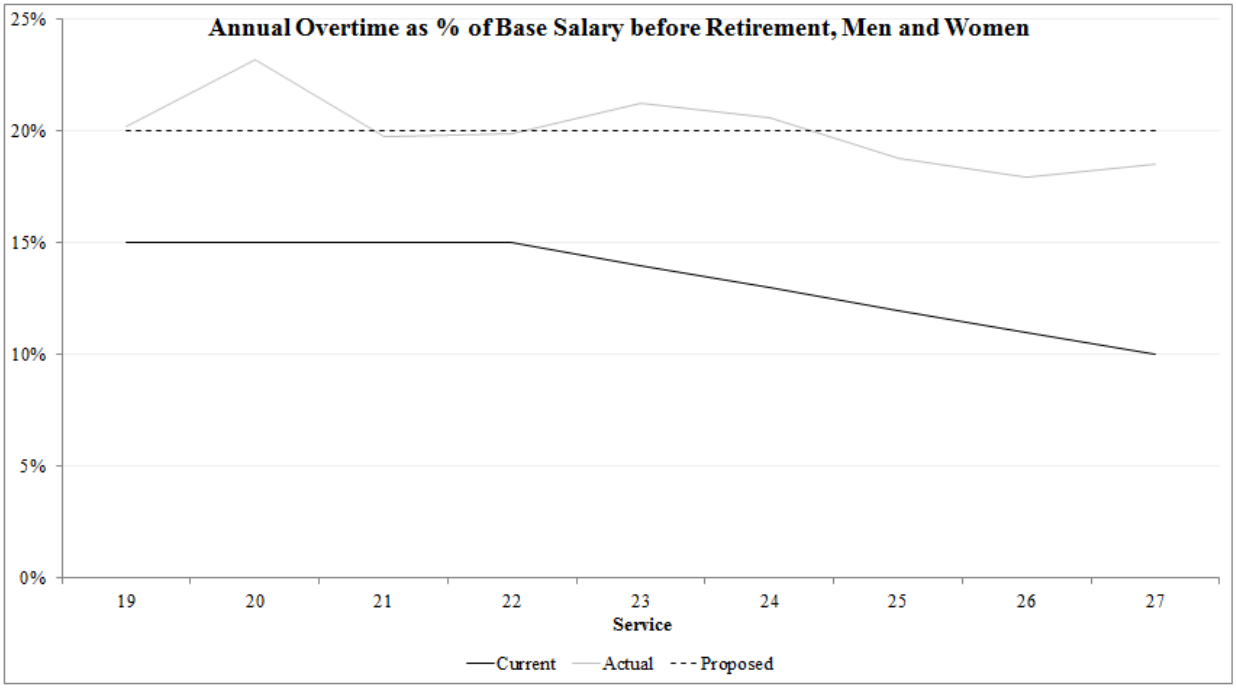
** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK CITY POLICE DEPARTMENT PENSION FUND
DISABILITY ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



NEW YORK CITY POLICE DEPARTMENT PENSION FUND
OVERTIME ASSUMPTIONS AND EXPERIENCE
FOR THE TEN-YEAR PERIOD ENDING 6/30/2013



GRS' APPROACH TO ASSIGNING STATUSES FOR POLICE ACTIVE TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*
A	Active			10
B	Active-Inactive, Adjusted	Withdrawal		20
B1	Beneficiary of Retiree	Beneficiary		
B2	Beneficiary of Ordinary Death	Beneficiary		
B3	Beneficiary of Accidental Death	Beneficiary		
B4	Beneficiary of Ordinary Disability	Beneficiary		
B5	Beneficiary of Accidental Disability	Beneficiary		
C	Active-Inactive, Adjusted	Withdrawal		20
D	Deceased	Ordinary Mortality		
D1	Ordinary Death w/o Ben	Ordinary Mortality		60
D2	Accidental Death w/o Ben	Accidental Mortality		61
F	Active-Inactive	Withdrawal		20
I	Ordinary Disability	Ordinary Disability		70
J	Accidental Disability	Accidental Disability		71
L	Lump Sum	Withdrawal		
P	Duplicate			
R	Service Retiree	Retirement		90
R	Service Retirement Year 2	Retirement		91
R	Service Retirement Year Ultimate	Retirement		92
R	Reduced Service Retirement	Retirement		93
S	Retiree from Vested	Retirement		
T	Terminated Non-Vested	Withdrawal		80
U	5-Year Out	Withdrawal		
V	Deferred Vested	Withdrawal		81
WI	Missing Ordinary Disability	Ordinary Disability		
WJ	Missing Accidental Disability	Accidental Disability		
WR	Missing Services Retirement	Retirement		
WS	Missing Retirement from Vested	Retirement		
Z	Refunded	Withdrawal		

GRS' APPROACH TO ASSIGNING STATUSES FOR POLICE PENSIONER TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*	RetCause	PayeePen
A	Active					
B	Active-Inactive, Adjusted	Withdrawal				
B1	Beneficiary of Retiree	Beneficiary			0 or 3	not 0 or 1
B2	Beneficiary of Ordinary Death	Beneficiary			7	not 0 or 1
B3	Beneficiary of Accidental Death	Beneficiary			4	not 0 or 1
B4	Beneficiary of Ordinary Disability	Beneficiary			2	not 0 or 1
B5	Beneficiary of Accidental Disability	Beneficiary			1	not 0 or 1
C	Active-Inactive, Adjusted	Withdrawal				
D	Deceased	Mortality*		60		
D1	Ordinary Death w/o Ben	Mortality*				
D2	Accidental Death w/o Ben	Mortality*				
F	Active-Inactive	Withdrawal				
I	Ordinary Disability	Ordinary Disability			2	0 or 1
J	Accidental Disability	Accidental Disability			1	0 or 1
L	Lump Sum	Withdrawal				
P	Duplicate					
R	Service Retiree	Retirement			3	0 or 1
S	Retiree from Vested	Retirement			0	0 or 1
T	Terminated Non-Vested	Withdrawal		80		
U	5-Year Out	Withdrawal				
V	Deferred Vested	Withdrawal	70	10	0	
WI	Missing Ordinary Disability	Ordinary Disability				
WJ	Missing Accidental Disability	Accidental Disability				
WR	Missing Services Retirement	Retirement				
WS	Missing Retirement from Vested	Retirement				
Z	Refunded	Withdrawal				

** The mortality decrements are determined by the member's status in the previous year. For example, a disability retiree's mortality decrement would be Disabled Mortality.*

Business Rule 1: Death Reclassification

Description:	Example:		2006	2007	2008	2009
For a member who shows as a death in a given data file and shows a date of death in an earlier period, the death status was filled backwards until the fiscal year associated with the death date.	A member is identified as a death status in the 6/30/2009 data file with a Date of Death of 7/2/2006. The member's 6/30/2007 status and all future statuses are updated to reflect the new Date of Death.	**Initial**	R	R	R	R
		⬇		⬇	⬇	⬇
		Matured	R	D	D	D

	Fiscal Year Ended June 30,											
Status	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
No Status												
A				-1			-1					**-2**
B												
B1	-204	-33	-38	-22	-36	-28	-39	-1				**-401**
B2			-1					-1		-3	-1	**-6**
B3												
B4	335	98	85	49	75	72	103	91	65	61	55	**1,089**
B5	-88	-8	-11	-10	-13	-9	-9	-61	-54	-50	-54	**-367**
C												
D												
D1	-10	-17	-6	-1	-12	-8	-20	-7	-5	-6		**-92**
D2												
F				-1	-1	-2	-2	-9	-4			**-19**
I	-11	-8	-2	-5	-4	-5	-5	-4	-1			**-45**
J	-5	-8	-2	-5	-4	-7	-5		-1			**-37**
L							-2					**-2**
R	-17	-23	-25	-4	-5	-13	-20	-8		-1		**-116**
S		-1								-1		**-2**
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Business Rule 2: Accidental Disability Reclassification

Description:	Example:		2002	2003	2004	2005
For members reclassifying to Accidental Disability (status code 'J') within one year after retirement, GRS changed the record as though the member immediately retired under Accidental Disability.	An active member retires 8/22/2002 and is reclassified to Accidental Disability as of 6/30/2005. The statuses for FYE 2003 and 2004 are changed to Accidental Disability.	**Initial**	A	R	J	J
		⬇				
		Matured	A	J	J	J

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status												
A												
B												
B1												
B2												
B3												
B4												
B5												
C												
D												
D1			13				56	41	60	48		**218**
D2												
F									-1			**-1**
I							-10	-2	-6	-8		**-26**
J												
L												
R			-13				-46	-39	-53	-38		**-189**
S										-2		**-2**
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Business Rule 3: Ordinary Disability Reclassification

Description:	Example:		2001	2002	2003	2004
For members retiring under Ordinary Disability (status code 'I'), either after service retirement or after termination, GRS changed the record as though the member immediately retired under Ordinary Disability.	An active member retires 4/23/2002 and is reclassified to ordinary disability in FYE 2004. The statuses for FYE 2002 and 2003 are changed to Ordinary Disability.	**Initial**	A	R	R	I
		⬇		⬇	⬇	
		Matured	A	I	I	I

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status												
A												
B												
B1												
B2												
B3												
B4												
B5												
C												
D							1	1	2	4		**8**
D1												
D2												
F							-1	-1	-1	-2		**-5**
I												
J												
L												
R									-1	-2		**-3**
S												
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Business Rule 4: Status Continuity

Description:	Example:		2004	2005	2006	2007
In any three year period, if the first and last year's status matched, the middle year was also changed to be consistent. This rule was applied to statuses A, I, J, and R.	A record shows ordinary disability in 6/30/2004 and 6/30/2006 but beneficiary in 6/30/2005. The 6/30/2005 status is changed to ordinary disability.	**Initial**	I	B3	I	I
		⬇				
		Matured	I	I	I	I

	Fiscal Year Ended June 30,											
Status	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
No Status												
A							79	66	60	46		**251**
B												
B1												
B2												
B3												
B4												
B5												
C												
D												
D1												
D2												
F							-79	-66	-60	-46		**-251**
I												
J												
L												
R												
S												
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Business Rule 5: Active-Inactive Reclassification #1

Description:	Example:		2008	2009	2010	2011
Status B was introduced to differentiate active-inactive members that returned to service. Any active member that becomes active-inactive for a period and eventually returns to active service will have all active-inactive statuses changed to B.	An active member as of 6/30/2008 becomes Active-Inactive as of 6/30/2009. When the member returns to active status in 6/30/2011, all prior active-inactive years are changed to B.	**Initial**	A	F	F	A
				⬇	⬇	
		Matured	A	B	B	A

Business Rule 6: Active-Inactive Reclassification #2

Description:	Example:		2010	2011	2012	2013
Status C was introduced to differentiate active-inactive members in the final two years of the experience period. Any active member that becomes active-inactive during this period will have all active-inactive statuses changed to C.	An active member as of FYE 2011 becomes Active-Inactive as of FYE 2012. Based on this Rule, the member's status for FYE 2012 and 2013 is changed to C.	**Initial**	A	A	F	F
					⬇	⬇
		Matured	A	A	C	C

Status B&C were added to classify members as active in the reconcilation process but not include them in the salary analysis.

Impact of Business Rules 5 and 6

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status												
A												
B				-4	-4	-15	-88	-70	-67	-47		**-295**
B1												
B2												
B3												
B4												
B5												
C										-63	-206	**-269**
D												
D1												
D2												
F				4	4	15	88	70	67	110	206	**564**
I												
J												
L												
R												
S												
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Status Changes Due to Maturation, Using Business Rules 1, 2, 3, 4, 5 and 6

	Fiscal Year Ended June 30,											
Status	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
No Status												
A				-1			78	66	60	46		**249**
B				-4	-4	-15	-88	-70	-67	-47		**-295**
B1	-204	-33	-38	-22	-36	-28	-39	-1				**-401**
B2			-1					-1		-3	-1	**-6**
B3												
B4	335	98	85	49	75	72	103	91	65	61	55	**1,089**
B5	-88	-8	-11	-10	-13	-9	-9	-61	-54	-50	-54	**-367**
C										-63	-206	**-269**
D							1	1	2	4		**8**
D1	-10	-17	7	-1	-12	-8	36	34	55	42		**126**
D2												
F				3	3	13	6	-6	1	62	206	**288**
I	-11	-8	-2	-5	-4	-5	-15	-6	-7	-8		**-71**
J	-5	-8	-2	-5	-4	-7	-5		-1			**-37**
L							-2					**-2**
R	-17	-23	-38	-4	-5	-13	-66	-47	-54	-41		**-308**
S		-1								-3		**-4**
T												
U												
V												
WI												
WJ												
WR												
WS												
Y												
Z												
Total												

Status Counts after Maturation, Using Business Rules 1, 2, 3, 4, 5 and 6

	Fiscal Year Ended June 30,											
Status	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
No Status	16,121	14,767	11,341	8,442	5,976	3,695	2,136	5,656	5,933	6,196	6,596	**86,859**
A	36,208	35,144	35,477	35,337	35,357	35,456	35,709	34,311	32,284	30,456	29,054	**374,793**
B												
B1	1,090	933	801	677	557	465	396	307	248	205	164	**5,843**
B2				2	3	3	3					**11**
B3	311	311	313	316	309	301	289	280	276	268	263	**3,237**
B4	27	28	21	19	18	16	14	13	11	10	10	**187**
B5	34	33	32	31	31	29	29	26	24	22	21	**312**
C												
D	10,552	11,453	12,391	13,266	14,213	15,171	16,130	17,068	18,020	18,934	19,884	**167,082**
D1	9	12	6	7	12	16	18	4		10	22	**116**
D2	8	5	2	2	6	12	13	2	2		3	**55**
F	3	3	3	1,336	1,503	1,738	1,885	1,736	1,547	1,277	1,141	**12,172**
I	3,933	3,911	3,878	3,829	3,751	3,665	3,587	3,519	3,438	3,342	3,258	**40,111**
J	10,152	10,449	10,672	10,942	11,134	11,306	11,485	11,634	11,803	11,943	12,067	**123,587**
L							8					**8**
R	22,510	23,766	25,235	26,500	27,440	27,751	27,648	26,876	27,866	28,691	28,947	**293,230**
S	119	110	136	167	213	207	203	1,262	1,340	1,388	1,420	**6,565**
T	2,244	2,293	2,850	2,188	2,512	3,178	3,426	323	296	375	298	**19,983**
U	42	40	40	40	39	39	39					**279**
V	495	597	643	755	782	808	838	846	775	746	715	**8,000**
WI			1									**1**
WJ			1									**1**
WR		3	12	2	2	2	2					**23**
WS			3									**3**
Y												
Z												
Total												**1,142,458**

Development of WTC Reclassification Assumption

The POLICE System reclassifies members from Service Retirement, Ordinary Disability, and Accidental Disability to WTC Accidental Disability or WTC Death if certain requirements are satisfied. The WTC benefit is payable to the member or the beneficiary of the member after death if the death has been determined to be caused by the WTC. Thus, reclassifications (or approvals) can occur before or after the death of the member.

To analyze the occurrence of spousal reclassification, GRS identified the members who would have been eligible for a WTC benefit, and then identified the members from that group whose beneficiary received a WTC benefit.

To be eligible for reclassification, GRS identified members who met the following conditions: (1) were active in the 6/30/2001 data (were active on September 11, 2001), (2) were still alive in the 6/30/2008 data, and (3) subsequently died prior to the 6/30/2013 data. The 6/30/2007 data was the first time WTC elements were included in the data set and thus deaths prior to that would not be reliable comparisons for future reclassifications. Using these conditions, a total of 43 members were used in the analysis.

We then grouped the data based on the WTC_elig field in the member's record and the RetCause field from the resulting beneficiary's record.

All 43 identified members had a WTC_elig field code of "WT", which means the member had filed paperwork to be eligible for WTC benefits. Of the 43, 10 had beneficiaries with a RetCause equal to 6 in the 6/30/2013 data (which means receiving a WTC benefit) and 33 had a non-WTC benefit. Thus, 23% of the members who died with a "WT" eligibility code have resulted in a WTC benefit.

No members without a "WT" in the WTC_elig field have been reclassified to a WTC benefit as of the 6/30/2013 data; so the reclassification occurrence has been 0% for members who had not filed paperwork.

Based on this data, GRS recommends an explicit assumption as to how many members will qualify for WTC benefits.

In our opinion, for members with a WTC_elig code of "WT", it would be reasonable to have an assumption of 25% to 35%, for those who will receive a WTC benefit.

While there have been no members without a WTC_elig code of "WT" show up with a WTC benefit, there has been very little time elapsed and very few occurrences. Therefore, we believe it would be reasonable to have a reclassification assumption of 5-10% for this group. This assumption may need to be updated as more experience becomes available.

POLICE WTC RECLASSIFICATION METHODOLOGY AND ASSUMPTIONS

GRS also has examined WTC Disability reclassification for participants of the POLICE System that reclassify immediately upon retirement, ultimately following retirement, or have not reclassified. For this analysis, member's *Status* and *WTC_Elig* code were collected over the eight-year period ending 6/30/2013 for all participants in the POLICE system who were active as of 6/30/2001. The *WTC_Elig* code TC (WTC Disability Benefit Approved) was used to indicate which members were approved to receive a WTC disability benefit. Members retiring under Service Retirement and Disability were looked at separately. Based on this information, it appears that a majority of the members who reclassify do so very soon after or in conjunction with retirement.

NEW YORK CITY POLICE PENSION FUND
RECLASSIFICATION TO WTC DISABILITY
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2013

	Year of Retirement															
First Year with WTC Elig = TC	2007		2008		2009		2010		2011		2012		2013		Total	
	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis
No occurrence	1,440	354	801	332	398	339	806	289	1,528	306	1,346	238	828	230	7,147	2,088
2007		30													0	30
2008		2		22											0	24
2009		4		2											0	6
2010	6					40		14							6	54
2011	3		2					1		22					5	23
2012	1		1				2	2		8		8			4	18
2013	1	1	1		1		4	1		2		3		17	7	24
Subtotal	11	37	4	24	1	40	6	18	0	32	0	11	0	17	22	179
Total	1,451	391	805	356	399	379	812	307	1,528	338	1,346	249	828	247	7,169	2,267

	Year of Retirement							
Reclassification	2007	2008	2009	2010	2011	2012	2013	Total
Immediate Ret	0%	0%	0%	0%	0%	0%	0%	0%
Immediate Dis	2%	2%	0%	1%	1%	1%	2%	1%
Ultimate Ret	1%	0%	0%	1%	0%	0%		0%
Ultimate Dis	0%	0%	5%	0%	1%	0%		1%
None Ret	78%	69%	51%	72%	82%	84%	77%	76%
None Dis	19%	29%	44%	26%	16%	15%	21%	22%
Total	100%	100%	100%	100%	100%	100%	100%	100%

SECTION V

SUMMARY RESULTS BY SYSTEM: FIRE

FIRE

Findings and Recommendations

The results of the four-year and ten-year experience studies are shown in Appendix X. We have quantified the differences between actual experience and current actuarial assumptions as well as provided illustrative proposed assumptions we believe would be appropriate and reasonable. The table on the page following a summary of our recommendations provides a summary of the reconciliation in comparison to the current assumptions.

The following business rules were applied to the FIRE data. A general description of each rule may be found at the beginning of Section V.

Business Rules

Rule #	Rule Name
1	Death Reclassification
2	Accidental Disability Reclassification
3	Ordinary Disability Reclassification
4	Status Continuity
5	Active-Inactive Reclassification #1
6	Active-Inactive Reclassification #2
7	Service Retirement Adjustment
8	Eligibility Adjustment

Based on our analysis of FIRE, GRS recommends consideration of the following changes for future valuations:

1. **Post-Retirement Mortality:** We recommend updating the base mortality table to a System-specific mortality table developed using FIRE's actual experience for the core ages for retirees (ages 60 to 84). We also recommend using a full generational mortality assumption using projection scale MP-2014. A new table based on the results of this study and the application of MP-2014 is provided in the Appendix.

2. **Salary and Overtime Assumptions:** The following table gives the average actual increase and the average expected increase by category.

	4-Year Period Ending FY2013		10-Year Period Ending FY2013	
	Expected	**Actual**	**Expected**	**Actual**
Inflation	2.50%	2.00%	2.50%	2.43%
General Increase above Inflation	1.00%	0.52%	1.00%	0.68%
Average Additional Merit	2.76%	4.55%	3.48%	4.52%
Total Average Salary Increase	6.26%	7.08%	6.98%	7.62%
Baseline Overtime	14.71%	19.29%	14.85%	19.54%
Dual Service Overtime	15.46%	25.12%	17.67%	30.41%
Overtime "Spike"	0.75%	5.83%	2.82%	10.87%

As shown, the actual merit increases were noticeably higher than assumed. As a result, we recommend the OA consider increasing the rates of the merit component of the salary increase assumption, especially for members with more than five years of service and have provided a revised assumption in the Appendix. However, since the rate of compensation increase is dependent on several external factors which include contract agreements and current human capital philosophies, we believe the OA is better positioned to reflect these factors and determine whether an update to this assumption is appropriate.

Experience also shows there is a behavior for members to incur additional overtime to increase their compensation in the year prior to retirement. This is most likely attributable to the members intentionally increasing their final compensation, or "spiking," for purposes of increasing the amount of their retirement benefit. Since "spiking" is a behavioral measure that is permitted by plan design and less related to compensation structure, we are recommending updating the assumption to a constant 24% Overtime Pay Assumption for members eligible for a service retirement benefit, which equates to an approximate average 7% overtime "spiking" assumption. This recommendation, if incorporated by the OA in their assumption updates, would increase the liability and contribution requirements. Since it is more difficult for Tier 6 members to spike their overtime based on their averaging period, a lower assumption is likely more appropriate for this group.

It is our understanding that management is aware of an increase in overtime for the City's uniformed forces in recent years. The increase in Fire overtime is the result of a hiring freeze from 2008 to 2013 due to a hiring discrimination lawsuit (United States v. City of New York). The City has budgeted for an increase in Fire headcount and the Office of Management and Budget projects that the Fire Department will reach its budgeted headcount

by the end of FY 2018. Additionally, the Fire Department is also working to reduce discretionary overtime. The OA should monitor this assumption for changes in behavior to reflect in future valuations.

3. **Disability Assumption**: Experience indicates the OA could substantially reduce the rates of disability for ordinary disability and non-WTC accidental disabilities. However, the OA purposefully uses higher rates of disability than actual experience to reflect members who would have qualified for disability, but instead chose normal retirement because they would be eligible for a VSF benefit. Thus, we are recommending lower probabilities but not reflecting as large an adjustment as the experience would suggest.

The cost estimates shown below are illustrative only and are based on the change in normal cost plus a 19-year amortization of the change in AAL as if all recommendations in this report were adopted. As discussed on Page II-1, there are always a range of reasonable assumptions and thus actual costs will be determined by the OA once the OA and the Board finalize the assumption changes.

Illustrative Cost Estimates

	FY 14 results (June 30, 2012 lag valuation)		
	AAL ($ Millions)	**Normal Cost ($Millions)**	**Empoyer Contribution ($ Millions)**
Base Results (current Assumptions)	$17,026	$418	$963
Estimated Change for changes in			
Mortality Assumptions	$240	$9	$32
Overtime Assumptions	$307	$11	$39
Other pay related and demographic assumptions	$261	$46	$71
Sub Total	$17,834	$484	$1,105
Estimated Change for ¼% decrease in investment return assumption	$456	$28	$57
Total	$18,290	$512	$1,162

NEW YORK FIRE PENSION FUND
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
	Service Retiree Mortality						The proposed assumption is a based on actual plan experience.
1A	Men	102%	194	102%	93%	192	Future mortality improvements will be projected using scale MP-
1B	By Year						2014.
	Disabled Retiree Mortality						The proposed assumption is a based on actual plan experience.
2A	Men	95%	220	94%	93%	204	Future mortality improvements will be projected using scale MP-
2B	By Year						2014.
3A	Active Member Withdrawals	91%	25	106%	106%	34	Recommend no change.
3B	By Year						
	Active Member Service Retirements						Actual experience has been trending downward. We recommend a lower assumption. The proposed assumptions are 70%, 90%, and
4A	In 1st Year of Eligibility	38%	14	71%	101%	28	85% of the current assumption for members retiring in the first,
4B	In 2nd Year of Eligibility	62%	4	96%	107%	6	second, and after second year of eligibility, respectively, with other
4C	After 2nd Year of Eligibility	53%	52	62%	73%	48	small adjustments at specific ages as warranted. We anticipate the use
4D	By Year						of the MSTATC field will lead to more accurate data in future experience studies.
	Active Member Ordinary Mortality						Actual experience has been trending downward. The proposed
5A	Men	46%	4	61%	101%	5	assumption is 60% of the current assumption.
5B	By Year						
6A	Active Member Accidental Mortality	58%	3	73%	98%	4	Actual experience has been trending downward. The proposed
6B	By Year						assumption is 75% of the current assumption.

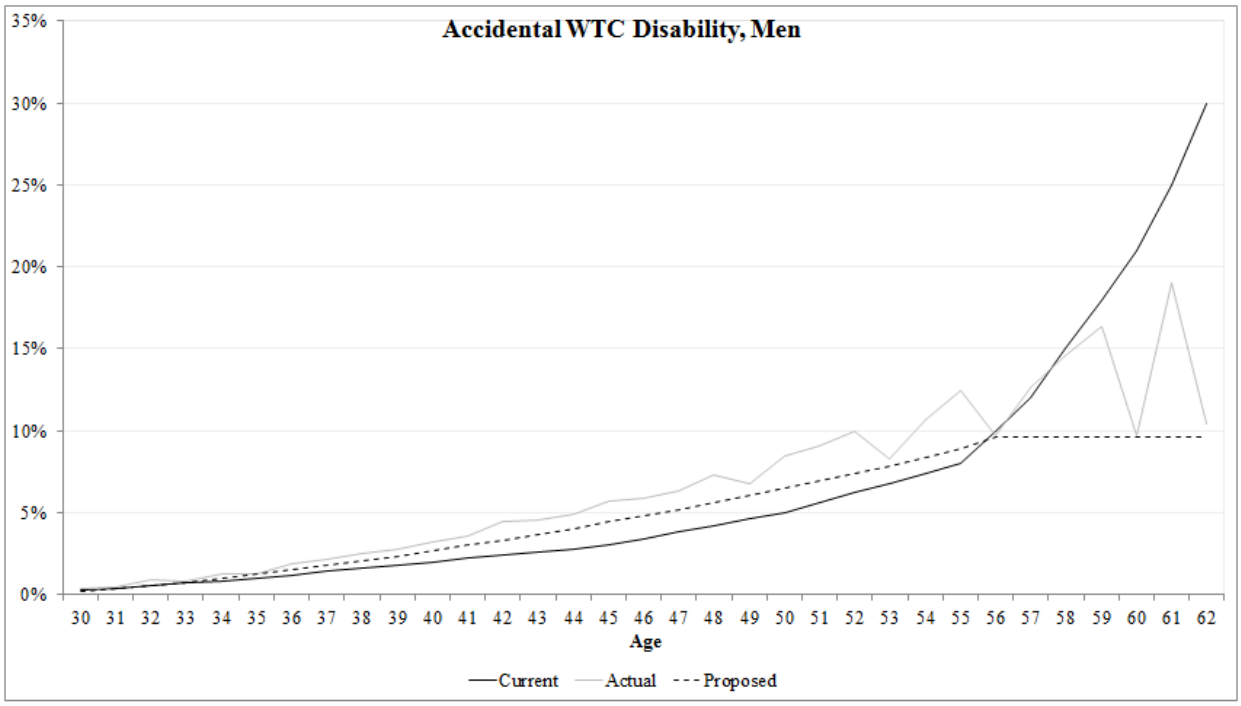
NEW YORK FIRE PENSION FUND
EXPERIENCE STUDY RESULTS
OVERVIEW

Table Number	Table Type	4-YEAR PERIOD ENDING 6/30/2013*		10-YEAR PERIOD ENDING 6/30/2013*			Comments
		Expected	Average Number of Decrements per Year	Ratio of Actual to Expected	Ratio of Actual to Proposed	Average Number of Decrements per Year	
7A	Active Member Ordinary Disability	6%	2	11%	13%	3	Materially different results emerged than were expected.
7B	By Year						Expectations should be lowered. The proposed assumption is 80% of the current assumption.
	Active Member Accidental Disability						Expectations should be moved towards experience in both cases.
8A	WTC Eligible	134%	328	152%	124%	365	New rates, exponentially-fitted to actual data, are proposed for both
8B	WTC Ineligible	52%	6	45%	79%	4	those eligible and not eligible for WTC Disability.
8C	By Year						
	Salary Increases**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Overall, salary experience has been higher than the current
9A	Total	6.26%	7.08%	6.98%	6.68%	7.62%	assumption.
9B	Merit Only	3.26%	4.55%	3.98%	3.67%	4.52%	
	General Increase over Inflation	0.50%	0.52%	0.50%	0.50%	0.68%	
9C	By Year						
	Overtime Pay**	**Expected**	**Actual**	**Expected**	**Proposed**	**Actual**	Actual OT rates appear to increase over member's working career.
10A	For All Years	14.71%	19.29%	14.85%	17.00%	19.54%	The current assumption assumes overtime rates will decline over time.
10B	In Year Before Service Retirement	15.46%	25.12%	17.67%	24.00%	30.41%	We recommend a materially higher, flat dual-service OT assumption.
10C	In Year Before Disability Retirement	14.74%	20.56%	15.36%	20.00%	23.98%	
10D	By Year						

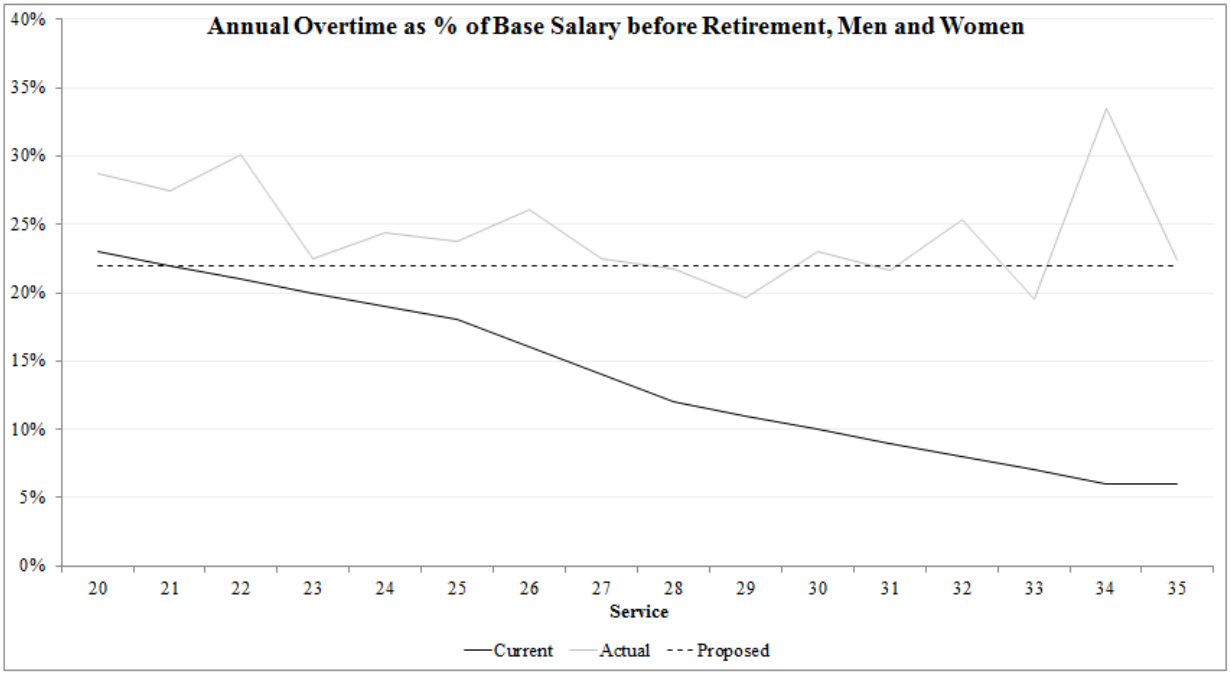
** Four-year and eight-year periods ending 6/30/2011 were studied for the Withdrawal and Disability Decrements.*

*** For Salary Increases, average annual percentage increase in salary is shown. For Overtime Pay, average annual overtime pay is expressed as a percentage of salary.*

NEW YORK FIRE DEPARTMENT FUND
DISABILITY ASSUMPTIONS AND EXPERIENCE
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2011



NEW YORK FIRE DEPARTMENT FUND
OVERTIME ASSUMPTIONS AND EXPERIENCE
FOR THE TEN-YEAR PERIOD ENDING 6/30/2013



GRS' APPROACH TO ASSIGNING STATUSES FOR FIRE ACTIVE TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*
A	Active			10
B	Active-Inactive, Adjusted	Withdrawal		20
B1	Beneficiary of Retiree	Beneficiary		
B2	Beneficiary of Ordinary Death	Beneficiary		
B3	Beneficiary of Accidental Death	Beneficiary		
B4	Beneficiary of Ordinary Disability	Beneficiary		
B5	Beneficiary of Accidental Disability	Beneficiary		
C	Active-Inactive, Adjusted	Withdrawal		20
D	Deceased	Ordinary Mortality		
D1	Ordinary Death w/o Ben	Ordinary Mortality		60
D2	Accidental Death w/o Ben	Accidental Mortality		61
F	Active-Inactive	Withdrawal		20
I	Ordinary Disability	Ordinary Disability		70
J	Accidental Disability	Accidental Disability		71
L	Lump Sum	Withdrawal		
P	Duplicate			
R	Service Retirement Year 1	Retirement		90
R	Service Retirement Year 2	Retirement		91
R	Service Retirement Year Ultimate	Retirement		92
R	Reduced Service Retirement	Retirement		93
S	Retiree from Vested	Retirement		
T	Terminated Non-Vested	Withdrawal		80
U	5-Year Out	Withdrawal		
V	Deferred Vested	Withdrawal		81
WI	Missing Ordinary Disability	Ordinary Disability		
WJ	Missing Accidental Disability	Accidental Disability		
WR	Missing Services Retirement	Retirement		
WS	Missing Retirement from Vested	Retirement		
Z	Refunded	Withdrawal		

GRS' APPROACH TO ASSIGNING STATUSES FOR FIRE PENSIONER TABLES FROM 6/30/2010 THROUGH 6/30/2013

GRS Status Code	Meaning	Associated Decrement	MSTATP*	MSTATC*	RetCause	PayeePen
A	Active					
B	Active-Inactive, Adjusted	Withdrawal				
B1	Beneficiary of Retiree	Beneficiary			0 or 3	not 0 or 1
B2	Beneficiary of Ordinary Death	Beneficiary				
B3	Beneficiary of Accidental Death	Beneficiary			4 or 6	not 0 or 1
B4	Beneficiary of Ordinary Disability	Beneficiary			2	not 0 or 1
B5	Beneficiary of Accidental Disability	Beneficiary			1 or 5	not 0 or 1
C	Active-Inactive, Adjusted	Withdrawal				
D	Deceased	Mortality*		60		
D1	Ordinary Death w/o Ben	Mortality*				
D2	Accidental Death w/o Ben	Mortality*				
F	Active-Inactive	Withdrawal				
I	Ordinary Disability	Ordinary Disability			2	0 or 1
J	Accidental Disability	Accidental Disability			1	0 or 1
L	Lump Sum	Withdrawal				
P	Duplicate					
R	Service Retiree	Retirement			3	0 or 1
S	Retiree from Vested	Retirement			0	0 or 1
T	Terminated Non-Vested	Withdrawal				
U	5-Year Out	Withdrawal				
V	Deferred Vested	Withdrawal	70	10	0	
WI	Missing Ordinary Disability	Ordinary Disability				
WJ	Missing Accidental Disability	Accidental Disability	70	10	1	0 or 1
WR	Missing Services Retirement	Retirement				
WS	Missing Retirement from Vested	Retirement				
Z	Refunded	Withdrawal		80		

* *The mortality decrements are determined by the member's status in the previous year. For example, a disability retiree's mortality decrement would be Disabled Mortality.*

Business Rule 1: Death Reclassification

Description:	Example:		2006	2007	2008	2009
For a member who shows as a death in a given data file and shows a date of death in an earlier period, the death status was filled backwards until the fiscal year associated with the death date.	A member is identified as a death status in the 6/30/2009 data file with a Date of Death of 7/2/2006. The member's 6/30/2007 status and all future statuses are updated to reflect the new Date of Death.	**Initial**	R	R	R	R
		⬇		⬇	⬇	⬇
		Matured	R	D	D	D

	Fiscal Year Ended June 30,											
Status	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
No Status	-262	-176	-173	-1	-3	-1	-1	-2		-2		**-619**
A	-5		-1									**-6**
B												
B1	-33	-23	-23	-17	-27	-16	-10	-7	-11			**-167**
B2												
B3				-31								**-31**
B4	-7	-2	-4	-2	-3	-4	-5		-4			**-31**
B5	-36	-6	-7	-4	-11	-12	-7	-11	-12	-12	-11	**-106**
C												
D	366	217	230	69	49	47	31	26	36	21	11	**1,071**
D1	-2	-2	-3	-4		-4	-7	-4	-5	-4		**-31**
D2												
F												
I	-1	-1	-1	-1	-1	-1						**-6**
J	-3	-1	-7	-6		-5		-2	-3	-1		**-27**
L												
P												
R	-4	-2	-11	-3	-4	-4						**-28**
S												
T	-12	-3										**-15**
U	-1											**-1**
V							-1					**-1**
WI												
WJ												
WR		-1										**-1**
WS												
Z									-1	-2		**-1**
Total												

Business Rule 2: Accidental Disability Reclassification

Description:	Example:		2002	2003	2004	2005
For members reclassifying to Accidental Disability (status code 'J'), either after service retirement or after termination, GRS changed the record as though the member immediately retired under Accidental Disability.	An active member retires 8/22/2002 and is reclassified to Accidental Disability as of 6/30/2005. The statuses for FYE 2003 and 2004 are changed to Accidental Disability.	**Initial**	A	R	R	J
		⬇		⬇	⬇	
		Matured	A	J	J	J

	Fiscal Year Ended June 30,											
Status	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
No Status	-27	-7	-2									**-36**
A												
B												
B1												
B2												
B3	-39	-39	-39									**-117**
B4												
B5												
C												
D												
D1												
D2												
F												
I												
J	93	119	63						32	10		**317**
L												
P												
R	-1		-20						-31	-10		**-62**
S									-1			**-1**
T												
U												
V												
WI												
WJ	-26	-73	-2									**-101**
WR												
WS												
Z												
Total												

Business Rule 3: Ordinary Disability Reclassification

Description:	Example:		2001	2002	2003	2004
For members retiring under Ordinary Disability (status code 'I'), either after service retirement or after termination, GRS changed the record as though the member immediately retired under Ordinary Disability.	An active member retires 4/23/2002 and is reclassified to ordinary disability in FYE 2004. The statuses for FYE 2002 and 2003 are changed to Ordinary Disability.	**Initial**	A	R	R	I
		⬇		⬇	⬇	
		Matured	A	I	I	I

	Fiscal Year Ended June 30,											
Status	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
No Status	-2	-2	-1	-1	-1	-1	-1					**-9**
A												
B												
B1												
B2												
B3												
B4												
B5												
C												
D												
D1												
D2												
F								-1				**-1**
I	2	3	2	2	3	3	3	2	2	1		**22**
J												
L												
P												
R			-1	-1	-1	-1	-1	-1	-2	-1		**-8**
S												
T												
U												
V												
WI					-1	-1	-1					**-3**
WJ												
WR		-1										**-1**
WS												
Z												
Total												

Business Rule 4: Status Continuity

Description:	Example:		2004	2005	2006	2007
In any three year period, if the first and last year's status matched, the middle year was also changed to be consistent. This rule was applied to statuses A, I, J, and R.	A record shows ordinary disability in 6/30/2004 and 6/30/2006 but beneficiary in 6/30/2005. The 6/30/2005 status is changed to ordinary disability.	**Initial**	I	B3	I	I
		⬇				
		Matured	I	I	I	I

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status												
A				2								**2**
B												
B1												
B2												
B3												
B4												
B5												
C												
D												
D1												
D2												
F												
I												
J												
L												
P												
R				3								**3**
S												
T				-2								**-2**
U												
V												
WI												
WJ												
WR				-3								**-3**
WS												
Z												
Total												

Business Rule 5: Active-Inactive Reclassification #1

Description:	Example:		2008	2009	2010	2011
Status B was introduced to differentiate active-inactive members that returned to service. Any active member that becomes active-inactive for a period and eventually returns to active service will have all active-inactive statuses changed to B.	An active member as of 6/30/2008 becomes Active-Inactive as of 6/30/2009. When the member returns to active status in 6/30/2011, all prior active-inactive years are changed to B.	**Initial**	A	F	F	A
				⬇	⬇	
		Matured	A	B	B	A

Business Rule 6: Active-Inactive Reclassification #2

Description:	Example:		2010	2011	2012	2013
Status C was introduced to differentiate active-inactive members in the final two years of the experience period. Any active member that becomes active-inactive during this period will have all active-inactive statuses changed to C.	An active member as of FYE 2011 becomes Active-Inactive as of FYE 2012. Based on this Rule, the member's status for FYE 2012 and 2013 is changed to C.	**Initial**	A	A	F	F
					⬇	⬇
		Matured	A	A	C	C

Status B&C were added to classify members as active in the reconcilation process but not include them in the salary analysis.

Impact of Business Rules 5 and 6

Status	Fiscal Year Ended June 30,											Total
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
No Status												
A												
B				1		11	23	12	11	6		**64**
B1												
B2												
B3												
B4												
B5												
C										2	12	**14**
D												
D1												
D2												
F				-1		-11	-23	-12	-11	-8	-12	**-78**
I												
J												
L												
P												
R												
S												
T												
U												
V												
WI												
WJ												
WR												
WS												
Z												
Total												

Status Changes Due to Maturation, Using Business Rules 1, 2, 3, 4, 5 and 6

	Fiscal Year Ended June 30,											
Status	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
No Status	-291	-185	-176	-2	-4	-2	-2	-2		-2		**-666**
A	-5		-1	2								**-4**
B				1		11	23	12	11	6		**64**
B1	-33	-23	-23	-17	-27	-16	-10	-7	-11			**-167**
B2												
B3	-39	-39	-39	-31								**-148**
B4	-7	-2	-4	-2	-3	-4	-5		-4			**-31**
B5	-36	-6	-7	-4	-11	-12	-7	-11	-12	-12	-11	**-129**
C										2	12	**14**
D	366	217	230	69	49	47	31	26	36	21	11	**1103**
D1	-2	-2	-3	-4		-4	-7	-4	-5	-4		**-35**
D2												
F				-1		-11	-23	-13	-11	-8	-12	**-79**
I	1	2	1	1	2	2	3	2	2	1		**17**
J	90	118	56	-6		-5		-2	29	9		**289**
L												
R	-5	-2	-32	-1	-5	-5	-1	-1	-33	-11		**-96**
S									-1			**-1**
T	-12	-3		-2								**-17**
U	-1											**-1**
V							-1					**-1**
WI					-1	-1	-1					**-3**
WJ	-26	-73	-2									**-101**
WR		-2		-3								**-5**
WS												
Y												
Z									-1	-2		**-3**
Total												

Status Counts after Maturation, Using Business Rules 1, 2, 3, 4, 5 and 6

	Fiscal Year Ended June 30,											
Status	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
No Status	6,496	5,564	4,822	4,196	3,740	3,152	2,837	3,093	3,105	3,128	3,008	**43,141**
A	10,898	11,328	11,498	11,640	11,529	11,585	11,459	11,079	10,649	10,266	10,022	**121,953**
B				1		11	23	12	11	6		**64**
B1	1,311	1,218	1,093	972	845	726	631	521	437	360	311	**8,425**
B2	1											**1**
B3	594	582	568	568	561	560	553	590	578	563	556	**6,273**
B4	15	15	13	12	12	12	12	15	13	14	15	**148**
B5	21	22	22	23	23	22	17	26	21	24	26	**247**
C										2	12	**14**
D	5,333	5,870	6,372	6,932	7,489	8,030	8,558	9,064	9,627	10,121	10,606	**88,002**
D1		1	2	5	6	7	7	7	10	3		**48**
D2	21	24	28	31	31	31	33	33	33	33	37	**335**
F	5	5				3	7	10	5	4	4	**43**
I	1,548	1,489	1,442	1,388	1,339	1,287	1,219	1,167	1,112	1,058	1,007	**14,056**
J	7,052	7,260	7,569	7,796	8,061	8,283	8,460	8,635	8,763	8,943	9,074	**89,896**
L							1					**1**
R	6,205	6,454	6,516	6,422	6,309	6,159	6,013	5,869	5,755	5,591	5,439	**66,732**
S	33	34	34	33	31	28	28	31	32	38	37	**359**
T	66	80	104	61	95	173	210	13	16	9	10	**837**
U	89	89	94	94	94	94	94					**648**
V	16	13	19	20	31	33	34	33	30	30	33	**292**
WI												
WJ	1	1		2	2	2	2			1		**11**
WR	481	147		2								**630**
WS	1											**1**
Y	10	2	2									**14**
Z									1	4	1	**6**
Total												**442,177**

Development of WTC Reclassification Assumption

The FIRE System reclassifies members from Service Retirement, Ordinary Disability, and Accidental Disability to WTC Accidental Disability or WTC Death if certain requirements are satisfied. The WTC benefit is payable to the member or the beneficiary of the member after death if the death has been determined to be caused by the WTC. Thus, reclassifications (or approvals) can occur before or after the death of the member.

To analyze the occurrence of spousal reclassification, GRS identified the members who would have been eligible for a WTC benefit, and then identified the members from that group whose beneficiary received a WTC benefit.

To be eligible for reclassification, GRS identified members who met the following conditions: (1) were active in the 6/30/2001 data (were active on September 11, 2001), (2) were still alive in the 6/30/2008 data, and (3) subsequently died prior to 6/30/2013. The 6/30/2008 data was the first time WTC elements were included in the data set and thus deaths prior to that would not be reliable comparisons for future reclassifications. Using these conditions, a total of 39 members were used in the analysis.

We then grouped the data based on the WTC_elig field in the member's record and the RetCause field from the resulting beneficiary's record.

Of the 39, 8 of the members had a "WTA" or blank WTC_elig field and of those 8, none of the beneficiaries have been reclassified to a WTC benefit as of the 6/30/2013 data; so the reclassification occurrence has been 0% (albeit a very small data set).

The remaining 31 members all had a WTC_elig field code of "WTB," which means the member had filed paperwork to be eligible for WTC benefits and the application had been verified. Of the 31, 17 had beneficiaries with a RetCause equal to 6 in the 6/20/2013 data (which means they were receiving a WTC benefit) and 14 had a non-WTC benefit. Thus, 55% of the members who died with a WTA eligibility code have resulted in a WTC benefit.

Based on this data, GRS recommends an explicit assumption as to how many members will qualify for WTC benefits.

In our opinion, for members with a WTC_elig code of WT, it would be reasonable to have an assumption of 55% to 70%, for those who will receive a WTC benefit.

While there have been no members without a WTC_elig code of "WT" show up with a WTC benefit, there has been very little time elapsed and very few occurrences. Therefore, we believe it would be reasonable to have a reclassification assumption of 5-15% for this group. This assumption may need to be updated as more experience becomes available.

FIRE WTC RECLASSIFICATION METHODOLOGY AND ASSUMPTIONS

GRS also has examined WTC Disability reclassification for participants of the FIRE System that reclassify immediately upon retirement, ultimately following retirement, or have not reclassified. For this analysis, member's *Status*, *WTC_Elig* code, and *Retirement Cause* code were collected over the eight-year period ending 6/30/2013 for all participants in the FIRE system who were active as of 6/30/2001 and had filed an Application for a WTC benefit. Any *WTC_Elig* value was used to indicate which members had filed for a WTC disability benefit. *Retirement Cause* value 5 was used to indicate which members were in receipt of a WTC Disability benefit. Members retiring under Service Retirement and Disability were looked at separately. Based on this information, it appears that most members who do reclassify do so very soon after or in conjunction with retirement.

NEW YORK CITY FIRE PENSION FUND
RECLASSIFICATION TO WTC DISABILITY
FOR THE EIGHT-YEAR PERIOD ENDING 6/30/2013

	Year of Retirement															
First Year with RetCause = 5	2007		2008		2009		2010		2011		2012		2013		Total	
	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis	Ret	Dis
No occurrence	89	308	42	214	38	164	42	155	89	146	52	141	90	111	442	1,239
2007		29													0	29
2008		20		115											0	135
2009		8		17		115									0	140
2010		13		6		26		125							0	170
2011		22		12		11		17		128					0	190
2012	1	4		5	2	3	2	1		18		130			5	161
2013	3	3	1	2	1	1		1		3		5		111	5	126
Subtotal	4	99	1	157	3	156	2	144	0	149	0	135	0	111	10	951
Total	93	407	43	371	41	320	44	299	89	295	52	276	90	222	452	2,190

	Year of Retirement							
Reclassification	2007	2008	2009	2010	2011	2012	2013	Total
Immediate Ret	0%	0%	0%	0%	0%	0%	0%	0%
Immediate Dis	6%	28%	32%	36%	33%	40%	36%	29%
Ultimate Ret	1%	0%	1%	1%	0%	0%		0%
Ultimate Dis	14%	10%	11%	6%	5%	2%		7%
None Ret	18%	10%	11%	12%	23%	16%	29%	17%
None Dis	62%	52%	45%	45%	38%	43%	36%	47%
Total	100%	100%	100%	100%	100%	100%	100%	100%