



New York City Retirement Systems Part II Experience Study Report Proposed Assumptions - TRS and BERS

Prepared by:

Glenn D. Bowen, FSA, EA, MAAA
Principal & Consulting Actuary

Scott F. Porter, FSA, EA, MAAA
Principal & Consulting Actuary

Milliman, Inc.
801 Cassatt Road
Suite 111
Berwyn, PA 19312
Tel +1 610-687-5644
milliman.com



801 Cassatt Road
Suite 111
Berwyn, PA 19312

Tel +1 610 687 5644
www.milliman.com

January 7, 2025

Ms. Krista Olson
Deputy Comptroller for Budget
New York City Comptroller's Office
1 Centre Street, 8th Floor
New York, NY 10007

Re: Part II Experience Study Report – TRS and BERS

Dear Ms. Olson:

We are pleased to present the enclosed Part II Experience Study report for the five New York City Retirement Systems ("NYCRS") containing Milliman's proposed assumptions, along with an updated Milliman Experience Study Tool.

- 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")
- New York City Fire Pension Fund ("FIRE")

This report includes Sections II and III for TRS and BERS.

The purpose of the Part II Experience Study report is to provide proposed demographic and economic assumptions to be used in the actuarial valuations performed by the Office of the Actuary (OA) for these systems based on our observations of the experience data and various discussions and meetings with Office of the Actuary. The experience includes data from 2012 – 2017 used in prior experience studies, along with updates for the 4-year period ending June 30, 2021.

This report incorporates analysis performed with the Milliman Experience Study Tool (MEST). MEST enables examination of the experience of the systems using many data elements such as age, service, plan, employee group, etc. The MEST has been further updated to display a comparison of the proposed assumptions as if they were in effect during the experience study period.

Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

This work product was prepared solely for New York City Comptroller's Office for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by staffs of Office of the Comptroller and the OA. This information includes, but is not limited to, statutory provisions, employee data, administrative policies, and financial information. Since the results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

Milliman's work product was prepared exclusively for the New York City Office of the Comptroller, for a specific and limited purpose. It is a complex, technical analysis that requires a high-level of knowledge concerning NYCRS' operations, and is based on NYCRS' data, which Milliman has not audited. Milliman's work product is not intended to be used by, or for the benefit of, any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its specific needs.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The consultants who worked on this assignment are actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel. The signing actuaries are independent of NYCRS. We are not aware of any relationship that would impair the objectivity of our work.

Ms. Krista Olson
January 7, 2025
Page 3

We would like to thank the staffs of the Office of the Comptroller and the Office of the Actuary (OA) for their cooperation. Their prompt and courteous responses to our questions and requests for information were of valuable assistance to us and are greatly appreciated.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "GB", with a stylized flourish at the end.

Glenn D. Bowen, FSA, EA, MAAA

A handwritten signature in black ink, appearing to read "Scott Porter", in a cursive style.

Scott Porter, FSA, EA, MAAA

0078NYC01-10
TRS_BERS Part II Experience Study Report.docx

TABLE OF CONTENTS

Executive Summary	1
TRS	3
BERS.....	4
Introduction.....	5
Section II – Teachers’ Retirement System of the City of New York (TRS).....	21
Rates of Salary Increase	23
<i>Summary.....</i>	33
<i>Assumption Tables</i>	34
Withdrawal	36
<i>Summary.....</i>	44
<i>Assumption Tables</i>	45
Retirement.....	47
<i>Basic Tier IV Plan (Plan F)</i>	50
<i>Age 55 and 25 Plan (Plan G).....</i>	59
<i>Age 55 and 27 Plan (Plans H and I)</i>	66
<i>Summary.....</i>	71
<i>Assumption Tables</i>	72
Disability.....	75
Ordinary Disability.....	76
<i>Males.....</i>	78
<i>Females</i>	83
<i>Summary.....</i>	88
Accidental Disability.....	89
<i>Males.....</i>	91
<i>Females</i>	93
<i>Summary.....</i>	94
<i>Assumption Tables</i>	95
Pre-retirement Death	99
Ordinary Death.....	100
<i>Males.....</i>	102
<i>Females</i>	104
<i>Summary.....</i>	105
<i>Assumption Tables</i>	106
Postretirement Mortality.....	110
Postretirement Mortality – Service Retirees.....	112
<i>Service Retirees - Males.....</i>	117

<i>Service Retirees - Females</i>	122
<i>Summary</i>	126
<i>Assumption Tables</i>	127
Postretirement Mortality – Disability Retirees	133
<i>Disabled Retirees - Males</i>	138
<i>Disabled Retirees - Females</i>	143
<i>Summary</i>	147
<i>Assumption Tables</i>	148
Postretirement Mortality – Contingent Beneficiaries	154
<i>Contingent Beneficiaries - Males</i>	159
<i>Contingent Beneficiaries - Females</i>	163
<i>Summary</i>	166
<i>Assumption Tables</i>	168
Section III – Board of Education Retirement System of the City of New York (BERS)	174
Rates of Salary Increase	177
<i>Summary</i>	187
<i>Assumption Tables</i>	188
Withdrawal	190
<i>Summary</i>	201
<i>Assumption Tables</i>	202
Retirement	204
<i>Basic Tier IV Plan (Plan F)</i>	207
<i>Age 57 Plan (Plans I and M)</i>	215
<i>Age 55 and 25 Plan (Plan K)</i>	224
<i>Summary</i>	229
<i>Assumption Tables</i>	230
Disability	233
Ordinary Disability	234
<i>Males</i>	236
<i>Females</i>	240
<i>Summary</i>	243
Accidental Disability	245
<i>Males</i>	247
<i>Females</i>	249
<i>Summary</i>	250
Assumption Tables	251
Pre-retirement Death	255
Ordinary Death	256
<i>Males</i>	259
<i>Females</i>	261
<i>Summary</i>	263

<i>Assumption Tables</i>	264
Postretirement Mortality	268
Postretirement Mortality – Service Retirees	270
<i>Service Retirees - Males</i>	275
<i>Service Retirees - Females</i>	279
<i>Summary</i>	284
<i>Assumption Tables</i>	285
Postretirement Mortality – Disability Retirees	291
<i>Disabled Retirees - Males</i>	296
<i>Disabled Retirees - Females</i>	300
<i>Summary</i>	304
<i>Assumption Tables</i>	306
Postretirement Mortality – Contingent Beneficiaries	312
<i>Contingent Beneficiaries - Males</i>	317
<i>Contingent Beneficiaries - Females</i>	321
<i>Summary</i>	325
<i>Assumption Tables</i>	326

Executive Summary

This report summarizes the Part II Experience Study performed by Milliman of the five New York City Retirement Systems (“NYCRS”):

- Section I - New York City Employees’ Retirement System (NYCERS)
- **Section II - Teachers’ Retirement System of the City of New York (TRS)**
- **Section III - Board of Education Retirement System of the City of New York (BERS)**
- Section IV - New York City Police Pension Fund (POLICE)
- Section V - New York City Fire Pension Fund (FIRE)

This report includes Sections II and III for TRS and BERS.

The primary purpose of the Part II Experience Study Report is to provide proposed actuarial assumptions based on the experience for the indicated systems:

- This report provides information on key pre-retirement demographic assumptions - withdrawal, retirement and disability – used in the actuarial valuations performed by the OA.
- This report provides information on key salary-related actuarial assumptions – rates of salary increase and overtime (not applicable for TRS and BERS).
- This report provides information on the pre-retirement and postretirement mortality assumptions used in the actuarial valuations performed by the OA.
- This report is supplemented by Excel files containing full age service tables detailing the proposed assumptions.

The experience study includes information for the 10-year period ending June 30, 2021 as provided by the OA. This includes data from 2012 – 2017 contained in the historical database along with updates for the 4-year period ending June 30, 2021 completed by Milliman.

The following is a summary of the proposed assumptions and the potential impact on plan liabilities for TRS and BERS. Milliman was not engaged to perform a replication nor determine the cost impact of the proposed assumptions. Therefore, the comments reflect our thoughts on the potential impact, but will ultimately depend on the current active membership based on analysis to be conducted by OA.

TRS

Summary of TRS Proposed Assumptions		
Decrement	Proposed Assumption	Potential Impact
Salary	Lower rates of salary increase but some service periods with higher rates.	Reducing salary increases will result in lower plan liabilities. Actual impact to be determined by OA.
Withdrawal	Lower rates of terminations for longer service members, although higher rates are proposed for shorter service members.	Reducing withdrawal rates results in higher plan liabilities. Actual impact to be determined by OA.
Retirement	Higher rates of retirement proposed at 20 or more years of service whereas lower rates are proposed for shorter service periods increasing the number of members to receive the 2% formula benefit.	Higher rates for longer service members will result in higher plan liabilities but actual impact to be determined by OA.
Ordinary Disability	Higher ordinary disability rates for members not eligible for the 2% benefit formula and unreduced retirement plus elimination of the assumption for those eligible.	Higher rates of ordinary disability result in higher plan liabilities plus eliminating retirement eligible members will result in higher plan liabilities.
Accidental Disability	Higher accidental disability rates for female members.	Increasing accidental disability rates results in higher plan liabilities.
Ordinary Death	No change in the assumption.	No impact on plan liabilities.
Post Retirement Mortality		
Service Retirees	Proposing adjustments to current custom table. Higher projected annuity factors for ages until early 70s and lower for older ages.	Anticipating higher liability for active members but potentially lower liability for retirees. Actual impact to be determined by OA.
Disabled Retirees	Proposed assumption consistent with industry standards, decreasing projected life expectancy.	Lower life expectancies are anticipated to decrease plan liabilities.
Contingent Beneficiaries	Proposed assumption consistent with industry standards, decreasing projected life expectancy.	Lower life expectancies are anticipated to decrease plan liabilities.

The actual direction of the impact of the changes to rates of salary increases, withdrawal and retirement is unknown. Changes to ordinary and accidental disability retirements will lead to higher costs. Changes to postretirement mortality tables will lead to higher costs for active members, but potentially lower costs for retirees. The net effect is probably an increase in plan liabilities, but the actual impact will be determined by OA.

BERS

Summary of BERS Proposed Assumptions		
Decrement	Proposed Assumption	Potential Impact
Salary	Lower rates of salary increase for longer service members but higher rates for shorter service members.	Reducing salary increases will result in lower plan liabilities. Actual impact to be determined by OA.
Withdrawal	Lower rates of terminations for longer service members, although higher rates are proposed for shorter service members.	Reducing withdrawal rates results in higher plan liabilities. Actual impact to be determined by OA.
Retirement	Higher rates of retirement proposed at 20 or more years of service whereas lower rates are proposed for shorter service periods increasing the number of members to receive the 2% formula benefit.	Higher rates for longer service members will result in higher plan liabilities.
Ordinary Disability	Higher ordinary disability rates for members not eligible for the 2% benefit formula and unreduced retirement plus elimination of the assumption for those eligible.	Higher rates of ordinary disability result in higher plan liabilities plus eliminating retirement eligible members will result in higher plan liabilities.
Accidental Disability	Higher accidental disability rates.	Increasing accidental disability rates results in higher plan liabilities.
Ordinary Death	Higher mortality rates.	Increasing rates of mortality results in lower plan liabilities.
Post Retirement Mortality		
Service Retirees	Proposed assumption consistent with industry standards, generally decreasing projected life expectancy.	Lower life expectancies are anticipated to decrease plan liabilities.
Disabled Retirees	Proposed assumption consistent with industry standards, decreasing projected life expectancy.	Lower life expectancies are anticipated to decrease plan liabilities.
Contingent Beneficiaries	Proposed assumption consistent with industry standards, decreasing projected life expectancy.	Lower life expectancies are anticipated to decrease plan liabilities.

Excluding the impact of the changes to the postretirement mortality tables, we believe the changes in withdrawal, retirement, ordinary disability and accidental disability that are anticipated to increase plan liabilities will exceed the impact of the changes in rates of salary increase and ordinary death that are anticipated to decrease plan liabilities. Changes to the postretirement mortality tables are anticipated to decrease plan liabilities. The net effect is probably a decrease in plan liabilities, but the actual impact will be determined by OA.

Introduction

Part II Experience Study Introduction

Milliman's focus for Part II of the experience study is to provide proposed actuarial assumptions reflecting the experience during the 10-year study period July 1, 2011 – June 30, 2021. The experience data used in our review splits this study period into three periods:

- Prior period: July 1, 2011 – June 30, 2017 (2012 – 2017), which includes updates made by Milliman to the historical data, primarily in 2017.
- Two-year period July 1, 2017 – June 30, 2019 (2018 – 2019)
- Two-year period July 1, 2019 – June 30, 2021 (2020 – 2021)

Throughout this report we refer to plan years by the end of the plan year. For example, 2012 refers to the period July 1, 2011 to June 30, 2012; 2021 refers to the period July 1, 2020 to June 30, 2021.

The proposed assumptions are based on our observations using the Milliman Experience Study Tool (MEST) which creates customized experience summaries for the chosen study periods. This report includes various graphs and charts produced by MEST.

This report focuses on key pre-retirement decrements – withdrawal, retirement and disability – and the mortality assumptions – pre-retirement and postretirement as well as the salary increase assumptions.

Selection of Actuarial Assumptions

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the System. To provide the best estimate of the long-term funded status of the System, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the System in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the System, or to the operation of the System itself. Demographic assumptions are based on the specific experience of the System's members.

Actuarial Standard of Practice (ASOP) No. 35 (please note that ASOP 35 was recently replaced by an updated version of ASOP 27 but the standard remains largely the same) governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is appropriate for the purpose of the measurement reflecting historical and current demographic data, that reflects the actuary's professional judgment and estimate of future experience, and that contains no significant bias, i.e., it is not significantly optimistic or pessimistic.

Choosing actuarial assumptions requires the application of actuarial judgment. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system as complex as NYCERS. Even allowing for minor

variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach.

Milliman's approach in selecting proposed assumptions was to primarily reflect an assumption that was in between the current assumption and the experience. There are circumstances where the proposed assumptions may reflect the experience to a greater degree, especially if there was a change in the assumption structure. For example, the proposed retirement assumption may reflect a distinction based on years of service that was not reflected in the current assumption. In these circumstances, the proposed retirement assumption may reflect the distinction contained in the experience data to a greater extent.




Experience Analysis Process

The general procedure in a study of demographic experience is to first determine the number of participants who were exposed to the possibility of retirement, withdrawal, disability, etc. We refer to these events as decrements. The next step is to determine how many actually retired, withdrew, became disabled, etc. Dividing the number of terminations in each age and service cell by the number exposed to the possibility of termination in that cell produces the rate of decrement.

In reviewing the actual rates of decrement, we compare them to the current assumed rates used in the actuarial valuations. For this purpose, the assumed rates are those used in the most recent actuarial valuation report, the June 30, 2020 lag actuarial valuation. For example, the assumed rates of withdrawal that apply in 2016 in this analysis are based on the assumptions from the 2020 lag actuarial valuation, not the assumptions in effect in 2016.

To compare actual rates of decrement to assumed rates of decrement, we produce actual to expected ratios ("A/E" ratio). These ratios compare actual decrements (one set due to retirement, a different set due to withdrawal, a different set due to disability, etc.) with expected decrements based on the actuarial assumptions. An A/E ratio that is greater than one indicates that there were more actual decrements than expected and a ratio that is less than one indicates that there were fewer actual decrements than expected. For example, a ratio of 1.5 means that 50% more members left the plan for that cause than expected. A ratio of 0.8 means that 20% fewer members left the plan for that cause than expected.

To assist reviewers in assessing whether an assumption may need to be modified or not, we incorporated a color-coded metric to indicate how far the actual experience is from that expected:

- A green circle  indicates that the experience is within 10% of that assumed, that is, the A/E ratio is in the range 0.9 – 1.1.
- An orange triangle  indicates that the experience is within 50% of that assumed, but not within 10%, that is, the A/E ratio is in the range 0.5 – 0.9 or 1.1 to 1.5.
- A red diamond  indicates that the experience is outside 50% of what was assumed, that is, the A/E ratio is smaller than 0.5 or greater than 1.5.

Please note that the color-coded symbols are meant to assist the reader to determine how far the actual experience is from that expected. Many factors are used to determine if an assumption

should be modified – reason for the deviation, credibility of the data, anticipation that experience in the future would be consistent with the prior experience, actuarial judgment, etc.

Historical Database Update

The OA provided separate historical databases with experience from 2001 to 2017 for each of the systems, the valuation files for the four-year period 2018 – 2021, detailed descriptions of the various codes contained in the data, and year by year status reconciliations or flow of lives. Milliman reviewed and updated the historical database to ensure completeness and consistency. We verified that the member valuation data provided to us was consistent with the flow of lives and updated the historical database accordingly. The historical database was imported into the MEST and we reviewed to ensure that the number of exposures and actual decrements were captured reasonably. In our review, we noticed that the 2017 status distribution in the historical database did not match the flow of lives or was inconsistent with information contained in the 2018 data. We updated the 2017 status for consistency with the 2018 data.

While the Historical Database contains the status used in each actuarial valuation, there are situations in which this status may not indicate the actual cause of decrement. Two such situations relate to disability retirements and members on leave of absence.

Disability Retirements

There are instances in which members may have applied for disability retirement, but the application had not been approved by the time the data was provided for the annual actuarial valuation. In this situation, a member status could be classified as a termination, leave of absence, etc. in one valuation file but as a disability retirement in a subsequent valuation file. In these situations, we modified the status in the historical database to reflect the eventual approval of the disability retirement. For any record who was active during the study period (2011 or later) and had a subsequent inactive status followed by a disability retirement, the years with an inactive status code were changed to the indicated disability retirement status. These adjustments are applied after any adjustments for leave of absence noted in the following section.

Please note that approvals for disability retirement that took place after June 30, 2021 for members who are indicated as terminated in the experience data are not reflected in this analysis which, consequently, underestimates the number of disability retirements, especially in the latter years of the study.

Leave of Absence

During the study period, the OA used different terminology for identifying members on leave of absence such as active off payroll, nonvested terminated, etc. In the prior experience study, records with a status code of leave of absence had this status code modified to reflect a subsequent event as if that subsequent event occurred when the leave of absence (LOA) occurred. We applied similar adjustments to the status codes in the historical database. LOA status codes exist for years 2016 and 2017 where the prior actuary did not have sufficient information to make an adjustment as well as on the valuation data added for years 2018 – 2021. The following summarizes the adjustments made when a record has a LOA code (“C”):

- If the status code in the year before the LOA code is an “F”, the LOA code was changed to a termination code (“F”).

- If the record has three consecutive LOA codes, then all LOA codes are changed to a termination code (“F”).
- If the record has an active status within 2 years after the first LOA code, then the LOA codes are changed to a rehire status code (“B”).
- If the record has an inactive status within 2 years after the first LOA code, then the LOA codes are changed to that inactive status code.

Due to this methodology, records will retain a LOA status code if:

- It first occurred in 2020 and remained a LOA status code in 2021.
- It first occurred in 2021.

Consistent with past practice, any member with a LOA status code was not included as a decrement because some of these members subsequently returned to active status. Furthermore, all remaining LOA status codes in 2020 are counted as exposures for withdrawal purposes. Therefore, all else being equal, the overall rates of termination are smaller during the two-year period 2020 – 2021 than in other years. Due to this situation, these years are primarily excluded from the analysis. We do note that the vast majority of records with a LOA status code do terminate employment (withdrawal, retire, become disabled, etc.).

Other BERS Adjustments

During our review process, there were numerous records where a death was first reflected in the 2019 actuarial valuation. After further review, OA provided actual dates of death and Milliman adjusted the status in earlier years.

Salary Adjustments

For TRS and BERS, base salary was set to the valuation data fields labeled “Salary_Total” and “ValuationSalary”, respectively. No additional adjustments were required.

Pension Benefits

The amount of a member’s pension is used in the retiree mortality analysis as typically members with higher pension benefits would have lower rates of mortality. Bolton was the first actuary to incorporate pension benefits in the historical database beginning with fiscal year 2015. This process is also consistent with the method used by the Society of Actuaries in producing industry-wide tables. For consistency, we utilized the same process as Bolton which reflected a member’s fixed annuity, cost-of-living-increase and any variable fund amounts. The variable fund amounts are multiplied by a corresponding unit value contained in the data. If an annual pension benefit was less than \$10,000, \$10,000 was used for amount-weighting purposes.

The following table lists the fields used:

Field	Description	Unit Value
TRS		
VarA_AnnuityCurrent	Variable Fund A - Employee	UnitValueVarA
VarB_AnnuityCurrent	Variable Fund B - Employee	UnitValueVarB
VarC_AnnuityCurrent	Variable Fund C - Employee	UnitValueVarC

VarD_AnnuityCurrent	Variable Fund D - Employee	UnitValueVarD
VarE_AnnuityCurrent	Variable Fund E - Employee	UnitValueVarE
VarF_AnnuityCurrent	Variable Fund F - Employee	UnitValueVarF
VarG_AnnuityCurrent	Variable Fund G - Employee	UnitValueVarG
AnnuityCurrent	Fixed Annuity – Employee	N/A
VarA_PensionCurrent	Variable Fund A – Employer	UnitValueVarA
VarB_PensionCurrent	Variable Fund B – Employer	UnitValueVarB
VarC_PensionCurrent	Variable Fund C – Employer	UnitValueVarC
VarD_PensionCurrent	Variable Fund D – Employer	UnitValueVarD
VarE_PensionCurrent	Variable Fund E – Employer	UnitValueVarE
VarF_PensionCurrent	Variable Fund F – Employer	UnitValueVarF
VarG_PensionCurrent	Variable Fund G - Employer	UnitValueVarG
Pension1Current	Fixed Annuity – Employer	N/A
SuppAmount	Cost of Living Amounts	N/A
<i>BERS</i>		
AnnPayA	Variable Fund A - Employee	UnitValueVarA
PenPayA	Variable Fund A – Employer	UnitValueVarA
LSAnnF	Fixed Annuity – Employee	N/A
PayAnnF	Fixed Annuity – Employer	N/A
PayPRF1F	Reserve Fund – Employer	N/A
PayAnnFR	Reserve Fund – Employee	N/A
AMTSUP	Cost of Living Amounts	N/A

Exposures and Decrements

An exposure is a member who is subject to the particular contingency being studied. For example, an active member who has met the conditions for retirement is a retirement exposure. If they have not met that condition, then they are a withdrawal exposure. The following section describes the rules used to determine exposures and decrements in this analysis:

- Any record considered an active employee in the indicated actuarial valuation is considered an exposure for pre-retirement decrements. This includes status codes of “A” and “B”. For withdrawal purposes, records with a LOA status code of “C” are also included as exposures.
- Members indicated as terminations during the year who do not meet the conditions for retirement are reflected in the termination decrement.
- Members indicated as retirements during the year, or members indicated as terminations who do meet the conditions for retirement, are reflected in the retirement decrement.
- Exposures for ordinary disability exclude service periods prior to the eligibility conditions. For example, if 10 years of service is required to receive an ordinary disability benefit, the exposures exclude all members prior to 10 years of service.

Age and Service Calculations

Age was determined as age nearest on July 1 based on the date of birth and the indicated valuation year. Service is based on the service field contained in each year’s valuation data as imported into the Historical Database and rounded to the nearest integer.

Due to the rounding of ages and service calculations, it may appear that some members retire before they are eligible. For example, a member retires at exactly at age 57, but the rounded age may have been calculated as age 56. Another example, a member retires once they have completed 25 years of service, but the rounded service is 24. Other reasons where a record appears to have retired prior to meeting the eligibility condition could be due to purchase service, prior service or data corrections that occur at time of retirement. In these situations, the difference between a member's actual service at retirement and that on the most recent record may be greater than 1.

To capture these records in the retirement analysis, we increased a member's age by up to 1 year or service by up to 5 years. The following details the adjustments:

- 18 TRS and 100 BERS members with 4 years of service were increased to 5 years.
- 101 TRS and 123 BERS members with between 0 and 3 years of service were increased to 5 years.
- 311 TRS and 5 BERS members in the Age 55 and 25 Plan, Age 55 and 27 Plan or a physically taxing plan with 24 or 26 years of service were increased to 25 years or 27 years, respectively.
- 494 TRS and 35 BERS members (excluding Age 57 Plan) age 54 were increased to age 55.
- 109 BERS Age 57 Plan members age 56 were increased to age 57.

Confidence Intervals

Within the MEST, the user has the ability to review if the experience falls within a certain confidence interval as they can select confidence intervals at the 90th, 95th, 98th or 99th percentile levels. The 99th confidence interval will contain the widest bands as there is a 99% chance that the experience would fall within that band. The confidence interval was determined based on either the current or the proposed assumption. The confidence interval range is wider when the number of members assumed to decrement under the particular cause being studied is small and it is narrower when the number of members is larger.

In this report, the 95th confidence interval was utilized.

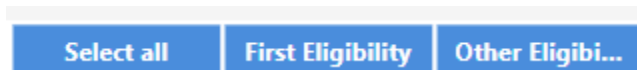
Milliman Experience Study Tool (MEST)

The purpose of the MEST is to analyze the experience by System using the status codes in the historical database. The MEST allows easy review of the experience by plan or other parameters for each System.

There are four primary charts in MEST for each decrement page. In addition, each of the four charts can be displayed on a service basis, age basis or year-by-year basis. Each of these pages is available for comparison to the current or the proposed assumptions. A tool bar at the top of page allows the user to select how the information is displayed.



For retirement, additional selections are available to review the experience at first eligibility or other eligibility criteria.



A walkthrough of these charts in MEST has been described below using the withdrawal decrement tab as an example.

The following charts show withdrawal decrements based on service. The chart includes the actual number of withdrawals, expected number, and the total number. The actual withdrawal rate is computed and compared to the current assumption.

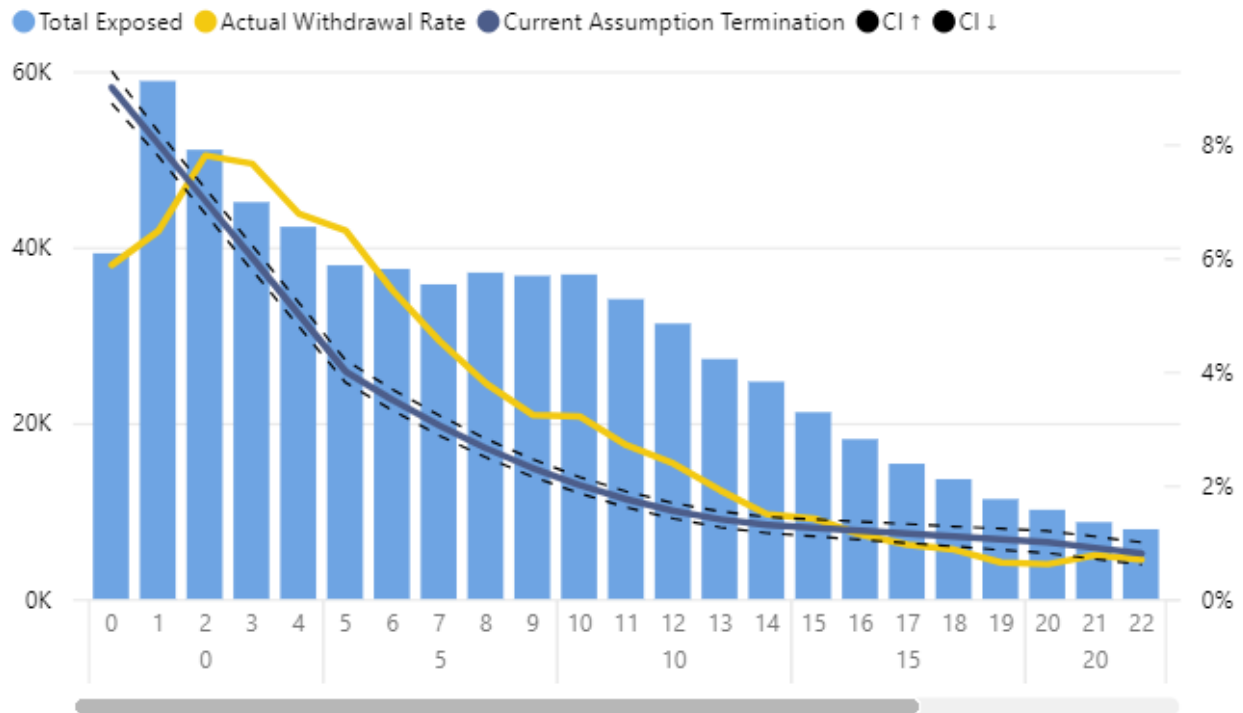
Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	2,003	3,017.7	33,530	5.97%	9.00%	▲ 0.66
1	3,302	4,058.2	50,727	6.51%	8.00%	▲ 0.81
2	3,482	3,291.5	47,021	7.41%	7.00%	● 1.06
3	3,382	2,596.4	43,273	7.82%	6.00%	▲ 1.30
4	2,818	2,026.3	40,525	6.95%	5.00%	▲ 1.39
5	2,431	1,491.4	37,286	6.52%	4.00%	◆ 1.63
6	2,026	1,293.4	36,954	5.48%	3.50%	◆ 1.57
7	1,623	1,081.7	35,466	4.58%	3.05%	◆ 1.50
8	1,404	978.7	36,931	3.80%	2.65%	▲ 1.43
9	1,189	843.2	36,663	3.24%	2.30%	▲ 1.41
10	1,184	737.7	36,886	3.21%	2.00%	◆ 1.60
11	921	596.5	34,088	2.70%	1.75%	◆ 1.54
12	746	485.3	31,310	2.38%	1.55%	◆ 1.54
13	521	381.9	27,279	1.91%	1.40%	▲ 1.36
14	368	321.2	24,704	1.49%	1.30%	▲ 1.15
15	300	265.4	21,229	1.41%	1.25%	▲ 1.13
16	206	218.0	18,166	1.13%	1.20%	● 0.94
17	147	176.8	15,377	0.96%	1.15%	▲ 0.83
18	118	149.8	13,618	0.87%	1.10%	▲ 0.79
19	73	119.2	11,357	0.64%	1.05%	▲ 0.61
20	62	101.4	10,137	0.61%	1.00%	▲ 0.61
Total	28,693	24,564.3	693,237	4.14%	3.54%	▲ 1.17

In this version, the actual withdrawal rate is computed and compared to the proposed assumption.

Service	Actual Withdrawals	Expected Withdrawals Proposed	Total Exposed	Actual Withdrawal Rate	Proposed Assumption Termination	Act/Exp Proposed Term
0	2,308	3,081.5	39,301	5.87%	7.84%	▲ 0.75
1	3,813	4,618.0	58,886	6.48%	7.84%	▲ 0.83
2	3,984	3,697.5	51,073	7.80%	7.24%	● 1.08
3	3,454	2,966.8	45,115	7.66%	6.58%	▲ 1.16
4	2,867	2,511.5	42,315	6.78%	5.94%	▲ 1.14
5	2,457	2,124.6	37,938	6.48%	5.60%	▲ 1.16
6	2,037	1,776.0	37,521	5.43%	4.73%	▲ 1.15
7	1,625	1,403.3	35,769	4.54%	3.92%	▲ 1.16
8	1,405	1,173.4	37,104	3.79%	3.16%	▲ 1.20
9	1,189	977.3	36,745	3.24%	2.66%	▲ 1.22
10	1,184	890.3	36,889	3.21%	2.41%	▲ 1.33
11	921	731.4	34,088	2.70%	2.15%	▲ 1.26
12	746	596.2	31,313	2.38%	1.90%	▲ 1.25
13	521	458.7	27,281	1.91%	1.68%	▲ 1.14
14	368	361.4	24,707	1.49%	1.46%	● 1.02
15	300	274.2	21,232	1.41%	1.29%	● 1.09
16	206	218.5	18,170	1.13%	1.20%	● 0.94
17	147	169.0	15,380	0.96%	1.10%	▲ 0.87
18	118	130.8	13,619	0.87%	0.96%	● 0.90
19	73	96.4	11,358	0.64%	0.85%	▲ 0.76
20	62	80.4	10,139	0.61%	0.79%	▲ 0.77
Total	30,172	28,661.8	716,666	4.21%	4.00%	● 1.05

The following chart compares the actual withdrawal rate (yellow line) to the current assumption (blue line) by service (or by age or plan year depending on selection). The blue bars show the number of exposures allowing the user to identify situations where there are relatively few exposures for that bucket and that the data may not be fully credible. In addition, the dotted lines display the confidence intervals on the current assumption.

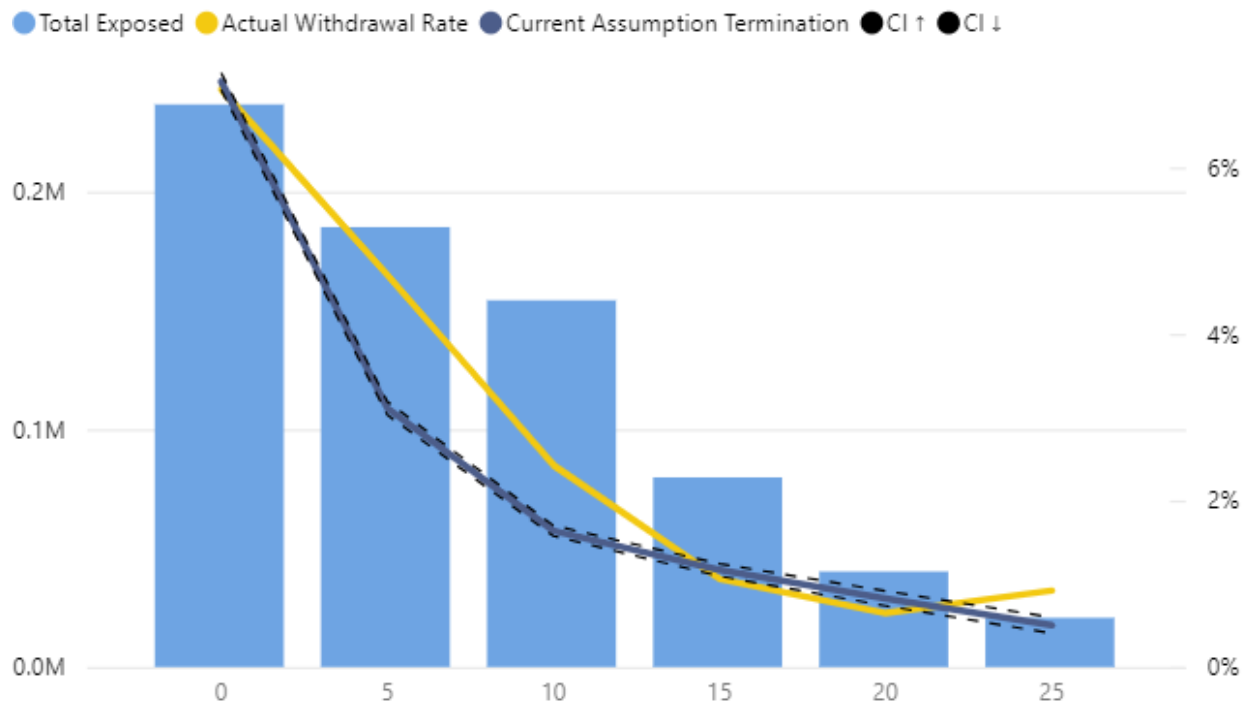
Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



Also, this chart can be used to review the experience in 5-year service or age bins. In the chart above, the second row in the x-axis shows 0, 5, 10, etc. indicating the service bin from 0-4 years, 5-9 years, 10-14 years, etc.

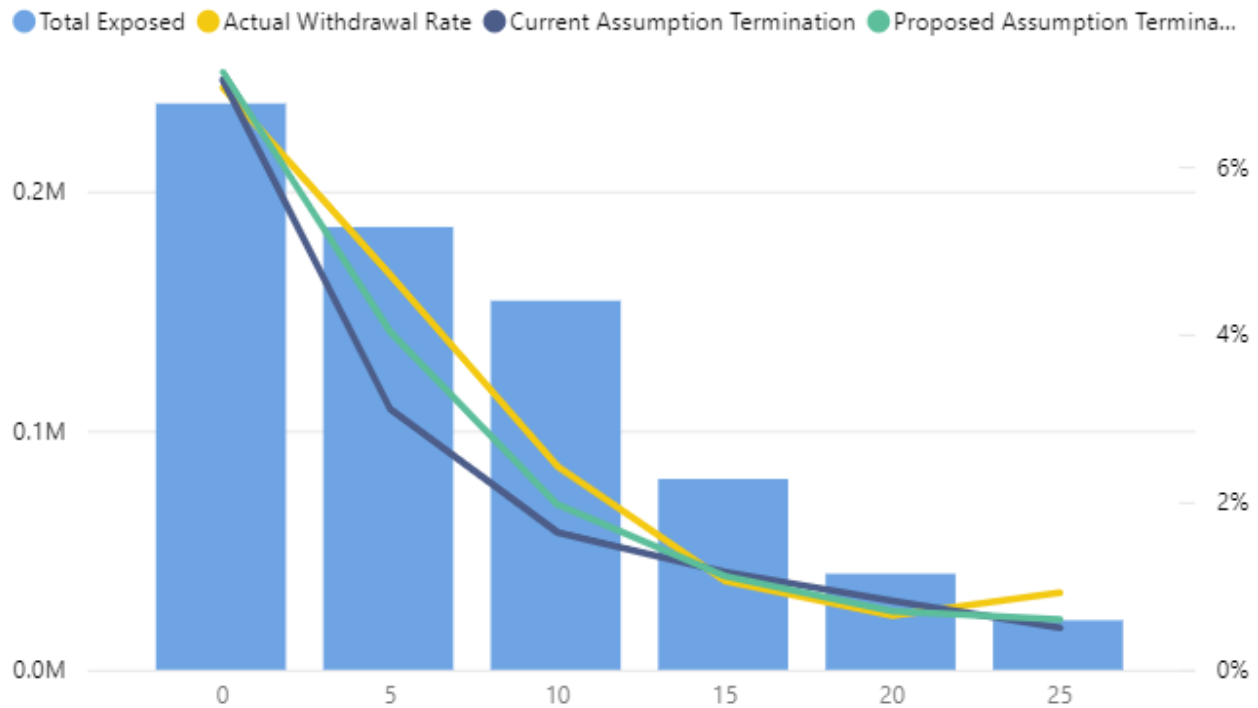
The following chart shows the results based on service bins based on the current assumption.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



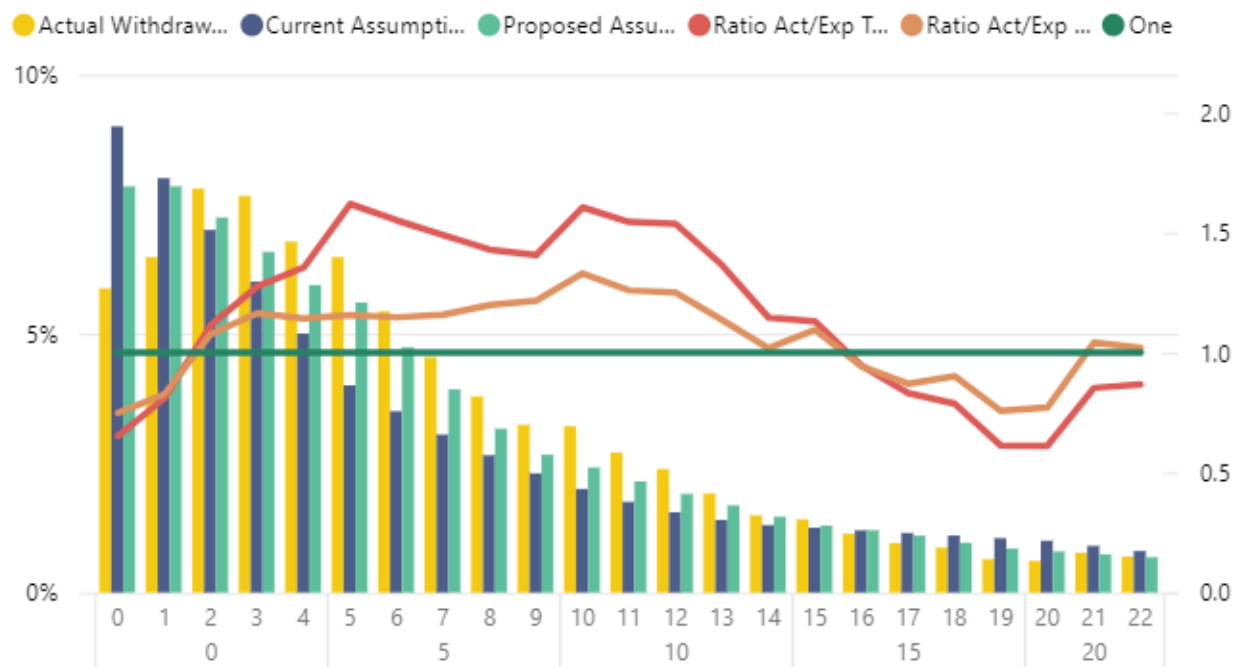
The following chart shows the results based on service bins based on the proposed assumptions (green line) in addition to the current assumption (yellow line).

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



In the next chart, the A/E ratio is graphed as the red line under the current assumptions and as the orange line under the proposed assumptions, and compared to the green line which is the 1.0 baseline (meaning that the actual experience is equal to that assumed). This provides the user with a different viewpoint in comparing the results of the study. The actual withdrawal rate (yellow bars), the current assumption (blue bars) and the proposed assumption (green bars) are shown on the graph.

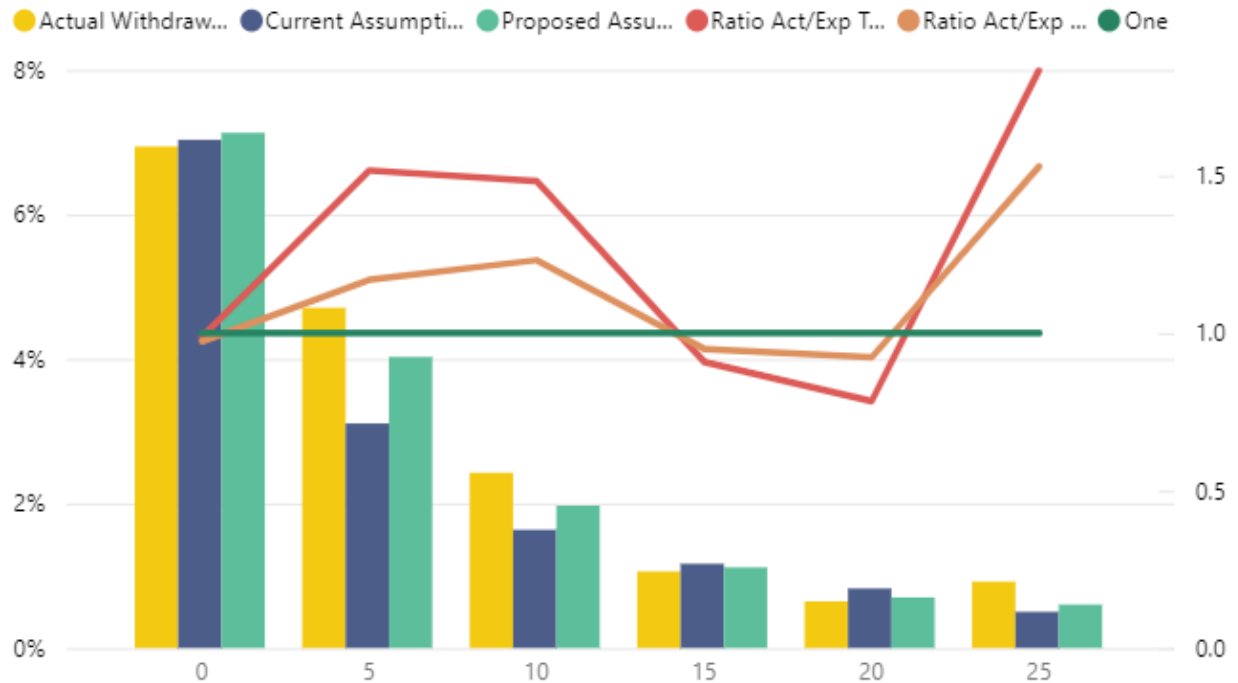
Withdrawal Rate - Actual, Expected, and Ratio; by Service w/Proposed



Also, this chart can be used to review the experience in 5-year service or age bins. In the chart above, the second row in the x-axis shows 0, 5, 10, etc. indicating the service bin from 0-4 years, 5-9 years, 10-14 years, etc.

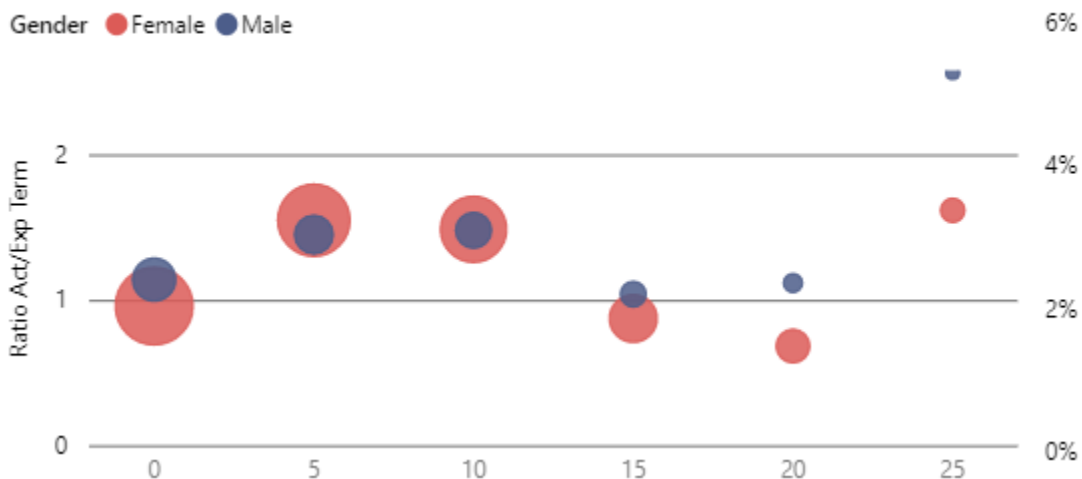
The following chart shows the results based on service bins.

Withdrawal Rate - Actual, Expected, and Ratio; by Service w/Proposed



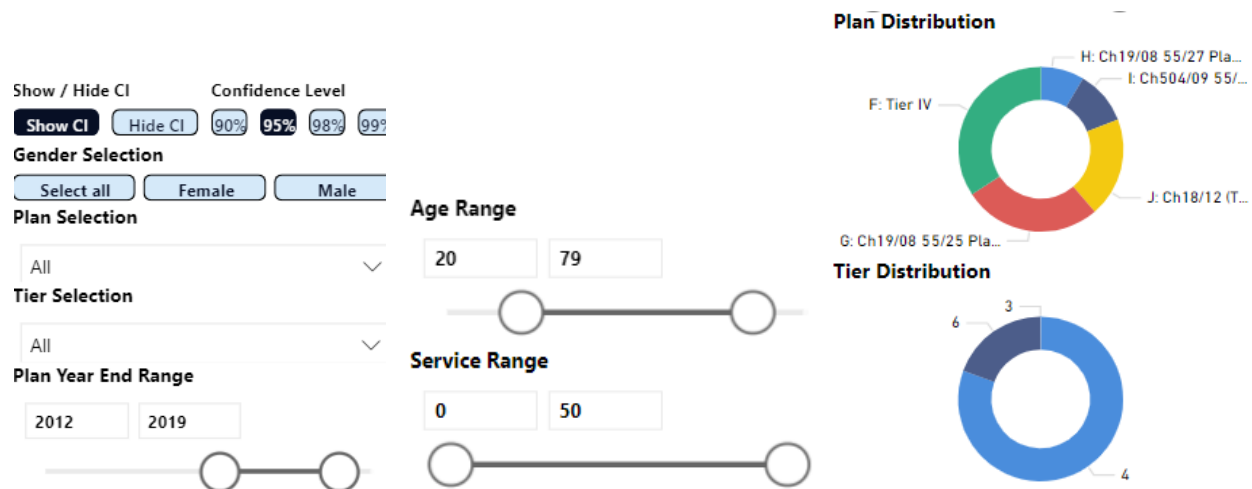
Finally, a bubble chart displaying the A/E ratios by gender is shown. The size of the bubble reflects the number of exposures.

Actual vs. Expected - Withdrawal Rate w/ Exposure Bubbles; by Service



In MEST, there are various items that the user can select. Once a selection is made, the charts update in real time and the totals are based on the selections.

- Plan selections – a drop-down box allows the user to select the available plan codes for that system (the options in the drop-down box depend on the selected system).
- Tier selections – a drop-down box allows the user to select the available tier codes for that system.
- Gender – male or female or both can be selected.
- Plan Year End Range – the user can select the specific years (years selected must be consecutive). Plan year 2021 contains the experience from July 1, 2020 to June 30, 2021.
- Age and Service Ranges – can be adjusted and combined with the different displays to delve deeper into the experience. For example, if a user wants to view the results by age for those who terminated with 10 or more years of service, the user can select the service range from 10 years to up to the maximum contained in the data and view results by age.
- Plan and Tier distributions provide the user with the number of exposures in each bucket (hover over the indicated cell). The user can select a specific plan or tier to see how those results differ from the totals, but we recommend using the drop-down boxes above.
- Confidence intervals – the user can select to review results under the 90th, 95th, 98th, or 99th percentiles.



Section II – Teachers' Retirement System of the City of New York (TRS)

Exposures and Decrements

To set the exposures and actual decrements for TRS, the following table details the age and service conditions for unreduced retirement and reduced retirement. If a member has not met any of these conditions for the indicated plan code by year, the member is considered a withdrawal exposure. Otherwise, if the member did meet any of these conditions, they would be considered a retirement exposure. Members with a status code of termination who, nonetheless, have met the conditions for retirement, are included as actual retirements.

Using the age and service slider, a user can drill down to view the results that reflect a variety of conditions by plan code, such as reduced retirement, retirement at first eligibility, or other conditions for retirement.

TRS Retirement Eligibility Chart

Plan Code	Plan Description	Mandated	Formula Bump at 20 YOS	Unreduced Retirement Condition 1		Unreduced Retirement Condition 2		Reduced Retirement Condition	
				Age 1	Service 1	Age 2	Service 2	Age	Service
A	CPP (Plan A)	TRUE		55	5				
B	ISF (Plan B)	TRUE		55	5				
C	Modified CPP (Plan C)	TRUE		62	25	55	30	55	5
D	Modified ISF (Plan D)	TRUE		62	5			55	5
F	Tier IV	TRUE	TRUE	62	5	55	30	55	5
G	Ch19/08 55/25 Plan [OPTIONAL]	FALSE	TRUE	62	5	55	25	55	5
H	Ch19/08 55/27 Plan [MANDATORY]	TRUE	TRUE	62	5	55	27	55	5
I	Ch504/09 55/27 Plan [MANDATORY]	TRUE	TRUE	62	10	55	27	55	10
J	CH18/12 (Tier 6) [MANDATORY]	TRUE	TRUE	63	10			55	5
O	Other	TRUE	TRUE	62	5				

Please note that exposures for Plan Codes A – D and O were excluded from the tool because there are very few of them, except when examining pre-retirement death.

For certain plans, such as the Tier 6 plans and the Ch 504/09 – 55/27 [Mandatory] plan, the vesting requirement was reduced from 10 years to 5 years due to the passage of Chapter 56, Laws of 2022. Since 10-year vesting was required during the study period, we have used 10 years in this report.

OA's retirement assumptions depend on whether a member can choose a certain retirement plan. If a member had a choice and elected the improved plan, the assumed rates of retirement are higher than those in which the member was mandated into the specific retirement plan. Higher rates of retirement apply to the indicated plan when the Mandated column is set to False. All Tier 6 plans are considered Mandated plans.

We understand that for certain elected plans (plan codes G, H and I) the OA assumes immediate reduced retirement for members who have not met the stated condition for unreduced retirement but have met the condition for early retirement under the Tier IV basic plan (age 55 and completion 5 years of service). In these situations, OA applies the rates of termination at these age/service conditions and not reduced rates of retirement. These members are included as a retirement exposure but both the current and proposed assumption reflects the reduced retirement assumption.

Rates of Salary Increase

The rates of salary increase reflect three components: 1) price inflation, 2) real wage inflation, and 3) merit increases. The combination of price inflation and real wage inflation is known as wage inflation. The current wage inflation is 3%, which reflects a price inflation assumption of 2.5% and 0.5% real wage inflation.

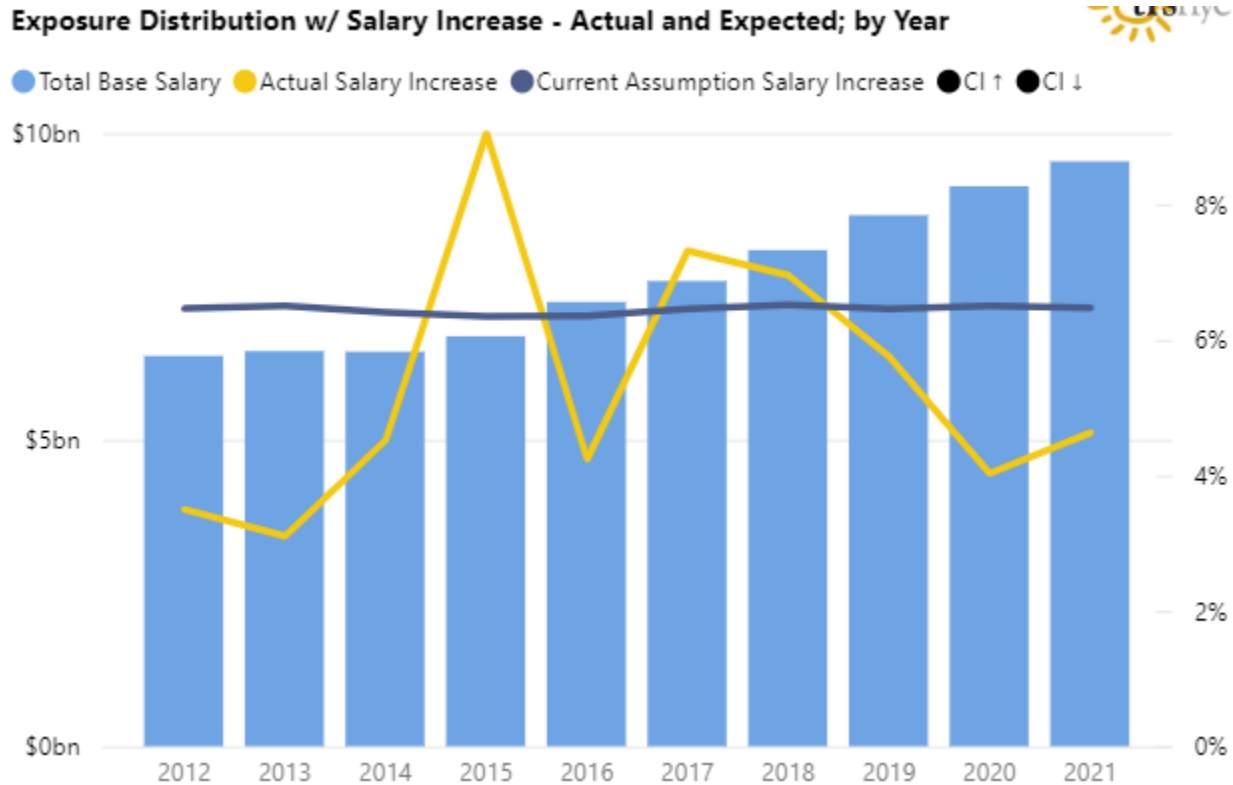
Based on the 2024 and 2023 OASDI Trustees report issued by Social Security, wage inflation from 2012 to 2020 had a cumulative compound average of 2.93%. Including the rate for 2021 of 9.04%, the average increased to 3.53%. However, in our analysis of the experience, we did not notice any large increases in wages during 2021. This is typical with government sector employees with union affiliations where salary increases are specified in contracts negotiated for a 3- to 5-year period. Thus, wage increases for these employees may not adjust as quickly as for other employment sectors included in the Social Security Trustees report.

For purposes of our analysis, we believe the 3% current wage inflation is representative of the actual experience during the study period. While inflation has been higher since 2021, we propose no changes to the inflation assumption of 2.5% and wage inflation assumptions of 3%. Therefore, we have developed proposed salary increases based on total salary increases during the indicated period. The merit portion is equal to the total less the 3% wage inflation.

For purposes of salary increases only members with a status code of A in consecutive years are included. Members with a LOA status code are excluded.

Although salary increases for government employees may respond less quickly to changes in inflation, using salary experience from many years in the past may not necessarily be indicative of future salary increases as they may not include changes negotiated in union contracts such as general increases, longevity payments, or other salary items. We reviewed the salary increases by year and determined what we believe was the most reasonable period to compare to the current assumption and develop proposed assumptions.

The following chart shows the experience by year for the age range 25 to 59 and for the service range 0 to 34.



We know that there was an agreement between New York City and the United Federation of Teachers (UFT) in June 2014, which we believe would have provided a one-time impact to salary increases in 2015 and a subsequent decrease in 2016. Therefore, for TRS, we focused on the 5-year period from 2017 – 2021.

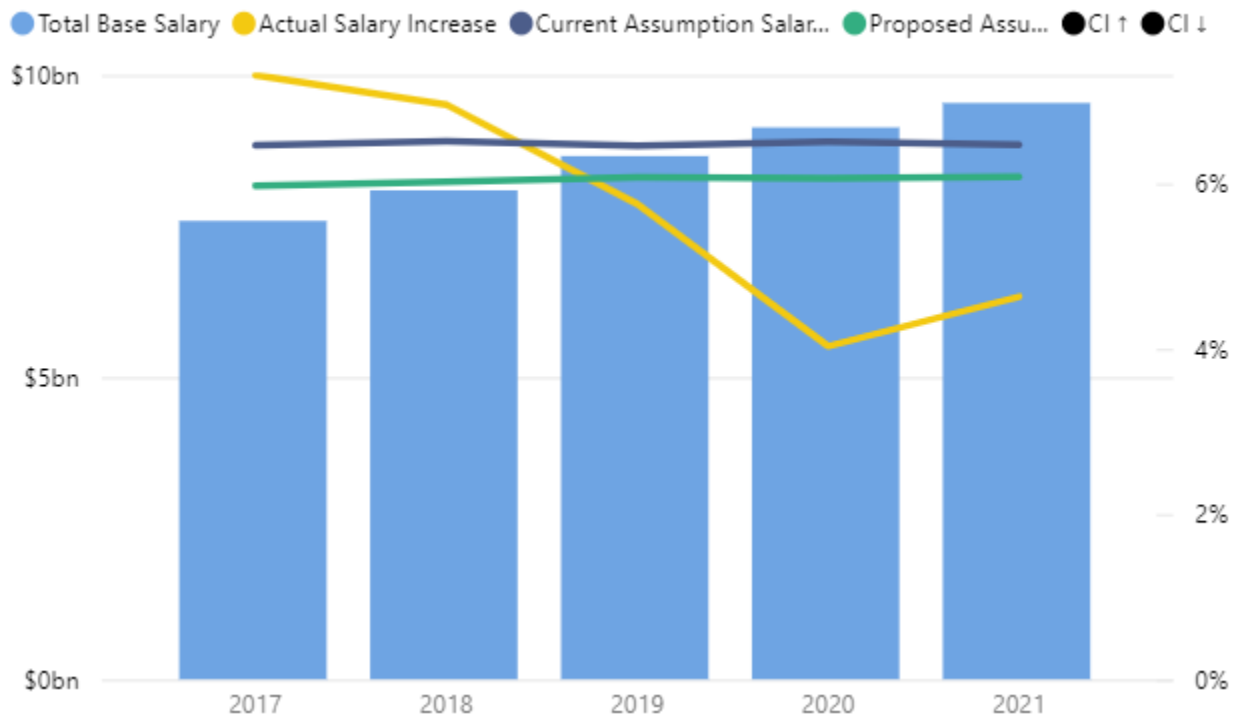
The current assumed rates of salary increases vary by service. The proposed assumption also varies by service. Overall, lower rates of salary increases are proposed.

The following table shows the experience for salary increases by year, for the age range (25 to 59), and for the service range (0 to 34) from 2017 to 2021. The actual rate of salary increases averaged 5.64% whereas the overall expected rate of increase averaged 6.48% based on the current assumptions and 6.05% based on the proposed assumptions.

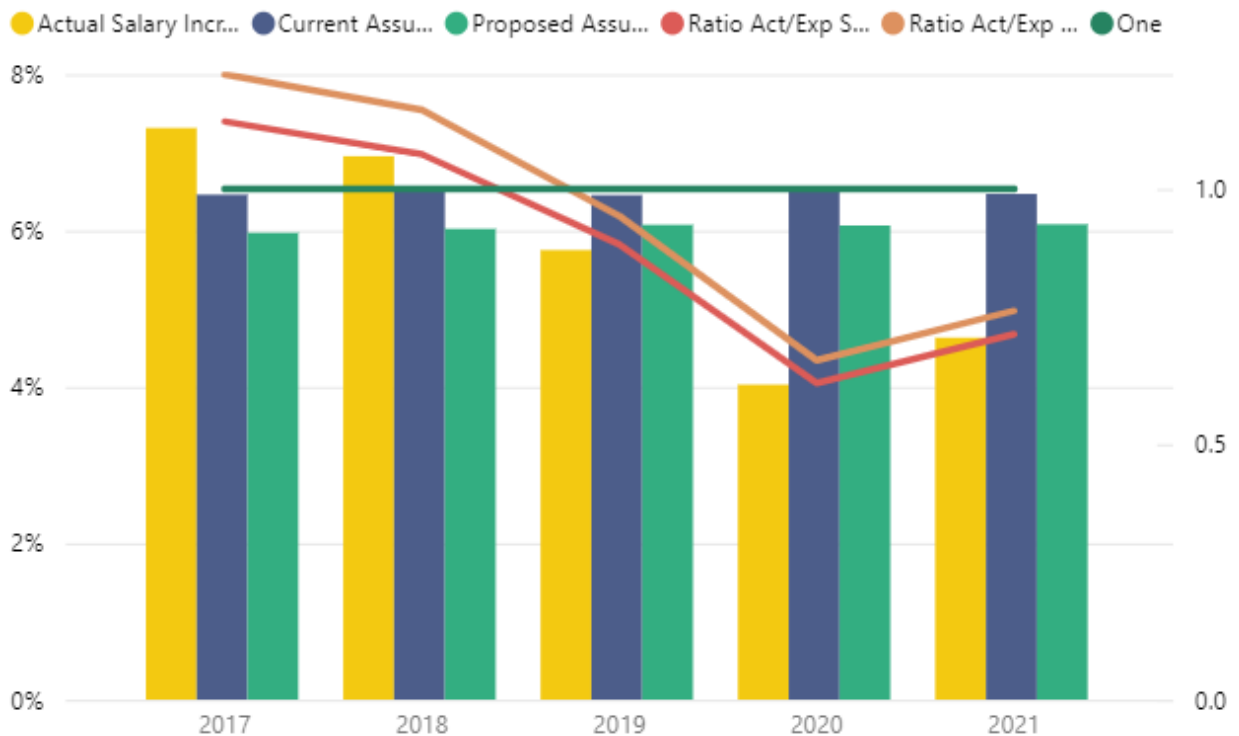
Plan Year	Exposed	Base Salary	Actual Salary	Expected Salary	Actual Salary Increase	Current Assumption Salary Increase	Ratio Act/Exp Salary Increase
2017	96,793	\$7,586.0M	\$8,140.7M	\$8,076.1M	7.31%	6.46%	▲ 1.13
2018	98,446	\$8,091.4M	\$8,653.8M	\$8,618.3M	6.95%	6.51%	● 1.07
2019	100,759	\$8,659.0M	\$9,157.0M	\$9,217.8M	5.75%	6.45%	▲ 0.89
2020	102,780	\$9,132.3M	\$9,500.3M	\$9,726.1M	4.03%	6.50%	▲ 0.62
2021	105,360	\$9,537.2M	\$9,978.8M	\$10,154.2M	4.63%	6.47%	▲ 0.72
Total	504,138	\$43,005.9M	\$45,430.7M	\$45,792.5M	5.64%	6.48%	▲ 0.87

Plan Year	Exposed	Base Salary	Actual Salary	Expected Salary Proposed	Actual Salary Increase	Proposed Assumption Salary Increase	Act/Exp Proposed Salary Increase
2017	96,793	\$7,586.0M	\$8,140.7M	\$8,039.0M	7.31%	5.97%	▲ 1.22
2018	98,446	\$8,091.4M	\$8,653.8M	\$8,578.6M	6.95%	6.02%	▲ 1.15
2019	100,759	\$8,659.0M	\$9,157.0M	\$9,184.9M	5.75%	6.07%	● 0.95
2020	102,780	\$9,132.3M	\$9,500.3M	\$9,686.2M	4.03%	6.07%	▲ 0.66
2021	105,360	\$9,537.2M	\$9,978.8M	\$10,117.2M	4.63%	6.08%	▲ 0.76
Total	504,138	\$43,005.9M	\$45,430.7M	\$45,605.9M	5.64%	6.05%	● 0.93

Exposure Distribution w/ Salary Increase - Actual and Expected; by Year



Salary Increase - Actual, Expected, and Ratio; by Year

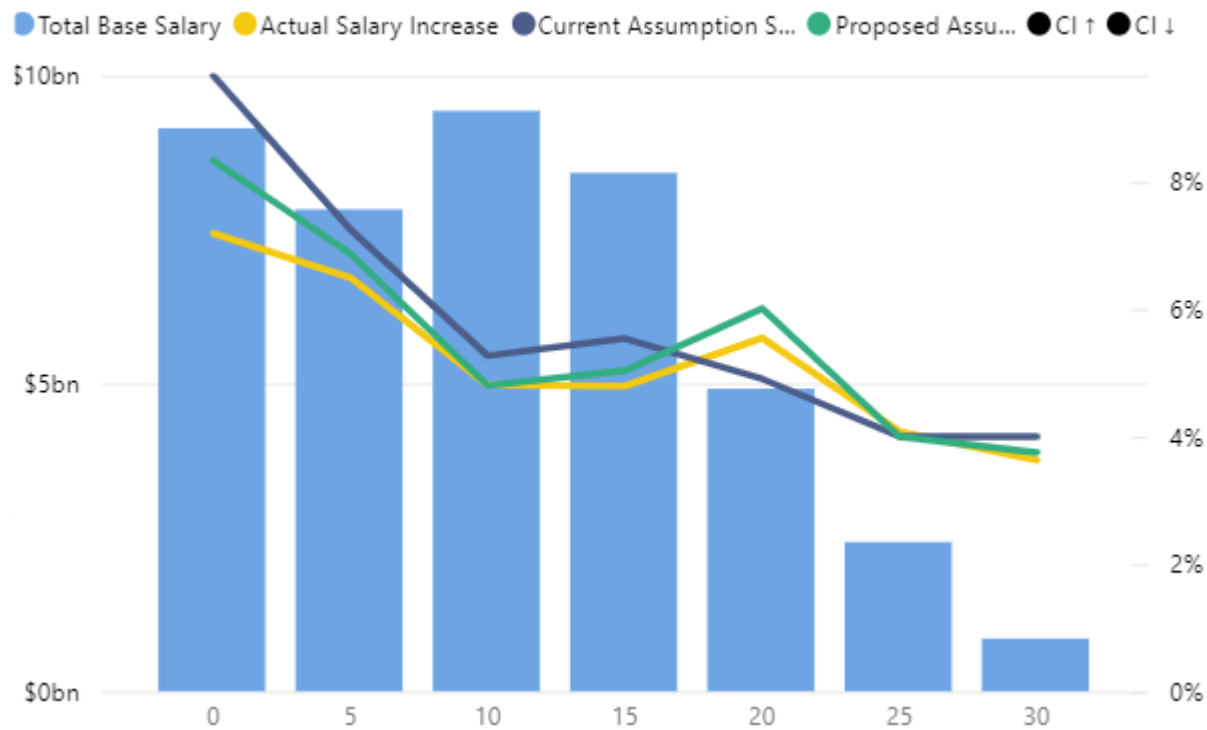


The following charts show the experience by service (0 to 34 years) from 2017 to 2021 first compared to the current assumption and then to the proposed assumption. This resulted in an increase in the A/E ratio from 0.87 to 0.93 for ages 25 to 59.

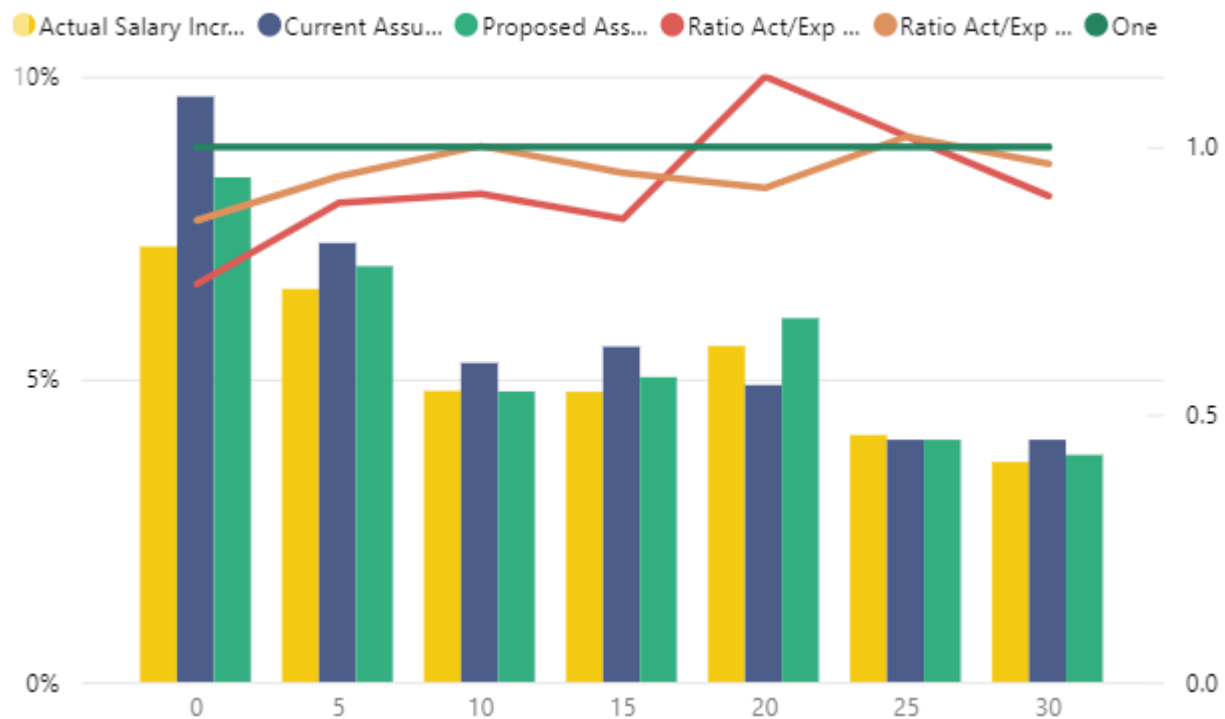
Service	Exposed	Base Salary	Actual Salary	Expected Salary	Actual Salary Increase	Current Assumption Salary Increase	Ratio Act/Exp Salary Increase
0	18,986	1,022.9M	\$1,125.5M	1,155.9M	10.03%	13.00%	▲ 0.77
1	33,663	2,034.0M	\$2,188.1M	2,257.7M	7.58%	11.00%	▲ 0.69
2	32,700	2,082.5M	\$2,227.7M	2,269.9M	6.97%	9.00%	▲ 0.77
3	30,479	2,038.4M	\$2,162.8M	2,201.5M	6.10%	8.00%	▲ 0.76
4	28,686	1,965.8M	\$2,097.0M	2,142.7M	6.68%	9.00%	▲ 0.74
5	25,150	1,806.9M	\$1,944.6M	1,951.5M	7.62%	8.00%	● 0.95
6	21,296	1,611.2M	\$1,738.8M	1,740.1M	7.92%	8.00%	● 0.99
7	18,385	1,454.8M	\$1,562.9M	1,556.6M	7.43%	7.00%	● 1.06
8	17,946	1,468.9M	\$1,532.7M	1,542.3M	4.35%	5.00%	▲ 0.87
9	17,700	1,484.9M	\$1,555.8M	1,603.7M	4.78%	8.00%	▲ 0.60
10	18,896	1,614.1M	\$1,713.6M	1,678.7M	6.17%	4.00%	◆ 1.54
11	20,303	1,787.3M	\$1,860.0M	1,858.8M	4.07%	4.00%	● 1.02
12	21,463	1,945.6M	\$2,028.0M	2,062.3M	4.24%	6.00%	▲ 0.71
13	22,044	2,061.3M	\$2,166.8M	2,143.8M	5.11%	4.00%	▲ 1.28
14	20,982	2,017.0M	\$2,110.0M	2,178.4M	4.61%	8.00%	▲ 0.58
15	19,674	1,929.2M	\$2,046.7M	2,006.3M	6.09%	4.00%	◆ 1.52
16	18,327	1,859.9M	\$1,928.2M	1,934.3M	3.67%	4.00%	● 0.92
17	16,854	1,712.6M	\$1,783.0M	1,798.2M	4.11%	5.00%	▲ 0.82
18	14,946	1,513.4M	\$1,582.5M	1,573.9M	4.57%	4.00%	▲ 1.14
19	13,718	1,404.6M	\$1,482.7M	1,573.2M	5.56%	12.00%	◆ 0.46
20	11,907	1,254.3M	\$1,349.8M	1,304.5M	7.61%	4.00%	◆ 1.90
21	10,057	1,109.4M	\$1,163.2M	1,198.2M	4.84%	8.00%	▲ 0.61
22	8,600	966.8M	\$1,025.7M	1,005.4M	6.10%	4.00%	◆ 1.52
23	7,365	852.2M	\$887.4M	886.3M	4.13%	4.00%	● 1.03
24	6,268	730.9M	\$760.2M	760.1M	4.01%	4.00%	● 1.00
25	5,242	611.1M	\$636.4M	635.5M	4.13%	4.00%	● 1.03
26	4,671	546.5M	\$569.2M	568.4M	4.15%	4.00%	● 1.04
27	4,143	486.7M	\$506.1M	506.1M	3.99%	4.00%	● 1.00
28	3,571	422.0M	\$439.3M	438.9M	4.10%	4.00%	● 1.02
29	3,014	356.4M	\$370.5M	370.6M	3.98%	4.00%	● 0.99
30	2,408	286.7M	\$297.8M	298.2M	3.87%	4.00%	● 0.97
31	1,864	222.8M	\$231.0M	231.7M	3.68%	4.00%	● 0.92
32	1,353	162.9M	\$168.5M	169.4M	3.45%	4.00%	▲ 0.86
33	918	112.5M	\$116.3M	117.0M	3.39%	4.00%	▲ 0.85
34	559	69.5M	\$71.8M	72.2M	3.30%	4.00%	▲ 0.83
Total	504,138	43,005.9M	\$45,430.7M	45,792.5M	5.64%	6.48%	▲ 0.87

Service	Exposed	Base Salary	Actual Salary	Expected Salary Proposed	Actual Salary Increase	Proposed Assumption Salary Increase	Act/Exp Proposed Salary Increase
0	18,986	1,022.9M	\$1,125.5M	1,135.4M	10.03%	11.00%	0.91
1	33,663	2,034.0M	\$2,188.1M	2,217.0M	7.58%	9.00%	0.84
2	32,700	2,082.5M	\$2,227.7M	2,249.1M	6.97%	8.00%	0.87
3	30,479	2,038.4M	\$2,162.8M	2,181.1M	6.10%	7.00%	0.87
4	28,686	1,965.8M	\$2,097.0M	2,123.0M	6.66%	8.00%	0.83
5	25,150	1,806.9M	\$1,944.6M	1,951.5M	7.62%	8.00%	0.95
6	21,296	1,611.2M	\$1,738.8M	1,740.1M	7.92%	8.00%	0.99
7	18,385	1,454.8M	\$1,562.9M	1,571.2M	7.43%	8.00%	0.93
8	17,946	1,468.9M	\$1,532.7M	1,542.3M	4.35%	5.00%	0.87
9	17,700	1,484.9M	\$1,555.8M	1,559.1M	4.78%	5.00%	0.96
10	18,896	1,614.1M	\$1,713.6M	1,702.9M	6.17%	5.50%	1.12
11	20,303	1,787.3M	\$1,860.0M	1,858.8M	4.07%	4.00%	1.02
12	21,463	1,945.6M	\$2,028.0M	2,023.4M	4.24%	4.00%	1.06
13	22,044	2,061.3M	\$2,166.8M	2,174.7M	5.11%	5.50%	0.93
14	20,982	2,017.0M	\$2,110.0M	2,117.9M	4.61%	5.00%	0.92
15	19,674	1,929.2M	\$2,046.7M	2,064.2M	6.09%	7.00%	0.87
16	18,327	1,859.9M	\$1,928.2M	1,934.3M	3.67%	4.00%	0.92
17	16,854	1,712.6M	\$1,783.0M	1,781.1M	4.11%	4.00%	1.03
18	14,946	1,513.4M	\$1,582.5M	1,589.1M	4.57%	5.00%	0.91
19	13,718	1,404.6M	\$1,482.7M	1,474.8M	5.56%	5.00%	1.11
20	11,907	1,254.3M	\$1,349.8M	1,367.2M	7.61%	9.00%	0.85
21	10,057	1,109.4M	\$1,163.2M	1,170.5M	4.84%	5.50%	0.88
22	8,600	966.8M	\$1,025.7M	1,024.8M	6.10%	6.00%	1.02
23	7,365	852.2M	\$887.4M	886.3M	4.13%	4.00%	1.03
24	6,268	730.9M	\$760.2M	760.1M	4.01%	4.00%	1.00
25	5,242	611.1M	\$636.4M	635.5M	4.13%	4.00%	1.03
26	4,671	546.5M	\$569.2M	568.4M	4.15%	4.00%	1.04
27	4,143	486.7M	\$506.1M	506.1M	3.99%	4.00%	1.00
28	3,571	422.0M	\$439.3M	438.9M	4.10%	4.00%	1.02
29	3,014	356.4M	\$370.5M	370.6M	3.96%	4.00%	0.99
30	2,408	286.7M	\$297.8M	297.5M	3.87%	3.75%	1.03
31	1,864	222.8M	\$231.0M	231.1M	3.68%	3.75%	0.98
32	1,353	162.9M	\$168.5M	169.0M	3.45%	3.75%	0.92
33	918	112.5M	\$116.3M	116.7M	3.39%	3.75%	0.90
34	559	69.5M	\$71.8M	72.1M	3.30%	3.75%	0.88
Total	504,138	43,005.9M	\$45,430.7M	45,605.9M	5.64%	6.05%	0.93

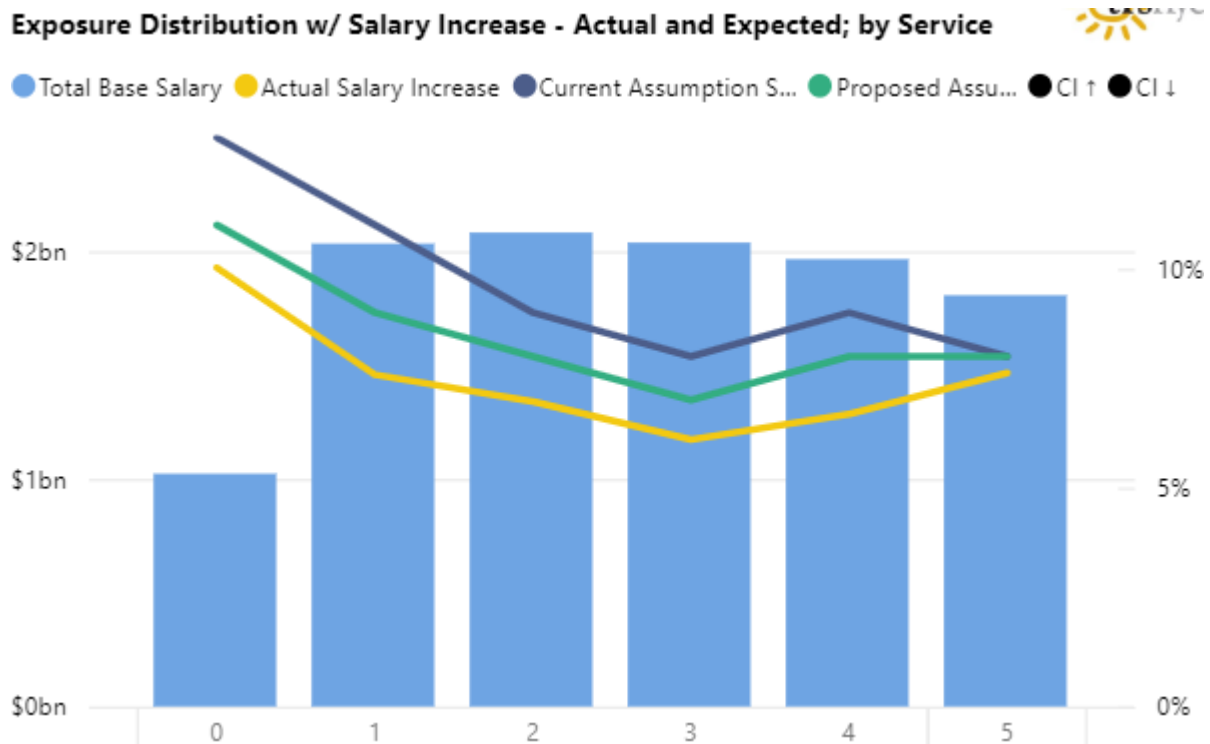
Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



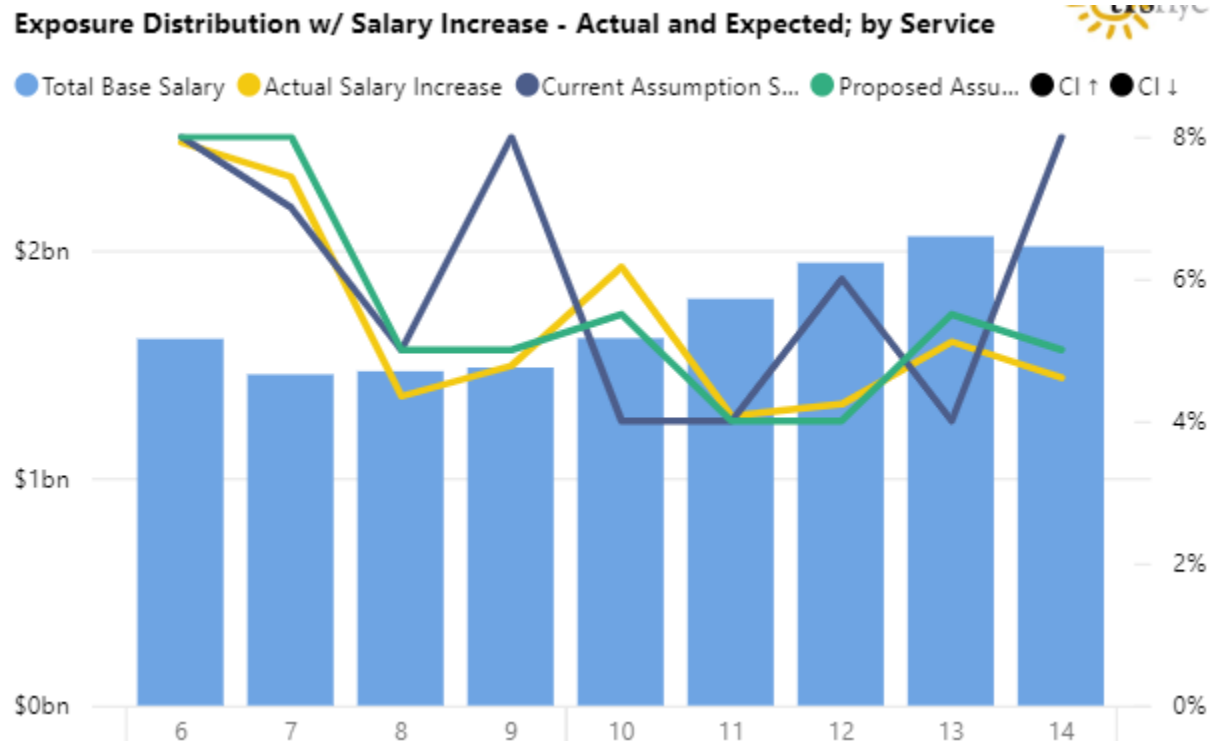
Salary Increase - Actual, Expected, and Ratio; by Service



This chart shows the results by service for the service range 0 to 5 years, which decreased the assumed rate of salary increases from 9.39% to 8.28% as compared to the actual rate of 7.26%. This resulted in an increase in the A/E ratio from 0.77 to 0.88 for ages 25 to 59.

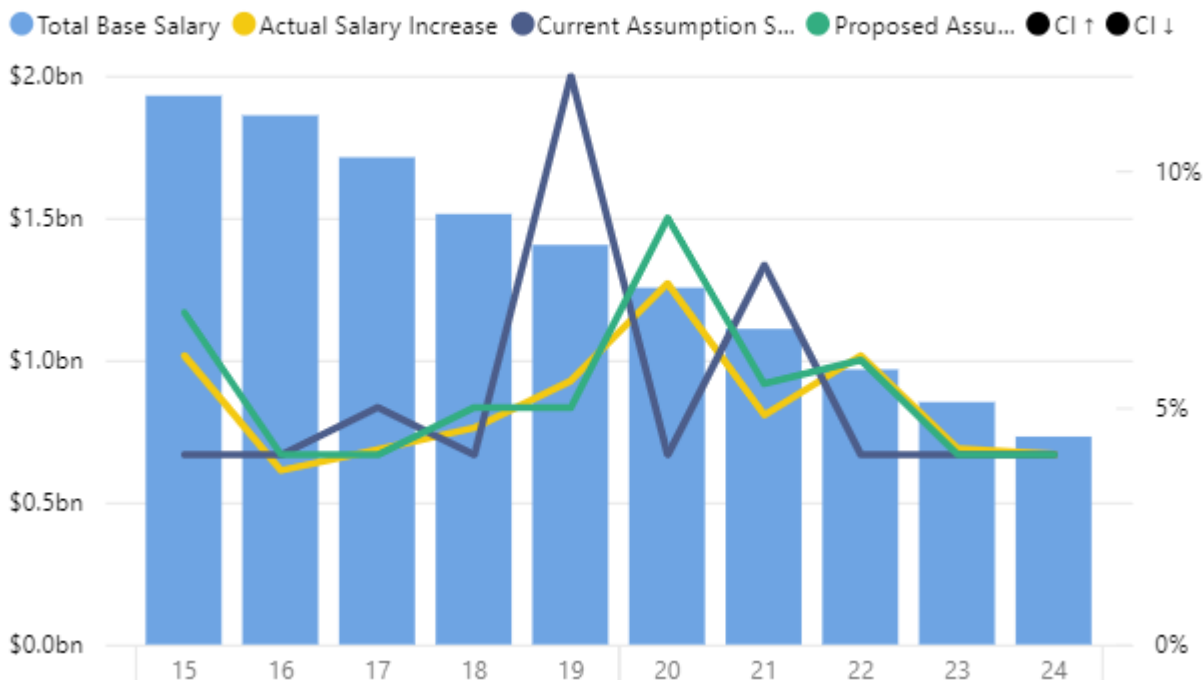


This chart shows the results by year for the service range 6 to 14 years, which decreased the assumed rate of salary increases from 5.95% to 5.47% as compared to the actual rate of 5.33%. This resulted in an increase in the A/E ratio from 0.90 to 0.97 for ages 25 to 59.

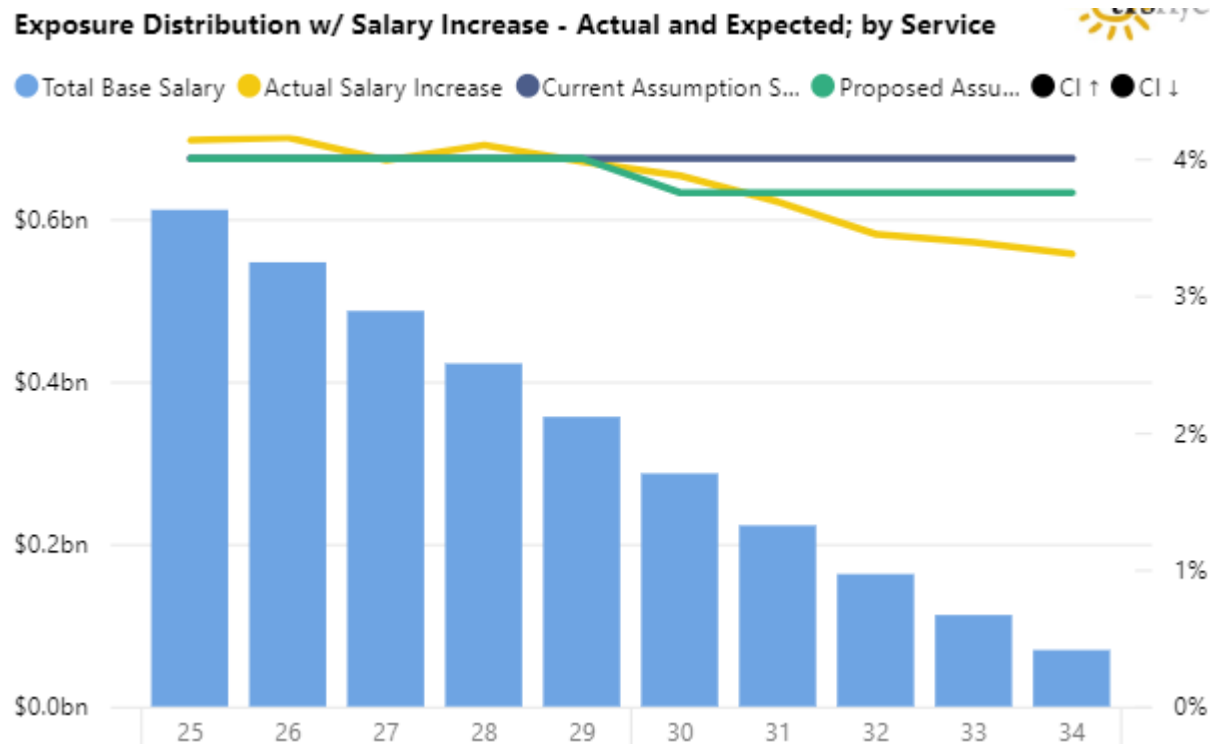


This chart shows the results by service for the service range 15 to 24 years, which increased the assumed rate of salary increases from 5.30% to 5.39% as compared to the actual rate of 5.07%. This resulted in a decrease in the A/E ratio from 0.96 to 0.94 for ages 25 to 59.

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



This chart shows the results by service for the service range 25 to 34 years, which decreased the assumed rate of salary increases from 4.00% to 3.93% as compared to the actual rate of 3.96%. This resulted in an increase in the A/E ratio from 0.99 to 1.01 for ages 25 to 59.



Summary

In total, the proposed rates of salary increases are lower than the current assumptions, although there are some services periods where higher rates are proposed. We would anticipate that this would decrease plan liabilities. The actual impact will depend on the demographics of the active membership.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT ASSUMPTION ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	10.00%	13.00%
1	8.00%	11.00%
2	6.00%	9.00%
3	5.00%	8.00%
4	6.00%	9.00%
5	5.00%	8.00%
6	5.00%	8.00%
7	4.00%	7.00%
8	2.00%	5.00%
9	5.00%	8.00%
10	1.00%	4.00%
11	1.00%	4.00%
12	3.00%	6.00%
13	1.00%	4.00%
14	5.00%	8.00%
15	1.00%	4.00%
16	1.00%	4.00%
17	2.00%	5.00%
18	1.00%	4.00%
19	9.00%	12.00%
20	1.00%	4.00%
21	5.00%	8.00%
22	1.00%	4.00%
23	1.00%	4.00%
24	1.00%	4.00%
25	1.00%	4.00%
26	1.00%	4.00%
27	1.00%	4.00%
28	1.00%	4.00%
29	1.00%	4.00%
30+	1.00%	4.00%

¹ Salary increase is the general wage increase of 3% plus the merit increase

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED ASSUMPTION ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	8.00%	11.00%
1	6.00%	9.00%
2	5.00%	8.00%
3	4.00%	7.00%
4	5.00%	8.00%
5	5.00%	8.00%
6	5.00%	8.00%
7	5.00%	8.00%
8	2.00%	5.00%
9	2.00%	5.00%
10	2.50%	5.50%
11	1.00%	4.00%
12	1.00%	4.00%
13	2.50%	5.50%
14	2.00%	5.00%
15	4.00%	7.00%
16	1.00%	4.00%
17	1.00%	4.00%
18	2.00%	5.00%
19	2.00%	5.00%
20	6.00%	9.00%
21	2.50%	5.50%
22	3.00%	6.00%
23	1.00%	4.00%
24	1.00%	4.00%
25	1.00%	4.00%
26	1.00%	4.00%
27	1.00%	4.00%
28	1.00%	4.00%
29	1.00%	4.00%
30+	0.75%	3.75%

¹ Salary increase is the general wage increase of 3% plus the merit increase

Withdrawal

The current withdrawal assumption varies by service. The proposed assumption varies by age in addition to service. Overall, this results in an increase in the assumed rates of withdrawal, especially at 15 or fewer years of service with slightly lower assumed rates of withdrawal at higher years of service.

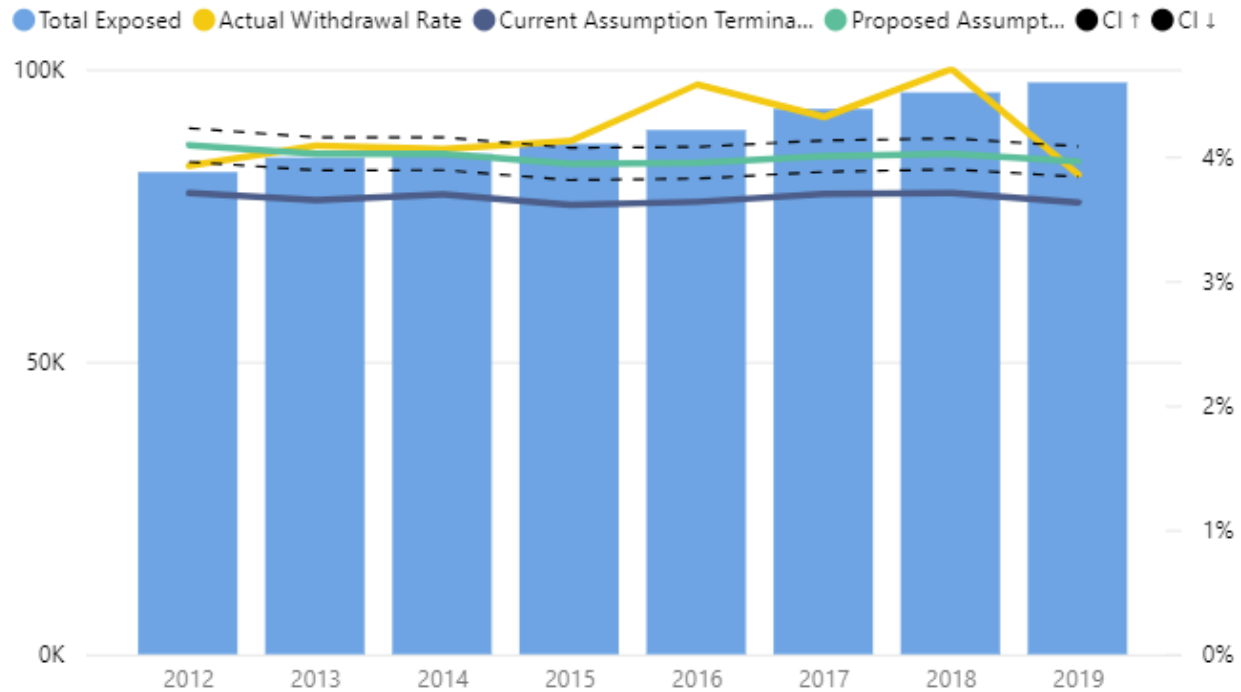
The analysis reflected years from 2012 - 2019 as the rate of termination during 2020 and 2021 may be artificially low due to members with a LOA status code. A record with a LOA status code is included as an exposure and not a decrement.

The following table shows the experience for withdrawal by year, for the age range (20 to 59), and for the service range (0 to 29). The actual rate of withdrawal averaged 4.21% whereas the overall expected rate of withdrawal averaged 3.67% based on the current assumptions and 4.00% based on the proposed assumptions.

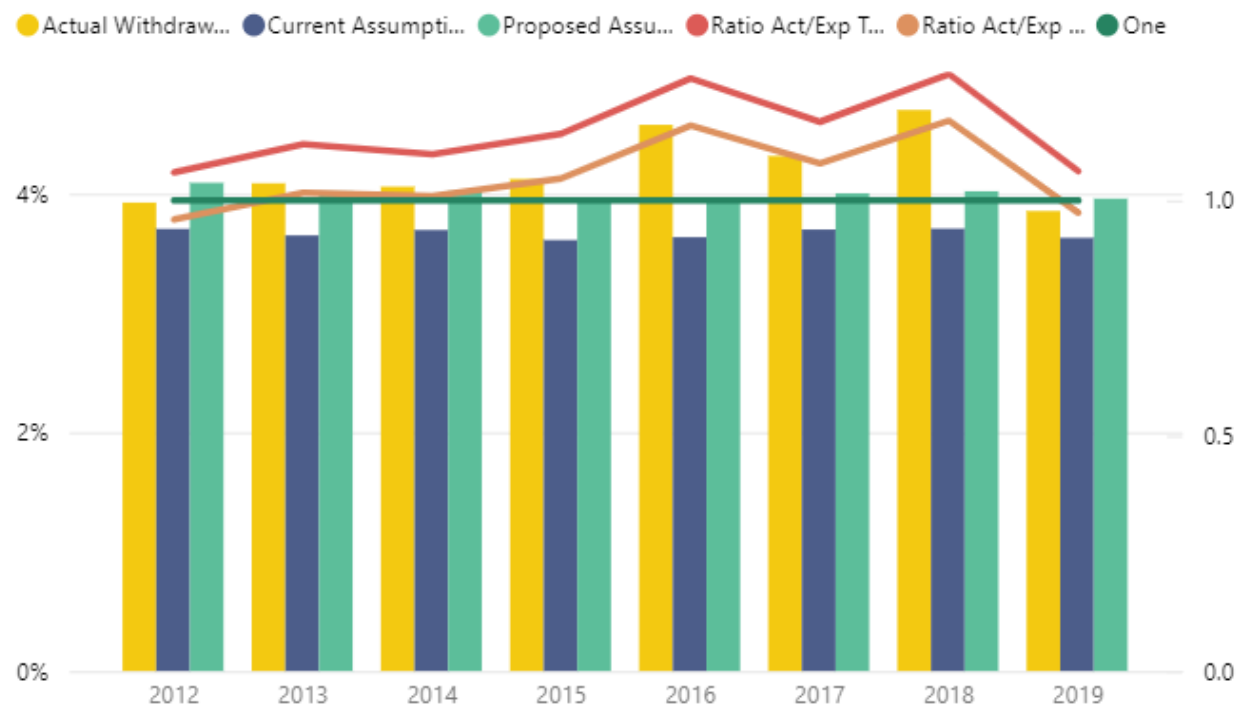
Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	3,234	3,052.5	82,412	3.92%	3.70%	1.06
2013	3,469	3,098.5	84,903	4.09%	3.65%	1.12
2014	3,471	3,160.5	85,540	4.06%	3.69%	1.10
2015	3,597	3,150.5	87,265	4.12%	3.61%	1.14
2016	4,100	3,256.5	89,601	4.58%	3.63%	1.26
2017	4,022	3,447.1	93,202	4.32%	3.70%	1.17
2018	4,513	3,558.6	96,020	4.70%	3.71%	1.27
2019	3,766	3,546.4	97,719	3.85%	3.63%	1.06
Total	30,172	26,270.6	716,662	4.21%	3.67%	1.15

Plan Year	Actual Withdrawals	Expected Withdrawals Proposed	Total Exposed	Actual Withdrawal Rate	Proposed Assumption Termination	Act/Exp Proposed Term
2012	3,234	3,370.6	82,412	3.92%	4.09%	0.96
2013	3,469	3,413.0	84,903	4.09%	4.02%	1.02
2014	3,471	3,439.5	85,540	4.06%	4.02%	1.01
2015	3,597	3,436.8	87,265	4.12%	3.94%	1.05
2016	4,100	3,537.5	89,601	4.58%	3.95%	1.16
2017	4,022	3,729.6	93,202	4.32%	4.00%	1.08
2018	4,513	3,859.2	96,020	4.70%	4.02%	1.17
2019	3,766	3,867.3	97,719	3.85%	3.96%	0.97
Total	30,172	28,653.5	716,662	4.21%	4.00%	1.05

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Year



Withdrawal Rate - Actual, Expected, and Ratio; by Year

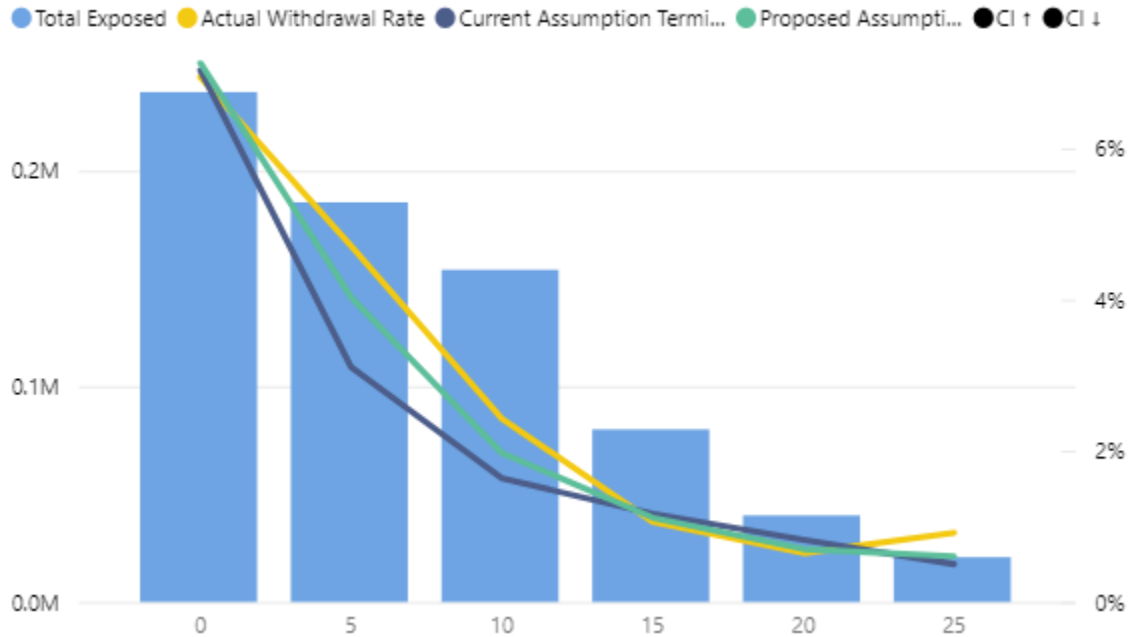


The following charts show the experience by service (0 to 29 years) in the experience study period first compared to the current assumption and then to the proposed assumption. This resulted in a decrease in the A/E ratio from 1.15 to 1.05 for ages 20 to 59. For ages 20 to 39, the A/E ratio decreased from 1.33 to 1.12 and for ages 40 to 59, the A/E ratio increased from 0.82 to 0.90.

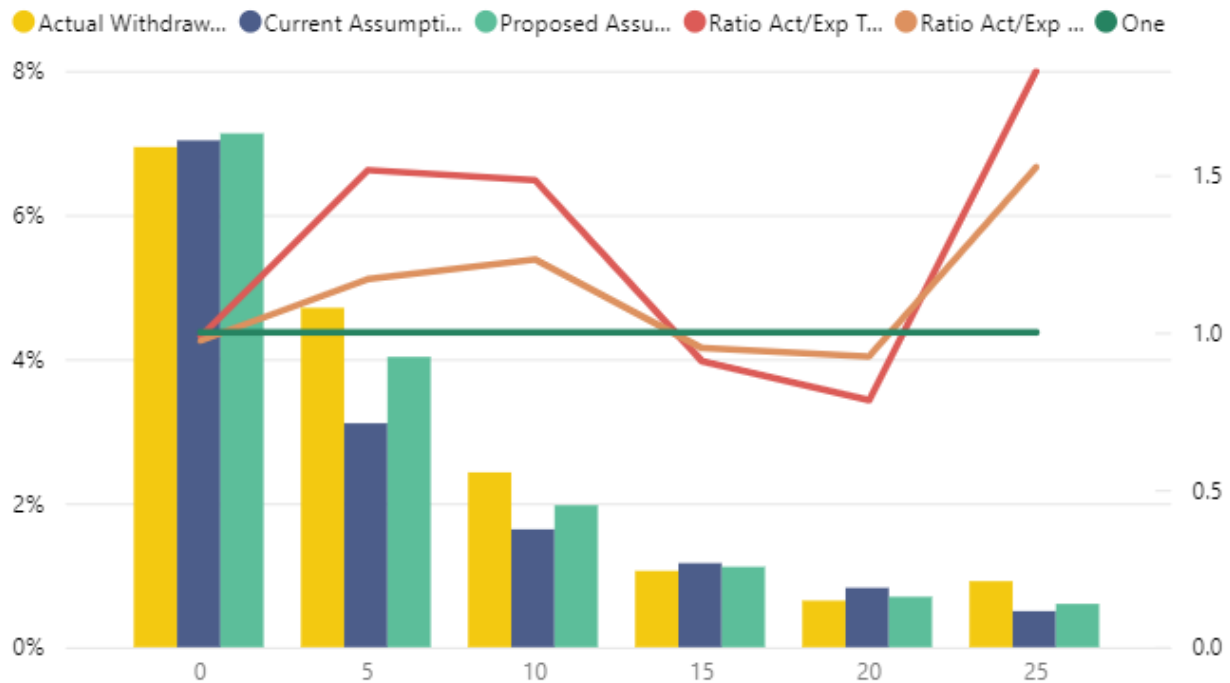
Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	2,289	3,514.9	39,054	5.86%	9.00%	▲ 0.65
1	3,832	4,730.6	59,133	6.48%	8.00%	▲ 0.81
2	3,968	3,552.8	50,754	7.82%	7.00%	▲ 1.12
3	3,470	2,726.0	45,434	7.64%	6.00%	▲ 1.27
4	2,852	2,103.3	42,066	6.78%	5.00%	▲ 1.36
5	2,472	1,527.3	38,183	6.47%	4.00%	◆ 1.62
6	2,029	1,305.7	37,305	5.44%	3.50%	◆ 1.55
7	1,633	1,097.5	35,985	4.54%	3.05%	▲ 1.49
8	1,398	979.2	36,950	3.78%	2.65%	▲ 1.43
9	1,196	848.7	36,899	3.24%	2.30%	▲ 1.41
10	1,178	731.0	36,549	3.22%	2.00%	◆ 1.61
11	927	602.5	34,428	2.69%	1.75%	◆ 1.54
12	742	482.1	31,106	2.39%	1.55%	◆ 1.54
13	525	384.8	27,488	1.91%	1.40%	▲ 1.36
14	365	317.9	24,456	1.49%	1.30%	▲ 1.15
15	303	268.5	21,483	1.41%	1.25%	▲ 1.13
16	204	216.1	18,007	1.13%	1.20%	● 0.94
17	149	178.7	15,543	0.96%	1.15%	▲ 0.83
18	118	148.1	13,464	0.88%	1.10%	▲ 0.80
19	73	120.9	11,513	0.63%	1.05%	▲ 0.60
20	62	100.3	10,033	0.62%	1.00%	▲ 0.62
21	67	79.6	8,840	0.76%	0.90%	▲ 0.84
22	55	62.9	7,862	0.70%	0.80%	▲ 0.87
23	36	49.6	7,090	0.51%	0.70%	▲ 0.73
24	39	37.7	6,287	0.62%	0.60%	● 1.03
25	60	28.0	5,608	1.07%	0.50%	◆ 2.14
26	53	24.7	4,932	1.07%	0.50%	◆ 2.15
27	32	20.9	4,186	0.76%	0.50%	◆ 1.53
28	29	17.3	3,469	0.84%	0.50%	◆ 1.67
29	16	12.8	2,555	0.63%	0.50%	▲ 1.25
Total	30,172	26,270.6	716,662	4.21%	3.67%	▲ 1.15

Service	Actual Withdrawals	Expected Withdrawals Proposed	Total Exposed	Actual Withdrawal Rate	Proposed Assumption Termination	Act/Exp Proposed Term
0	2,289	3,061.6	39,054	5.86%	7.84%	▲ 0.75
1	3,832	4,636.5	59,133	6.48%	7.84%	▲ 0.83
2	3,968	3,675.5	50,754	7.82%	7.24%	● 1.08
3	3,470	2,986.9	45,434	7.64%	6.57%	▲ 1.16
4	2,852	2,497.6	42,066	6.78%	5.94%	▲ 1.14
5	2,472	2,137.5	38,183	6.47%	5.60%	▲ 1.16
6	2,029	1,766.2	37,305	5.44%	4.73%	▲ 1.15
7	1,633	1,411.6	35,985	4.54%	3.92%	▲ 1.16
8	1,398	1,168.7	36,950	3.78%	3.16%	▲ 1.20
9	1,196	981.3	36,899	3.24%	2.66%	▲ 1.22
10	1,178	882.5	36,549	3.22%	2.41%	▲ 1.33
11	927	738.6	34,428	2.69%	2.15%	▲ 1.26
12	742	592.4	31,106	2.39%	1.90%	▲ 1.25
13	525	462.2	27,488	1.91%	1.68%	▲ 1.14
14	365	357.8	24,456	1.49%	1.46%	● 1.02
15	303	277.4	21,483	1.41%	1.29%	● 1.09
16	204	216.5	18,007	1.13%	1.20%	● 0.94
17	149	170.8	15,543	0.96%	1.10%	▲ 0.87
18	118	129.3	13,464	0.88%	0.96%	● 0.91
19	73	97.8	11,513	0.63%	0.85%	▲ 0.75
20	62	79.5	10,033	0.62%	0.79%	▲ 0.78
21	67	65.1	8,840	0.76%	0.74%	● 1.03
22	55	53.5	7,862	0.70%	0.68%	● 1.03
23	36	44.4	7,090	0.51%	0.63%	▲ 0.81
24	39	37.8	6,287	0.62%	0.60%	● 1.03
25	60	33.7	5,608	1.07%	0.60%	◆ 1.78
26	53	29.6	4,932	1.07%	0.60%	◆ 1.79
27	32	25.1	4,186	0.76%	0.60%	▲ 1.27
28	29	20.8	3,469	0.84%	0.60%	▲ 1.39
29	16	15.3	2,555	0.63%	0.60%	● 1.04
Total	30,172	28,653.5	716,662	4.21%	4.00%	● 1.05

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service

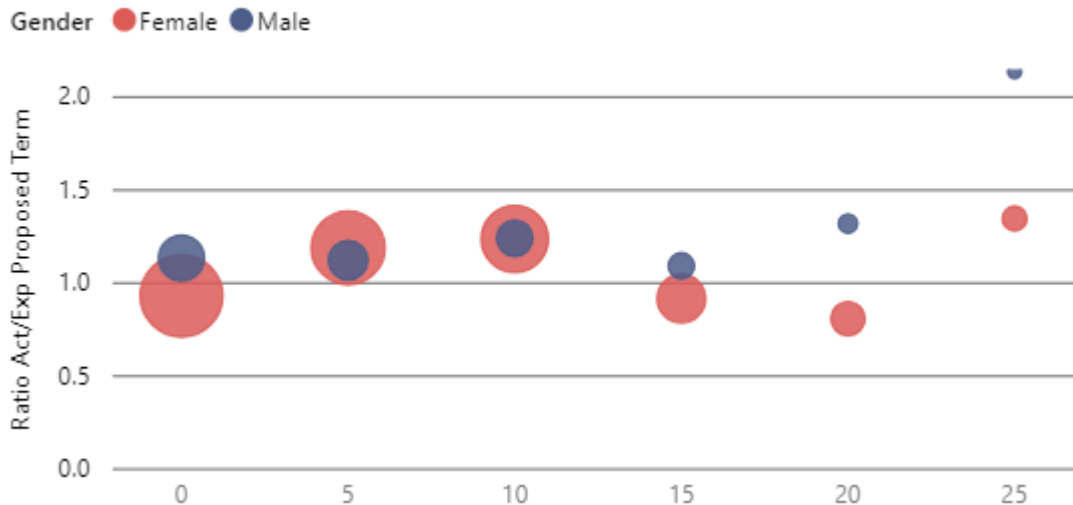


Withdrawal Rate - Actual, Expected, and Ratio; by Service w/Proposed



The following chart shows the actual experience by gender versus the proposed assumption. Since the experience did not vary by gender significantly, a unisex table is proposed.

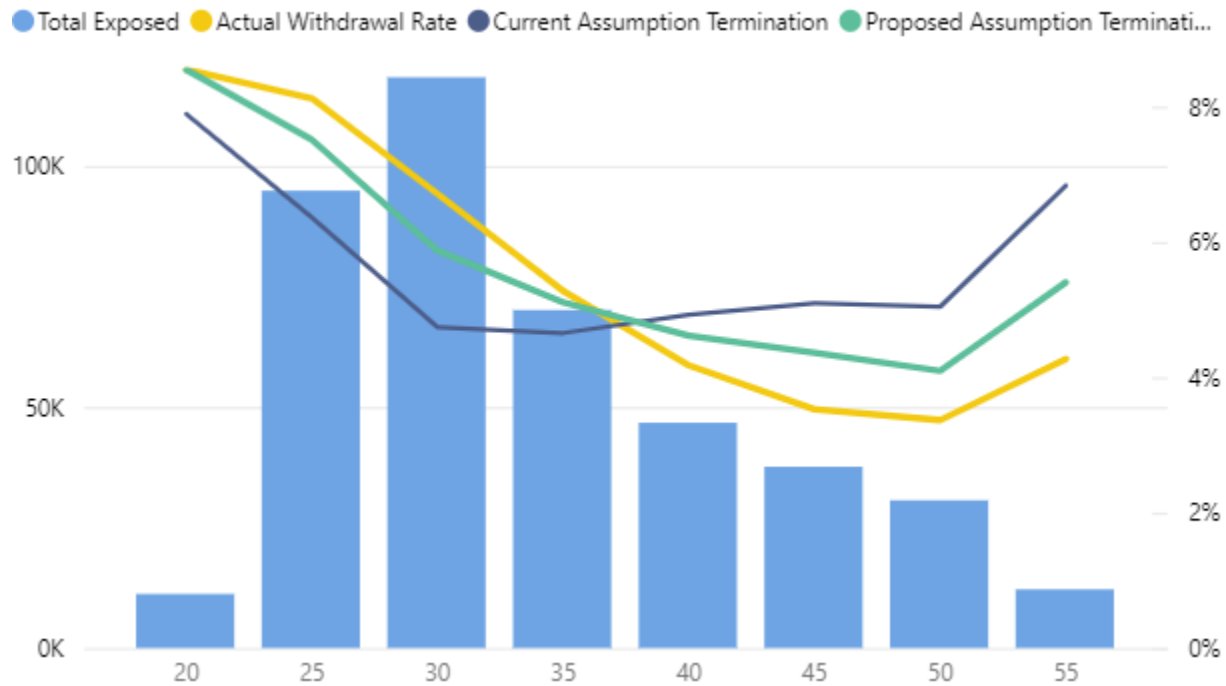
Actual vs. Expected - Withdrawal Proposed w/ Exposure Bubbles; by Service



The proposed assumption varies by age in addition to service as we observed lower rates of withdrawal for older members at the same service periods. The following charts show the results by age over 10-year service periods.

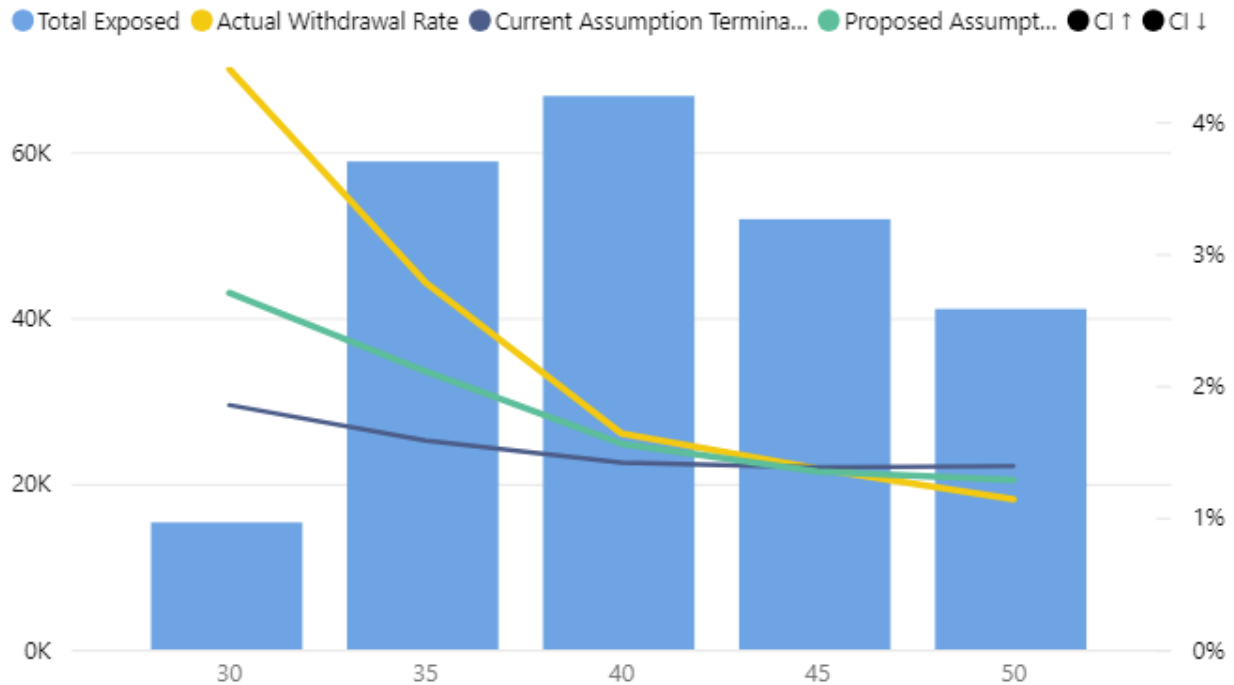
This chart shows the results by age for the service range 0 to 9 years, which increased the assumed rate of withdrawal from 5.31% to 5.77% as compared to the actual rate of 5.96%. This resulted in a decrease in the A/E ratio from 1.12 to 1.03 for ages 20 to 59. For ages 20 to 39, the A/E ratio decreased from 1.29 to 1.09 and for ages 40 to 59, the A/E ratio increased from 0.73 to 0.85.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



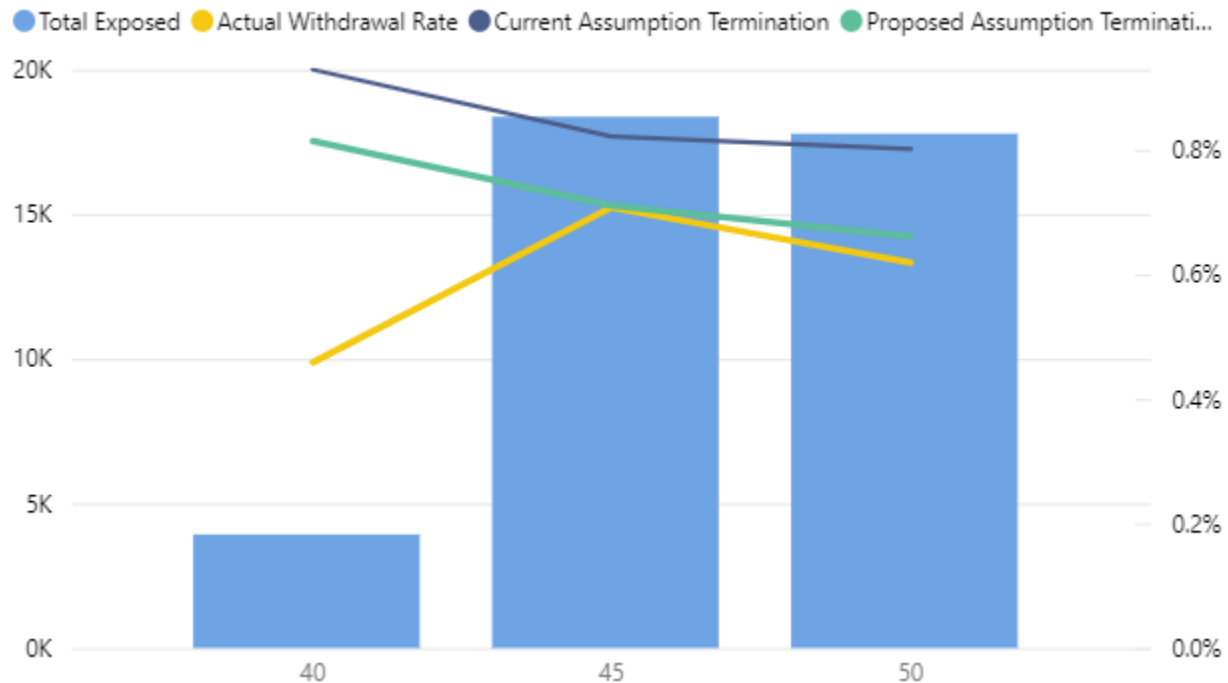
This chart shows the results by age for the service range 10 to 19 years, which increased the assumed rate of withdrawal from 1.47% to 1.68% as compared to the actual rate of 1.96%. This resulted in a decrease in the A/E ratio from 1.33 to 1.17 for ages 30 to 59. For ages 30 to 39, the A/E ratio decreased from 1.90 to 1.40 and for ages 40 to 59, the A/E ratio decreased from 1.02 to 1.00.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



This chart shows the results by age for the service range 20 to 24 years, which decreased the assumed rate of withdrawal from 0.82% to 0.70% as compared to the actual rate of 0.64%. This resulted in an increase in the A/E ratio from 0.78 to 0.92 for ages 40 to 54.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



Summary

In total, the proposed rates of withdrawal have increased the anticipated number of terminations. Typically, higher rates of withdrawal will result in a decrease in plan liabilities. However, lower assumptions are proposed for longer service members and older members increasing plan liabilities for these members. The actual impact will depend on the demographics of the active membership.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF TERMINATION	
Years of Service	Probability of Termination
0	9.00%
1	8.00%
2	7.00%
3	6.00%
4	5.00%
5	4.00%
6	3.50%
7	3.05%
8	2.65%
9	2.30%
10	2.00%
11	1.75%
12	1.55%
13	1.40%
14	1.30%
15	1.25%
16	1.20%
17	1.15%
18	1.10%
19	1.05%
20	1.00%
21	0.90%
22	0.80%
23	0.70%
24	0.60%
25	0.50%

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
PROPOSED						
PROBABILITIES OF TERMINATION						
Sample Service Periods ¹						
Age	0	5	10	15	20	25
25 ²	9.20%	6.60%	3.15%	1.70%	1.05%	0.80%
26	9.10%	6.55%	3.10%	1.70%	1.05%	0.75%
27	9.05%	6.50%	3.10%	1.65%	1.00%	0.75%
28	8.95%	6.45%	3.05%	1.65%	1.00%	0.75%
29	8.90%	6.40%	3.05%	1.65%	1.00%	0.75%
30	8.80%	6.35%	3.00%	1.65%	1.00%	0.75%
31	8.70%	6.25%	3.00%	1.60%	1.00%	0.75%
32	8.65%	6.20%	2.95%	1.60%	1.00%	0.75%
33	8.55%	6.15%	2.90%	1.60%	1.00%	0.75%
34	8.50%	6.10%	2.85%	1.55%	0.95%	0.75%
35	8.10%	5.95%	2.80%	1.55%	0.95%	0.70%
36	7.90%	5.85%	2.75%	1.55%	0.95%	0.70%
37	7.70%	5.55%	2.70%	1.50%	0.90%	0.70%
38	7.50%	5.30%	2.65%	1.45%	0.90%	0.70%
39	7.30%	5.15%	2.50%	1.40%	0.90%	0.65%
40	7.10%	4.85%	2.25%	1.35%	0.85%	0.60%
41	7.00%	4.75%	2.20%	1.30%	0.85%	0.60%
42	7.00%	4.60%	2.15%	1.25%	0.85%	0.60%
43	7.00%	4.45%	2.10%	1.25%	0.85%	0.60%
44	7.00%	4.30%	2.05%	1.25%	0.85%	0.60%
45	7.00%	4.20%	2.00%	1.25%	0.80%	0.60%
46	7.00%	4.05%	1.95%	1.25%	0.80%	0.60%
47	7.00%	3.90%	1.90%	1.25%	0.80%	0.60%
48	7.00%	3.75%	1.85%	1.25%	0.80%	0.60%
49	7.00%	3.75%	1.80%	1.25%	0.80%	0.60%
50	7.00%	3.60%	1.75%	1.20%	0.75%	0.60%
51	7.00%	3.60%	1.75%	1.20%	0.75%	0.60%
52	7.00%	3.60%	1.75%	1.20%	0.75%	0.60%
53	7.00%	3.60%	1.75%	1.20%	0.75%	0.60%
54 ³	7.00%	3.60%	1.75%	1.20%	0.75%	0.60%

¹ See full age / service table for rates at all service periods

² Applies to ages 25 and younger

³ Applies to ages 54 and older

Retirement

The current retirement assumption varies by age and eligibility for unreduced retirement with higher rates occurring at first eligibility. Furthermore, higher rates of retirement are assumed for members who had the option to elect an improved program. The proposed assumption varies by service in addition to these elements. Primarily lower rates of retirement are assumed prior to 20 or 25 years of service with even lower rates prior to 10 years of service.

Lower rates of retirement are proposed for members with less than 10 years of service since these members are not eligible for retiree health benefits. Higher rates of retirement are proposed for members with at least 20 years of service or 25 years of service for the improved plan members to reflect the higher benefit accrual rate.

The analysis reflected years from 2016 - 2021 as an agreement between New York City and the United Federation of Teachers (UFT) in June 2014 impacted the experience during 2014 and 2015. Please refer to our Part I Experience Study report for further discussion.

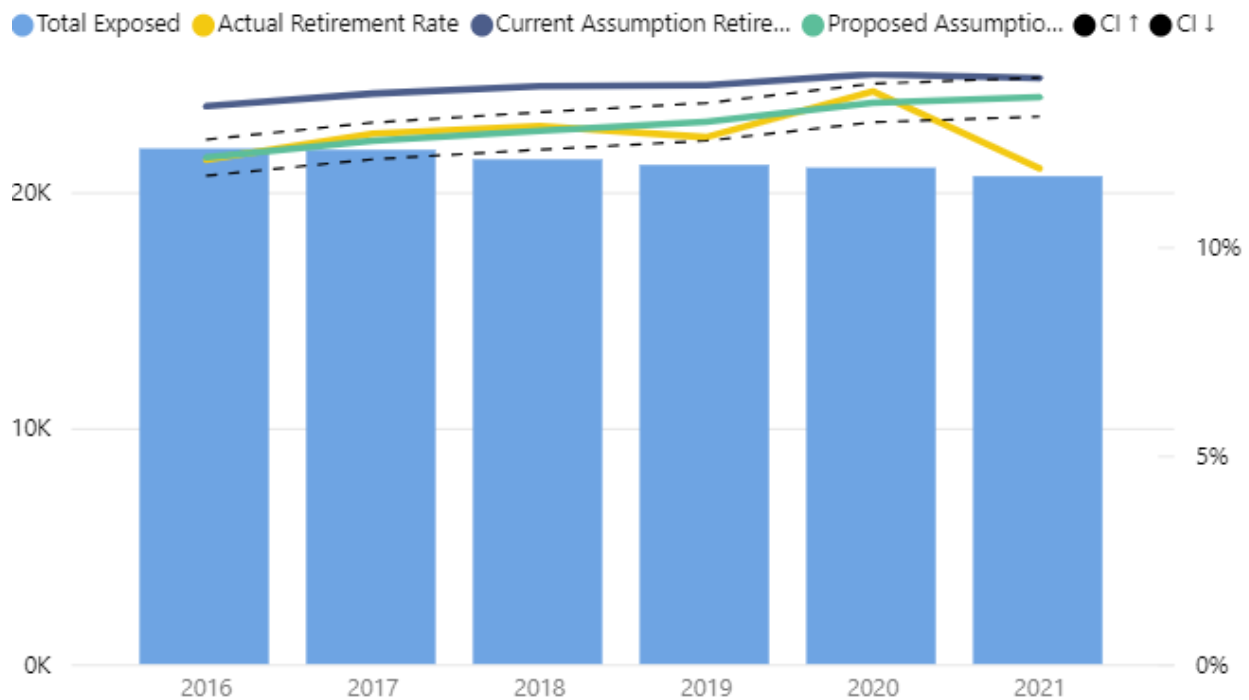
Since Tier 6 became effective on April 1, 2012, and required 10 years of service for vesting, there is little to no retirement experience associated with these plans. Chapter 56 Laws of 2022 changed the vesting requirements for the Tier 6 plans and the Ch 504/09 – 55/27 [Mandatory]) plan to five years of service. Since the vesting requirement was 10 years during the study period, we used the 10-year requirement in this report. The proposed tables reflect adjustments to apply to the Tier 6 plans.

The following table shows the experience for retirement by year, for the age range (55 to 79), and for the service range (5 to 39) for all plans and all types of retirement. The actual rate of retirement averaged 12.65% whereas the overall expected rate of retirement averaged 13.82% based on the current assumptions and 12.90% based on the proposed assumptions.

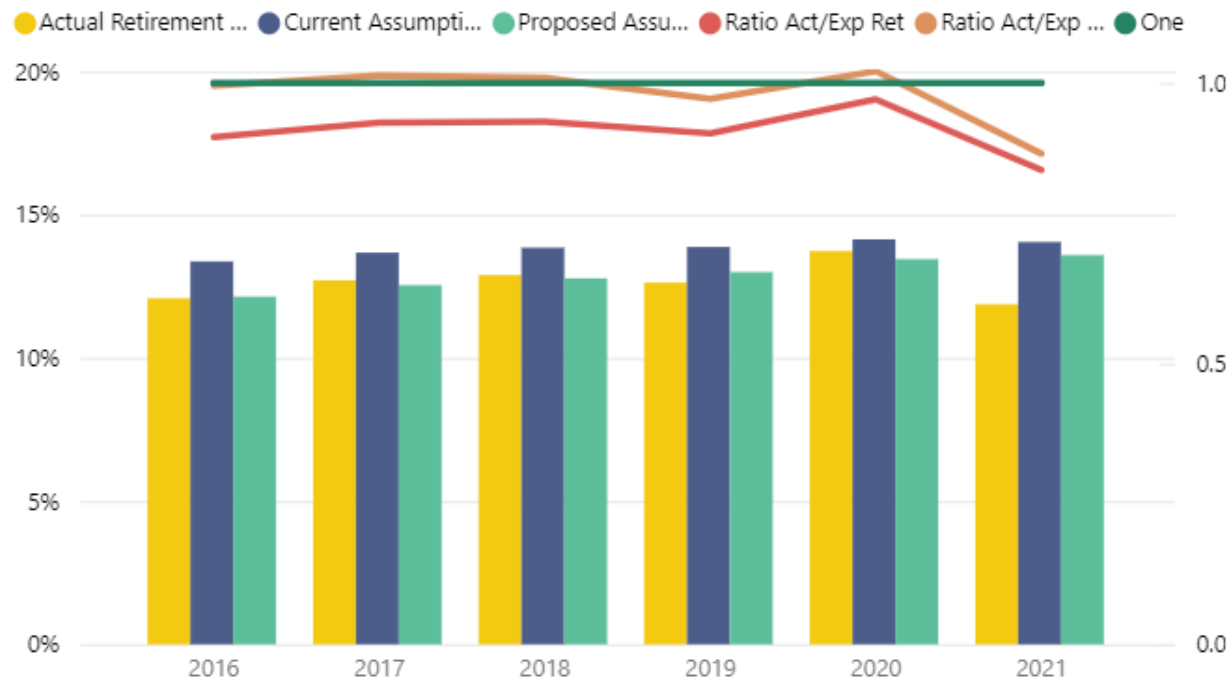
Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2016	2,639	2,919.8	21,849	12.08%	13.36%	0.90
2017	2,769	2,979.1	21,793	12.71%	13.67%	0.93
2018	2,756	2,960.6	21,387	12.89%	13.84%	0.93
2019	2,670	2,933.3	21,150	12.62%	13.87%	0.91
2020	2,887	2,973.9	21,037	13.72%	14.14%	0.97
2021	2,454	2,903.3	20,674	11.87%	14.04%	0.85
Total	16,175	17,669.9	127,890	12.65%	13.82%	0.92

Plan Year	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Ratio Act/Exp Proposed Ret
2016	2,639	2,651.4	21,849	12.08%	12.14%	1.00
2017	2,769	2,731.6	21,793	12.71%	12.53%	1.01
2018	2,756	2,732.0	21,387	12.89%	12.77%	1.01
2019	2,670	2,747.5	21,150	12.62%	12.99%	0.97
2020	2,887	2,828.2	21,037	13.72%	13.44%	1.02
2021	2,454	2,808.3	20,674	11.87%	13.58%	0.87
Total	16,175	16,499.1	127,890	12.65%	12.90%	0.98

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Year



Retirement Rate - Actual, Expected, and Ratio; by Year



Analysis

We will review the retirement experience split by three plan codes:

1. Tier IV (plan code F) – normal retirement at age 62 with reduced retirement benefits at age 55 using mandated plan retirement rates. No reduction occurs once a member accrues at least 30 years of service.
2. Chapter 19 55/25 Plan (Plan Code G) – normal retirement is age 55 with 25 years of service using elected improved plan retirement rates.
3. Chapter 19 and Chapter 504 55/27 Plan (Plan Codes H and I) – normal retirement is age 55 with 27 years of service using mandated plan retirement rates.
 - a. Chapter 504 allows reduced retirement at age 55 and requires 10 years of service.

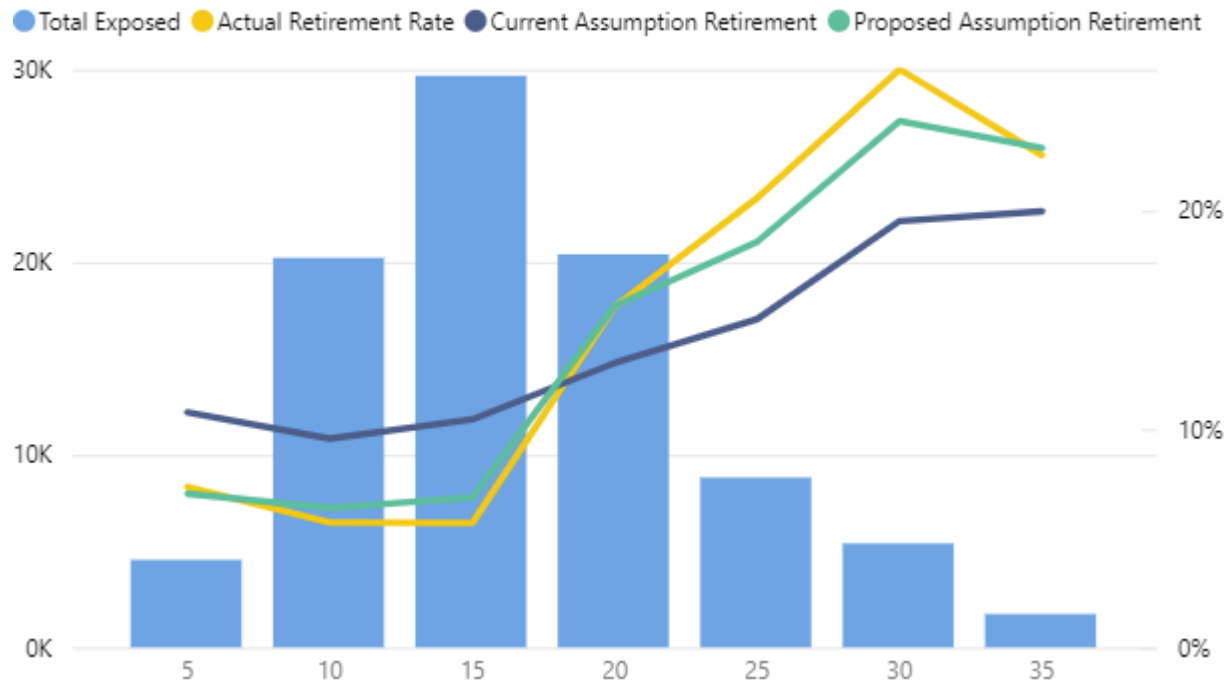
Basic Tier IV Plan (Plan F)

The following table shows the experience of Basic Tier IV Plan by service based on the age range (55 to 79) and service range (5 to 39) for the period 2016 – 2021 for all types of retirement. The actual rate of retirement averaged 11.01% whereas the overall expected rate of retirement averaged 12.01% based on the current assumptions and 11.21% based on the proposed assumptions. This resulted in an increase in the A/E ratio from 0.92 to 0.98.

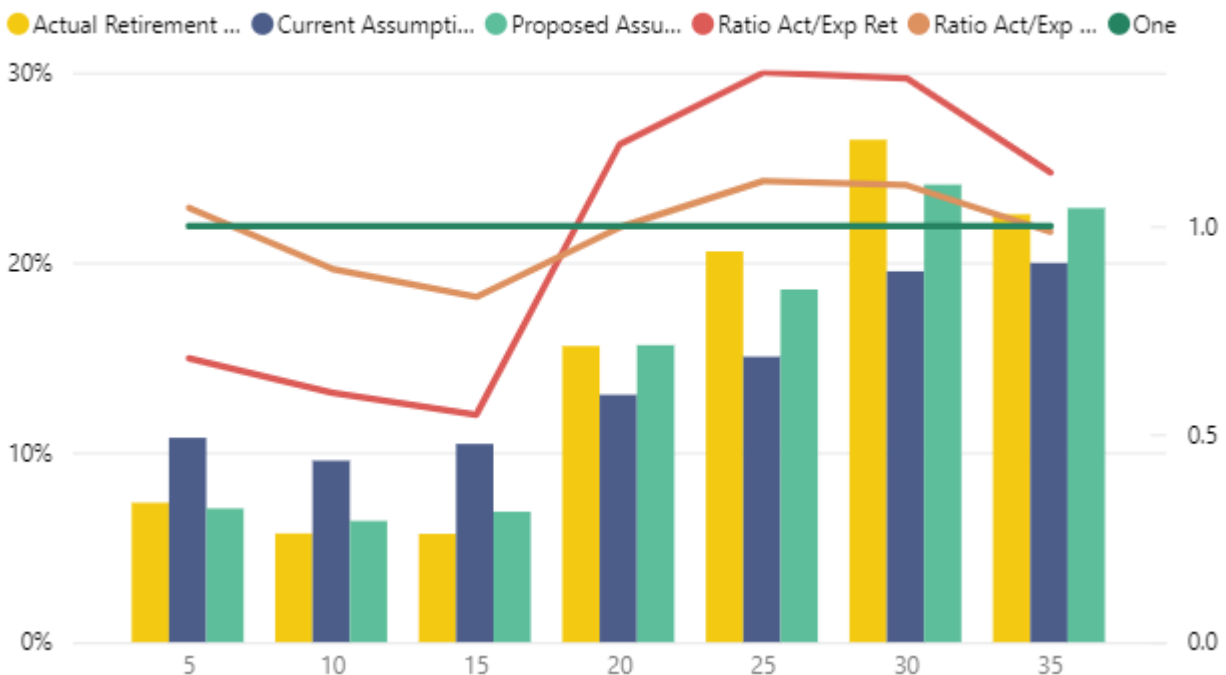
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	83	69.3	545	15.23%	12.72%	▲ 1.20
6	50	79.9	602	8.31%	13.28%	▲ 0.63
7	64	79.9	724	8.84%	11.04%	▲ 0.80
8	61	101.4	1,043	5.85%	9.72%	▲ 0.60
9	77	162.5	1,662	4.63%	9.78%	◆ 0.47
10	183	242.9	2,513	7.28%	9.67%	▲ 0.75
11	188	301.9	3,196	5.88%	9.45%	▲ 0.62
12	227	382.9	4,072	5.57%	9.40%	▲ 0.59
13	261	468.3	4,885	5.34%	9.59%	▲ 0.56
14	291	521.4	5,395	5.39%	9.66%	▲ 0.56
15	381	570.2	5,806	6.56%	9.82%	▲ 0.67
16	374	594.1	5,977	6.26%	9.94%	▲ 0.63
17	361	621.9	6,044	5.97%	10.29%	▲ 0.58
18	317	655.2	6,087	5.21%	10.76%	◆ 0.48
19	268	673.0	5,929	4.52%	11.35%	◆ 0.40
20	948	693.0	5,656	16.76%	12.25%	▲ 1.37
21	690	573.6	4,646	14.85%	12.35%	▲ 1.20
22	554	499.4	3,859	14.36%	12.94%	▲ 1.11
23	488	449.3	3,293	14.82%	13.64%	● 1.09
24	487	427.8	2,850	17.09%	15.01%	▲ 1.14
25	587	395.6	2,464	23.82%	16.05%	▲ 1.48
26	483	323.0	2,029	23.80%	15.92%	▲ 1.50
27	320	256.2	1,671	19.15%	15.33%	▲ 1.25
28	242	201.3	1,409	17.18%	14.29%	▲ 1.20
29	199	165.8	1,350	14.74%	12.28%	▲ 1.20
30	442	284.8	1,485	29.76%	19.18%	◆ 1.55
31	350	243.4	1,241	28.20%	19.61%	▲ 1.44
32	275	216.2	1,104	24.91%	19.59%	▲ 1.27
33	202	174.1	884	22.85%	19.70%	▲ 1.16
34	158	133.5	671	23.55%	19.90%	▲ 1.18
35	126	102.4	514	24.51%	19.93%	▲ 1.23
36	90	80.3	402	22.39%	19.99%	▲ 1.12
37	70	68.3	342	20.47%	19.96%	● 1.03
38	57	56.0	280	20.36%	19.99%	● 1.02
39	50	42.4	212	23.58%	20.00%	▲ 1.18
Total	10,004	10,911.4	90,842	11.01%	12.01%	● 0.92

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
5	83	68.2	545	15.23%	12.52%	▲ 1.22
6	50	49.9	602	8.31%	8.28%	● 1.00
7	64	49.5	724	8.84%	6.84%	▲ 1.29
8	61	61.4	1,043	5.85%	5.89%	● 0.99
9	77	94.6	1,662	4.63%	5.69%	▲ 0.81
10	183	163.7	2,513	7.28%	6.51%	▲ 1.12
11	188	202.8	3,196	5.88%	6.35%	● 0.93
12	227	256.6	4,072	5.57%	6.30%	▲ 0.88
13	261	310.4	4,885	5.34%	6.35%	▲ 0.84
14	291	347.1	5,395	5.39%	6.43%	▲ 0.84
15	381	378.3	5,806	6.56%	6.52%	● 1.01
16	374	395.2	5,977	6.26%	6.61%	● 0.95
17	361	409.9	6,044	5.97%	6.78%	▲ 0.88
18	317	428.4	6,087	5.21%	7.04%	▲ 0.74
19	268	438.5	5,929	4.52%	7.40%	▲ 0.61
20	948	837.0	5,656	16.76%	14.80%	▲ 1.13
21	690	688.5	4,646	14.85%	14.82%	● 1.00
22	554	598.8	3,859	14.36%	15.52%	● 0.93
23	488	538.6	3,293	14.82%	16.35%	● 0.91
24	487	510.0	2,850	17.09%	17.90%	● 0.95
25	587	499.9	2,464	23.82%	20.29%	▲ 1.17
26	483	390.5	2,029	23.80%	19.25%	▲ 1.24
27	320	312.8	1,671	19.15%	18.72%	● 1.02
28	242	247.8	1,409	17.18%	17.59%	● 0.98
29	199	207.3	1,350	14.74%	15.35%	● 0.96
30	442	386.4	1,485	29.76%	26.02%	▲ 1.14
31	350	295.6	1,241	28.20%	23.82%	▲ 1.18
32	275	262.0	1,104	24.91%	23.73%	● 1.05
33	202	203.5	884	22.85%	23.02%	● 0.99
34	158	149.2	671	23.55%	22.24%	● 1.06
35	126	114.3	514	24.51%	22.24%	▲ 1.10
36	90	90.2	402	22.39%	22.44%	● 1.00
37	70	78.0	342	20.47%	22.82%	▲ 0.90
38	57	66.2	280	20.36%	23.63%	▲ 0.86
39	50	51.4	212	23.58%	24.22%	● 0.97
Total	10,004	10,182.2	90,842	11.01%	11.21%	● 0.98

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



Retirement Rate - Actual, Expected, and Ratio; by Service

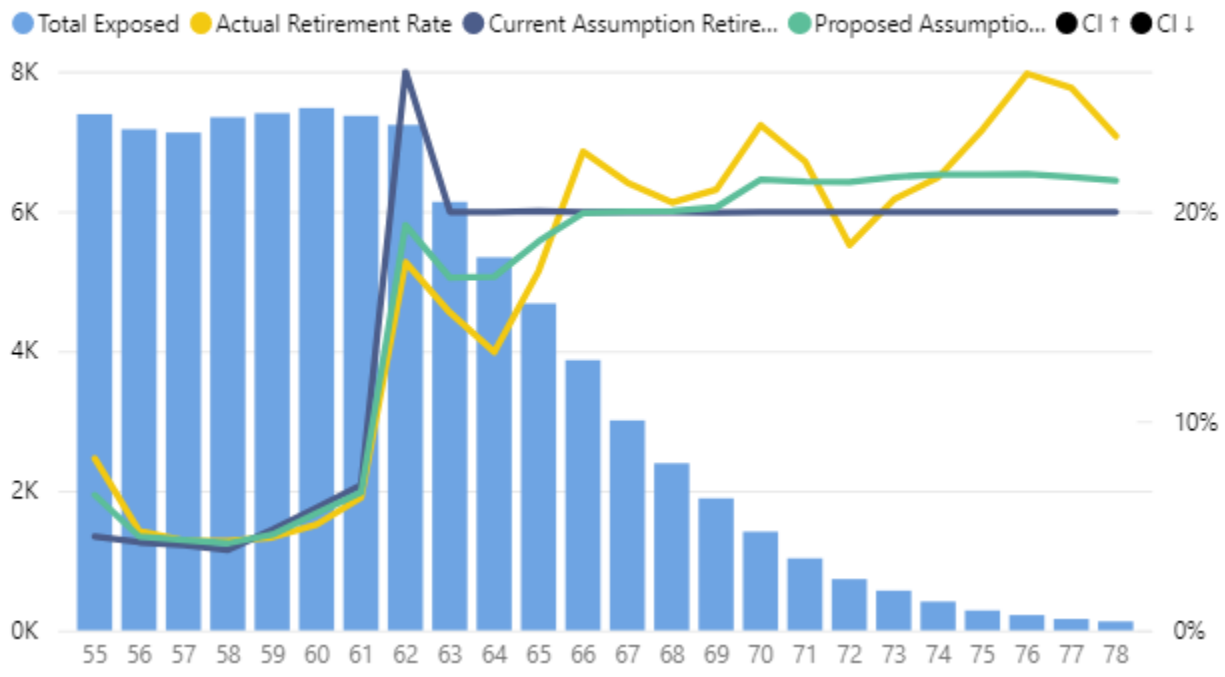


The following charts display the experience of Basic Tier IV Plan by age based on the age range (55 to 79) and service range (5 to 39) for the period 2016 – 2021 for the current and proposed assumptions.

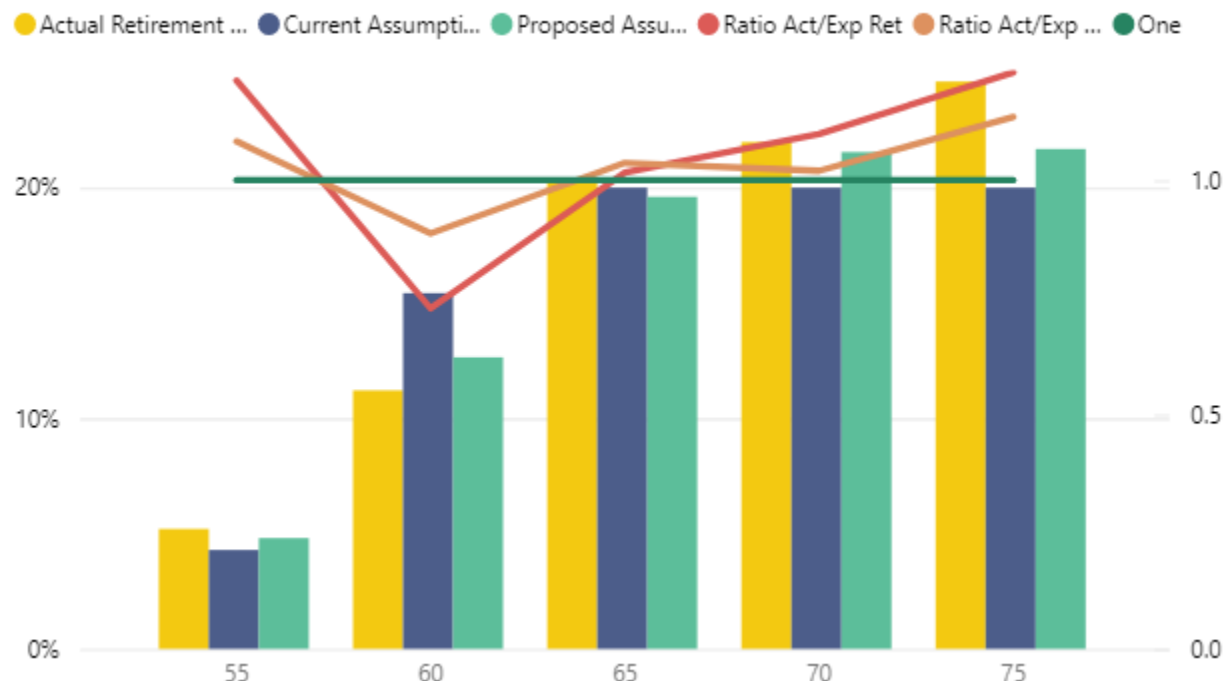
Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	607	331.0	7,388	8.22%	4.48%	1.83
56	340	301.8	7,172	4.74%	4.21%	1.13
57	306	291.2	7,124	4.30%	4.09%	1.05
58	313	282.4	7,344	4.26%	3.85%	1.11
59	329	356.0	7,402	4.44%	4.81%	0.92
60	378	437.7	7,476	5.06%	5.85%	0.86
61	468	511.7	7,364	6.36%	6.95%	0.91
62	1,273	1,932.7	7,234	17.60%	26.72%	0.66
63	931	1,225.9	6,132	15.18%	19.99%	0.76
64	710	1,067.3	5,339	13.30%	19.99%	0.67
65	804	937.8	4,678	17.19%	20.05%	0.86
66	885	773.0	3,868	22.88%	19.98%	1.14
67	643	600.5	3,005	21.40%	19.98%	1.07
68	489	477.8	2,391	20.45%	19.98%	1.02
69	398	377.3	1,889	21.07%	19.97%	1.05
70	341	282.4	1,412	24.15%	20.00%	1.21
71	231	206.0	1,030	22.43%	20.00%	1.12
72	135	146.6	733	18.42%	20.00%	0.92
73	117	113.6	568	20.60%	20.00%	1.03
74	89	82.2	411	21.65%	20.00%	1.08
75	68	56.8	284	23.94%	20.00%	1.20
76	58	43.6	218	26.61%	20.00%	1.33
77	42	32.4	162	25.93%	20.00%	1.30
78	30	25.4	127	23.62%	20.00%	1.18
79	19	18.2	91	20.88%	20.00%	1.04
Total	10,004	10,911.4	90,842	11.01%	12.01%	0.92

Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
55	607	477.7	7,388	8.22%	6.47%	▲ 1.27
56	340	321.3	7,172	4.74%	4.48%	● 1.06
57	306	307.4	7,124	4.30%	4.32%	● 1.00
58	313	305.4	7,344	4.26%	4.16%	● 1.03
59	329	338.4	7,402	4.44%	4.57%	● 0.97
60	378	418.0	7,476	5.06%	5.59%	● 0.90
61	468	486.5	7,364	6.36%	6.61%	● 0.96
62	1,273	1,401.4	7,234	17.60%	19.37%	● 0.91
63	931	1,033.9	6,132	15.18%	16.86%	● 0.90
64	710	902.3	5,339	13.30%	16.90%	▲ 0.79
65	804	869.9	4,678	17.19%	18.60%	● 0.92
66	885	771.2	3,868	22.88%	19.94%	▲ 1.15
67	643	601.4	3,005	21.40%	20.01%	● 1.07
68	489	479.4	2,391	20.45%	20.05%	● 1.02
69	398	381.9	1,889	21.07%	20.22%	● 1.04
70	341	304.3	1,412	24.15%	21.55%	▲ 1.12
71	231	220.9	1,030	22.43%	21.45%	● 1.05
72	135	157.1	733	18.42%	21.43%	▲ 0.86
73	117	123.1	568	20.60%	21.67%	● 0.95
74	89	89.6	411	21.65%	21.79%	● 0.99
75	68	61.9	284	23.94%	21.79%	● 1.10
76	58	47.6	218	26.61%	21.81%	▲ 1.22
77	42	35.1	162	25.93%	21.67%	▲ 1.20
78	30	27.3	127	23.62%	21.50%	● 1.10
79	19	19.4	91	20.88%	21.29%	● 0.98
Total	10,004	10,182.2	90,842	11.01%	11.21%	● 0.98

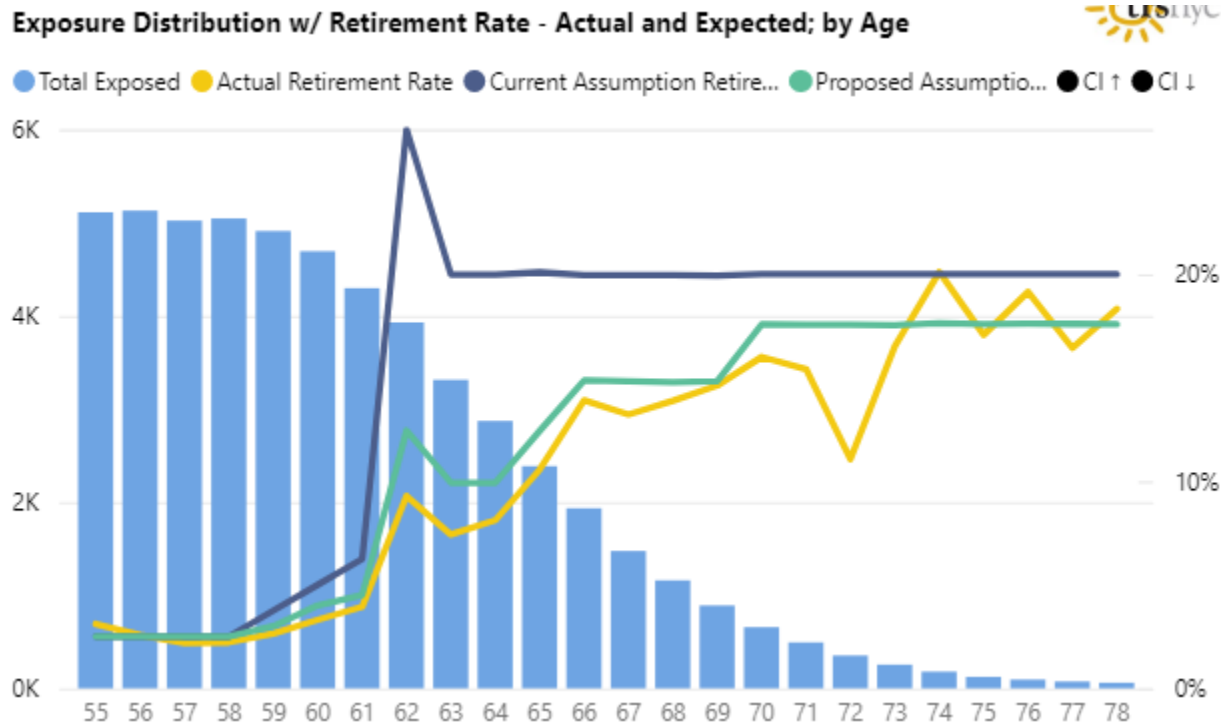
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



Retirement Rate - Actual, Expected, and Ratio; by Age

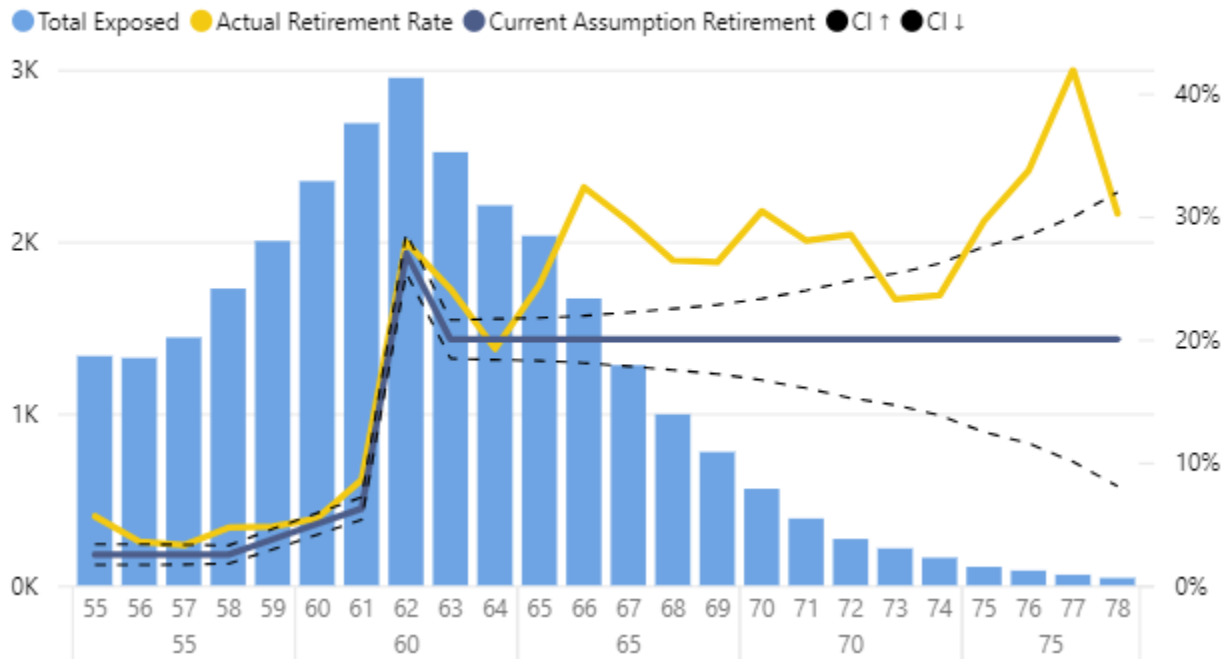


This chart shows the results by age for the service range 5 to 19 years, which decreased the assumed rate of retirement from 10.14% to 6.71% as compared to the actual rate of 5.85%. This resulted in an increase in the A/E ratio from 0.58 to 0.87 for ages 55 to 79. For early retirement ages 55 to 61, the A/E ratio increased from 0.81 to 0.93 and for normal retirement ages 62 to 79, the A/E ratio increased from 0.51 to 0.85.



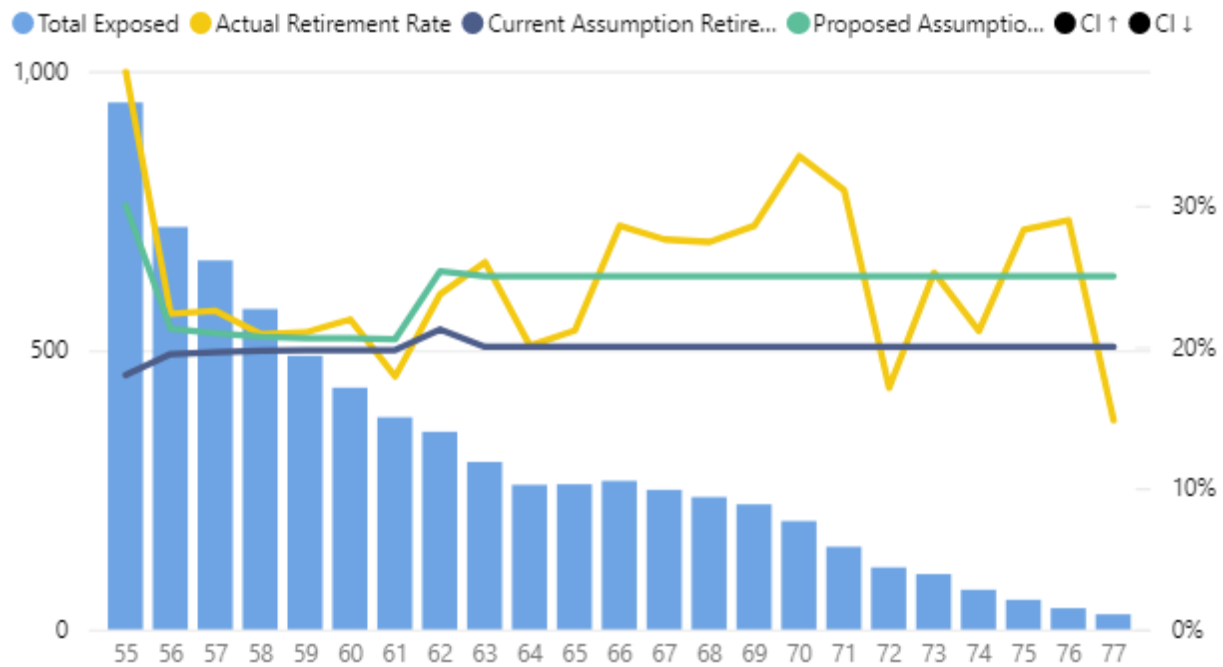
This chart shows the results by age for the service range 20 to 29 years, which increased the assumed rate of retirement from 13.63% to 16.53% as compared to the actual rate of 17.10%. This resulted in a decrease in the A/E ratio from 1.25 to 1.03 for ages 55 to 79. For early retirement ages 55 to 61, the A/E ratio decreased from 1.39 to 1.07 and for normal retirement ages 62 to 79, the A/E ratio decreased from 1.23 to 1.03.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



This chart shows the results by age for the service range 30 to 39 years, which increased the assumed rate of retirement from 19.64% to 23.78% as compared to the actual rate of 25.51%. This resulted in a decrease in the A/E ratio from 1.30 to 1.07 for unreduced retirement ages 55 to 79.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



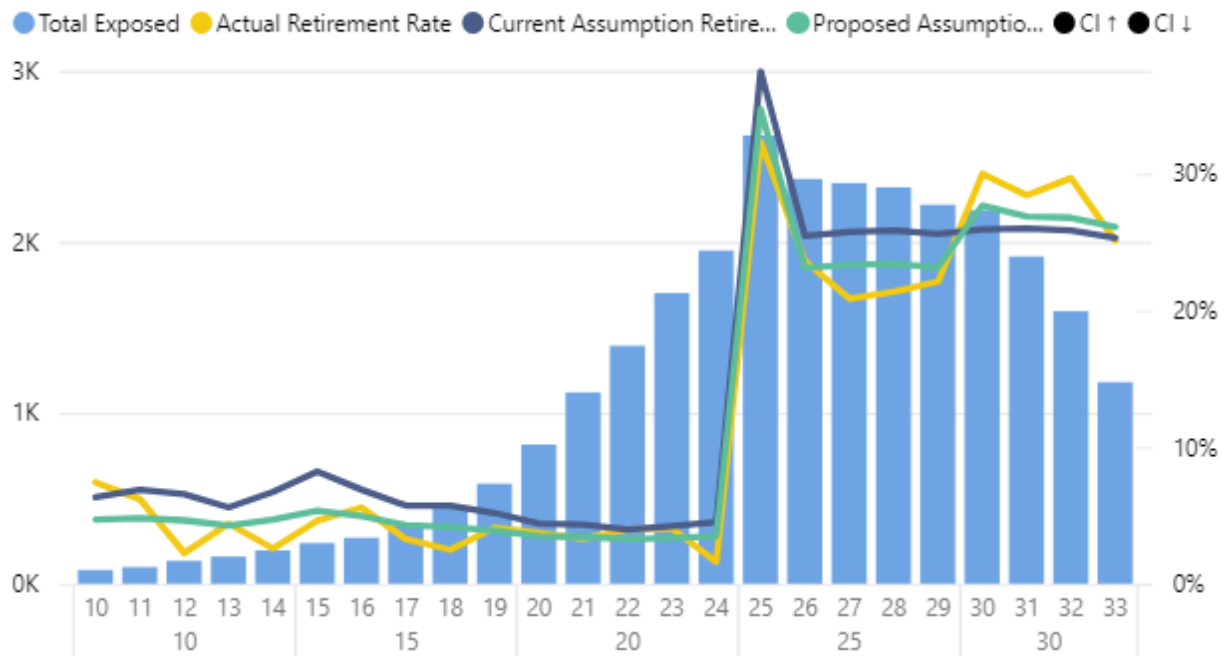
Age 55 and 25 Plan (Plan G)

The following table shows the experience of the Age 55 and 25 Plan by service based on the age range (55 to 69) and service range (10 to 39) for the period 2016 – 2021 for all types of retirement. The actual rate of retirement averaged 18.75% whereas the overall expected rate of retirement averaged 20.10% based on the current assumptions and 19.10% based on the proposed assumptions.

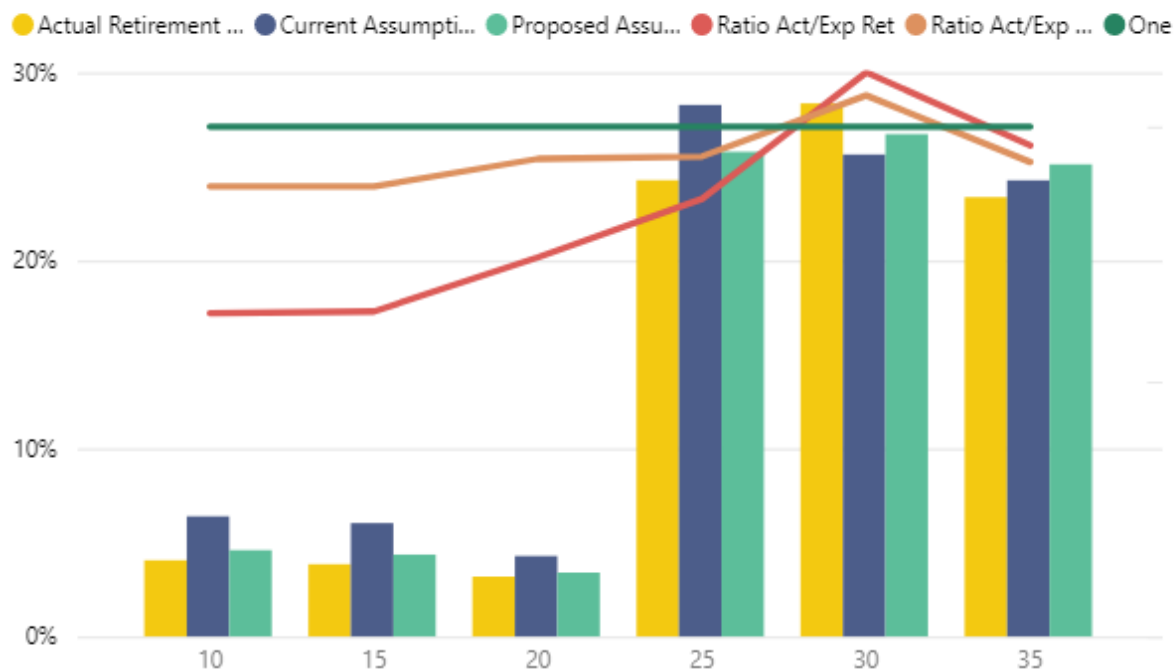
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
10	6	5.1	81	7.41%	6.33%	▲ 1.17
11	6	6.7	97	6.19%	6.88%	▲ 0.90
12	3	8.8	134	2.24%	6.55%	◆ 0.34
13	7	8.9	159	4.40%	5.59%	▲ 0.79
14	5	13.1	195	2.56%	6.72%	◆ 0.38
15	11	19.6	238	4.62%	8.22%	▲ 0.56
16	15	18.5	269	5.58%	6.87%	▲ 0.81
17	11	19.3	338	3.25%	5.72%	▲ 0.57
18	11	25.3	443	2.48%	5.71%	◆ 0.44
19	24	30.3	585	4.10%	5.18%	▲ 0.79
20	30	35.8	814	3.69%	4.40%	▲ 0.84
21	37	48.3	1,119	3.31%	4.32%	▲ 0.77
22	55	55.0	1,392	3.95%	3.95%	● 1.00
23	69	71.4	1,700	4.06%	4.20%	● 0.97
24	31	88.0	1,949	1.59%	4.52%	◆ 0.35
25	848	983.7	2,622	32.34%	37.52%	▲ 0.86
26	559	602.3	2,368	23.61%	25.43%	● 0.93
27	489	603.5	2,344	20.86%	25.75%	▲ 0.81
28	495	599.3	2,319	21.35%	25.84%	▲ 0.83
29	490	567.3	2,217	22.10%	25.59%	▲ 0.86
30	655	566.5	2,185	29.98%	25.92%	▲ 1.16
31	544	497.4	1,914	28.42%	25.99%	● 1.09
32	473	412.1	1,594	29.67%	25.85%	▲ 1.15
33	296	298.4	1,179	25.11%	25.31%	● 0.99
34	228	210.9	872	26.15%	24.19%	● 1.08
35	131	137.3	570	22.98%	24.10%	● 0.95
36	89	91.9	379	23.48%	24.25%	● 0.97
37	57	56.7	232	24.57%	24.42%	● 1.01
38	30	33.7	135	22.22%	24.93%	▲ 0.89
39	19	18.9	79	24.05%	23.95%	● 1.00
Total	5,724	6,134.0	30,522	18.75%	20.10%	● 0.93

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
10	6	3.8	81	7.41%	4.70%	1.58
11	6	4.7	97	6.19%	4.79%	1.29
12	3	6.2	134	2.24%	4.63%	0.48
13	7	6.8	159	4.40%	4.26%	1.03
14	5	9.1	195	2.56%	4.69%	0.55
15	11	12.7	238	4.62%	5.35%	0.86
16	15	13.3	269	5.58%	4.93%	1.13
17	11	14.5	338	3.25%	4.29%	0.76
18	11	18.3	443	2.48%	4.13%	0.60
19	24	22.8	585	4.10%	3.90%	1.05
20	30	28.4	814	3.69%	3.49%	1.06
21	37	38.4	1,119	3.31%	3.43%	0.96
22	55	45.6	1,392	3.95%	3.27%	1.21
23	69	56.9	1,700	4.06%	3.34%	1.21
24	31	67.8	1,949	1.59%	3.48%	0.46
25	848	910.2	2,622	32.34%	34.72%	0.93
26	559	547.5	2,368	23.61%	23.12%	1.02
27	489	546.4	2,344	20.86%	23.31%	0.89
28	495	542.6	2,319	21.35%	23.40%	0.91
29	490	513.2	2,217	22.10%	23.15%	0.95
30	655	604.7	2,185	29.98%	27.67%	1.08
31	544	513.9	1,914	28.42%	26.85%	1.06
32	473	426.7	1,594	29.67%	26.77%	1.11
33	296	307.6	1,179	25.11%	26.09%	0.96
34	228	216.4	872	26.15%	24.82%	1.05
35	131	140.5	570	22.98%	24.66%	0.93
36	89	95.0	379	23.48%	25.06%	0.94
37	57	58.8	232	24.57%	25.34%	0.97
38	30	35.3	135	22.22%	26.14%	0.85
39	19	20.8	79	24.05%	26.28%	0.92
Total	5,724	5,828.9	30,522	18.75%	19.10%	0.98

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



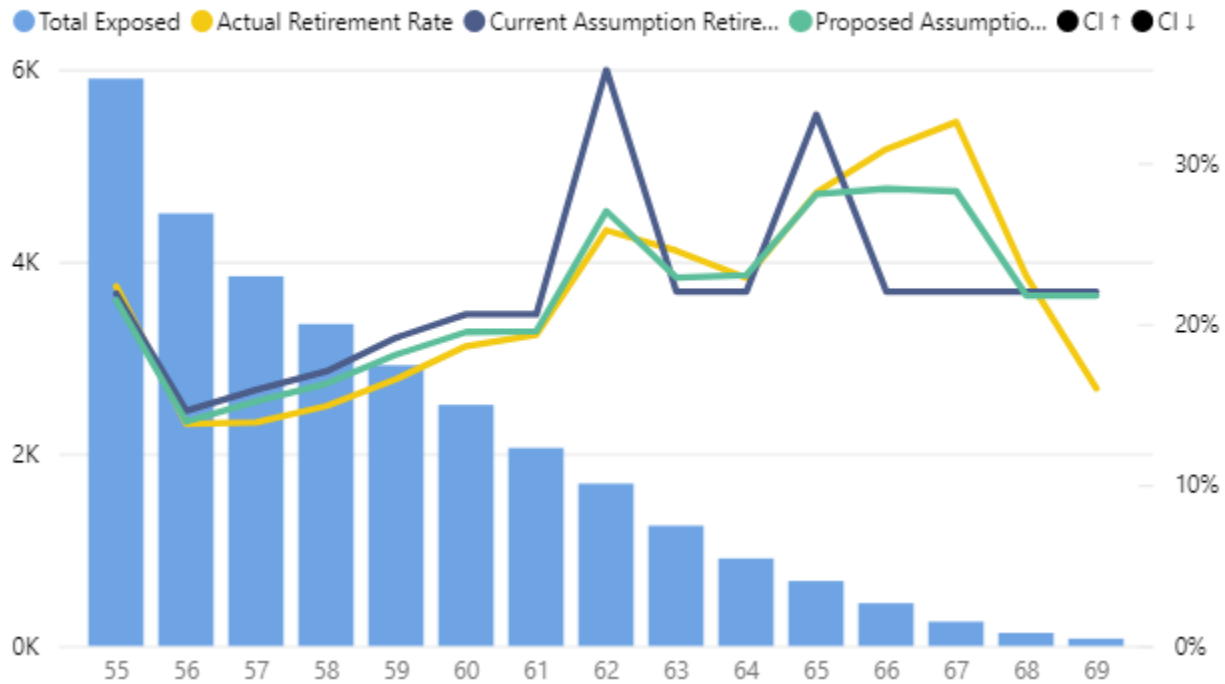
Retirement Rate - Actual, Expected, and Ratio; by Service



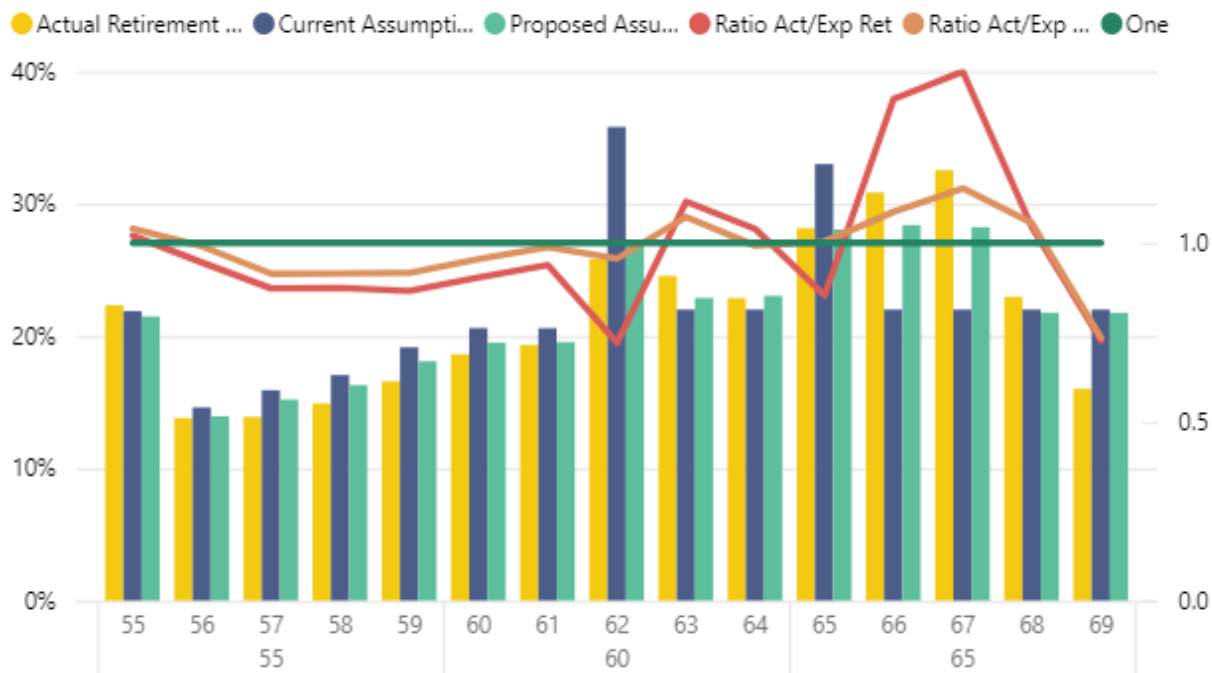
The following table shows the experience of the Age 55 and 25 Plan by age based on the age range (55 to 69) and service range (10 to 39) for the period 2016 – 2021 for all types of retirement.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	1,318	1,291.7	5,904	22.32%	21.88%	1.02
56	621	657.1	4,501	13.80%	14.60%	0.95
57	534	611.7	3,847	13.88%	15.90%	0.87
58	499	571.0	3,350	14.90%	17.04%	0.87
59	484	559.2	2,921	16.57%	19.15%	0.87
60	467	516.7	2,508	18.62%	20.60%	0.90
61	398	424.2	2,060	19.32%	20.59%	0.94
62	436	604.8	1,689	25.81%	35.81%	0.72
63	307	275.2	1,251	24.54%	22.00%	1.12
64	208	200.2	910	22.86%	22.00%	1.04
65	190	222.7	675	28.15%	33.00%	0.85
66	137	97.7	444	30.86%	22.00%	1.40
67	82	55.4	252	32.54%	22.00%	1.48
68	31	29.7	135	22.96%	22.00%	1.04
69	12	16.5	75	16.00%	22.00%	0.73
Total	5,724	6,134.0	30,522	18.75%	20.10%	0.93
Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
55	1,318	1,267.9	5,904	22.32%	21.47%	1.04
56	621	627.0	4,501	13.80%	13.93%	0.99
57	534	584.5	3,847	13.88%	15.19%	0.91
58	499	545.5	3,350	14.90%	16.28%	0.91
59	484	528.4	2,921	16.57%	18.09%	0.92
60	467	489.0	2,508	18.62%	19.50%	0.96
61	398	402.5	2,060	19.32%	19.54%	0.99
62	436	456.0	1,689	25.81%	27.00%	0.96
63	307	286.2	1,251	24.54%	22.88%	1.07
64	208	209.6	910	22.86%	23.03%	0.99
65	190	189.4	675	28.15%	28.05%	1.00
66	137	126.1	444	30.86%	28.39%	1.09
67	82	71.2	252	32.54%	28.23%	1.15
68	31	29.4	135	22.96%	21.76%	1.06
69	12	16.3	75	16.00%	21.76%	0.74
Total	5,724	5,828.9	30,522	18.75%	19.10%	0.98

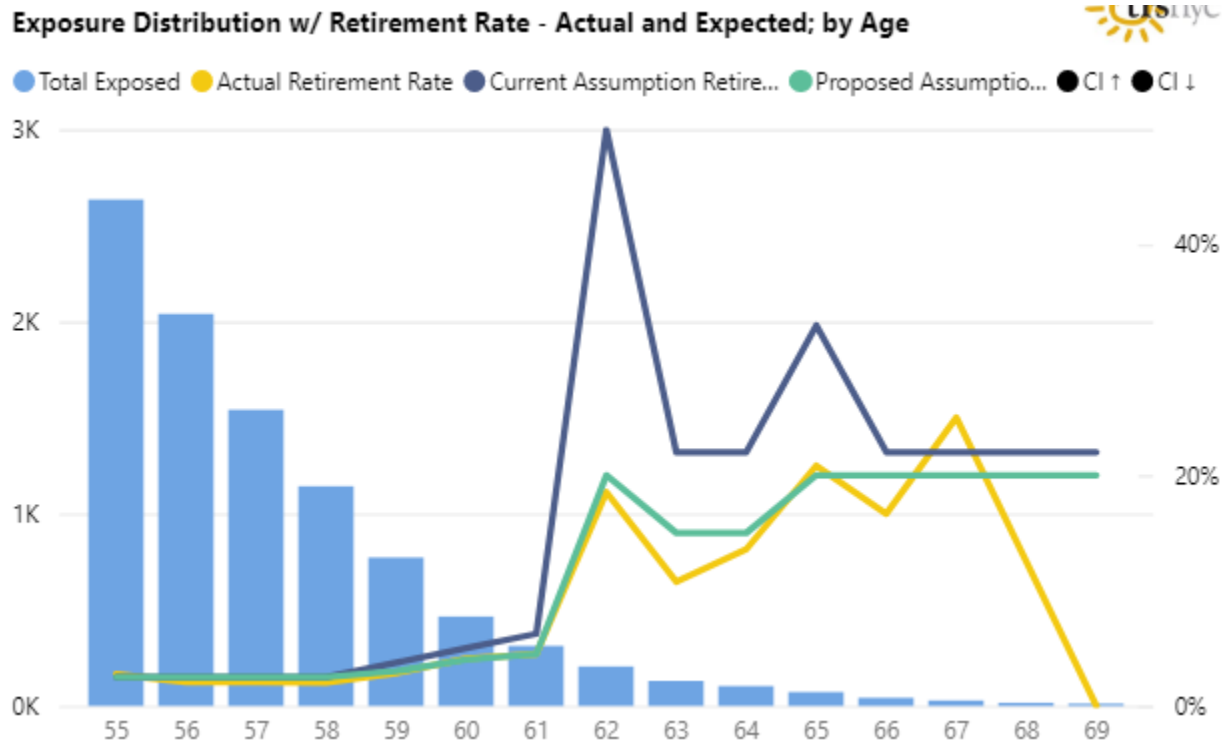
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



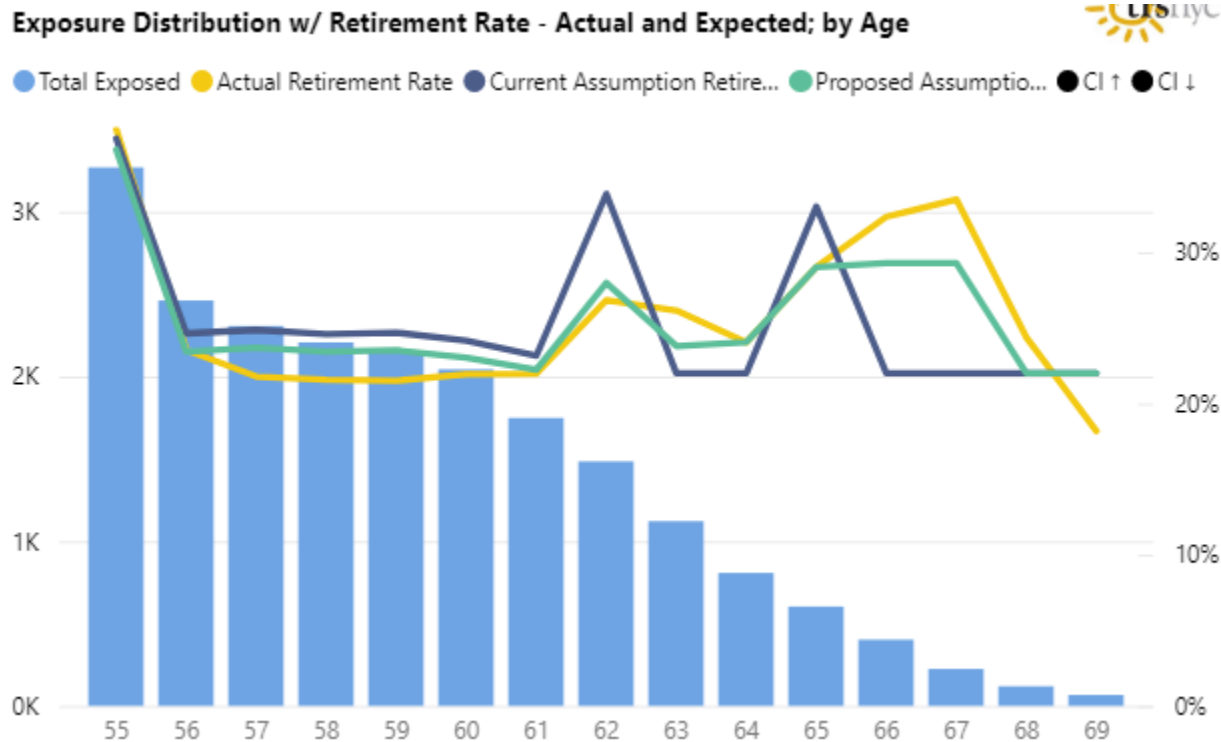
Retirement Rate - Actual, Expected, and Ratio; by Age



This chart shows the results by age for the service range 10 to 24 years, which decreased the assumed rate of retirement from 4.77% to 3.67% as compared to the actual rate of 3.37%. This resulted in an increase in the A/E ratio from 0.71 to 0.92 for ages 55 to 79. For early retirement ages 55 to 61, the A/E ratio increased from 0.88 to 0.93 and for normal retirement ages 62 to 69, the A/E ratio increased from 0.49 to 0.89.



This chart shows the results by age for the service range 25 to 39 years, which decreased the assumed rate of retirement from 27.04% to 26.08% as compared to the actual rate of 25.72%. This resulted in an increase in the A/E ratio from 0.95 to 0.99 for unreduced retirement ages 55 to 69.



Age 55 and 27 Plan (Plans H and I)

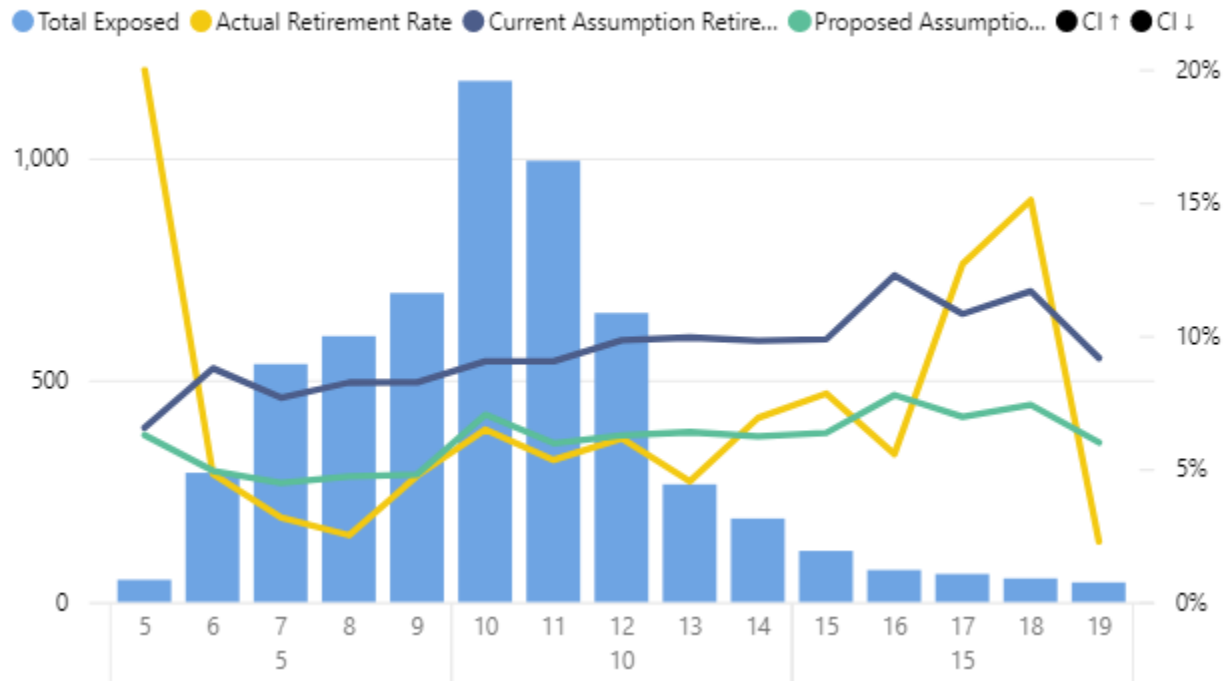
The following table shows the experience of the Age 55 and 27 Plan (Ch 19/08 – 55/27 [Mandatory]) by service based on the age range (55 to 69) and service range (5 to 19) for the period 2016 – 2021 for all types of retirement. There was nearly no experience for service periods in excess of 19 years and so it was excluded from the analysis. The proposed assumptions reflect experience from the Basic Tier IV Plan adjusted for these plan provisions accordingly.

The actual rate of retirement averaged 5.40% whereas the overall expected rate of retirement averaged 8.96% based on the current assumptions and 5.84% based on the proposed assumptions.

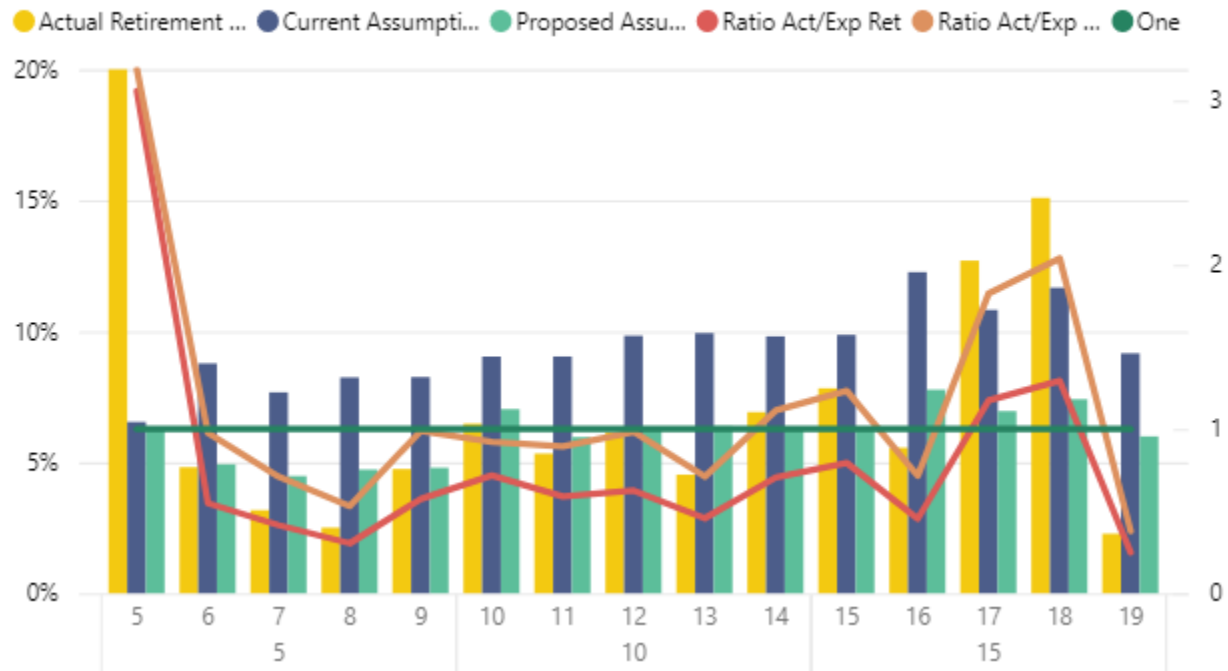
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	10	3.3	50	20.00%	6.54%	3.06
6	14	25.5	291	4.81%	8.77%	0.55
7	17	41.1	536	3.17%	7.67%	0.41
8	15	49.4	599	2.50%	8.24%	0.30
9	33	57.4	696	4.74%	8.25%	0.57
10	76	106.1	1,174	6.47%	9.04%	0.72
11	53	89.8	994	5.33%	9.04%	0.59
12	40	64.0	651	6.14%	9.83%	0.62
13	12	26.3	265	4.53%	9.93%	0.46
14	13	18.4	188	6.91%	9.81%	0.70
15	9	11.3	115	7.83%	9.86%	0.79
16	4	8.8	72	5.56%	12.26%	0.45
17	8	6.8	63	12.70%	10.82%	1.17
18	8	6.2	53	15.09%	11.67%	1.29
19	1	4.0	44	2.27%	9.16%	0.25
Total	313	518.6	5,791	5.40%	8.96%	0.60

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
5	10	3.1	50	20.00%	6.27%	3.19
6	14	14.3	291	4.81%	4.92%	0.98
7	17	24.0	536	3.17%	4.47%	0.71
8	15	28.3	599	2.50%	4.72%	0.53
9	33	33.3	696	4.74%	4.79%	0.99
10	76	82.5	1,174	6.47%	7.03%	0.92
11	53	59.2	994	5.33%	5.96%	0.89
12	40	40.7	651	6.14%	6.26%	0.98
13	12	16.9	265	4.53%	6.38%	0.71
14	13	11.7	188	6.91%	6.22%	1.11
15	9	7.3	115	7.83%	6.35%	1.23
16	4	5.6	72	5.56%	7.77%	0.71
17	8	4.4	63	12.70%	6.95%	1.83
18	8	3.9	53	15.09%	7.41%	2.04
19	1	2.6	44	2.27%	5.99%	0.38
Total	313	338.0	5,791	5.40%	5.84%	0.93

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



Retirement Rate - Actual, Expected, and Ratio; by Service



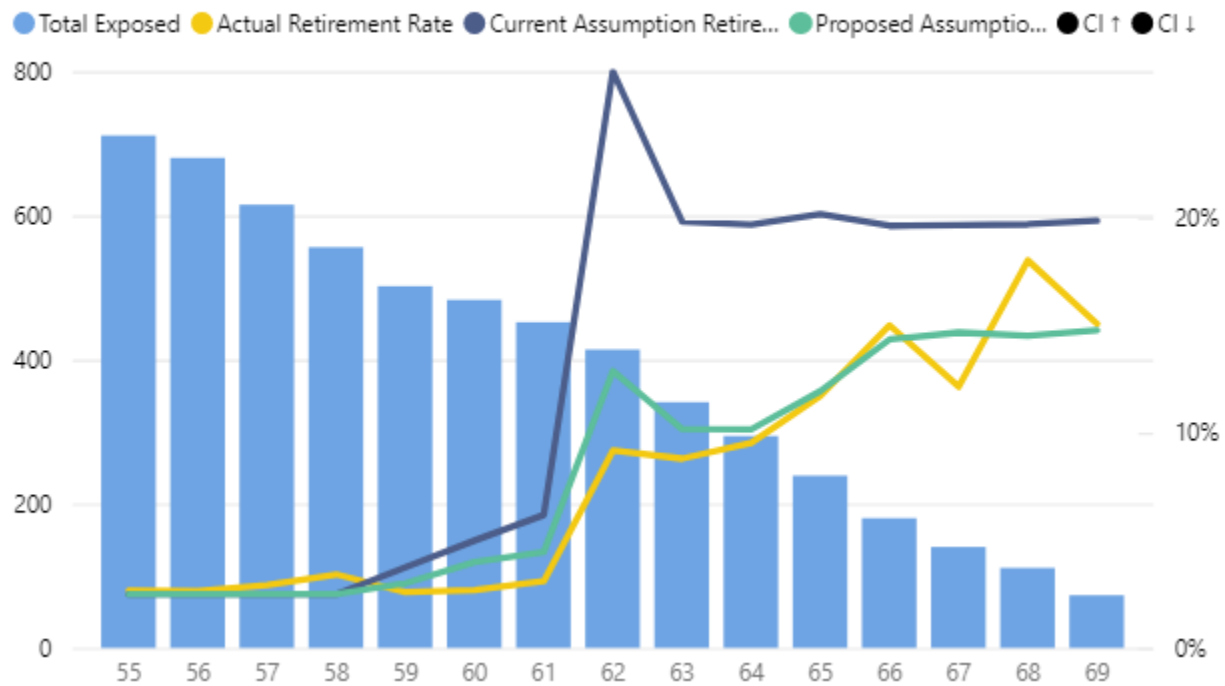
The following table shows the experience of the Age 55 and 27 Plan (Ch 19/08 – 55/27 [Mandatory]) by age based on the age range (55 to 69) and service range (5 to 19) for the period 2016 – 2021 for all types of retirement.

Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

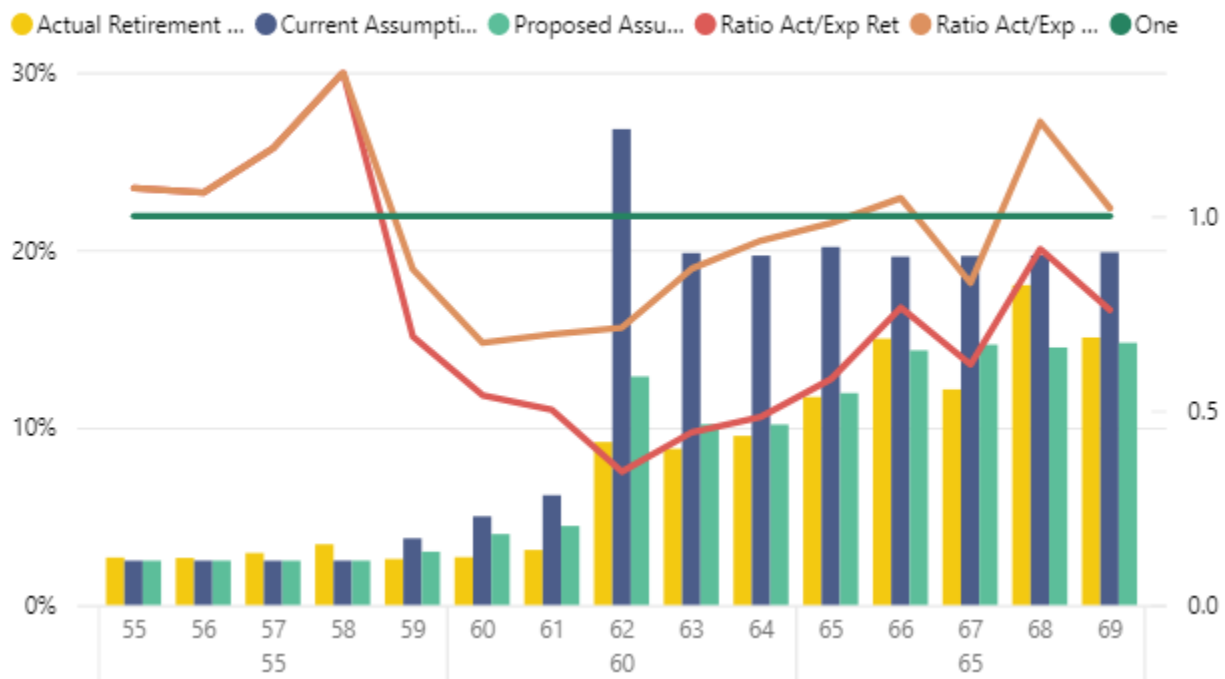
Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	19	17.7	711	2.67%	2.49%	1.07
56	18	17.0	680	2.65%	2.50%	1.06
57	18	15.3	615	2.93%	2.49%	1.17
58	19	13.9	556	3.42%	2.50%	1.37
59	13	18.8	502	2.59%	3.75%	0.69
60	13	24.1	483	2.69%	4.99%	0.54
61	14	27.9	452	3.10%	6.18%	0.50
62	38	111.0	414	9.18%	26.80%	0.34
63	30	67.6	341	8.80%	19.82%	0.44
64	28	57.9	294	9.52%	19.68%	0.48
65	28	48.2	239	11.72%	20.17%	0.58
66	27	35.3	180	15.00%	19.62%	0.76
67	17	27.5	140	12.14%	19.66%	0.62
68	20	21.9	111	18.02%	19.69%	0.91
69	11	14.5	73	15.07%	19.86%	0.76
Total	313	518.6	5,791	5.40%	8.96%	0.60

Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
55	19	17.7	711	2.67%	2.49%	1.07
56	18	17.0	680	2.65%	2.50%	1.06
57	18	15.3	615	2.93%	2.49%	1.17
58	19	13.9	556	3.42%	2.50%	1.37
59	13	15.1	502	2.59%	3.00%	0.86
60	13	19.3	483	2.69%	3.99%	0.67
61	14	20.1	452	3.10%	4.45%	0.70
62	38	53.3	414	9.18%	12.87%	0.71
63	30	34.7	341	8.80%	10.18%	0.86
64	28	29.9	294	9.52%	10.16%	0.94
65	28	28.5	239	11.72%	11.94%	0.98
66	27	25.8	180	15.00%	14.34%	1.05
67	17	20.5	140	12.14%	14.66%	0.83
68	20	16.1	111	18.02%	14.50%	1.24
69	11	10.8	73	15.07%	14.77%	1.02
Total	313	338.0	5,791	5.40%	5.84%	0.93

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age

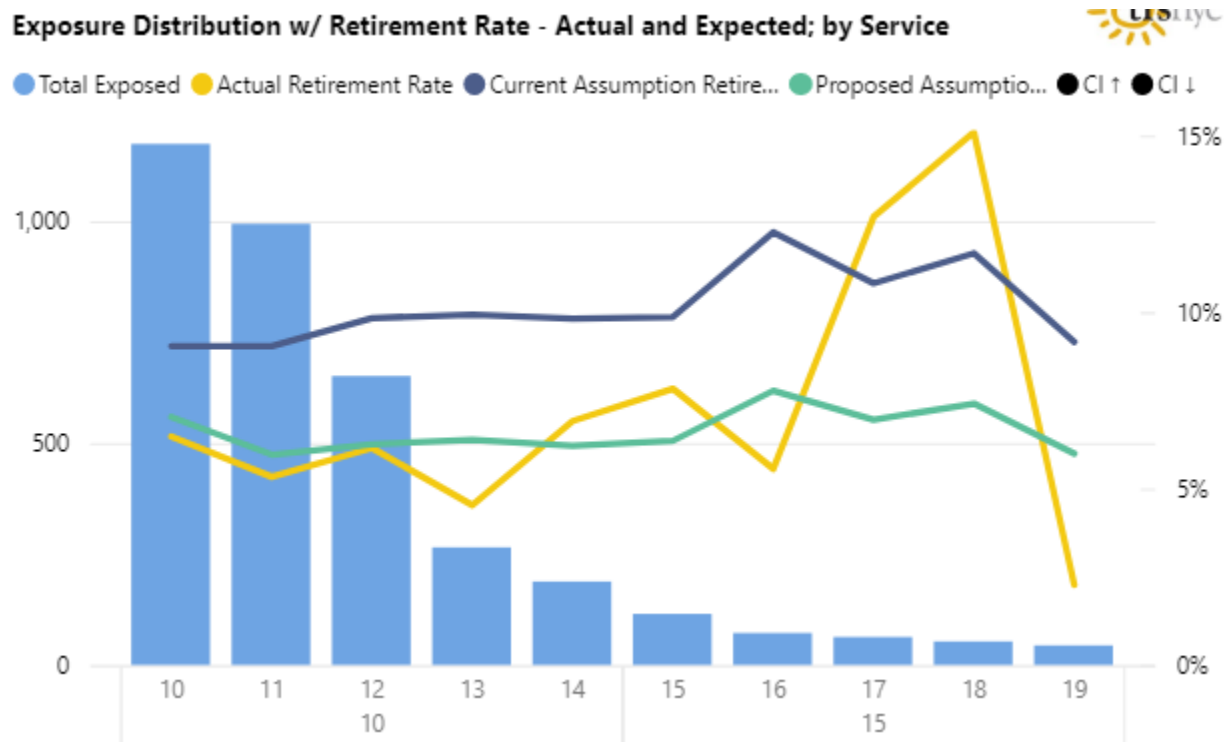


Retirement Rate - Actual, Expected, and Ratio; by Age



The following table shows the experience of the Age 55 and 27 Plan (Ch 504/09 – 55/27 [Mandatory])) by age based on the age range (55 to 69) and service range (10 to 19) for the period 2016 – 2021 for all types of retirement. Since 10 years of service was required for retirement during the study period, service prior to 10 years was excluded. Nearly all of the retirement experience occurred for service periods 10 - 12 years. The proposed assumptions reflect experience from 55 and 27 Plan H and the Basic Tier IV Plan adjusted for these plan provisions accordingly.

The actual rate of retirement averaged 6.19% whereas the overall expected rate of retirement averaged 9.45% based on the current assumptions and 6.49% based on the proposed assumptions.



Summary

In total, the proposed rates of retirement have decreased the anticipated number of retirements. Typically, lower rates of retirement will result in a decrease in plan liabilities. However, higher assumptions are proposed for members with at least 20 years of service essentially increase the number of members retiring with a 2% benefit accrual which would lead to higher plan liabilities. The actual impact will depend on the demographics of the active membership.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF SERVICE RETIREMENT					
Age	Reduced Service Retirement	Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program		Unreduced Service Retirement Probabilities For Members Who Elected an Improved Retirement Program	
		Year 1	Ultimate	Year 1	Ultimate
55	2.50%	18.00%	0.00%	37.50%	0.00%
56	2.50%	18.00%	20.00%	37.50%	22.00%
57	2.50%	18.00%	20.00%	37.50%	22.00%
58	2.50%	18.00%	20.00%	37.50%	22.00%
59	3.75%	18.00%	20.00%	37.50%	22.00%
60	5.00%	18.00%	20.00%	37.50%	22.00%
61	6.25%	18.00%	20.00%	37.50%	22.00%
62	0.00% ¹	27.00% ²	20.00%	50.00%	33.00%
63	0.00%	18.00% ³	20.00%	37.50%	22.00%
64	0.00%	18.00%	20.00%	37.50%	22.00%
65	0.00%	27.00%	20.00%	50.00%	33.00%
66	0.00%	18.00%	20.00%	37.50%	22.00%
67	0.00%	18.00%	20.00%	37.50%	22.00%
68	0.00%	18.00%	20.00%	37.50%	22.00%
69	0.00%	18.00%	20.00%	37.50%	22.00%
70	0.00%	20.00%	20.00%	37.50%	22.00%
71	0.00%	20.00%	20.00%	37.50%	22.00%
72	0.00%	20.00%	20.00%	37.50%	22.00%
73	0.00%	20.00%	20.00%	37.50%	22.00%
74	0.00%	20.00%	20.00%	37.50%	22.00%
75	0.00%	20.00%	20.00%	37.50%	22.00%
76	0.00%	20.00%	20.00%	37.50%	22.00%
77	0.00%	20.00%	20.00%	37.50%	22.00%
78	0.00%	20.00%	20.00%	37.50%	22.00%
79	0.00%	20.00%	20.00%	37.50%	22.00%
80	N/A	100.00%	100.00%	100.00%	100.00%

¹ 7.50% only applies to Tier 6 members; 0.00% otherwise.

² 27.00% for Tier 1, 2, & 4 members and 18.00% for Tier 6 members.

³ 18.00% for Tier 1, 2, & 4 members and 27.00% for Tier 6 members.

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM						
PROBABILITIES OF SERVICE RETIREMENT						
Age	Reduced Service Retirement		Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program			
	<20 YOS ¹	>= 20 YOS	< 10 YOS ³	10 - 19 YOS	20 - 29 YOS	>= 30 YOS ⁵
55	2.50%	5.00%	N/A	N/A	N/A	30.00%
56	2.50%	3.00%	N/A	N/A	N/A	20.00% ⁶
57	2.50%	3.00%	N/A	N/A	N/A	20.00% ⁶
58	2.50%	3.50%	N/A	N/A	N/A	20.00% ⁶
59	3.00%	4.50%	N/A	N/A	N/A	20.00% ⁶
60	4.00%	6.00%	N/A	N/A	N/A	20.00% ⁶
61	4.50%	8.00%	N/A	N/A	N/A	20.00% ⁶
62	0.00% ²	0.00% ²	10.00%	12.50%	27.00% ⁴	25.00% ⁶
63	0.00%	0.00%	8.00%	10.00% ⁷	25.00% ⁷	25.00% ⁷
64	0.00%	0.00%	8.00%	10.00%	25.00%	25.00%
65	0.00%	0.00%	10.00%	12.50%	25.00%	25.00%
66	0.00%	0.00%	12.00%	15.00%	25.00%	25.00%
67	0.00%	0.00%	12.00%	15.00%	25.00%	25.00%
68	0.00%	0.00%	12.00%	15.00%	25.00%	25.00%
69	0.00%	0.00%	12.00%	15.00%	25.00%	25.00%
70	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
71	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
72	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
73	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
74	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
75	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
76	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
77	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
78	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
79	0.00%	0.00%	17.50%	17.50%	25.00%	25.00%
80+	N/A	N/A	100.00%	100.00%	100.00%	100.00%

¹ Applies to improved plan members at 20 or more years of service

² 6.00% and 10.00% only apply to Tier 6 members with less than or at least 20 years of service, respectively; 0.00% otherwise.

³ 20.00% at 5 years of service, except 25% at age 62

⁴ 35.00% at 25 years of service

⁵ Apply at 27 years of service for Ch. 504 55/27 Plans

⁶ 25.00% at 30 years of service until age 62; 27% at age 62 and 30 years of service (adjustments apply at 27 years for Chapter 504 55/27 Plans)

⁷ Age 62 rates of 12.5% and 27%, apply to age 63 to Tier 6 members, including adjustments specified in footnotes 3,4, 6

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
PROBABILITIES OF SERVICE RETIREMENT				
Age	Unreduced Service Retirement Probabilities For Members Who Elected an Improved Retirement Program			
	< 10 YOS	10 - 24 YOS	25 - 29 YOS	>= 30 YOS
55	N/A	N/A	35.00%	40.00%
56	N/A	N/A	20.00% ⁸	22.00% ⁹
57	N/A	N/A	20.00% ⁸	22.00% ⁹
58	N/A	N/A	20.00% ⁸	22.00% ⁹
59	N/A	N/A	20.00% ⁸	22.00% ⁹
60	N/A	N/A	20.00% ⁸	22.00% ⁹
61	N/A	N/A	20.00% ⁸	22.00% ⁹
62	16.00%	20.00%	25.00% ⁸	30.00%
63	12.00%	15.00%	22.00%	25.00%
64	12.00%	15.00%	22.00%	25.00%
65	16.00%	20.00%	25.00%	30.00%
66	16.00%	20.00%	25.00%	30.00%
67	16.00%	20.00%	25.00%	30.00%
68	16.00%	20.00%	22.00%	22.00%
69	16.00%	20.00%	22.00%	22.00%
70	100.00%	100.00%	100.00%	100.00%
71	100.00%	100.00%	100.00%	100.00%
72	100.00%	100.00%	100.00%	100.00%
73	100.00%	100.00%	100.00%	100.00%
74	100.00%	100.00%	100.00%	100.00%
75	100.00%	100.00%	100.00%	100.00%
76	100.00%	100.00%	100.00%	100.00%
77	100.00%	100.00%	100.00%	100.00%
78	100.00%	100.00%	100.00%	100.00%
79	100.00%	100.00%	100.00%	100.00%
80+	100.00%	100.00%	100.00%	100.00%

⁸ 35.00% at 25 years of service

⁹ 24.00% at 30 years of service

Disability

The current ordinary and accidental disability assumptions vary by age and gender. The ordinary disability benefit is equal to $1/60$ times final average salary for each year of service accrued but no less than $1/3$ of the member's final average salary. The accidental disability retirement is $2/3$ of the final average salary. The benefit is payable during the lifetime of the member and members may select any optional form of payment. For members eligible for retirement, the greater of the service retirement benefit and the disability retirement benefit is payable. For members who have accrued at least 20 years of service, the service retirement benefit exceeds the ordinary disability retirement benefit if the member has met the conditions for an unreduced retirement benefit.

Due to this fact, rates of ordinary disability were determined excluding the experience for members eligible for unreduced retirement and the 2% benefit accrual formula. Therefore, we propose the rates of ordinary disability do not apply upon attainment of age 62 and completion of 20 years of service or other criteria to receive an unreduced retirement benefit that varies by Plan (55 and 30 for Basic Plan; 55 and 25 for Plan G and 55 and 27 for Plans H and I). If eligible for early retirement, we propose that the greater of the early retirement benefit and the ordinary disability retirement be valued.

In addition, the rates of ordinary disability would not apply during the 10-year eligibility service period. Finally, we propose the accidental disability rates would cease to apply at completion of 35 years of service.

In performing the experience analysis, it is necessary to reassign disability retirement codes retroactively to reflect the eventual approval of a disability retirement. Members with a disability code in a given year had all inactive status codes in prior years changed to a disability status code. Adjustments were made as far back as 2012.

It is difficult to determine how future years would impact the experience during the study period as we believe that this type of retroactive adjustment will be required in subsequent iterations of this study. The consequence will be a restatement of the number of disability retirements experienced during this study period, specifically 2019 – 2021.

For this purpose, our analysis reflected years from 2012 – 2019.

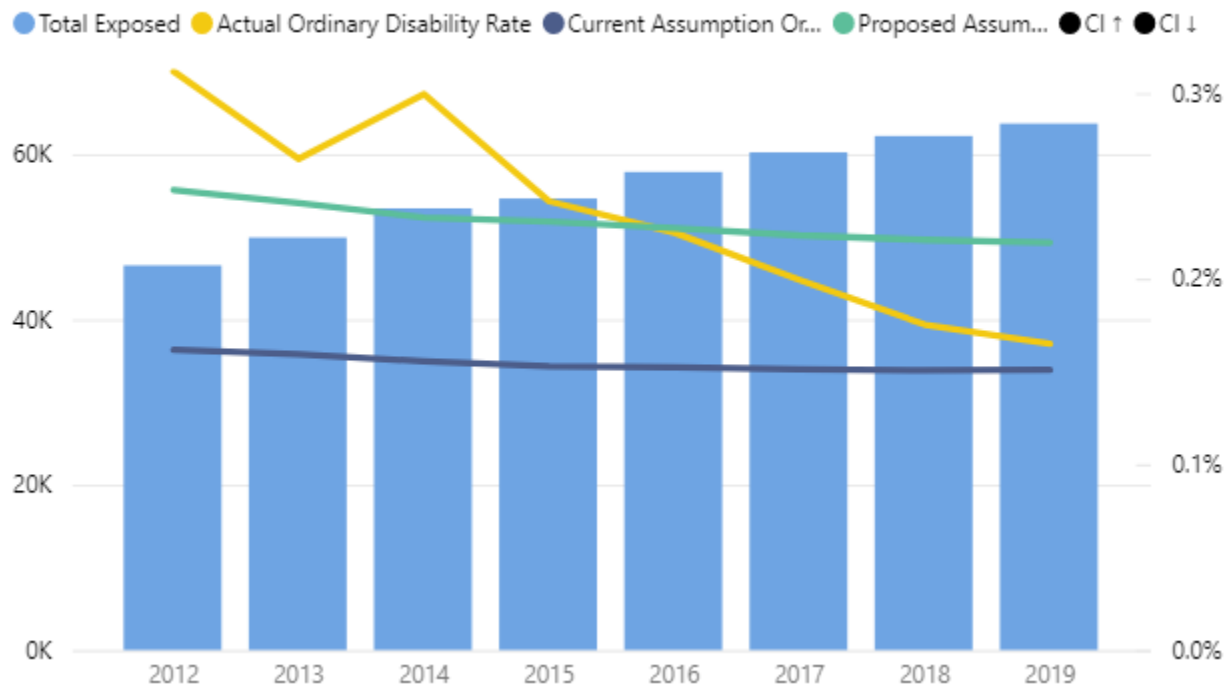
Ordinary Disability

The following table shows the experience for ordinary disability retirement by year, for the age range 30 to 69 and the service range 10 to 34 who have not met the conditions for unreduced retirement and the 2% benefit formula. The actual rate of ordinary disability averaged 0.2304% whereas the overall expected rate of ordinary disability averaged 0.1539% based on the current assumptions and 0.2294% based on the proposed assumptions.

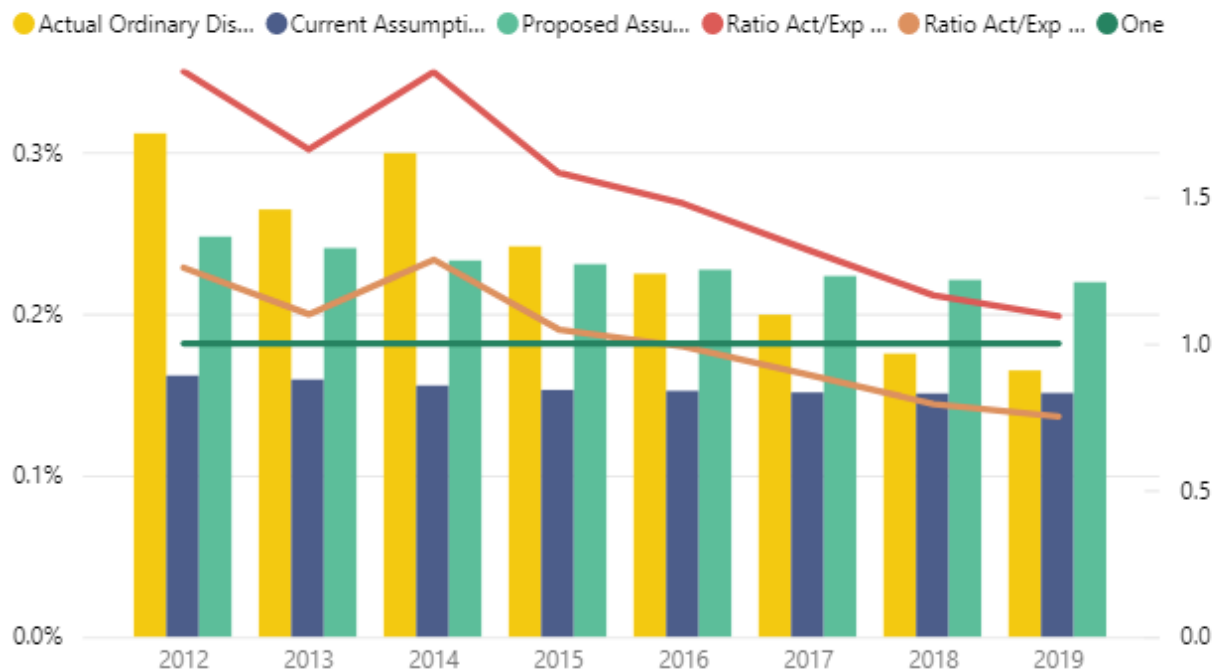
Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	145	75.2	46,529	0.3116%	0.1617%	1.93
2013	132	79.5	49,902	0.2645%	0.1592%	1.66
2014	160	83.1	53,432	0.2994%	0.1555%	1.93
2015	132	83.5	54,626	0.2416%	0.1528%	1.58
2016	130	88.0	57,836	0.2248%	0.1522%	1.48
2017	120	91.1	60,205	0.1993%	0.1512%	1.32
2018	109	93.6	62,186	0.1753%	0.1506%	1.16
2019	105	96.1	63,691	0.1649%	0.1509%	1.09
Total	1,033	690.0	448,407	0.2304%	0.1539%	1.50

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Ratio Act/Exp Proposed Ordinary Disability
2012	145	115.2	46,529	0.3116%	0.2477%	1.26
2013	132	120.1	49,902	0.2645%	0.2406%	1.10
2014	160	124.5	53,432	0.2994%	0.2329%	1.29
2015	132	126.0	54,626	0.2416%	0.2306%	1.05
2016	130	131.4	57,836	0.2248%	0.2272%	0.99
2017	120	134.4	60,205	0.1993%	0.2233%	0.89
2018	109	137.4	62,186	0.1753%	0.2209%	0.79
2019	105	139.8	63,691	0.1649%	0.2195%	0.75
Total	1,033	1,028.8	448,407	0.2304%	0.2294%	1.00

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Year



Ordinary Disability Rate - Actual, Expected, and Ratio; by Year



Males

The following table shows the experience of male members by age based on the age range (30 to 69) and service range (10 to 34) for the period 2012 – 2019 for all plans. The actual rate of ordinary disability averaged 0.2015% whereas the overall expected rate of ordinary disability averaged 0.1325% based on the current assumptions and 0.2057% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.52 to 0.98.

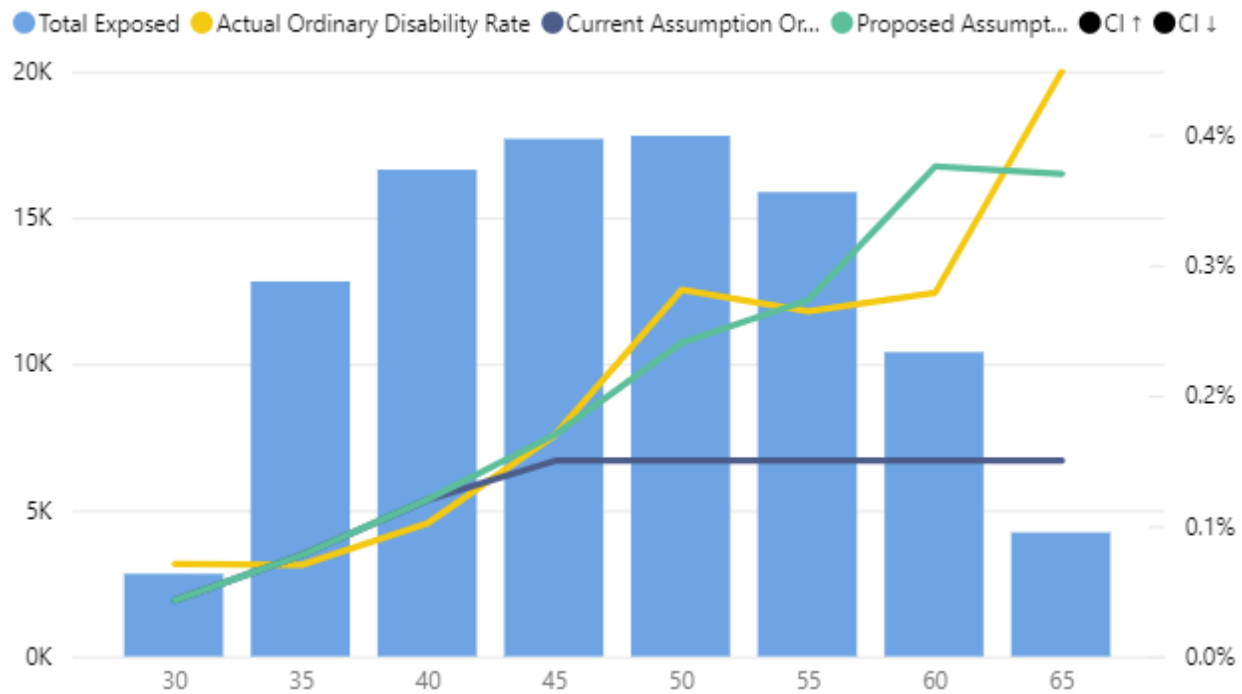
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.0	33	0.0000%	0.0100%	0.00
31	0	0.0	59	0.0000%	0.0200%	0.00
32	1	0.1	397	0.2519%	0.0300%	8.40
33	0	0.4	882	0.0000%	0.0400%	0.00
34	1	0.7	1,453	0.0688%	0.0500%	1.38
35	0	1.2	1,945	0.0000%	0.0600%	0.00
36	2	1.6	2,368	0.0845%	0.0680%	1.24
37	2	2.0	2,670	0.0749%	0.0760%	0.99
38	3	2.4	2,839	0.1057%	0.0840%	1.26
39	2	2.8	2,994	0.0668%	0.0920%	0.73
40	1	3.2	3,165	0.0316%	0.1000%	0.32
41	5	3.6	3,292	0.1519%	0.1100%	1.38
42	2	4.1	3,399	0.0588%	0.1200%	0.49
43	3	4.4	3,394	0.0884%	0.1300%	0.68
44	6	4.7	3,388	0.1771%	0.1400%	1.26
45	4	5.2	3,487	0.1147%	0.1500%	0.76
46	7	5.3	3,557	0.1968%	0.1500%	1.31
47	8	5.3	3,552	0.2252%	0.1500%	1.50
48	5	5.4	3,567	0.1402%	0.1500%	0.93
49	6	5.3	3,526	0.1702%	0.1500%	1.13

50	10	5.2	3,491	0.2865%	0.1500%	◆	1.91
51	8	5.2	3,484	0.2296%	0.1500%	◆	1.53
52	16	5.4	3,571	0.4481%	0.1500%	◆	2.99
53	10	5.4	3,629	0.2756%	0.1500%	◆	1.84
54	6	5.4	3,620	0.1657%	0.1500%	▲	1.10
55	9	5.7	3,792	0.2373%	0.1500%	◆	1.58
56	10	5.0	3,317	0.3015%	0.1500%	◆	2.01
57	4	4.7	3,102	0.1289%	0.1500%	▲	0.86
58	12	4.4	2,931	0.4094%	0.1500%	◆	2.73
59	7	4.1	2,725	0.2569%	0.1500%	◆	1.71
60	9	3.9	2,605	0.3455%	0.1500%	◆	2.30
61	5	3.6	2,411	0.2074%	0.1500%	▲	1.38
62	6	3.2	2,164	0.2773%	0.1500%	◆	1.85
63	7	2.6	1,742	0.4018%	0.1500%	◆	2.68
64	2	2.2	1,476	0.1355%	0.1500%	●	0.90
65	6	2.0	1,305	0.4598%	0.1500%	◆	3.07
66	3	1.6	1,066	0.2814%	0.1500%	◆	1.88
67	5	1.2	805	0.6211%	0.1500%	◆	4.14
68	3	0.9	599	0.5008%	0.1500%	◆	3.34
69	2	0.7	460	0.4348%	0.1500%	◆	2.90
Total	198	130.2	98,262	0.2015%	0.1325%	◆	1.52

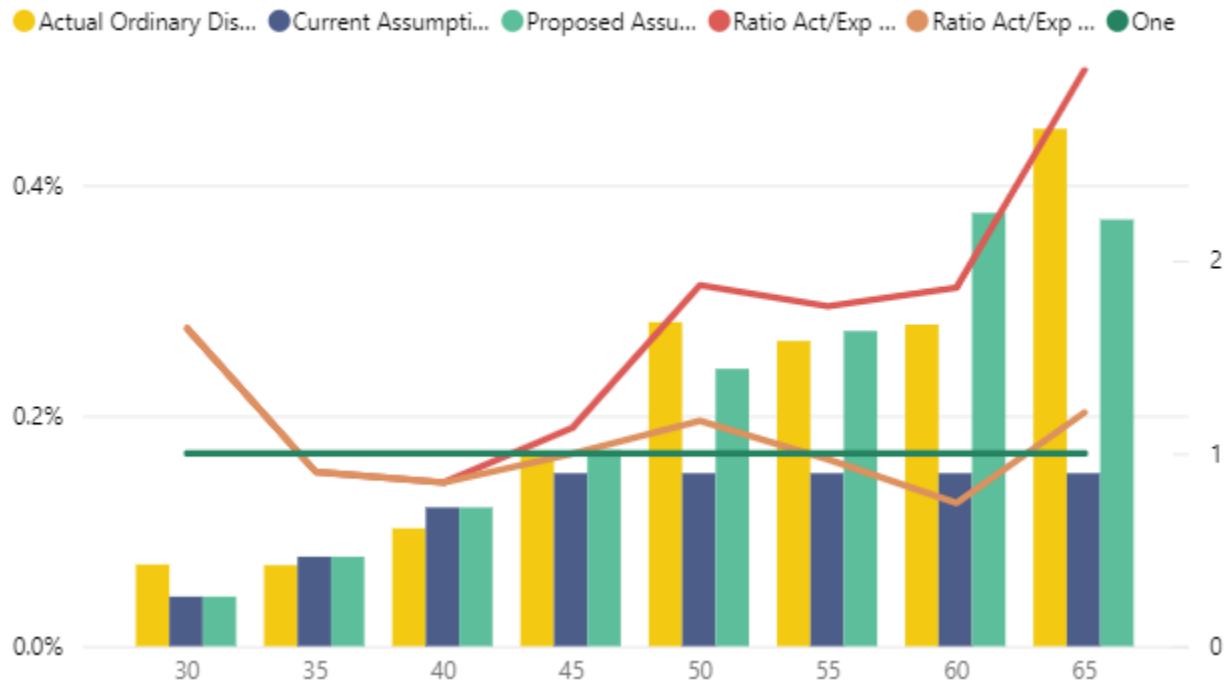
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Act/Exp Proposed Ordinary Disability
30	0	0.0	33	0.0000%	0.0100%	◆ 0.00
31	0	0.0	59	0.0000%	0.0200%	◆ 0.00
32	1	0.1	397	0.2519%	0.0300%	◆ 8.40
33	0	0.4	882	0.0000%	0.0400%	◆ 0.00
34	1	0.7	1,453	0.0688%	0.0500%	▲ 1.38
35	0	1.2	1,945	0.0000%	0.0600%	◆ 0.00
36	2	1.6	2,368	0.0845%	0.0680%	▲ 1.24
37	2	2.0	2,670	0.0749%	0.0760%	● 0.99
38	3	2.4	2,839	0.1057%	0.0840%	▲ 1.26
39	2	2.8	2,994	0.0668%	0.0920%	▲ 0.73
40	1	3.2	3,165	0.0316%	0.1000%	◆ 0.32
41	5	3.6	3,292	0.1519%	0.1100%	▲ 1.38
42	2	4.1	3,399	0.0588%	0.1200%	◆ 0.49
43	3	4.4	3,394	0.0884%	0.1300%	▲ 0.68
44	6	4.7	3,388	0.1771%	0.1400%	▲ 1.26
45	4	5.2	3,487	0.1147%	0.1500%	▲ 0.76
46	7	5.7	3,557	0.1968%	0.1600%	▲ 1.23
47	8	6.0	3,552	0.2252%	0.1700%	▲ 1.32
48	5	6.4	3,567	0.1402%	0.1800%	▲ 0.78
49	6	6.7	3,526	0.1702%	0.1900%	▲ 0.90

50	10	7.0	3,491	0.2865%	0.2000%	▲	1.43
51	8	7.7	3,484	0.2296%	0.2200%	●	1.04
52	16	8.6	3,571	0.4481%	0.2400%	◆	1.87
53	10	9.4	3,629	0.2756%	0.2600%	●	1.06
54	6	10.1	3,620	0.1657%	0.2800%	▲	0.59
55	9	7.5	3,792	0.2373%	0.1979%	▲	1.20
56	10	8.1	3,317	0.3015%	0.2437%	▲	1.24
57	4	8.7	3,102	0.1289%	0.2802%	◆	0.46
58	12	9.3	2,931	0.4094%	0.3170%	▲	1.29
59	7	9.8	2,725	0.2569%	0.3593%	▲	0.72
60	9	10.4	2,605	0.3455%	0.3997%	▲	0.86
61	5	11.1	2,411	0.2074%	0.4586%	◆	0.45
62	6	6.7	2,164	0.2773%	0.3108%	▲	0.89
63	7	5.7	1,742	0.4018%	0.3281%	▲	1.22
64	2	5.1	1,476	0.1355%	0.3488%	◆	0.39
65	6	4.8	1,305	0.4598%	0.3692%	▲	1.25
66	3	3.9	1,066	0.2814%	0.3622%	▲	0.78
67	5	3.0	805	0.6211%	0.3763%	◆	1.65
68	3	2.2	599	0.5008%	0.3746%	▲	1.34
69	2	1.7	460	0.4348%	0.3730%	▲	1.17
Total	198	202.1	98,262	0.2015%	0.2057%	●	0.98

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Age



Ordinary Disability Rate - Actual, Expected, and Ratio; by Age



Females

The following table shows the experience of female members by age based on the age range (30 to 69) and service range (10 to 34) for the period 2012 – 2019 for all plans. The actual rate of ordinary disability averaged 0.2385% whereas the overall expected rate of ordinary disability averaged 0.1599% based on the current assumptions and 0.2361% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.49 to 1.01.

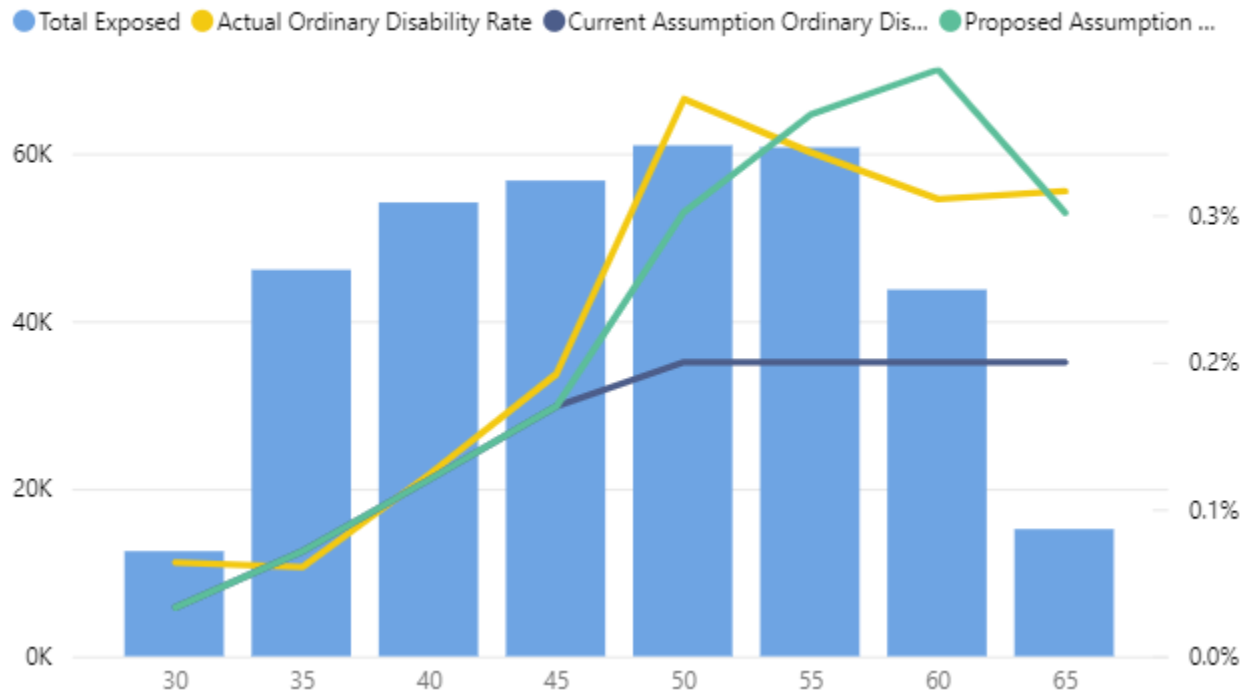
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	3	0.0	46	6.5217%	0.0100%	652.17
31	0	0.0	159	0.0000%	0.0100%	0.00
32	1	0.4	1,934	0.0517%	0.0200%	2.59
33	2	1.3	4,189	0.0477%	0.0300%	1.59
34	2	2.5	6,210	0.0322%	0.0400%	0.81
35	4	3.8	7,681	0.0521%	0.0500%	1.04
36	3	5.3	8,793	0.0341%	0.0600%	0.57
37	1	6.7	9,501	0.0105%	0.0700%	0.15
38	7	7.9	9,897	0.0707%	0.0800%	0.88
39	13	9.2	10,247	0.1269%	0.0900%	1.41
40	7	10.5	10,492	0.0667%	0.1000%	0.67
41	7	11.9	10,782	0.0649%	0.1100%	0.59
42	16	13.1	10,937	0.1463%	0.1200%	1.22
43	15	14.2	10,902	0.1376%	0.1300%	1.06
44	22	15.4	11,027	0.1995%	0.1400%	1.43
45	17	16.7	11,157	0.1524%	0.1500%	1.02
46	12	18.0	11,266	0.1065%	0.1600%	0.67
47	20	19.4	11,420	0.1751%	0.1700%	1.03
48	26	20.6	11,456	0.2270%	0.1800%	1.26
49	34	21.8	11,459	0.2967%	0.1900%	1.56

50	41	23.2	11,594	0.3536%	0.2000%	◆	1.77
51	50	23.7	11,859	0.4216%	0.2000%	◆	2.11
52	55	24.3	12,148	0.4527%	0.2000%	◆	2.26
53	33	25.1	12,545	0.2631%	0.2000%	▲	1.32
54	52	25.6	12,806	0.4061%	0.2000%	◆	2.03
55	38	27.1	13,552	0.2804%	0.2000%	▲	1.40
56	38	24.6	12,281	0.3094%	0.2000%	◆	1.55
57	43	23.9	11,934	0.3603%	0.2000%	◆	1.80
58	49	23.4	11,685	0.4193%	0.2000%	◆	2.10
59	40	22.5	11,265	0.3551%	0.2000%	◆	1.78
60	36	21.8	10,901	0.3302%	0.2000%	◆	1.65
61	29	20.5	10,233	0.2834%	0.2000%	▲	1.42
62	32	18.6	9,308	0.3438%	0.2000%	◆	1.72
63	19	14.6	7,316	0.2597%	0.2000%	▲	1.30
64	20	12.0	5,989	0.3339%	0.2000%	◆	1.67
65	20	10.0	4,993	0.4006%	0.2000%	◆	2.00
66	10	7.7	3,845	0.2601%	0.2000%	▲	1.30
67	10	5.5	2,771	0.3609%	0.2000%	◆	1.80
68	3	4.0	2,011	0.1492%	0.2000%	▲	0.75
69	5	3.1	1,554	0.3218%	0.2000%	◆	1.61
Total	835	559.9	350,145	0.2385%	0.1599%	▲	1.49

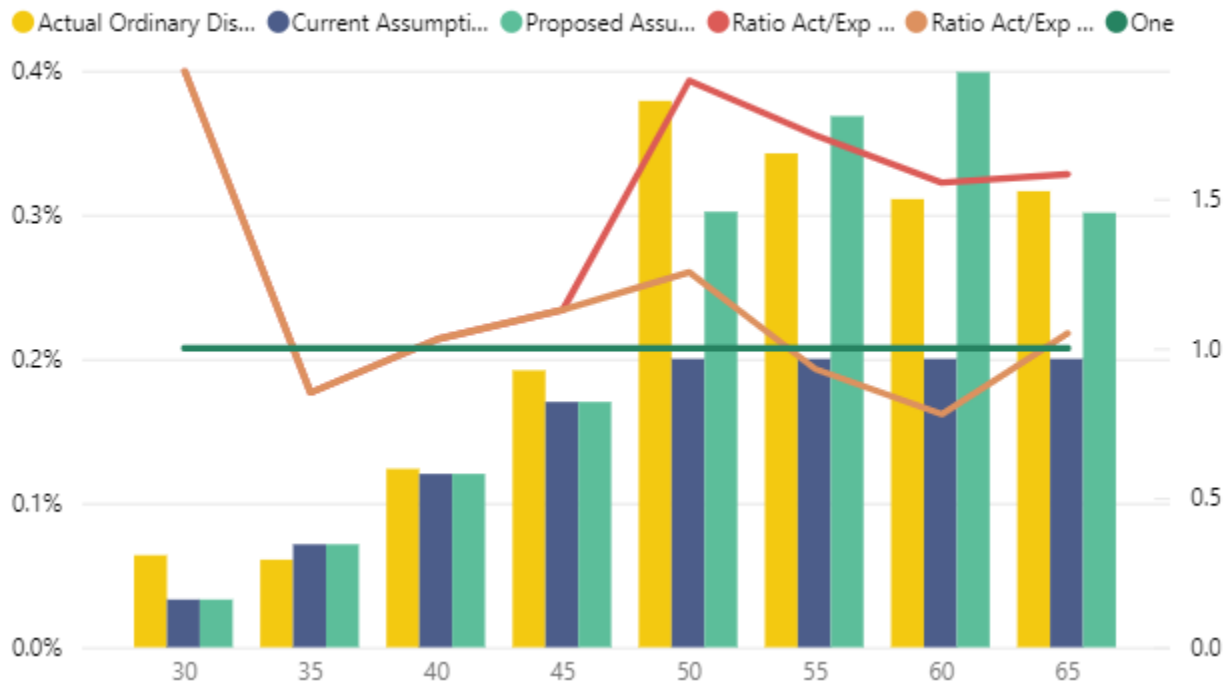
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Act/Exp Proposed Ordinary Disability
30	3	0.0	46	6.5217%	0.0100%	◇ 652.17
31	0	0.0	159	0.0000%	0.0100%	◇ 0.00
32	1	0.4	1,934	0.0517%	0.0200%	◇ 2.59
33	2	1.3	4,189	0.0477%	0.0300%	◇ 1.59
34	2	2.5	6,210	0.0322%	0.0400%	▲ 0.81
35	4	3.8	7,681	0.0521%	0.0500%	● 1.04
36	3	5.3	8,793	0.0341%	0.0600%	▲ 0.57
37	1	6.7	9,501	0.0105%	0.0700%	◇ 0.15
38	7	7.9	9,897	0.0707%	0.0800%	▲ 0.88
39	13	9.2	10,247	0.1269%	0.0900%	▲ 1.41
40	7	10.5	10,492	0.0667%	0.1000%	▲ 0.67
41	7	11.9	10,782	0.0649%	0.1100%	▲ 0.59
42	16	13.1	10,937	0.1463%	0.1200%	▲ 1.22
43	15	14.2	10,902	0.1376%	0.1300%	● 1.06
44	22	15.4	11,027	0.1995%	0.1400%	▲ 1.43
45	17	16.7	11,157	0.1524%	0.1500%	● 1.02
46	12	18.0	11,266	0.1065%	0.1600%	▲ 0.67
47	20	19.4	11,420	0.1751%	0.1700%	● 1.03
48	26	20.6	11,456	0.2270%	0.1800%	▲ 1.26
49	34	21.8	11,459	0.2967%	0.1900%	◇ 1.56

50	41	25.5	11,594	0.3536%	0.2200%	◆	1.61
51	50	30.8	11,859	0.4216%	0.2600%	◆	1.62
52	55	36.4	12,148	0.4527%	0.3000%	◆	1.51
53	33	42.7	12,545	0.2631%	0.3400%	▲	0.77
54	52	48.7	12,806	0.4061%	0.3800%	●	1.07
55	38	39.8	13,552	0.2804%	0.2935%	●	0.96
56	38	42.0	12,281	0.3094%	0.3416%	●	0.91
57	43	44.7	11,934	0.3603%	0.3742%	●	0.96
58	49	47.6	11,685	0.4193%	0.4073%	●	1.03
59	40	49.6	11,265	0.3551%	0.4407%	▲	0.81
60	36	52.0	10,901	0.3302%	0.4770%	▲	0.69
61	29	53.1	10,233	0.2834%	0.5185%	▲	0.55
62	32	28.0	9,308	0.3438%	0.3003%	▲	1.14
63	19	22.8	7,316	0.2597%	0.3120%	▲	0.83
64	20	18.7	5,989	0.3339%	0.3121%	●	1.07
65	20	15.3	4,993	0.4006%	0.3069%	▲	1.31
66	10	11.6	3,845	0.2601%	0.3030%	▲	0.86
67	10	8.4	2,771	0.3609%	0.3015%	▲	1.20
68	3	5.9	2,011	0.1492%	0.2944%	▲	0.51
69	5	4.5	1,554	0.3218%	0.2884%	▲	1.12
Total	835	826.7	350,145	0.2385%	0.2361%	●	1.01

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Age



Ordinary Disability Rate - Actual, Expected, and Ratio; by Age



Summary

Retirement eligibility and the change in the benefit accrual rate upon completing 20 years of service have a significant impact on the number of members who apply for disability retirement. By eliminating rates of ordinary disability retirement at these criteria, we believe it will increase plan liabilities. Furthermore, increasing the rates of ordinary disability for other members will also result in higher plan liabilities.

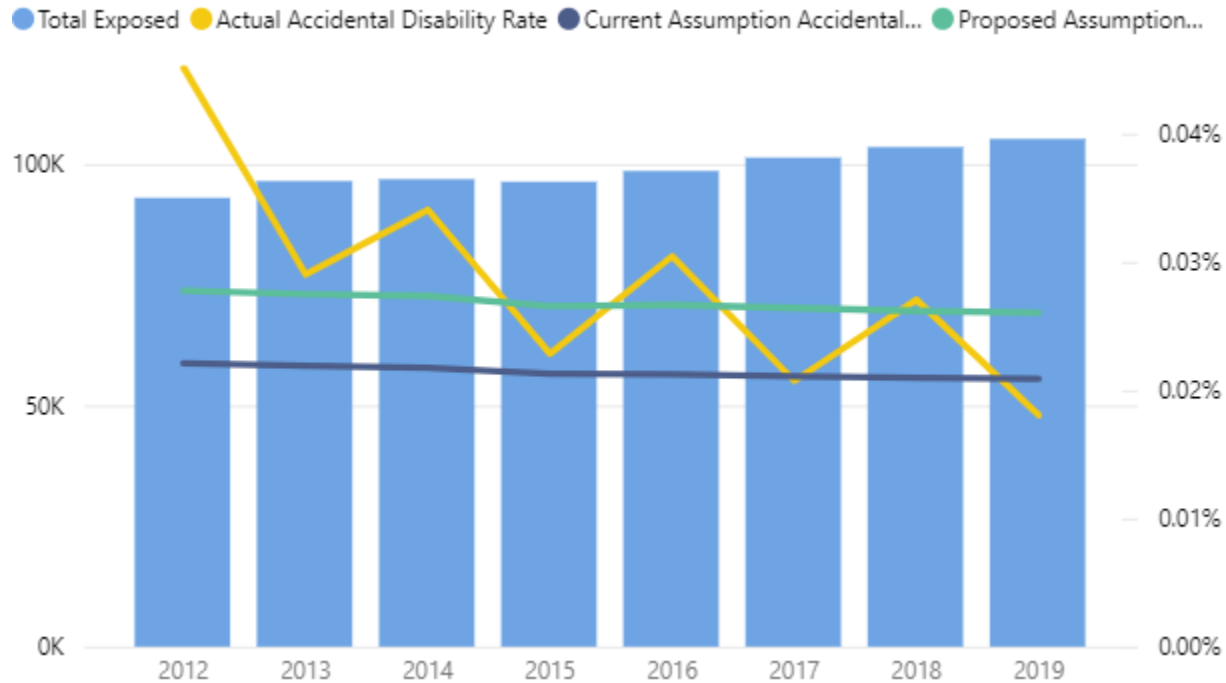
Accidental Disability

The current accidental disability assumption varies by gender and age. The proposed assumption maintains the same structure. The following charts show the experience for accidental disability retirement by year for the age range 25 to 69 and for the service range 0 to 34. The actual rate of accidental disability averaged 0.0256% whereas the overall expected rate of accidental disability averaged 0.0193% based on the current assumptions and 0.0241% based on the proposed assumptions.

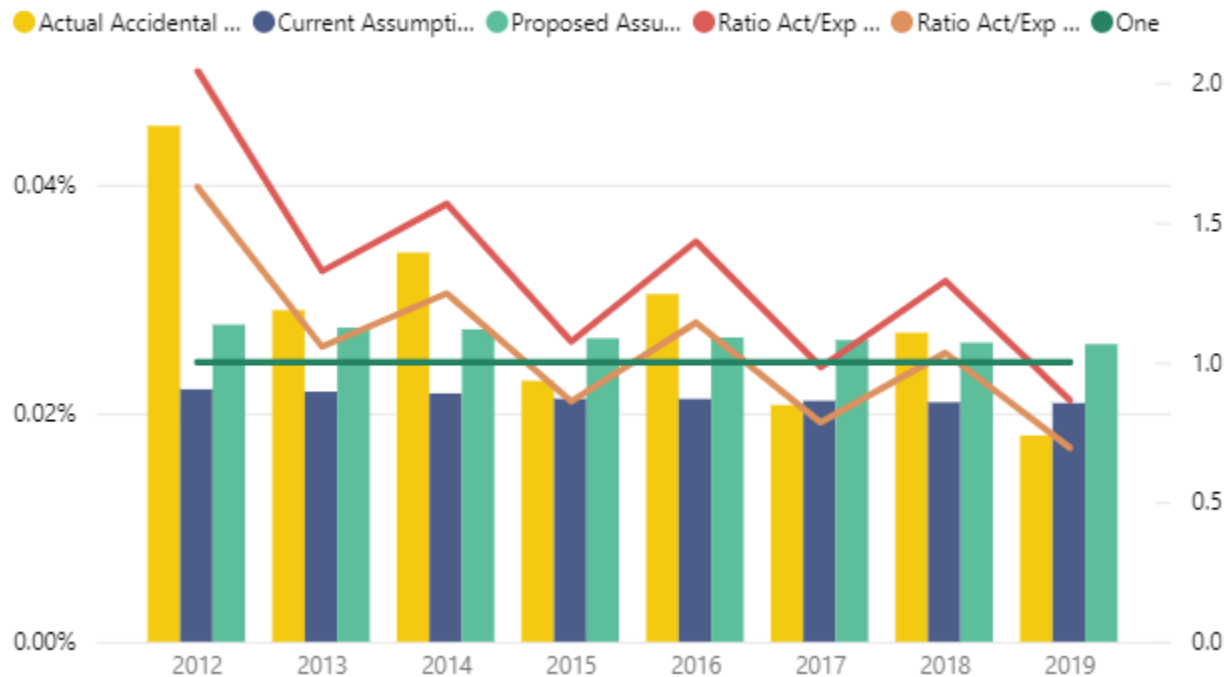
Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	42	20.8	104,577	0.0402%	0.0199%	2.02
2013	30	21.3	107,466	0.0279%	0.0199%	1.41
2014	33	21.3	107,641	0.0307%	0.0198%	1.55
2015	22	20.7	107,523	0.0205%	0.0193%	1.06
2016	30	21.2	110,515	0.0271%	0.0192%	1.42
2017	21	21.6	113,996	0.0184%	0.0190%	0.97
2018	29	22.0	116,511	0.0249%	0.0188%	1.32
2019	20	22.2	118,074	0.0169%	0.0188%	0.90
Total	227	171.1	886,303	0.0256%	0.0193%	1.33

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities Proposed	Total Exposed	Actual Accidental Disability Rate	Proposed Assumption Accidental Disability	Act/Exp Proposed Accidental Disability
2012	42	26.0	104,577	0.0402%	0.0249%	1.61
2013	30	26.7	107,466	0.0279%	0.0249%	1.12
2014	33	26.7	107,641	0.0307%	0.0248%	1.24
2015	22	25.8	107,523	0.0205%	0.0240%	0.85
2016	30	26.5	110,515	0.0271%	0.0240%	1.13
2017	21	27.0	113,996	0.0184%	0.0237%	0.78
2018	29	27.4	116,511	0.0249%	0.0235%	1.06
2019	20	27.7	118,074	0.0169%	0.0234%	0.72
Total	227	213.9	886,303	0.0256%	0.0241%	1.06

Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Year



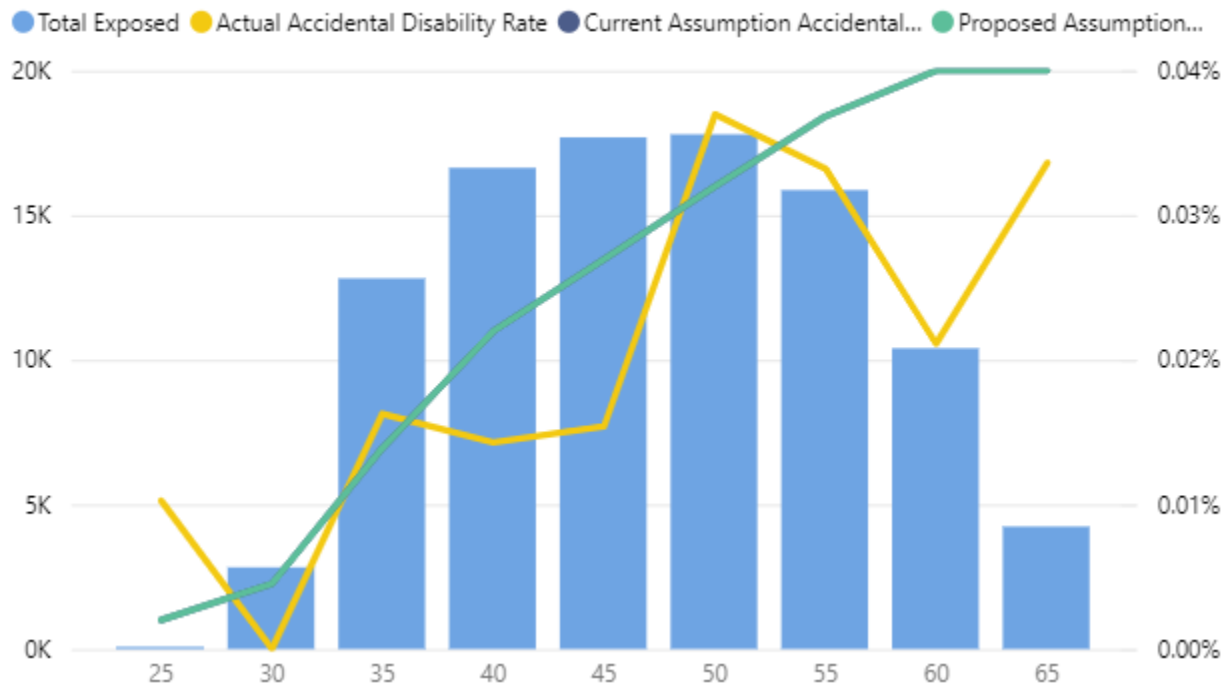
Accidental Disability Rate - Actual, Expected, and Ratio; by Year



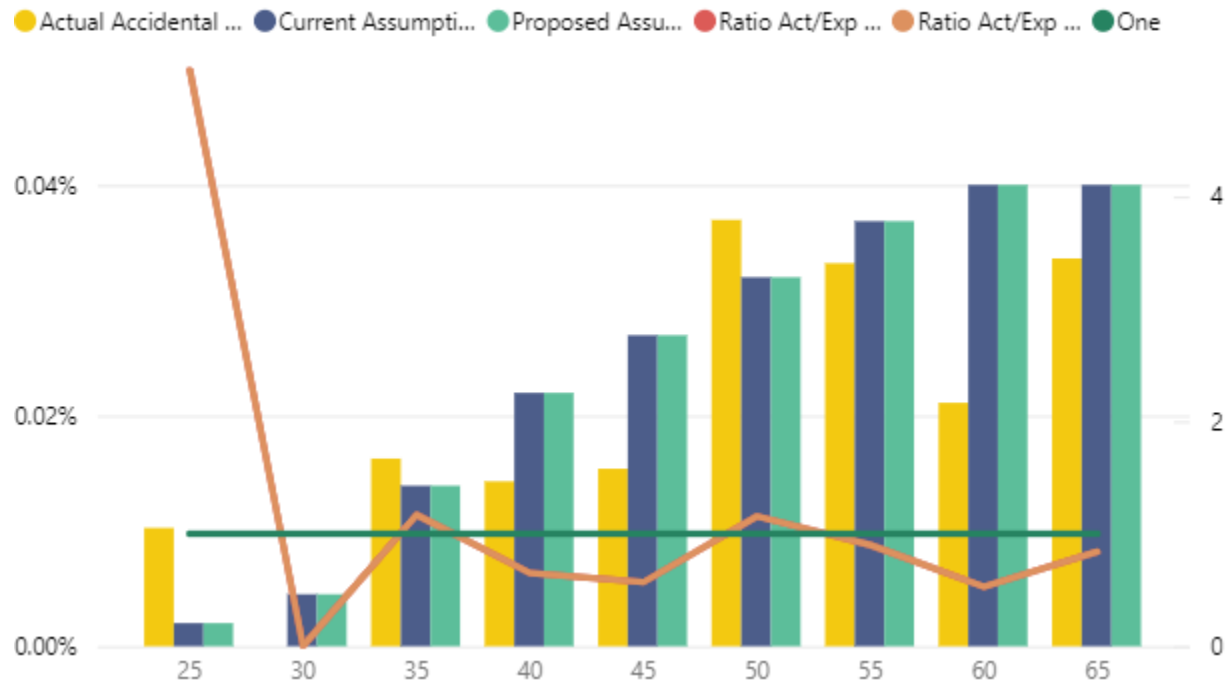
Males

The following table shows the experience of male members by age based on the age range (25 to 69) and service range (0 to 34) for the period 2012 – 2019 for all plans. The actual rate of accidental disability averaged 0.0180% whereas the overall expected rate of accidental disability averaged 0.0214% based on the current assumptions. No change in the assumption is proposed.

Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Age



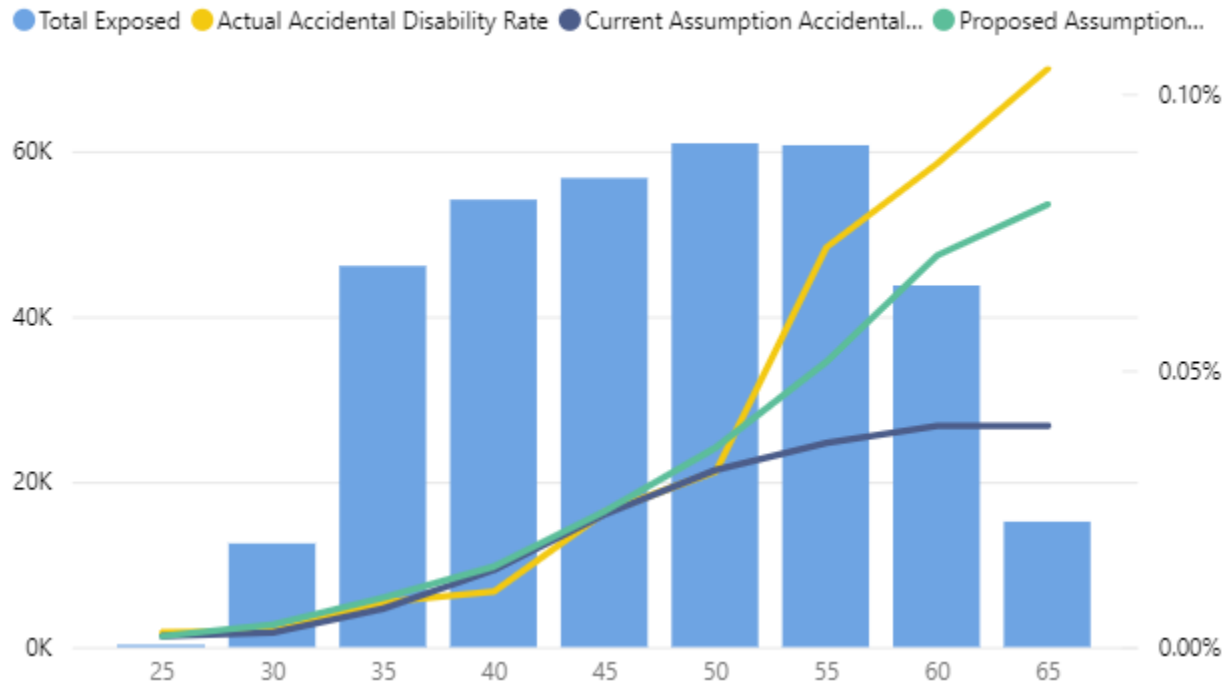
Accidental Disability Rate - Actual, Expected, and Ratio; by Age



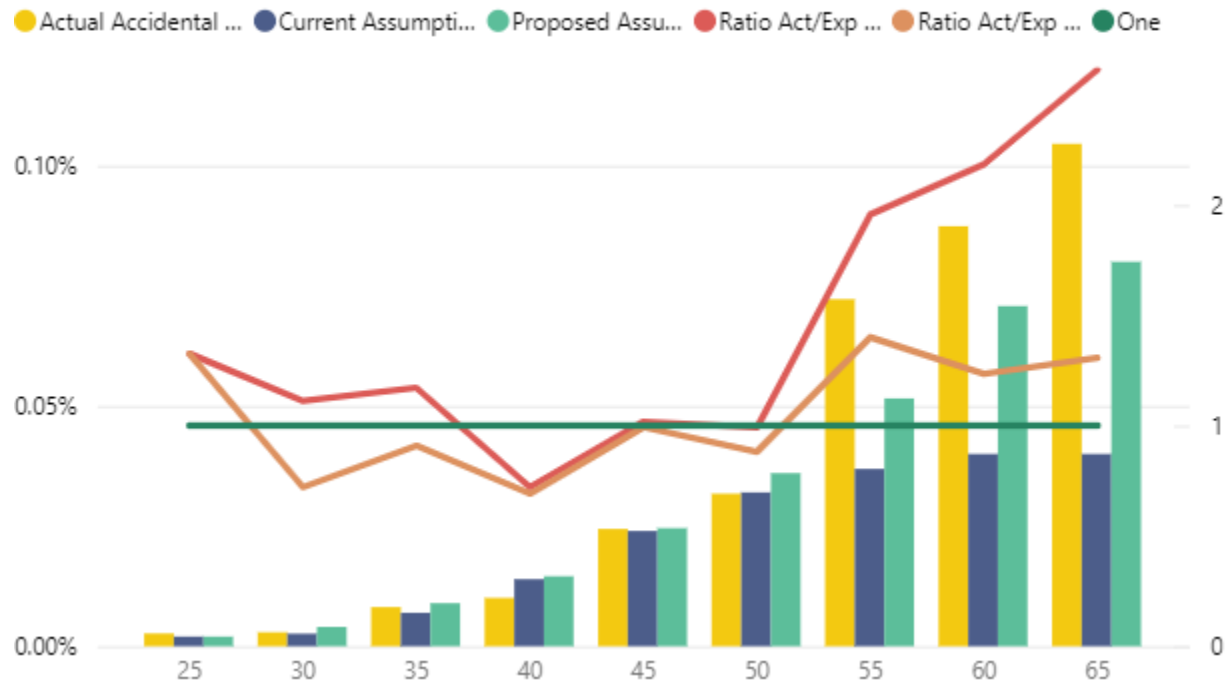
Females

The following table shows the experience of female members by age based on the age range (25 to 69) and service range (0 to 34) for the period 2012 – 2019 for all plans. The actual rate of accidental disability averaged 0.0278% whereas the overall expected rate of accidental disability averaged 0.0187% based on the current assumptions and 0.0249% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.49 to 1.12.

Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Age



Accidental Disability Rate - Actual, Expected, and Ratio; by Age



Summary

For female members, the proposed rates have increased the anticipated number of accidental disability retirements, which will result in an increase in plan liabilities. No change is proposed for male members.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
CURRENT				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
15	0.010%	0.010%	0.002%	0.002%
16	0.010%	0.010%	0.002%	0.002%
17	0.010%	0.010%	0.002%	0.002%
18	0.010%	0.010%	0.002%	0.002%
19	0.010%	0.010%	0.002%	0.002%
20	0.010%	0.010%	0.002%	0.002%
21	0.010%	0.010%	0.002%	0.002%
22	0.010%	0.010%	0.002%	0.002%
23	0.010%	0.010%	0.002%	0.002%
24	0.010%	0.010%	0.002%	0.002%
25	0.010%	0.010%	0.002%	0.002%
26	0.010%	0.010%	0.002%	0.002%
27	0.010%	0.010%	0.002%	0.002%
28	0.010%	0.010%	0.002%	0.002%
29	0.010%	0.010%	0.002%	0.002%
30	0.010%	0.010%	0.002%	0.002%
31	0.020%	0.010%	0.002%	0.002%
32	0.030%	0.020%	0.004%	0.002%
33	0.040%	0.030%	0.006%	0.003%
34	0.050%	0.040%	0.008%	0.004%
35	0.060%	0.050%	0.010%	0.005%
36	0.068%	0.060%	0.012%	0.006%
37	0.076%	0.070%	0.014%	0.007%
38	0.084%	0.080%	0.016%	0.008%
39	0.092%	0.090%	0.018%	0.009%
40	0.100%	0.100%	0.020%	0.010%
41	0.110%	0.110%	0.021%	0.012%
42	0.120%	0.120%	0.022%	0.014%
43	0.130%	0.130%	0.023%	0.016%
44	0.140%	0.140%	0.024%	0.018%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM				
CURRENT				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
45	0.150%	0.150%	0.025%	0.020%
46	0.150%	0.160%	0.026%	0.022%
47	0.150%	0.170%	0.027%	0.024%
48	0.150%	0.180%	0.028%	0.026%
49	0.150%	0.190%	0.029%	0.028%
50	0.150%	0.200%	0.030%	0.030%
51	0.150%	0.200%	0.031%	0.031%
52	0.150%	0.200%	0.032%	0.032%
53	0.150%	0.200%	0.033%	0.033%
54	0.150%	0.200%	0.034%	0.034%
55	0.150%	0.200%	0.035%	0.035%
56	0.150%	0.200%	0.036%	0.036%
57	0.150%	0.200%	0.037%	0.037%
58	0.150%	0.200%	0.038%	0.038%
59	0.150%	0.200%	0.039%	0.039%
60	0.150%	0.200%	0.040%	0.040%
61	0.150%	0.200%	0.040%	0.040%
62	0.150%	0.200%	0.040%	0.040%
63	0.150%	0.200%	0.040%	0.040%
64	0.150%	0.200%	0.040%	0.040%
65	0.150%	0.200%	0.040%	0.040%
66	0.150%	0.200%	0.040%	0.040%
67	0.150%	0.200%	0.040%	0.040%
68	0.150%	0.200%	0.040%	0.040%
69	0.150%	0.200%	0.040%	0.040%
70	0.150%	0.200%	0.040%	0.040%
71	0.150%	0.200%	0.040%	0.040%
72	0.150%	0.200%	0.040%	0.040%
73	0.150%	0.200%	0.040%	0.040%
74	0.150%	0.200%	0.040%	0.040%
75	0.150%	0.200%	0.040%	0.040%
76	0.150%	0.200%	0.040%	0.040%
77	0.150%	0.200%	0.040%	0.040%
78	0.150%	0.200%	0.040%	0.040%
79	0.150%	0.200%	0.040%	0.040%
80	N/A	N/A	N/A	N/A

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF DISABILITY RETIREMENT ¹				
	Ordinary Disability ²		Accidental Disability ³	
Age	Males	Females	Males	Females
15	0.010%	0.010%	0.002%	0.002%
16	0.010%	0.010%	0.002%	0.002%
17	0.010%	0.010%	0.002%	0.002%
18	0.010%	0.010%	0.002%	0.002%
19	0.010%	0.010%	0.002%	0.002%
20	0.010%	0.010%	0.002%	0.002%
21	0.010%	0.010%	0.002%	0.002%
22	0.010%	0.010%	0.002%	0.002%
23	0.010%	0.010%	0.002%	0.002%
24	0.010%	0.010%	0.002%	0.002%
25	0.010%	0.010%	0.002%	0.002%
26	0.010%	0.010%	0.002%	0.002%
27	0.010%	0.010%	0.002%	0.002%
28	0.010%	0.010%	0.002%	0.002%
29	0.010%	0.010%	0.002%	0.002%
30	0.010%	0.010%	0.002%	0.002%
31	0.020%	0.010%	0.002%	0.003%
32	0.030%	0.020%	0.004%	0.004%
33	0.040%	0.030%	0.006%	0.005%
34	0.050%	0.040%	0.008%	0.006%
35	0.060%	0.050%	0.010%	0.007%
36	0.068%	0.060%	0.012%	0.008%
37	0.076%	0.070%	0.014%	0.009%
38	0.084%	0.080%	0.016%	0.010%
39	0.092%	0.090%	0.018%	0.011%
40	0.100%	0.100%	0.020%	0.012%
41	0.110%	0.110%	0.021%	0.013%
42	0.120%	0.120%	0.022%	0.014%
43	0.130%	0.130%	0.023%	0.016%
44	0.140%	0.140%	0.024%	0.018%
45	0.150%	0.150%	0.025%	0.020%
46	0.160%	0.160%	0.026%	0.022%
47	0.170%	0.170%	0.027%	0.024%
48	0.180%	0.180%	0.028%	0.027%
49	0.190%	0.190%	0.029%	0.030%
50	0.200%	0.220%	0.030%	0.032%

	Ordinary Disability ²		Accidental Disability ³	
Age	Males	Females	Males	Females
51	0.220%	0.260%	0.031%	0.034%
52	0.240%	0.300%	0.032%	0.036%
53	0.260%	0.340%	0.033%	0.038%
54	0.280%	0.380%	0.034%	0.040%
55	0.300%	0.420%	0.035%	0.044%
56	0.350%	0.460%	0.036%	0.048%
57	0.400%	0.500%	0.037%	0.052%
58	0.450%	0.540%	0.038%	0.056%
59	0.500%	0.580%	0.039%	0.060%
60	0.550%	0.620%	0.040%	0.064%
61	0.600%	0.660%	0.040%	0.068%
62	0.660%	0.660%	0.040%	0.072%
63	0.660%	0.660%	0.040%	0.076%
64	0.660%	0.660%	0.040%	0.080%
65	0.660%	0.660%	0.040%	0.080%
66	0.660%	0.660%	0.040%	0.080%
67	0.660%	0.660%	0.040%	0.080%
68	0.660%	0.660%	0.040%	0.080%
69	0.660%	0.660%	0.040%	0.080%
70	0.660%	0.660%	0.040%	0.080%
71	0.660%	0.660%	0.040%	0.080%
72	0.660%	0.660%	0.040%	0.080%
73	0.660%	0.660%	0.040%	0.080%
74	0.660%	0.660%	0.040%	0.080%
75	0.660%	0.660%	0.040%	0.080%
76	0.660%	0.660%	0.040%	0.080%
77	0.660%	0.660%	0.040%	0.080%
78	0.660%	0.660%	0.040%	0.080%
79	0.660%	0.660%	0.040%	0.080%
80	N/A	N/A	N/A	N/A

¹

Greater of disability benefit and retirement benefit is valued if eligible for early or service retirement

² No rates of ordinary disability apply prior to completion of 10 years of service or upon attainment of the following age/service combinations:

Basic Plan (Plan F): Age 62 and 20 years of service or Age 55 and 30 years of service

Tier 6 (Plan J): Age 63 and 20 years of service

55/27 (Plans H&I): Age 62 and 20 years of service or Age 55 and 27 years of service

55/25 (Plans G): Age 62 and 20 years of service or Age 55 and 25 years of service

³ No rates of accidental disability apply upon completion of 35 years of service

Pre-retirement Death

Plan codes excluded in the analysis of other contingencies are part of the analysis of pre-retirement death.

Mortality assumptions involve two components: a base table and a mortality improvement scale. The mortality improvement scale adjusts the mortality rates of the base table to reflect that generally rates of mortality are anticipated to improve over time.

The Society of Actuaries (SOA) has published mortality improvement scales (MP scales) each year from 2014 to 2021. In the last several actuarial valuations, OA has used the mortality improvement scale that coincides with the valuation date. For example, OA used the MP-2020 scale in its June 30, 2020 lag actuarial valuation. In this analysis, we used the most recent improvement scale (MP-2021) published by the SOA as of the date of this analysis. Please note that the SOA has not published an updated MP scale due to the pandemic.

The SOA MP-2021 improvement scale is based on data through 2019 (before the onset of Covid) from the Social Security Administration (SSA). Even though the aggregate (for all ages) long-term trend has been towards mortality improvements, this is not always the case for each age. Therefore, there are situations where the expected mortality rate in a later year is higher than base rate.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and treatment of excess deaths due to the Covid pandemic, which occurred in 2020 – 2022. The analysis to develop our recommendations exclude the mortality experience of members during the pandemic and reflect the experience from 2012 - 2019.

In this study the base table of the current assumption corresponds to the year 2012; expected mortality rates in future years are obtained from the base table and the MP-2021 scale. For example, the 2017 (July 1, 2016 – June 30, 2017) mortality rates are derived from the base table (2012) adjusted with four years of improvements until 2016. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

For the proposed assumption, proposed rates were initially determined as of the mid-year of the study period or fiscal year 2016. MP-2021 was then used to adjust those rates to earlier and later years. The proposed mortality rates shown in the following section have been adjusted to reflect a base year of 2019. We recommend that MP-2021 continue to be used to reflect mortality improvements both before and after the measurement date.

In reviewing the current assumption, we compared the actual experience to published tables from the SOA. The most recent tables published by the SOA reflected experience for public plan retirement systems separated into Teachers (PubT), General employees (PubG) and Public Safety (PubS) members. Adjustments were made to the standard SOA tables to match the experience of the system or the current tables, and for consistency with recommended postretirement mortality tables, to determine if the SOA tables provided a better fit.

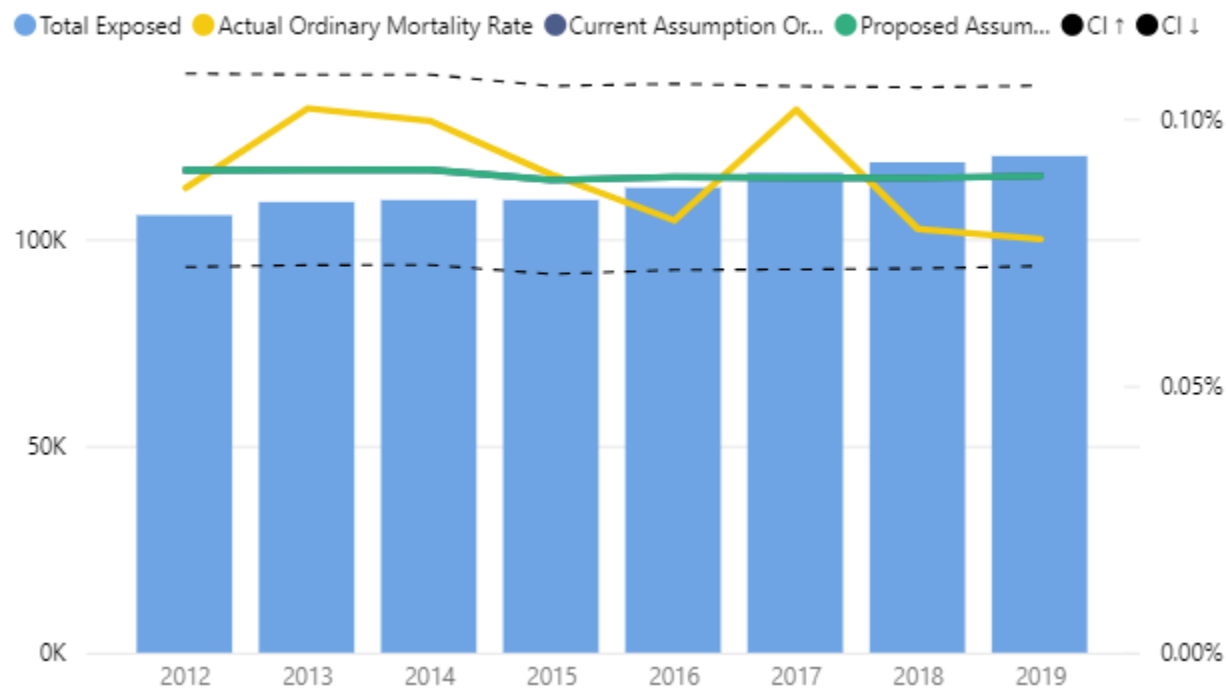
Ordinary Death

For TRS, we compared the experience to PubT tables adjusted by 120% for males and 115% for females. We found the current assumption to provide a better fit and propose no change.

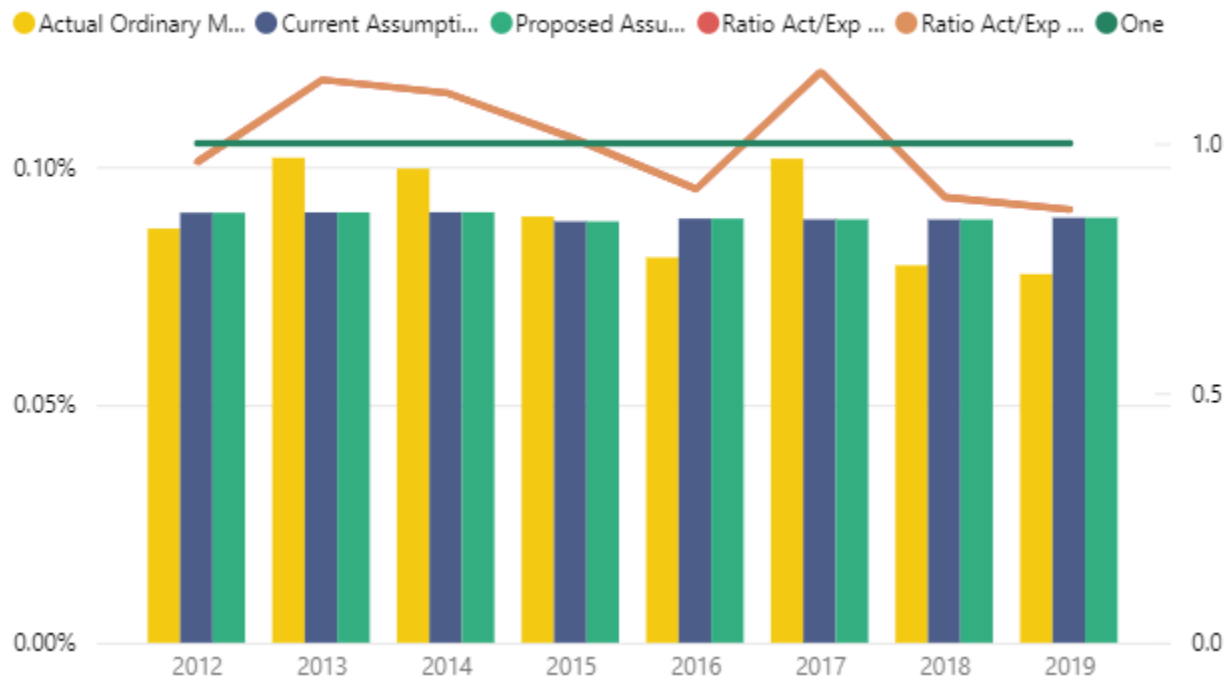
The following tables show the experience of ordinary death by year, for the age range (20 to 69) during the period 2012 – 2019 based on the proposed assumption for both males and females combined. No change in the assumption is recommended. The A/E ratio is 1.00.

Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
2012	92	95.5	105,737	0.0870%	0.0904%	0.96
2013	111	98.5	108,946	0.1019%	0.0904%	1.13
2014	109	99.0	109,438	0.0996%	0.0904%	1.10
2015	98	96.9	109,455	0.0895%	0.0885%	1.01
2016	91	100.2	112,420	0.0809%	0.0891%	0.91
2017	118	103.2	116,015	0.1017%	0.0889%	1.14
2018	94	105.4	118,544	0.0793%	0.0889%	0.89
2019	93	107.2	120,069	0.0775%	0.0893%	0.87
Total	806	805.9	900,624	0.0895%	0.0895%	1.00

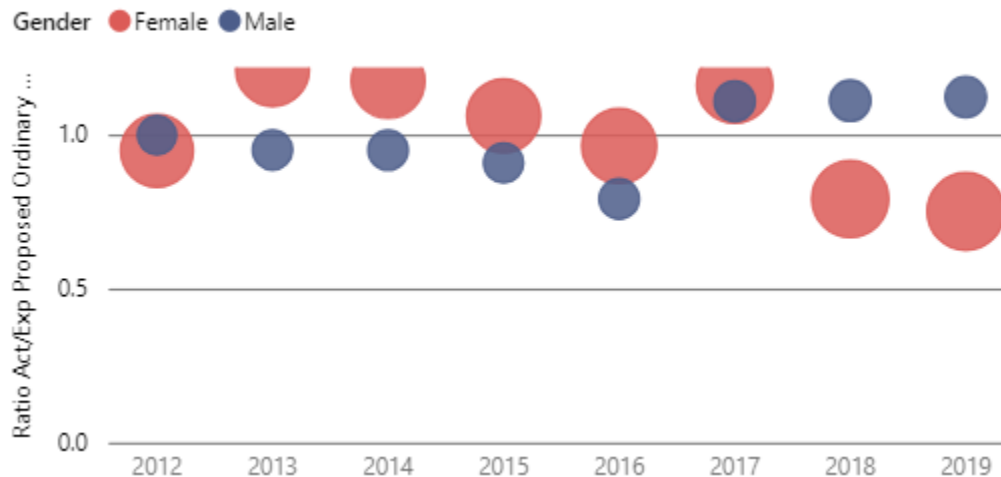
Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Year



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Ordinary Mortality Proposed w/ Exposure Bubbles; by Year



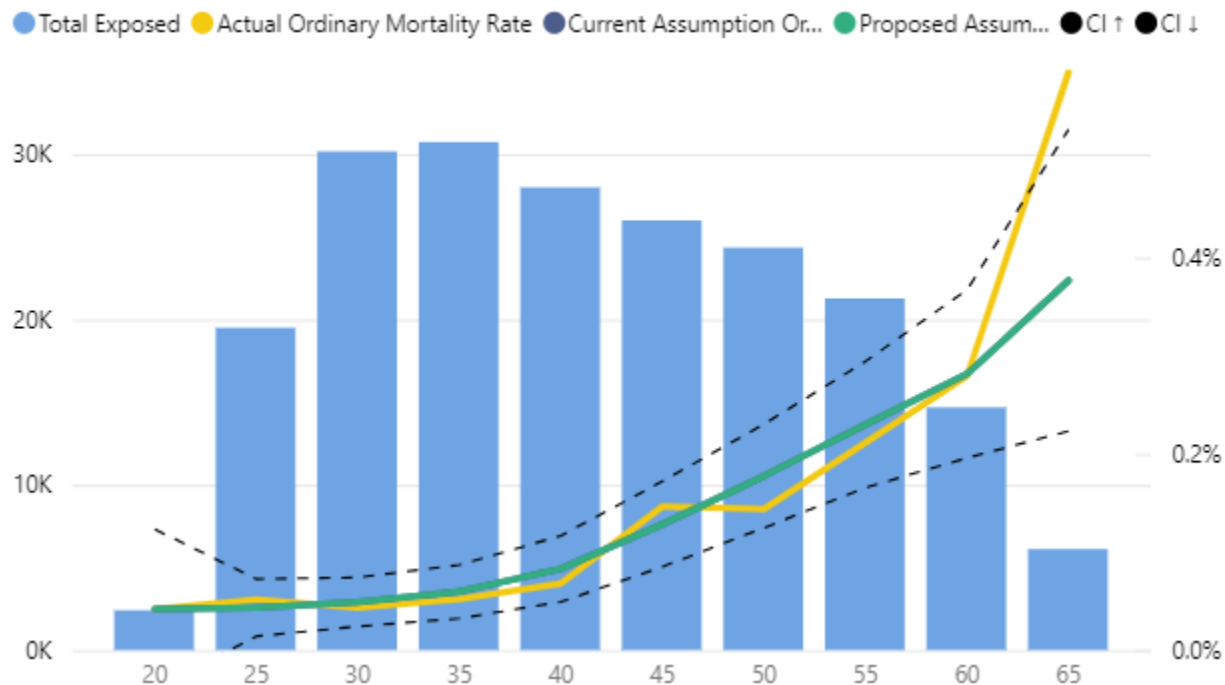
The following section displays results by gender.

Males

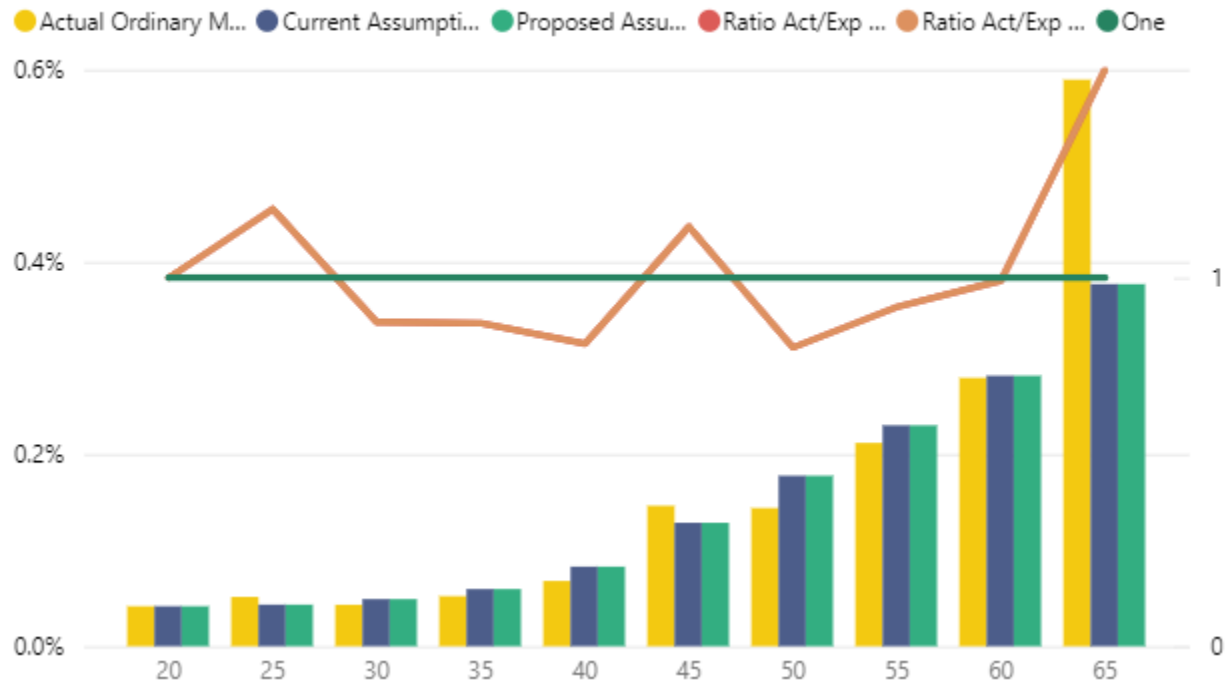
The following charts show the experience of ordinary death by age band, for the age range (20 to 69) during the period 2012 – 2019 based on the proposed assumption. No change in the assumption is recommended. The A/E ratio is 0.99. Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
20	1	1.0	2,406	0.0416%	0.0416%	1.00
25	10	8.4	19,500	0.0513%	0.0432%	1.19
30	13	14.8	30,167	0.0431%	0.0490%	0.88
35	16	18.3	30,735	0.0521%	0.0594%	0.88
40	19	23.2	27,989	0.0679%	0.0828%	0.82
45	38	33.4	25,995	0.1462%	0.1284%	1.14
50	35	43.2	24,346	0.1438%	0.1774%	0.81
55	45	48.9	21,275	0.2115%	0.2298%	0.92
60	41	41.3	14,684	0.2792%	0.2814%	0.99
65	36	23.0	6,107	0.5895%	0.3768%	1.56
Total	254	255.4	203,204	0.1250%	0.1257%	0.99

Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Age



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Age

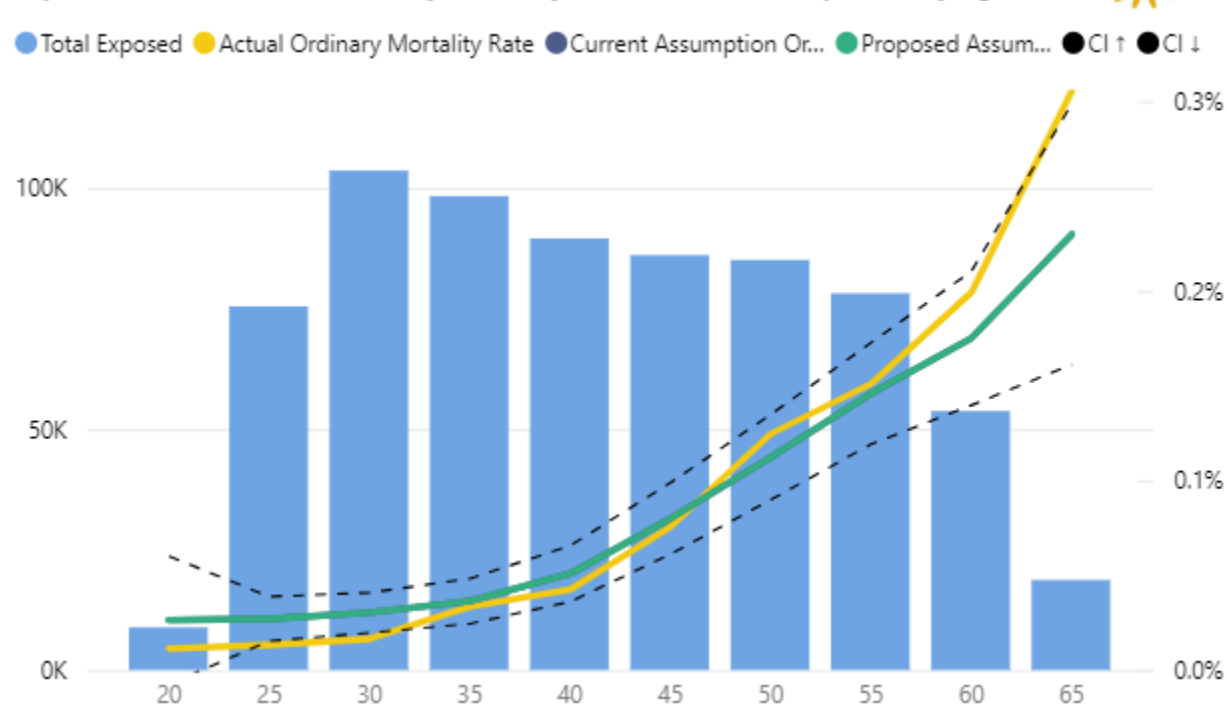


Females

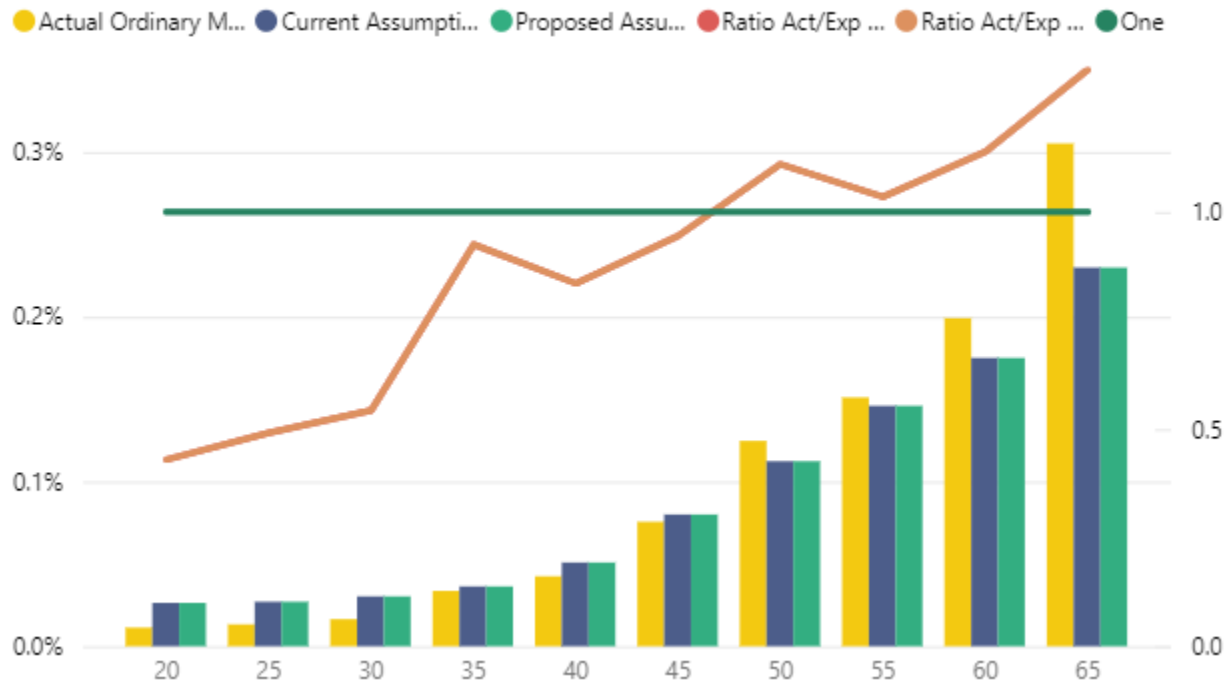
The following charts show the experience of ordinary death by age, for the age range (20 to 69) during the period 2012 – 2019 based on the proposed assumption. No change in the assumption is recommended. The A/E ratio is 1.00. Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
20	1	2.3	8,855	0.0113%	0.0263%	0.43
25	10	20.4	75,450	0.0133%	0.0270%	0.49
30	17	31.3	103,591	0.0164%	0.0302%	0.54
35	33	35.7	98,321	0.0336%	0.0363%	0.93
40	38	45.5	89,523	0.0424%	0.0508%	0.84
45	65	68.8	86,065	0.0755%	0.0799%	0.94
50	106	95.5	85,067	0.1246%	0.1123%	1.11
55	118	114.0	78,144	0.1510%	0.1459%	1.03
60	107	94.0	53,725	0.1992%	0.1750%	1.14
65	57	42.9	18,679	0.3052%	0.2298%	1.33
Total	552	550.4	697,420	0.0791%	0.0789%	1.00

Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Age



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

No change in the ordinary death assumption is proposed and thus, there is no liability impact.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS BASE TABLE			
	Ordinary Death		
Age	Males	Females	Accidental Death
15	0.040%	0.025%	0.000%
16	0.040%	0.025%	0.000%
17	0.040%	0.025%	0.000%
18	0.040%	0.025%	0.000%
19	0.040%	0.025%	0.000%
20	0.040%	0.025%	0.000%
21	0.040%	0.025%	0.000%
22	0.040%	0.025%	0.000%
23	0.040%	0.025%	0.000%
24	0.040%	0.025%	0.000%
25	0.040%	0.025%	0.000%
26	0.040%	0.025%	0.000%
27	0.040%	0.025%	0.000%
28	0.040%	0.025%	0.000%
29	0.040%	0.025%	0.000%
30	0.040%	0.025%	0.000%
31	0.042%	0.026%	0.000%
32	0.044%	0.028%	0.000%
33	0.046%	0.029%	0.000%
34	0.048%	0.030%	0.000%
35	0.050%	0.031%	0.000%
36	0.052%	0.033%	0.000%
37	0.054%	0.034%	0.000%
38	0.056%	0.035%	0.000%
39	0.058%	0.036%	0.000%
40	0.060%	0.038%	0.000%
41	0.070%	0.044%	0.000%
42	0.080%	0.050%	0.000%
43	0.090%	0.056%	0.000%
44	0.100%	0.063%	0.000%
45	0.110%	0.069%	0.000%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS BASE TABLE			
	Ordinary Death		
Age	Males	Females	Accidental Death
46	0.120%	0.075%	0.000%
47	0.130%	0.081%	0.000%
48	0.140%	0.088%	0.000%
49	0.150%	0.094%	0.000%
50	0.160%	0.100%	0.000%
51	0.170%	0.106%	0.000%
52	0.180%	0.113%	0.000%
53	0.190%	0.119%	0.000%
54	0.200%	0.125%	0.000%
55	0.210%	0.131%	0.000%
56	0.220%	0.138%	0.000%
57	0.230%	0.144%	0.000%
58	0.240%	0.150%	0.000%
59	0.250%	0.156%	0.000%
60	0.260%	0.163%	0.000%
61	0.270%	0.169%	0.000%
62	0.280%	0.175%	0.000%
63	0.290%	0.181%	0.000%
64	0.300%	0.188%	0.000%
65	0.320%	0.200%	0.000%
66	0.350%	0.219%	0.000%
67	0.390%	0.244%	0.000%
68	0.440%	0.275%	0.000%
69	0.500%	0.313%	0.000%
70	0.540%	0.350%	0.000%
71	0.600%	0.388%	0.000%
72	0.650%	0.425%	0.000%
73	0.700%	0.463%	0.000%
74	0.750%	0.525%	0.000%
75	0.800%	0.588%	0.000%
76	0.890%	0.650%	0.000%
77	0.980%	0.713%	0.000%
78	1.070%	0.775%	0.000%
79	1.160%	0.925%	0.000%
80	0.000%	0.000%	0.000%

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS BASE YEAR 2019 BASE TABLE			
	Ordinary Death		
Age	Males	Females	Accidental Death
15	0.040%	0.025%	0.000%
16	0.040%	0.025%	0.000%
17	0.040%	0.025%	0.000%
18	0.040%	0.025%	0.000%
19	0.040%	0.025%	0.000%
20	0.042%	0.027%	0.000%
21	0.043%	0.027%	0.000%
22	0.043%	0.028%	0.000%
23	0.044%	0.028%	0.000%
24	0.045%	0.029%	0.000%
25	0.046%	0.029%	0.000%
26	0.047%	0.030%	0.000%
27	0.048%	0.030%	0.000%
28	0.049%	0.031%	0.000%
29	0.050%	0.031%	0.000%
30	0.051%	0.031%	0.000%
31	0.055%	0.033%	0.000%
32	0.058%	0.036%	0.000%
33	0.061%	0.037%	0.000%
34	0.064%	0.038%	0.000%
35	0.067%	0.039%	0.000%
36	0.069%	0.041%	0.000%
37	0.071%	0.041%	0.000%
38	0.072%	0.042%	0.000%
39	0.073%	0.042%	0.000%
40	0.074%	0.043%	0.000%
41	0.084%	0.048%	0.000%
42	0.093%	0.053%	0.000%
43	0.101%	0.058%	0.000%
44	0.109%	0.063%	0.000%
45	0.116%	0.068%	0.000%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR ACTIVE MEMBERS BASE YEAR 2019 BASE TABLE			
	Ordinary Death		
Age	Males	Females	Accidental Death
46	0.123%	0.073%	0.000%
47	0.131%	0.077%	0.000%
48	0.138%	0.083%	0.000%
49	0.146%	0.089%	0.000%
50	0.154%	0.095%	0.000%
51	0.163%	0.101%	0.000%
52	0.173%	0.109%	0.000%
53	0.183%	0.116%	0.000%
54	0.194%	0.124%	0.000%
55	0.206%	0.132%	0.000%
56	0.218%	0.141%	0.000%
57	0.231%	0.149%	0.000%
58	0.244%	0.157%	0.000%
59	0.256%	0.164%	0.000%
60	0.269%	0.171%	0.000%
61	0.280%	0.176%	0.000%
62	0.291%	0.180%	0.000%
63	0.301%	0.184%	0.000%
64	0.309%	0.188%	0.000%
65	0.326%	0.196%	0.000%
66	0.353%	0.211%	0.000%
67	0.388%	0.232%	0.000%
68	0.432%	0.258%	0.000%
69	0.486%	0.291%	0.000%
70	0.519%	0.324%	0.000%
71	0.571%	0.359%	0.000%
72	0.615%	0.393%	0.000%
73	0.659%	0.429%	0.000%
74	0.704%	0.488%	0.000%
75	0.750%	0.549%	0.000%
76	0.835%	0.610%	0.000%
77	0.920%	0.672%	0.000%
78	1.007%	0.735%	0.000%
79	1.093%	0.881%	0.000%
80	0.000%	0.000%	0.000%

Postretirement Mortality

In addition to gender, the post-retirement mortality assumption depends on the type of inactive member:

- 1) Service Retirees
- 2) Disabled Retirees
- 3) Contingent Beneficiaries

The MEST contains all retirees on one page and beneficiaries on another page. On the retiree page, the experience can be examined by status to review disabled retirees versus service retirees. Service retirees include members who have commenced their pension benefit from a terminated vested status in addition to members who have retired from active status. There is a separate MEST containing the postretirement mortality experience of members across all NYCERS systems, which allowed us to review experience and develop proposed assumptions over multiple systems where it was advantageous to do so.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and treatment of excess deaths due to the Covid pandemic, which occurred in 2020 – 2022. The analysis to develop our recommendations excludes the mortality experience of members during the pandemic and reflects the experience from 2015 - 2019. Experience prior to 2015 was excluded as benefit amounts were not available in the historical database prior to this period.

Most mortality studies have found that higher benefits are positively correlated with smaller mortality rates and longer life expectancy. Accordingly, the OA utilizes adjustment factors to convert post-retirement mortality weighted by headcounts to post-retirement mortality weighted by benefit amounts. The current assumption adjustment factors used by the OA are:

Post-Retirement Mortality Adjustment Factor To Convert from Headcount-Weighted to Amount-Weighted		
	Males	Females
Service Retiree	0.908	0.944
Disabled Retiree	0.940	0.962
Contingent Beneficiary	0.890	0.951

Mortality assumptions involve two components: a base table and a mortality improvement scale. The mortality improvement scale adjusts the mortality rates of the base table to reflect that generally rates of mortality are anticipated to improve over time. As noted in the pre-retirement death section, we used the most recent improvement scale (MP-2021) published by the SOA as of the date of this analysis. Please note that the SOA has not published an updated MP scale due to the pandemic.

In this study the base table of the current assumption corresponds to the year 2012; expected mortality rates in future years are obtained from the base table and the MP-2021 scale. For example, the 2017 (July 1, 2016 – June 30, 2017) mortality rates are derived from the base table (2012) adjusted with four years of improvements until 2016. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

For the proposed assumption, proposed rates were initially determined as of the mid-year of the study period or fiscal year 2017. MP-2021 was then used to adjust those rates to earlier and later years. The proposed mortality rates shown in the following section have been adjusted to reflect a base year of 2019. We recommend that MP-2021 continue to be used to reflect mortality improvements both before and after the measurement date.

In reviewing the current assumption, we compared the actual experience to published tables from the SOA. The most recent tables published by the SOA reflected experience for public plan retirement systems separated into Teachers (PubT), General employees (PubG) and Public Safety (PubS) members. The SOA publishes versions of each of these tables where the mortality rates are weighted by the amount of the pension benefit (“amount-weighted”) or weighted by the number of members (headcount-weighted). We compared the amount-weighted experience to the amount-weighted SOA table and the headcount-weighted experience to the headcount-weighted SOA table. Adjustments were made to the applicable standard SOA tables to match the experience of the system to determine if the SOA tables provided a better statistical fit to the experience.

The SOA combined the experience of teachers and general employees in developing disability annuity mortality tables. Due to lack of credibility, a relatively lower disability incidence rate and consistency with the SOA tables, we combined the experience of TRS, BERS and NYCERS (general, sanitation, transit, and TBTA) in proposing a recommended assumption.

The SOA also combined the experience of all contingent beneficiaries (teachers, general employees and public safety members) into a single table. We combined the experience of all NYCERS systems (TRS, BERS, NYCERS, POLICE and FIRE) in proposing a recommended assumption. The contingent survivor assumption would apply upon the death of the member. While both the member and contingent survivor are both alive, we propose the healthy annuitant mortality table apply.

In the actuarial valuation of pension benefits, we recommend that amount-weighted mortality rates be used. Headcount-weighted mortality rates may be used for other purposes, such as a retiree medical valuation.

Postretirement Mortality – Service Retirees

For TRS, we compared the experience to PubT tables and found the current assumption provides a better statistical fit. We propose adjustments to the current amount-weighted assumption to reflect actual experience by age. Separate adjustments were then made to determine headcount-weighted proposed rates.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (55 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions. The A/E increased from 0.96 to 0.99.

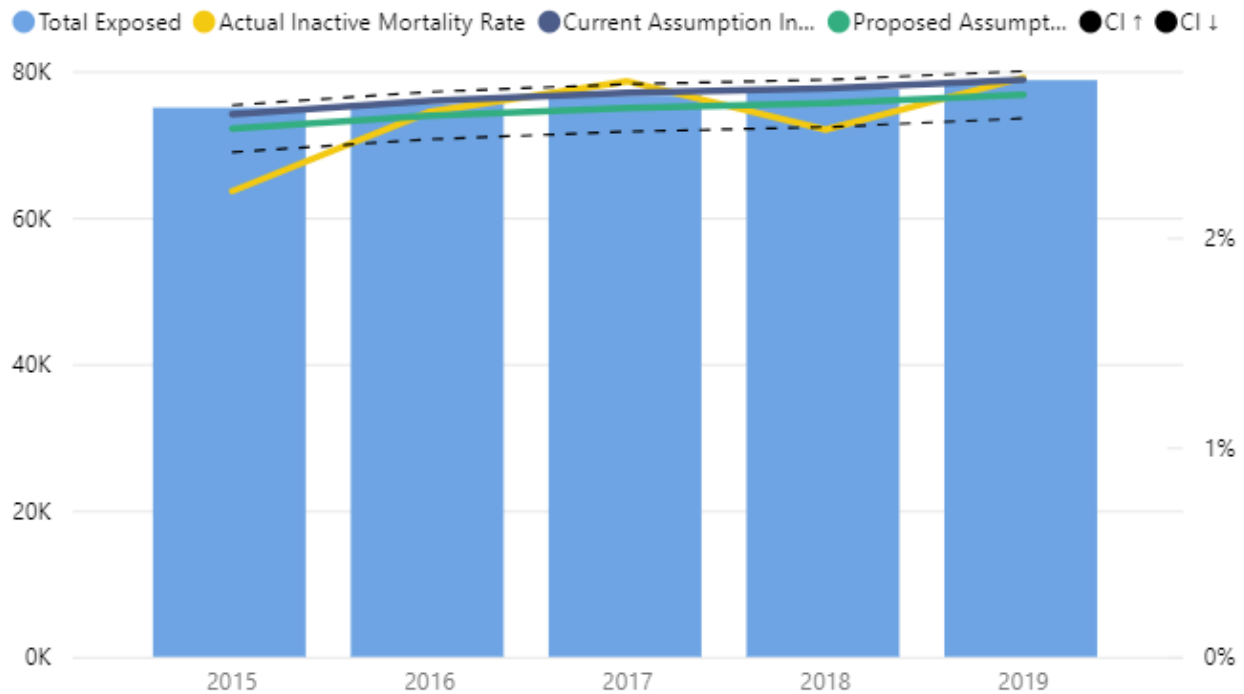
Current Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	1,665	1,940.8	75,000	2.2200%	2.5877%	0.86
2016	1,964	2,003.8	75,560	2.5993%	2.6519%	0.98
2017	2,103	2,061.3	76,657	2.7434%	2.6889%	1.02
2018	1,949	2,101.7	77,525	2.5140%	2.7110%	0.93
2019	2,175	2,167.3	78,764	2.7614%	2.7516%	1.00
Total	9,856	10,274.8	383,506	2.5700%	2.6792%	0.96

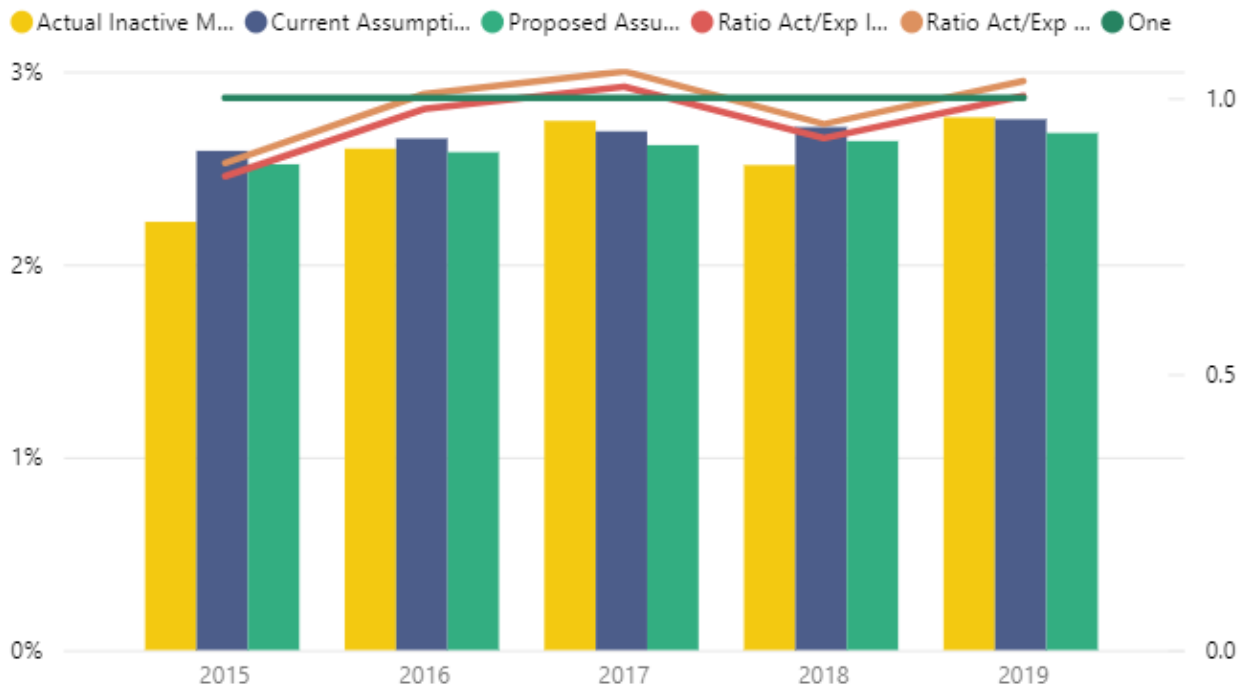
Proposed Assumption– Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
2015	1,665	1,888.7	75,000	2.2200%	2.5182%	0.88
2016	1,964	1,950.0	75,560	2.5993%	2.5807%	1.01
2017	2,103	2,006.5	76,657	2.7434%	2.6175%	1.05
2018	1,949	2,045.5	77,525	2.5140%	2.6385%	0.95
2019	2,175	2,110.9	78,764	2.7614%	2.6800%	1.03
Total	9,856	10,001.5	383,506	2.5700%	2.6079%	0.99

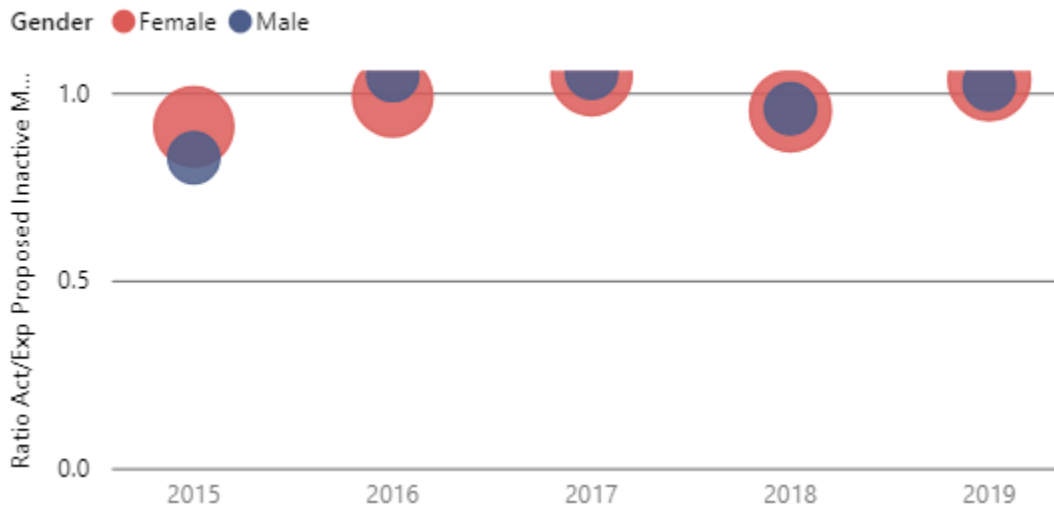
Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Exposure Bubbles; by Year



The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (55 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions. The A/E remained at 0.99.

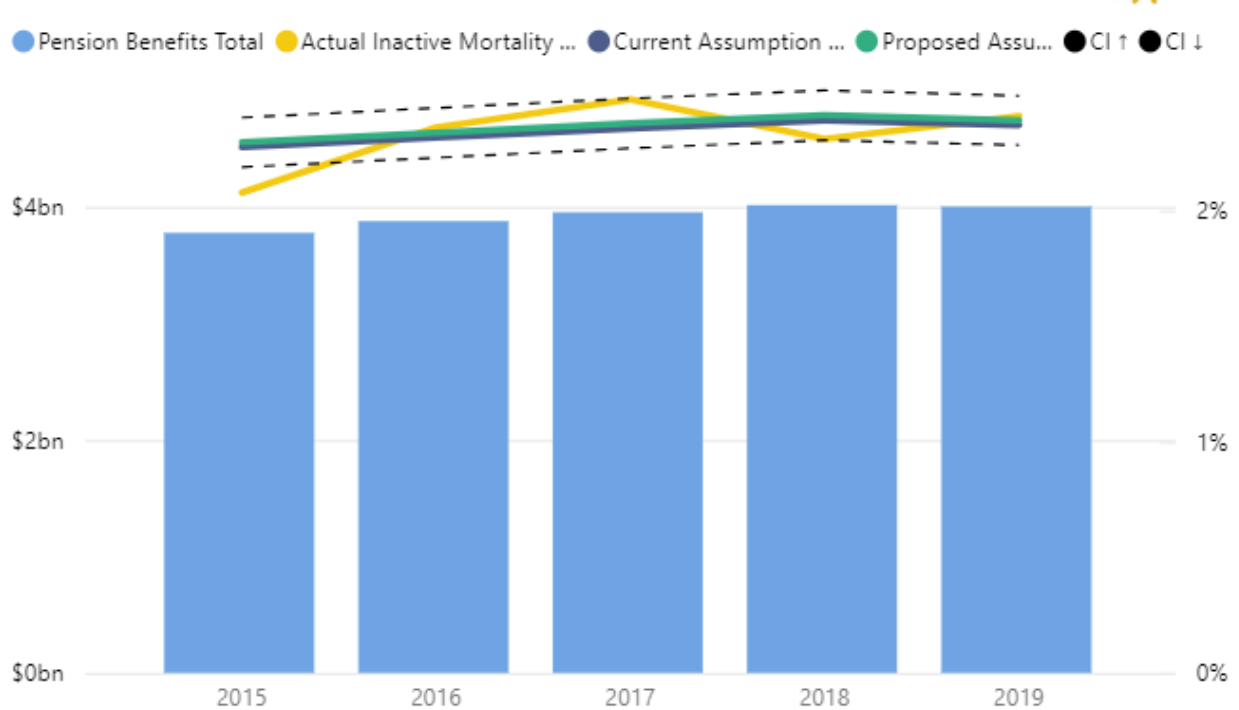
Current Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
2015	\$78.5M	\$85.9M	\$3,776.6M	2.0776%	2.2756%	0.91
2016	\$91.5M	\$89.8M	\$3,877.3M	2.3598%	2.3154%	1.02
2017	\$98.0M	\$93.1M	\$3,953.1M	2.4800%	2.3553%	1.05
2018	\$92.7M	\$95.9M	\$4,014.4M	2.3099%	2.3894%	0.97
2019	\$96.4M	\$94.9M	\$4,003.1M	2.4093%	2.3703%	1.02
Total	\$457.2M	\$459.6M	\$19,624.5M	2.3296%	2.3421%	0.99

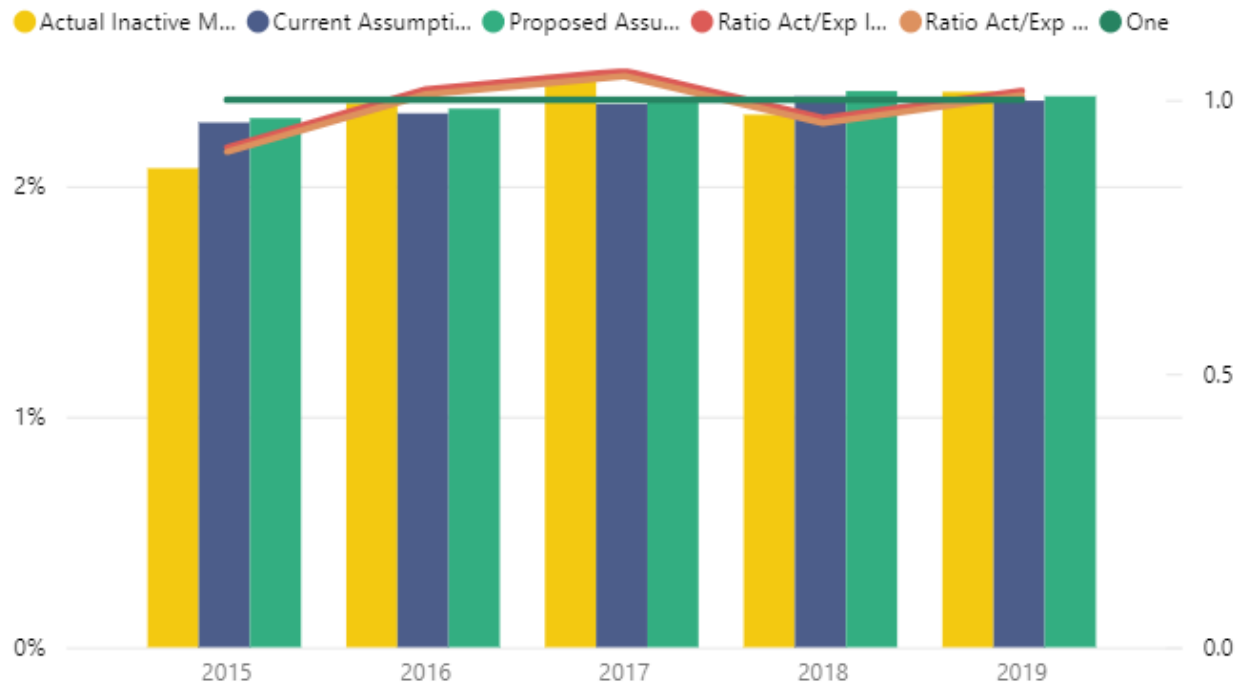
Proposed Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
2015	\$78,461K	\$86,676K	\$3,776,578K	2.0776%	2.2951%	0.91
2016	\$91,497K	\$90,579K	\$3,877,292K	2.3598%	2.3361%	1.01
2017	\$98,040K	\$93,976K	\$3,953,142K	2.4800%	2.3772%	1.04
2018	\$92,730K	\$96,836K	\$4,014,378K	2.3099%	2.4122%	0.96
2019	\$96,446K	\$95,665K	\$4,003,074K	2.4093%	2.3898%	1.01
Total	\$457,173K	\$463,732K	\$19,624,464K	2.3296%	2.3630%	0.99

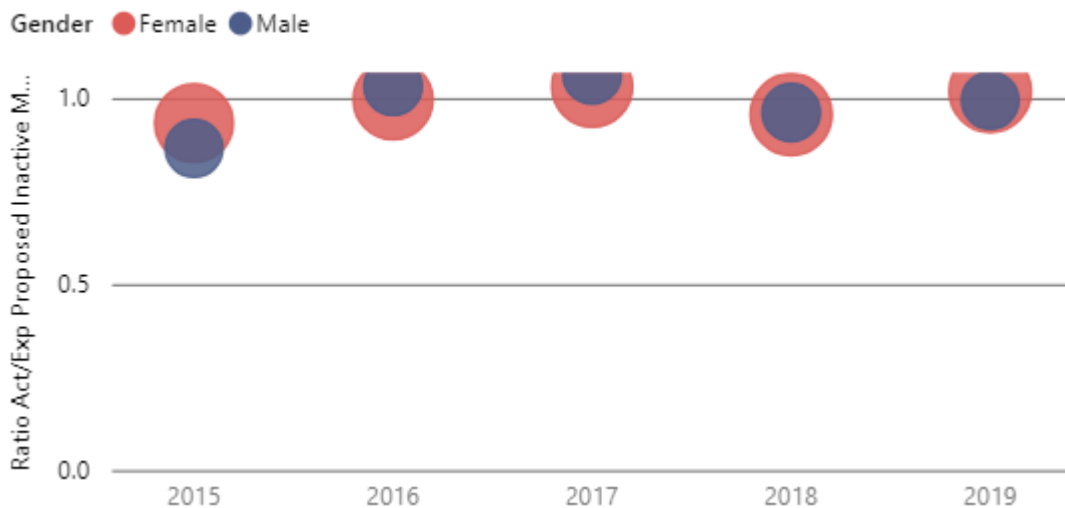
Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Benefit Bubbles; by Year














The following section displays results by gender.

Service Retirees - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (55 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions. While the A/E decreased from 1.00 to 0.98, the overall fit for each group improved. For ages 55 to 74, the A/E increased from 0.88 to 0.98 and for ages 75 – 104, the A/E decreased from 1.05 to 0.99.

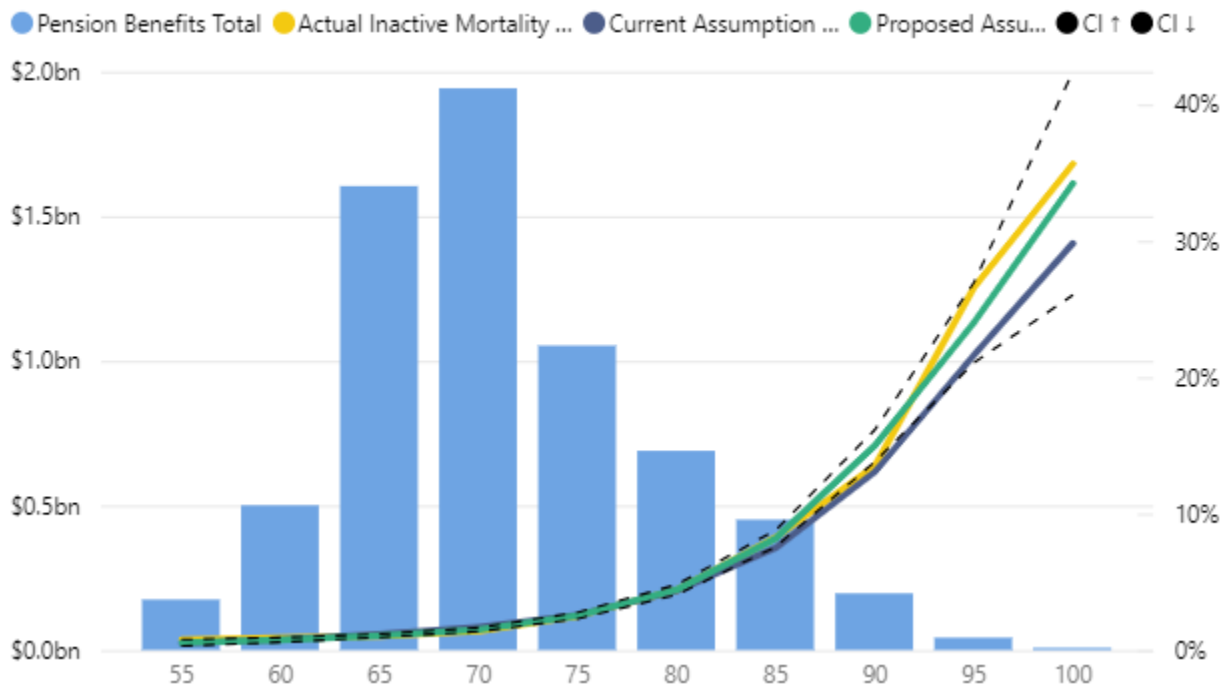
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

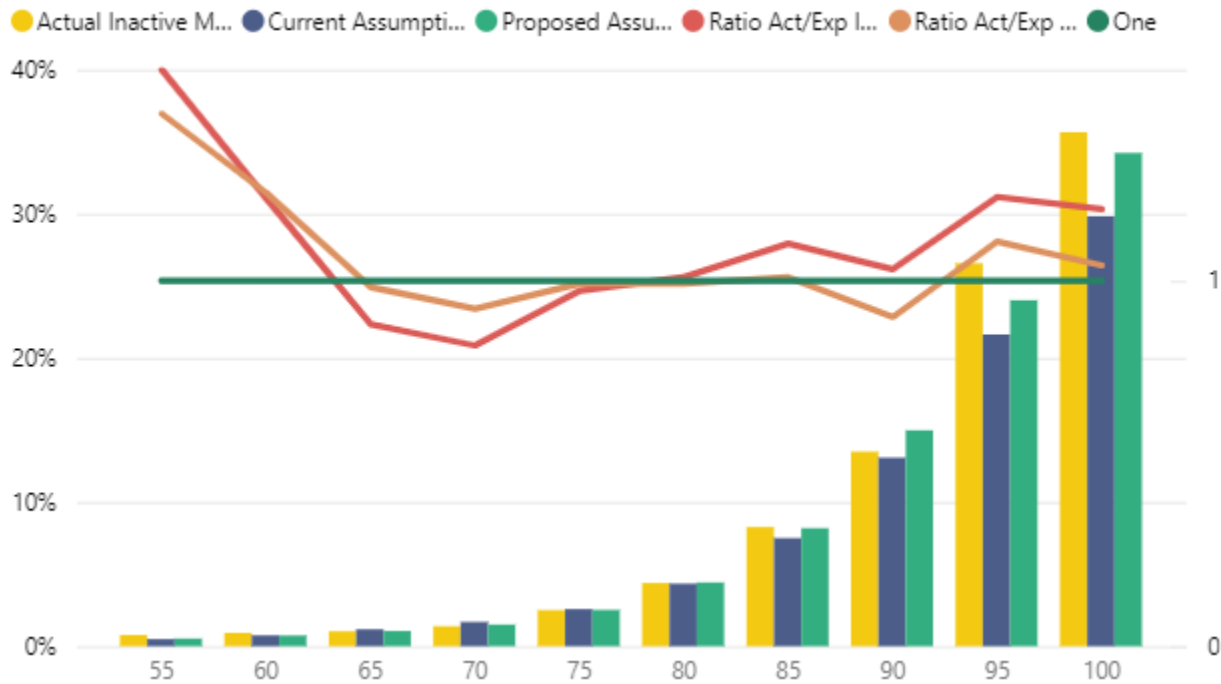
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
55	\$1.4M	\$0.9M	\$174.8M	0.7734%	0.4901%	 1.58
60	\$4.6M	\$3.8M	\$500.5M	0.9212%	0.7511%	 1.23
65	\$16.6M	\$18.8M	\$1,604.2M	1.0349%	1.1739%	 0.88
70	\$26.9M	\$32.7M	\$1,942.1M	1.3847%	1.6828%	 0.82
75	\$26.3M	\$27.1M	\$1,052.7M	2.5022%	2.5734%	 0.97
80	\$30.2M	\$29.9M	\$688.8M	4.3827%	4.3413%	 1.01
85	\$37.3M	\$33.8M	\$451.1M	8.2632%	7.4996%	 1.10
90	\$26.5M	\$25.6M	\$196.1M	13.4963%	13.0796%	 1.03
95	\$11.4M	\$9.3M	\$42.9M	26.5686%	21.6230%	 1.23
100	\$2.4M	\$2.0M	\$6.8M	35.6564%	29.8165%	 1.20
Total	\$183.6M	\$183.9M	\$6,660.0M	2.7563%	2.7616%	 1.00

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
55	\$1.4M	\$0.9M	\$174.8M	0.7734%	0.5308%	▲ 1.46
60	\$4.6M	\$3.7M	\$500.5M	0.9212%	0.7425%	▲ 1.24
65	\$16.6M	\$16.9M	\$1,604.2M	1.0349%	1.0534%	● 0.98
70	\$26.9M	\$29.1M	\$1,942.1M	1.3847%	1.4997%	● 0.92
75	\$26.3M	\$26.5M	\$1,052.7M	2.5022%	2.5211%	● 0.99
80	\$30.2M	\$30.4M	\$688.8M	4.3827%	4.4203%	● 0.99
85	\$37.3M	\$36.9M	\$451.1M	8.2632%	8.1865%	● 1.01
90	\$26.5M	\$29.4M	\$196.1M	13.4963%	14.9780%	● 0.90
95	\$11.4M	\$10.3M	\$42.9M	26.5686%	24.0015%	▲ 1.11
100	\$2.4M	\$2.3M	\$6.8M	35.6564%	34.2173%	● 1.04
Total	\$183.6M	\$186.6M	\$6,660.0M	2.7563%	2.8017%	● 0.98

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age 



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



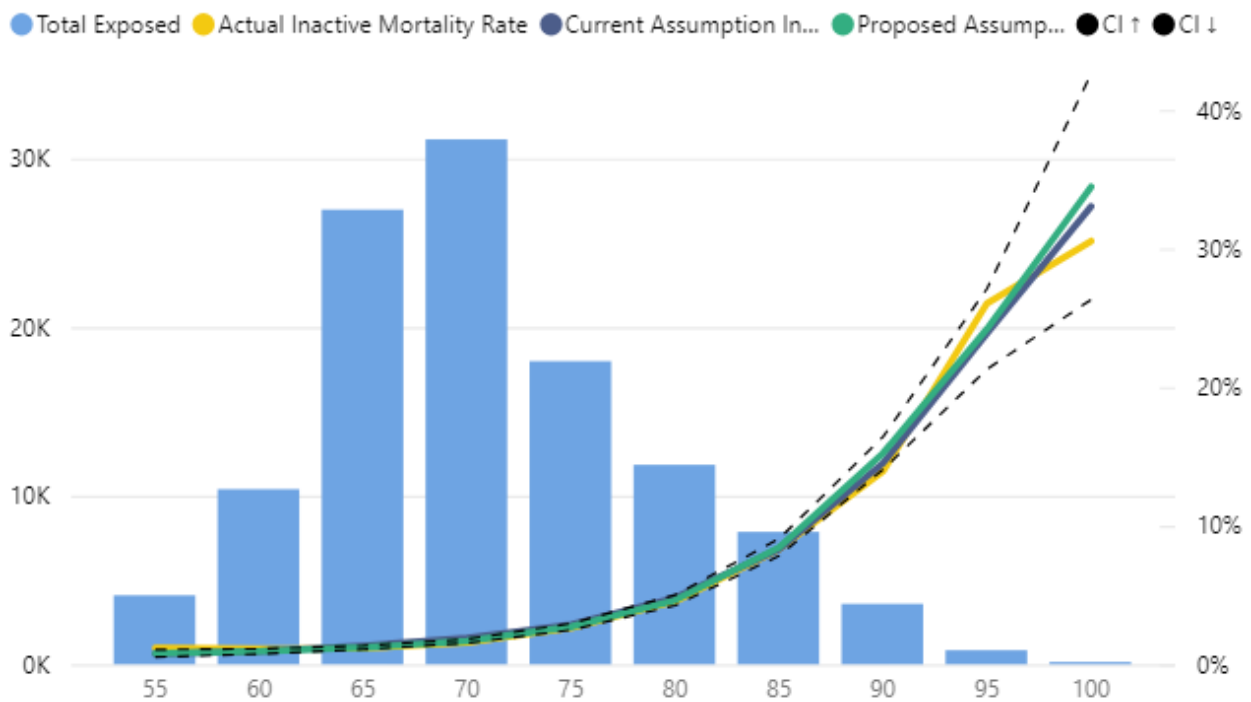
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (55 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions. The A/E increased from 0.94 to 0.98.

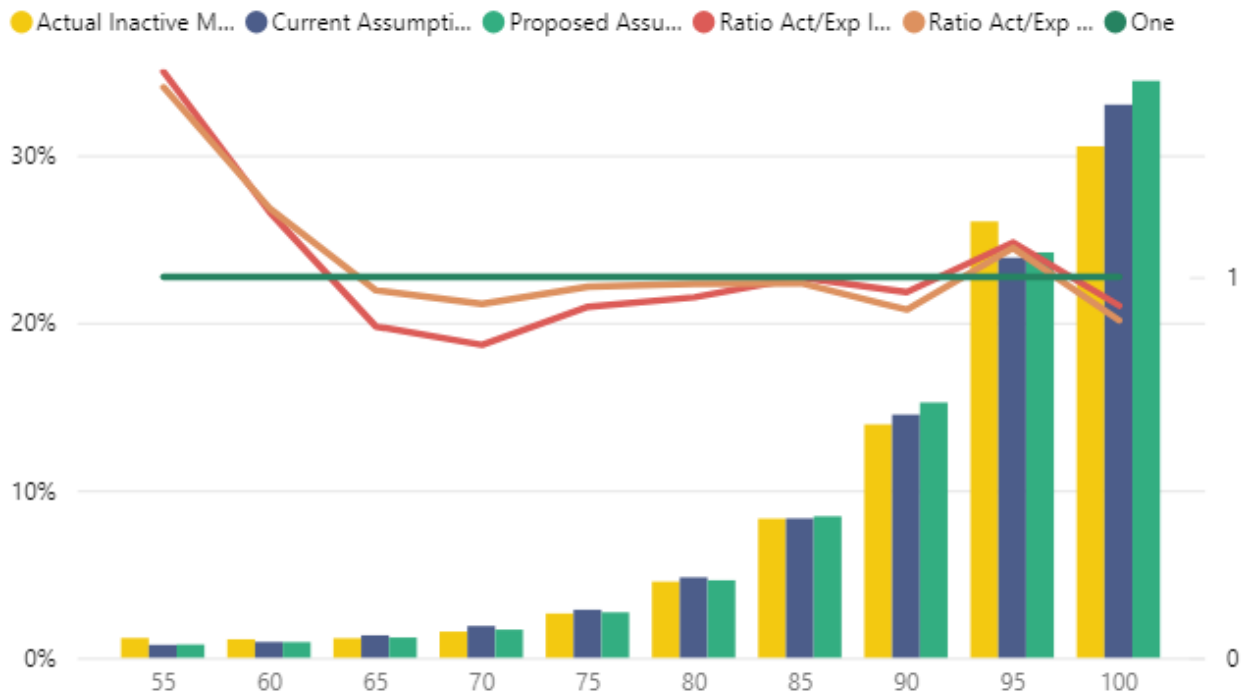
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
55	32	19.4	3,613	0.8857%	0.5364%	1.65
60	92	80.4	9,730	0.9455%	0.8261%	1.14
65	289	334.4	26,028	1.1103%	1.2847%	0.86
70	451	562.5	30,285	1.4892%	1.8575%	0.80
75	455	501.5	17,657	2.5769%	2.8405%	0.91
80	530	557.9	11,671	4.5412%	4.7804%	0.95
85	645	641.9	7,748	8.3247%	8.2847%	1.00
90	491	510.7	3,532	13.9015%	14.4581%	0.96
95	214	193.3	813	26.3223%	23.7804%	1.11
100	39	42.5	129	30.2326%	32.9759%	0.92
Total	3,238	3,444.6	111,206	2.9117%	3.0975%	0.94

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
55	32	20.3	3,613	0.8857%	0.5617%	1.58
60	92	76.8	9,730	0.9455%	0.7890%	1.20
65	289	290.1	26,028	1.1103%	1.1147%	1.00
70	451	482.9	30,285	1.4892%	1.5945%	0.93
75	455	467.3	17,657	2.5769%	2.6467%	0.97
80	530	533.0	11,671	4.5412%	4.5670%	0.99
85	645	649.4	7,748	8.3247%	8.3818%	0.99
90	491	536.6	3,532	13.9015%	15.1922%	0.92
95	214	196.4	813	26.3223%	24.1635%	1.09
100	39	44.4	129	30.2326%	34.4251%	0.88
Total	3,238	3,297.3	111,206	2.9117%	2.9650%	0.98

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Service Retirees - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (55 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions. While the A/E remained at 0.99, the overall fit for each group improved. For ages 55 to 74, the A/E increased from 0.91 to 0.97 and for ages 75 – 104, the A/E decreased from 1.02 to 0.99.

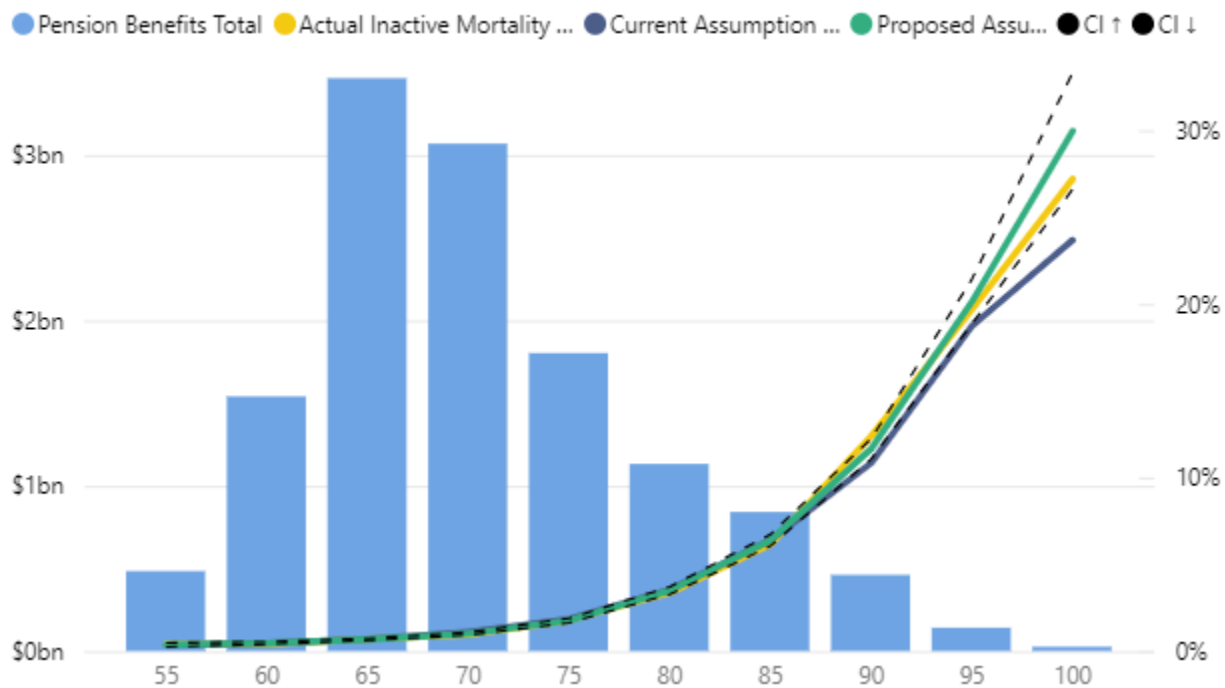
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

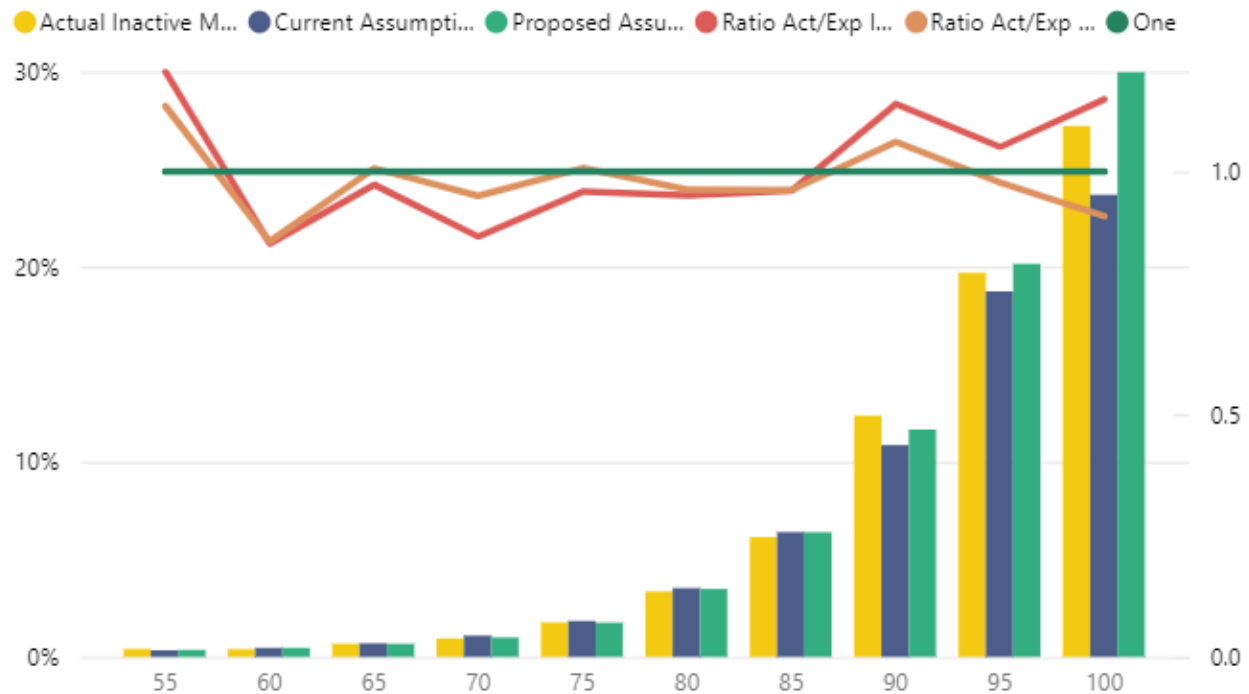
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
55	\$2.0M	\$1.6M	\$483.5M	0.4060%	0.3366%	▲ 1.21
60	\$6.1M	\$7.1M	\$1,540.5M	0.3938%	0.4626%	▲ 0.85
65	\$23.3M	\$24.0M	\$3,466.4M	0.6735%	0.6923%	● 0.97
70	\$29.0M	\$33.4M	\$3,069.9M	0.9436%	1.0896%	▲ 0.87
75	\$31.8M	\$33.2M	\$1,802.9M	1.7654%	1.8416%	● 0.96
80	\$37.9M	\$39.9M	\$1,132.1M	3.3511%	3.5248%	● 0.95
85	\$51.7M	\$53.8M	\$841.3M	6.1422%	6.3958%	● 0.96
90	\$57.0M	\$50.0M	\$460.7M	12.3645%	10.8512%	▲ 1.14
95	\$27.8M	\$26.4M	\$141.1M	19.6813%	18.7319%	● 1.05
100	\$7.1M	\$6.2M	\$26.0M	27.2056%	23.6822%	▲ 1.15
Total	\$273.6M	\$275.7M	\$12,964.5M	2.1104%	2.1266%	● 0.99

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
55	\$2.0M	\$1.7M	\$483.5M	0.4060%	0.3576%	▲ 1.14
60	\$6.1M	\$7.1M	\$1,540.5M	0.3938%	0.4600%	▲ 0.86
65	\$23.3M	\$23.2M	\$3,466.4M	0.6735%	0.6689%	● 1.01
70	\$29.0M	\$30.5M	\$3,069.9M	0.9436%	0.9935%	● 0.95
75	\$31.8M	\$31.6M	\$1,802.9M	1.7654%	1.7532%	● 1.01
80	\$37.9M	\$39.4M	\$1,132.1M	3.3511%	3.4806%	● 0.96
85	\$51.7M	\$53.7M	\$841.3M	6.1422%	6.3866%	● 0.96
90	\$57.0M	\$53.7M	\$460.7M	12.3645%	11.6493%	● 1.06
95	\$27.8M	\$28.4M	\$141.1M	19.6813%	20.1412%	● 0.98
100	\$7.1M	\$7.8M	\$26.0M	27.2056%	29.9642%	● 0.91
Total	\$273.6M	\$277.1M	\$12,964.5M	2.1104%	2.1377%	● 0.99

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age 



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



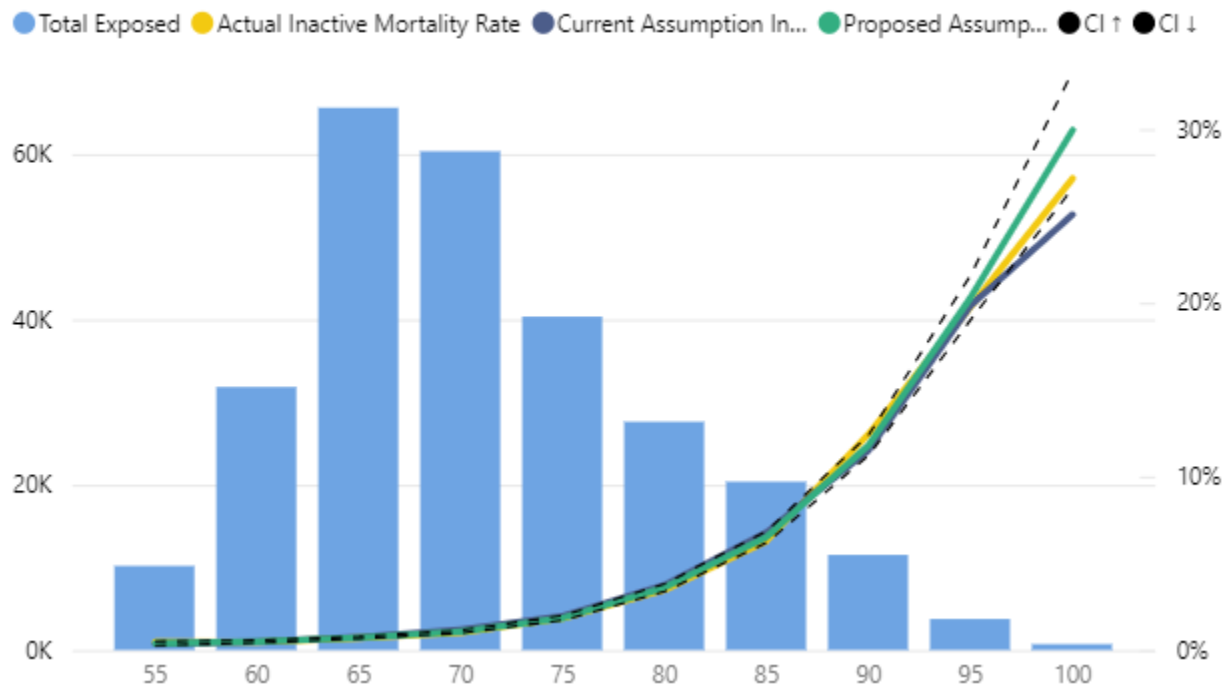
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (55 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions. The A/E increased from 0.97 to 0.99.

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
55	48	36.1	10,180	0.4715%	0.3547%	1.33
60	143	156.0	31,827	0.4493%	0.4900%	0.92
65	459	479.9	65,619	0.6995%	0.7313%	0.96
70	610	700.8	60,354	1.0107%	1.1611%	0.87
75	744	792.0	40,340	1.8443%	1.9634%	0.94
80	960	1,032.5	27,624	3.4752%	3.7377%	0.93
85	1,283	1,381.3	20,374	6.2972%	6.7796%	0.93
90	1,434	1,326.8	11,511	12.4576%	11.5264%	1.08
95	743	745.8	3,757	19.7764%	19.8517%	1.00
100	194	179.1	714	27.1709%	25.0813%	1.08
Total	6,618	6,830.2	272,300	2.4304%	2.5083%	0.97

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
55	48	38.6	10,180	0.4715%	0.3789%	▲ 1.24
60	143	155.8	31,827	0.4493%	0.4894%	● 0.92
65	459	465.7	65,619	0.6995%	0.7097%	● 0.99
70	610	639.2	60,354	1.0107%	1.0591%	● 0.95
75	744	745.8	40,340	1.8443%	1.8488%	● 1.00
80	960	994.3	27,624	3.4752%	3.5993%	● 0.97
85	1,283	1,328.5	20,374	6.2972%	6.5204%	● 0.97
90	1,434	1,359.5	11,511	12.4576%	11.8103%	● 1.05
95	743	763.1	3,757	19.7764%	20.3107%	● 0.97
100	194	213.9	714	27.1709%	29.9548%	● 0.91
Total	6,618	6,704.2	272,300	2.4304%	2.4621%	● 0.99

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Summary

We have proposed new assumptions to better reflect recent non-pandemic experience. In total, the proposed mortality tables are anticipated to increase plan liabilities for younger retirement ages up to about mid-70s and then anticipated to decrease plan liabilities for older retirement ages. We would anticipate that this would increase plan liabilities for current active members but reduce liabilities for retirees. The actual impact will depend on the relative change for each group.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
15	0.0108%	0.0105%	68	1.3827%	0.8399%
16	0.0146%	0.0128%	69	1.5070%	0.8992%
17	0.0197%	0.0140%	70	1.6306%	0.9855%
18	0.0222%	0.0145%	71	1.7953%	1.1072%
19	0.0235%	0.0151%	72	1.9579%	1.2311%
20	0.0246%	0.0153%	73	2.1191%	1.3549%
21	0.0263%	0.0162%	74	2.2784%	1.4775%
22	0.0278%	0.0171%	75	2.4370%	1.5961%
23	0.0295%	0.0181%	76	2.7233%	1.8356%
24	0.0309%	0.0193%	77	3.0074%	2.0765%
25	0.0320%	0.0206%	78	3.2885%	2.3162%
26	0.0335%	0.0220%	79	3.5677%	2.5533%
27	0.0347%	0.0234%	80	3.8824%	2.7842%
28	0.0364%	0.0249%	81	4.4474%	3.3221%
29	0.0386%	0.0267%	82	5.0193%	3.8708%
30	0.0418%	0.0286%	83	5.5977%	4.4089%
31	0.0476%	0.0348%	84	6.1798%	5.0027%
32	0.0532%	0.0401%	85	6.7676%	5.5878%
33	0.0583%	0.0449%	86	7.7139%	6.2981%
34	0.0629%	0.0489%	87	8.6843%	6.9333%
35	0.0673%	0.0527%	88	9.6857%	7.5758%
36	0.0698%	0.0557%	89	10.7135%	8.5620%
37	0.0720%	0.0591%	90	11.7744%	9.6778%
38	0.0745%	0.0626%	91	13.6049%	10.8390%
39	0.0782%	0.0672%	92	15.5105%	11.9717%
40	0.0837%	0.0726%	93	17.4679%	13.1425%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
41	0.0941%	0.0775%	94	19.5105%	15.1670%
42	0.1051%	0.0838%	95	21.6689%	17.3761%
43	0.1167%	0.0918%	96	23.7343%	19.5275%
44	0.1294%	0.1013%	97	25.7571%	21.6213%
45	0.1432%	0.1132%	98	27.8633%	23.3643%
46	0.1582%	0.1271%	99	29.8272%	23.8705%
47	0.1744%	0.1429%	100	31.5152%	23.9898%
48	0.1918%	0.1597%	101	33.0771%	24.9134%
49	0.2102%	0.1774%	102	34.4234%	26.0067%
50	0.2317%	0.1950%	103	35.6398%	27.2992%
51	0.2657%	0.2130%	104	36.6357%	28.7614%
52	0.3011%	0.2304%	105	37.3430%	30.3385%
53	0.3373%	0.2472%	106	37.7004%	31.9944%
54	0.3744%	0.2638%	107	37.8599%	33.6898%
55	0.4112%	0.2806%	108	38.0314%	35.3785%
56	0.4578%	0.3034%	109	38.1998%	37.0129%
57	0.5025%	0.3264%	110	50.0000%	50.0000%
58	0.5448%	0.3498%	111	50.0000%	50.0000%
59	0.5843%	0.3732%	112	50.0000%	50.0000%
60	0.6211%	0.3973%	113	50.0000%	50.0000%
61	0.7018%	0.4321%	114	50.0000%	50.0000%
62	0.7804%	0.4686%	115	50.0000%	50.0000%
63	0.8588%	0.5072%	116	50.0000%	50.0000%
64	0.9371%	0.5479%	117	50.0000%	50.0000%
65	0.9994%	0.5912%	118	50.0000%	50.0000%
66	1.1295%	0.6619%	119	50.0000%	50.0000%
67	1.2569%	0.7367%	120	100.0000%	100.0000%

¹ An adjustment factor of 0.908 is applied to the probabilities above to develop benefit weighted probabilities of mortality

² An adjustment factor of 0.944 is applied to the probabilities above to develop benefit weighted probabilities of mortality

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0112%	0.0111%	68	1.0982%	0.7148%
16	0.0152%	0.0136%	69	1.1693%	0.7587%
17	0.0205%	0.0149%	70	1.2373%	0.8100%
18	0.0231%	0.0154%	71	1.3658%	0.8887%
19	0.0244%	0.0160%	72	1.4960%	0.9669%
20	0.0275%	0.0180%	73	1.6298%	1.0662%
21	0.0296%	0.0193%	74	1.7864%	1.1667%
22	0.0317%	0.0206%	75	1.9501%	1.2941%
23	0.0344%	0.0222%	76	2.2262%	1.5280%
24	0.0368%	0.0240%	77	2.5128%	1.7557%
25	0.0391%	0.0261%	78	2.8088%	2.0102%
26	0.0421%	0.0284%	79	3.1144%	2.2497%
27	0.0447%	0.0308%	80	3.3974%	2.5779%
28	0.0482%	0.0333%	81	3.8638%	2.9537%
29	0.0523%	0.0364%	82	4.3730%	3.4547%
30	0.0579%	0.0395%	83	4.9380%	3.9480%
31	0.0671%	0.0485%	84	5.5195%	4.4933%
32	0.0762%	0.0563%	85	6.2387%	5.0319%
33	0.0843%	0.0631%	86	7.1962%	5.6823%
34	0.0915%	0.0684%	87	8.2712%	6.3934%
35	0.0979%	0.0729%	88	9.4130%	7.0649%
36	0.1011%	0.0758%	89	10.6176%	8.0693%
37	0.1031%	0.0787%	90	11.8888%	9.2998%
38	0.1048%	0.0811%	91	13.7494%	10.6148%
39	0.1073%	0.0844%	92	15.6722%	11.9357%
40	0.1116%	0.0883%	93	17.4842%	13.3296%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.1213%	0.0911%	94	19.3321%	15.3521%
42	0.1307%	0.0953%	95	21.0400%	17.2269%
43	0.1398%	0.1011%	96	23.0780%	19.0166%
44	0.1495%	0.1084%	97	25.0826%	21.0788%
45	0.1597%	0.1181%	98	27.1773%	23.0277%
46	0.1711%	0.1299%	99	29.1543%	24.8782%
47	0.1835%	0.1438%	100	31.1411%	26.8130%
48	0.1973%	0.1590%	101	33.3316%	29.0367%
49	0.2126%	0.1760%	102	35.3607%	31.3139%
50	0.2317%	0.1937%	103	37.3162%	33.4294%
51	0.2640%	0.2131%	104	39.0835%	35.5366%
52	0.2990%	0.2332%	105	41.2363%	37.5417%
53	0.3361%	0.2542%	106	43.0644%	39.6463%
54	0.3760%	0.2761%	107	44.6787%	41.4914%
55	0.4173%	0.2992%	108	46.3292%	43.3061%
56	0.4616%	0.3223%	109	47.9991%	45.3748%
57	0.5037%	0.3447%	110	49.2643%	47.0677%
58	0.5424%	0.3656%	111	49.3926%	48.6651%
59	0.5769%	0.3842%	112	49.5164%	49.5505%
60	0.6064%	0.4007%	113	49.6404%	49.6547%
61	0.6750%	0.4288%	114	49.7797%	49.7592%
62	0.7366%	0.4555%	115	49.9850%	49.9900%
63	0.7921%	0.4811%	116	49.9950%	49.9950%
64	0.8410%	0.5058%	117	50.0000%	50.0000%
65	0.8701%	0.5364%	118	50.0000%	50.0000%
66	0.9513%	0.5844%	119	50.0000%	50.0000%
67	1.0227%	0.6410%	120	100.0000%	100.0000%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0119%	0.0119%	68	1.1682%	0.7605%
16	0.0161%	0.0145%	69	1.2439%	0.8072%
17	0.0218%	0.0158%	70	1.3163%	0.8617%
18	0.0246%	0.0164%	71	1.4530%	0.9454%
19	0.0260%	0.0171%	72	1.5872%	1.0258%
20	0.0291%	0.0191%	73	1.7247%	1.1283%
21	0.0315%	0.0204%	74	1.8854%	1.2314%
22	0.0338%	0.0218%	75	2.0527%	1.3622%
23	0.0366%	0.0235%	76	2.3373%	1.6042%
24	0.0391%	0.0256%	77	2.6312%	1.8386%
25	0.0417%	0.0277%	78	2.9334%	2.0994%
26	0.0447%	0.0303%	79	3.2442%	2.3434%
27	0.0477%	0.0327%	80	3.5298%	2.6784%
28	0.0513%	0.0355%	81	4.0040%	3.0608%
29	0.0557%	0.0387%	82	4.5198%	3.5708%
30	0.0616%	0.0420%	83	5.0908%	4.0701%
31	0.0714%	0.0516%	84	5.6755%	4.6203%
32	0.0810%	0.0599%	85	6.3987%	5.1610%
33	0.0897%	0.0671%	86	7.3618%	5.8132%
34	0.0973%	0.0727%	87	8.4399%	6.5239%
35	0.1042%	0.0775%	88	9.5808%	7.1908%
36	0.1075%	0.0806%	89	10.7794%	8.1922%
37	0.1096%	0.0837%	90	12.0393%	9.4174%
38	0.1114%	0.0863%	91	13.8884%	10.7220%
39	0.1142%	0.0899%	92	15.8304%	12.0563%
40	0.1187%	0.0939%	93	17.6608%	13.4643%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.1291%	0.0970%	94	19.5274%	15.5071%
42	0.1391%	0.1014%	95	21.2525%	17.4009%
43	0.1488%	0.1076%	96	23.3110%	19.2086%
44	0.1590%	0.1153%	97	25.2721%	21.2381%
45	0.1700%	0.1257%	98	27.3139%	23.1434%
46	0.1820%	0.1382%	99	29.2274%	24.9406%
47	0.1953%	0.1530%	100	31.1411%	26.8130%
48	0.2099%	0.1693%	101	33.3316%	29.0367%
49	0.2262%	0.1873%	102	35.3607%	31.3139%
50	0.2465%	0.2061%	103	37.3162%	33.4294%
51	0.2809%	0.2268%	104	39.0835%	35.5366%
52	0.3181%	0.2481%	105	41.2363%	37.5417%
53	0.3575%	0.2704%	106	43.0644%	39.6463%
54	0.4000%	0.2936%	107	44.6787%	41.4914%
55	0.4439%	0.3183%	108	46.3292%	43.3061%
56	0.4911%	0.3429%	109	47.9991%	45.3748%
57	0.5357%	0.3666%	110	49.2643%	47.0677%
58	0.5771%	0.3890%	111	49.3926%	48.6651%
59	0.6137%	0.4087%	112	49.5164%	49.5505%
60	0.6450%	0.4263%	113	49.6404%	49.6547%
61	0.7182%	0.4562%	114	49.7797%	49.7592%
62	0.7836%	0.4845%	115	49.9850%	49.9900%
63	0.8426%	0.5118%	116	49.9950%	49.9950%
64	0.8948%	0.5380%	117	50.0000%	50.0000%
65	0.9256%	0.5706%	118	50.0000%	50.0000%
66	1.0122%	0.6218%	119	50.0000%	50.0000%
67	1.0880%	0.6820%	120	100.0000%	100.0000%

Postretirement Mortality – Disability Retirees

The SOA combined the experience of teachers and general employees in developing disability annuity mortality tables. Due to lack of credibility, a relatively lower disability incidence rate and consistency with the SOA tables, we combined the experience of TRS, BERS and NYCERS (general, sanitation, transit, and TBTA) in proposing a recommended assumption. We propose to use the PUB disabled annuitant non-public safety mortality table, without any adjustment. Separate tables exist on a headcount-weighted and amount-weighted basis.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (50 to 99) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.06 to 1.01 and decreased from 1.11 to 0.88 for only TRS.

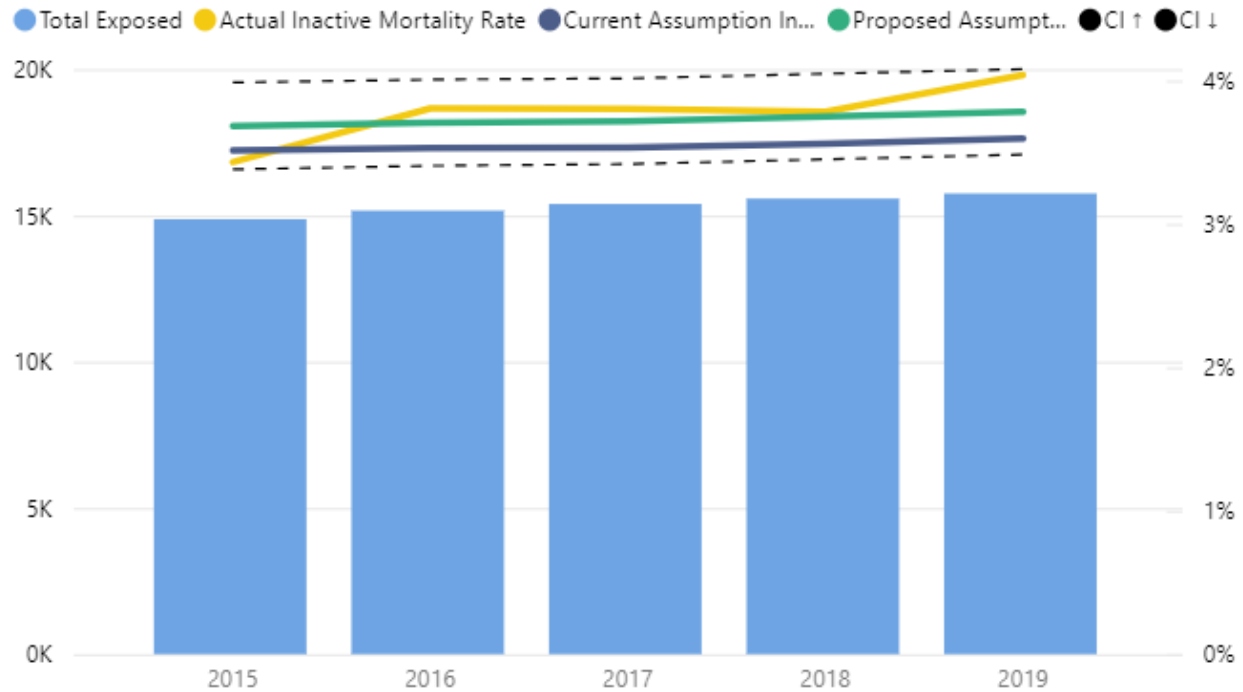
Current Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	510	522.3	14,868	3.4302%	3.5130%	0.98
2016	577	535.1	15,161	3.8058%	3.5298%	1.08
2017	585	543.9	15,390	3.8012%	3.5339%	1.08
2018	589	554.3	15,575	3.7817%	3.5591%	1.06
2019	636	566.1	15,749	4.0384%	3.5948%	1.12
Total	2,897	2,721.8	76,743	3.7749%	3.5466%	1.06

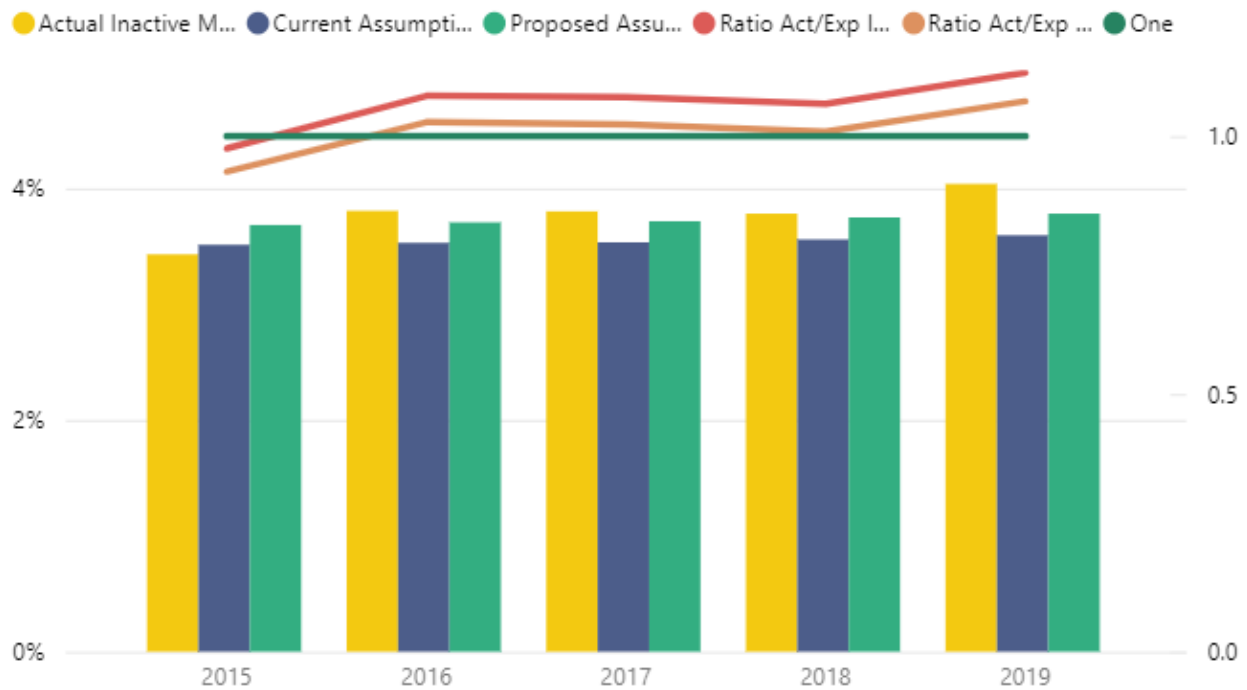
Proposed Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
2015	510	547.7	14,868	3.4302%	3.6834%	0.93
2016	577	561.9	15,161	3.8058%	3.7061%	1.03
2017	585	571.9	15,390	3.8012%	3.7160%	1.02
2018	589	583.9	15,575	3.7817%	3.7491%	1.01
2019	636	595.6	15,749	4.0384%	3.7817%	1.07
Total	2,897	2,860.9	76,743	3.7749%	3.7279%	1.01

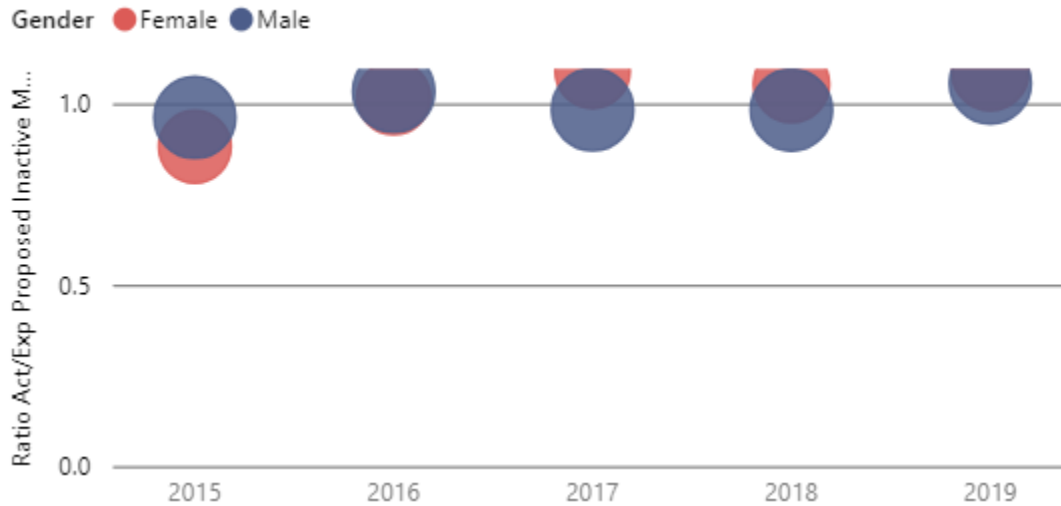
Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Exposure Bubbles; by Year



The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (50 to 99) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.03 to 1.01 and decreased from 1.04 to 0.85 for only TRS.

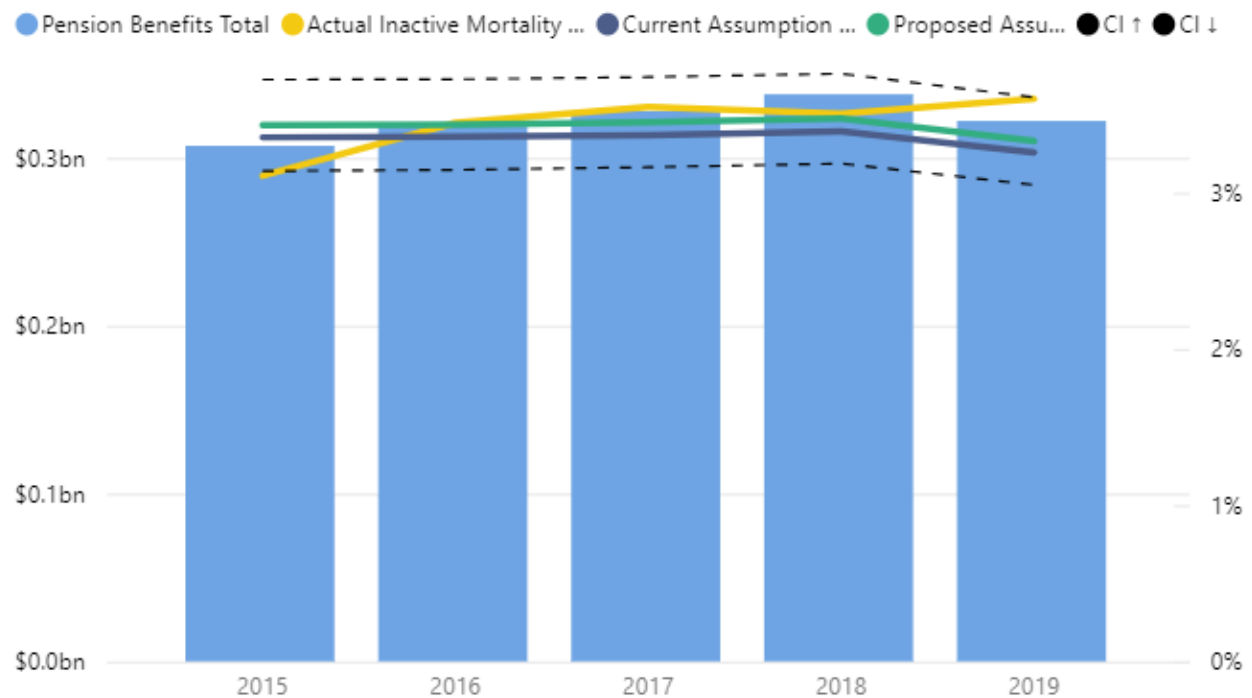
Current Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
2015	\$9.5M	\$10.3M	\$307.1M	3.1077%	3.3531%	0.93
2016	\$11.0M	\$10.8M	\$320.1M	3.4462%	3.3589%	1.03
2017	\$11.6M	\$11.0M	\$327.6M	3.5471%	3.3676%	1.05
2018	\$11.8M	\$11.5M	\$337.7M	3.5058%	3.3914%	1.03
2019	\$11.6M	\$10.5M	\$321.9M	3.6001%	3.2563%	1.11
Total	\$55.6M	\$54.0M	\$1,614.5M	3.4454%	3.3459%	1.03

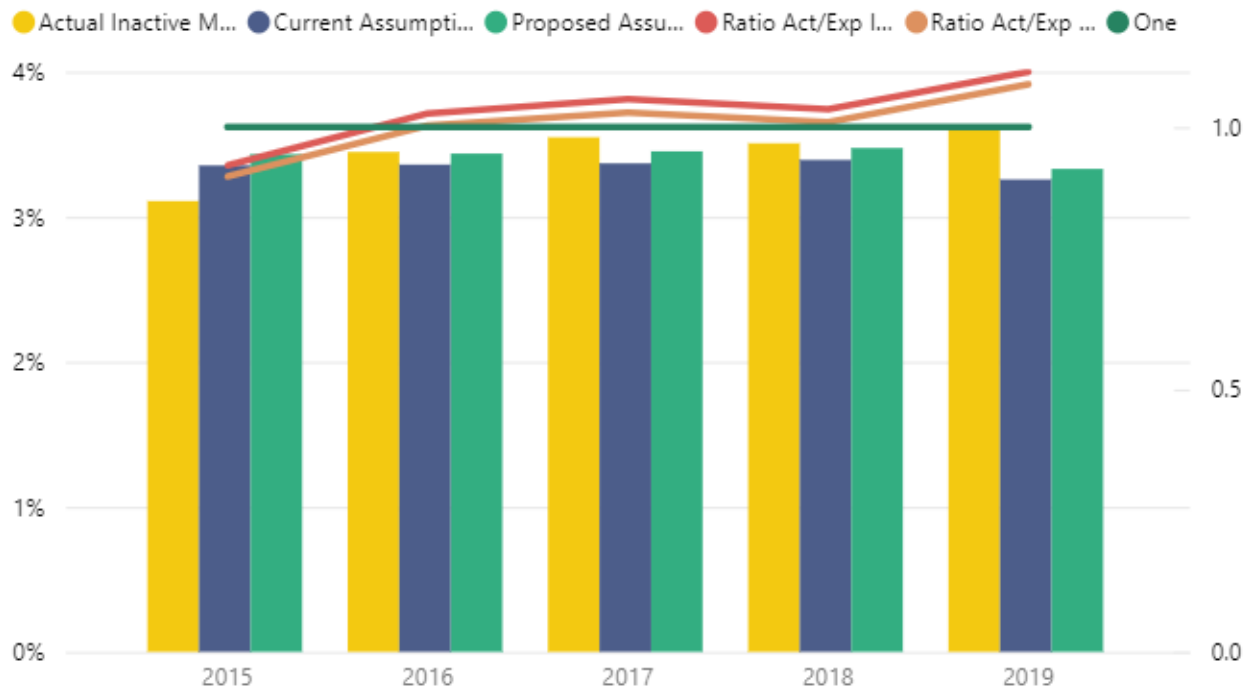
Proposed Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
2015	\$9.5M	\$10.5M	\$307.1M	3.1077%	3.4304%	0.91
2016	\$11.0M	\$11.0M	\$320.1M	3.4462%	3.4350%	1.00
2017	\$11.6M	\$11.3M	\$327.6M	3.5471%	3.4507%	1.03
2018	\$11.8M	\$11.7M	\$337.7M	3.5058%	3.4732%	1.01
2019	\$11.6M	\$10.7M	\$321.9M	3.6001%	3.3294%	1.08
Total	\$55.6M	\$55.3M	\$1,614.5M	3.4454%	3.4243%	1.01

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



The following section displays results by gender.

Disabled Retirees - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for males on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.01 to 0.99 and decreased from 1.03 to 0.84 for only TRS.

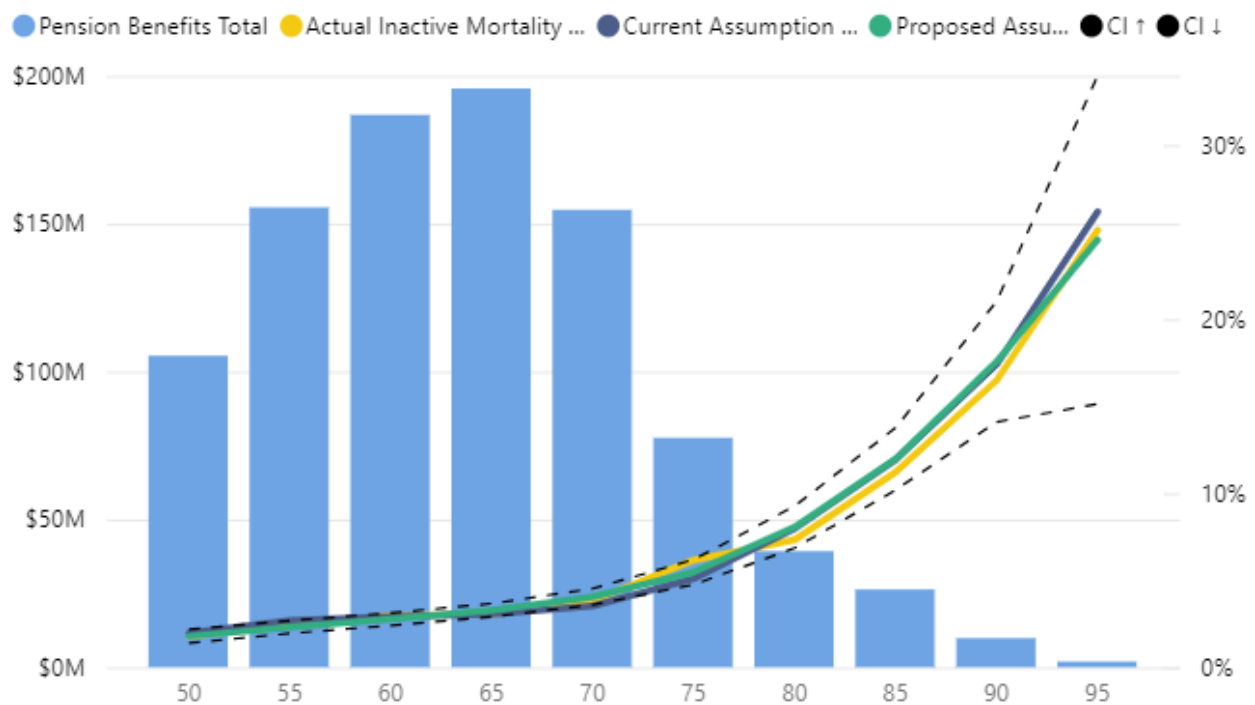
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

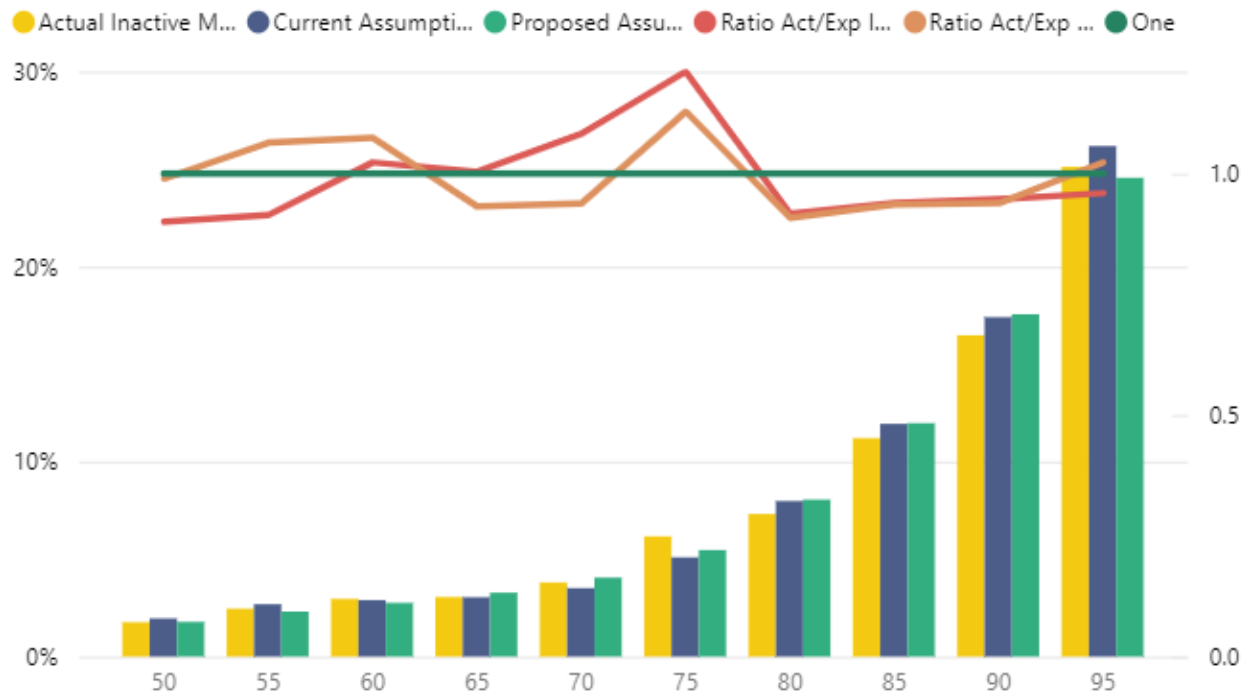
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
50	\$1.9M	\$2.1M	\$105.3M	1.7623%	1.9566%	0.90
55	\$3.8M	\$4.2M	\$155.5M	2.4536%	2.6839%	0.91
60	\$5.5M	\$5.4M	\$186.8M	2.9593%	2.8932%	1.02
65	\$6.0M	\$6.0M	\$195.7M	3.0536%	3.0422%	1.00
70	\$5.9M	\$5.4M	\$154.7M	3.7998%	3.5101%	1.08
75	\$4.8M	\$3.9M	\$77.6M	6.1619%	5.0870%	1.21
80	\$2.9M	\$3.1M	\$39.3M	7.3109%	7.9752%	0.92
85	\$2.9M	\$3.1M	\$26.3M	11.1982%	11.9311%	0.94
90	\$1.6M	\$1.7M	\$9.8M	16.4765%	17.4047%	0.95
95	\$0.5M	\$0.5M	\$1.9M	25.1120%	26.1766%	0.96
Total	\$35.7M	\$35.4M	\$952.7M	3.7513%	3.7198%	1.01

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
50	\$1.9M	\$1.9M	\$105.3M	1.7623%	1.7812%	0.99
55	\$3.8M	\$3.6M	\$155.5M	2.4536%	2.3066%	1.06
60	\$5.5M	\$5.1M	\$186.8M	2.9593%	2.7549%	1.07
65	\$6.0M	\$6.4M	\$195.7M	3.0536%	3.2756%	0.93
70	\$5.9M	\$6.3M	\$154.7M	3.7998%	4.0505%	0.94
75	\$4.8M	\$4.2M	\$77.6M	6.1619%	5.4621%	1.13
80	\$2.9M	\$3.2M	\$39.3M	7.3109%	8.0491%	0.91
85	\$2.9M	\$3.1M	\$26.3M	11.1982%	11.9678%	0.94
90	\$1.6M	\$1.7M	\$9.8M	16.4765%	17.5516%	0.94
95	\$0.5M	\$0.5M	\$1.9M	25.1120%	24.5481%	1.02
Total	\$35.7M	\$36.0M	\$952.7M	3.7513%	3.7803%	0.99

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



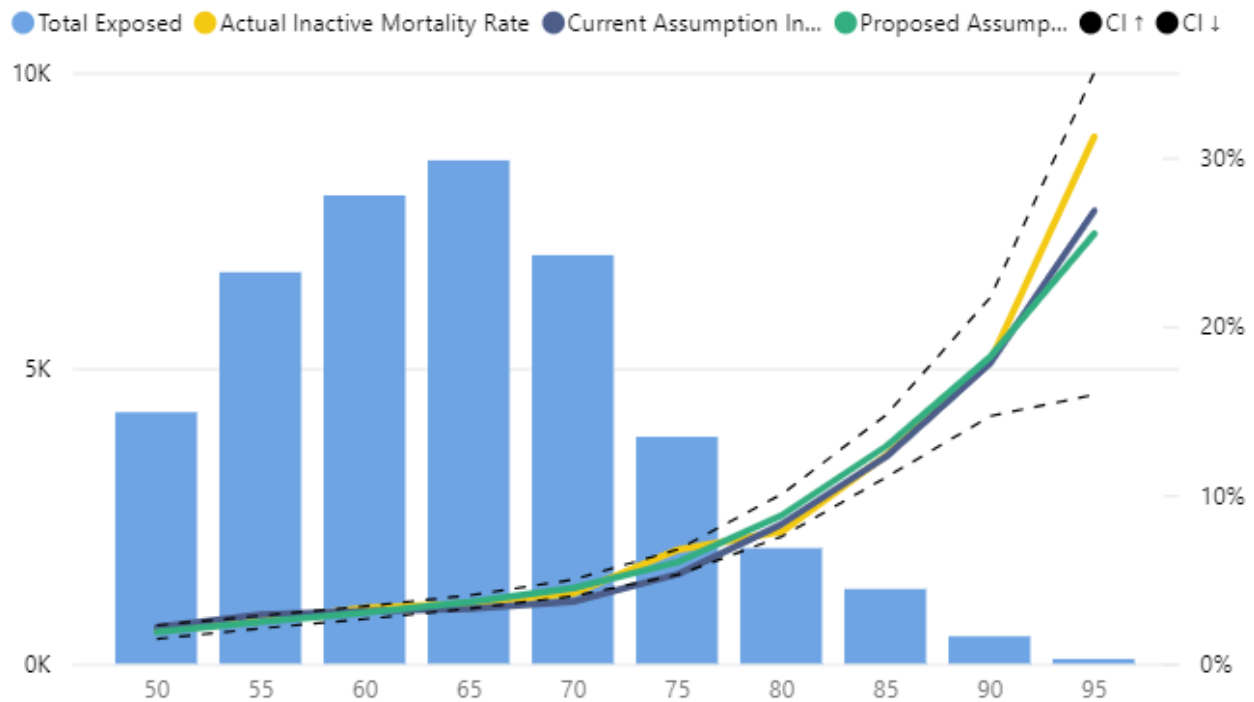
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for males on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.06 to 1.00 and decreased from 1.13 to 0.89 for only TRS.

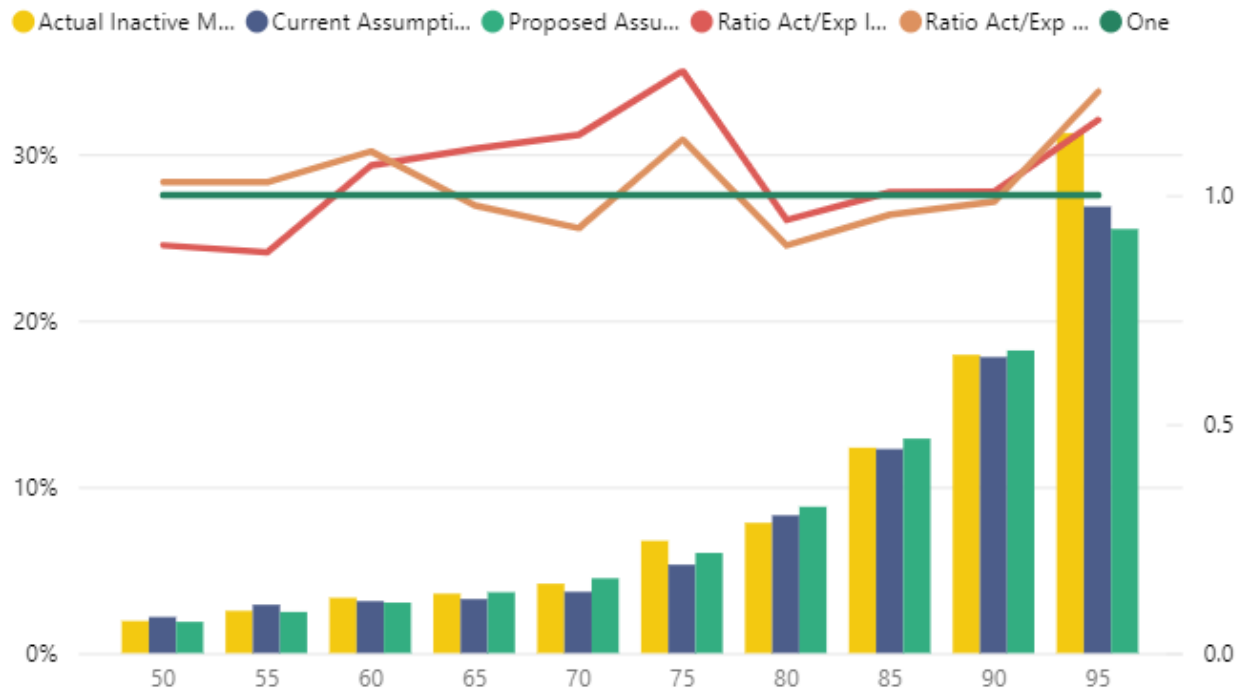
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
50	82	92.1	4,254	1.9276%	2.1651%	0.89
55	168	192.0	6,622	2.5370%	2.8998%	0.87
60	263	247.0	7,922	3.3199%	3.1175%	1.06
65	304	276.1	8,515	3.5702%	3.2420%	1.10
70	288	254.4	6,911	4.1673%	3.6815%	1.13
75	259	203.7	3,838	6.7483%	5.3070%	1.27
80	153	161.8	1,955	7.8261%	8.2751%	0.95
85	156	155.0	1,264	12.3418%	12.2615%	1.01
90	83	82.4	463	17.9266%	17.7917%	1.01
95	25	21.5	80	31.2500%	26.8389%	1.16
Total	1,781	1,685.9	41,824	4.2583%	4.0309%	1.06

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
50	82	79.7	4,254	1.9276%	1.8739%	1.03
55	168	163.4	6,622	2.5370%	2.4678%	1.03
60	263	240.0	7,922	3.3199%	3.0298%	1.10
65	304	311.1	8,515	3.5702%	3.6533%	0.98
70	288	310.4	6,911	4.1673%	4.4916%	0.93
75	259	231.0	3,838	6.7483%	6.0185%	1.12
80	153	171.9	1,955	7.8261%	8.7929%	0.89
85	156	162.9	1,264	12.3418%	12.8885%	0.96
90	83	84.2	463	17.9266%	18.1868%	0.99
95	25	20.4	80	31.2500%	25.4901%	1.23
Total	1,781	1,775.1	41,824	4.2583%	4.2441%	1.00

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Disabled Retirees - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for females on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.07 to 1.03 and decreased from 1.05 to 0.86 for only TRS.

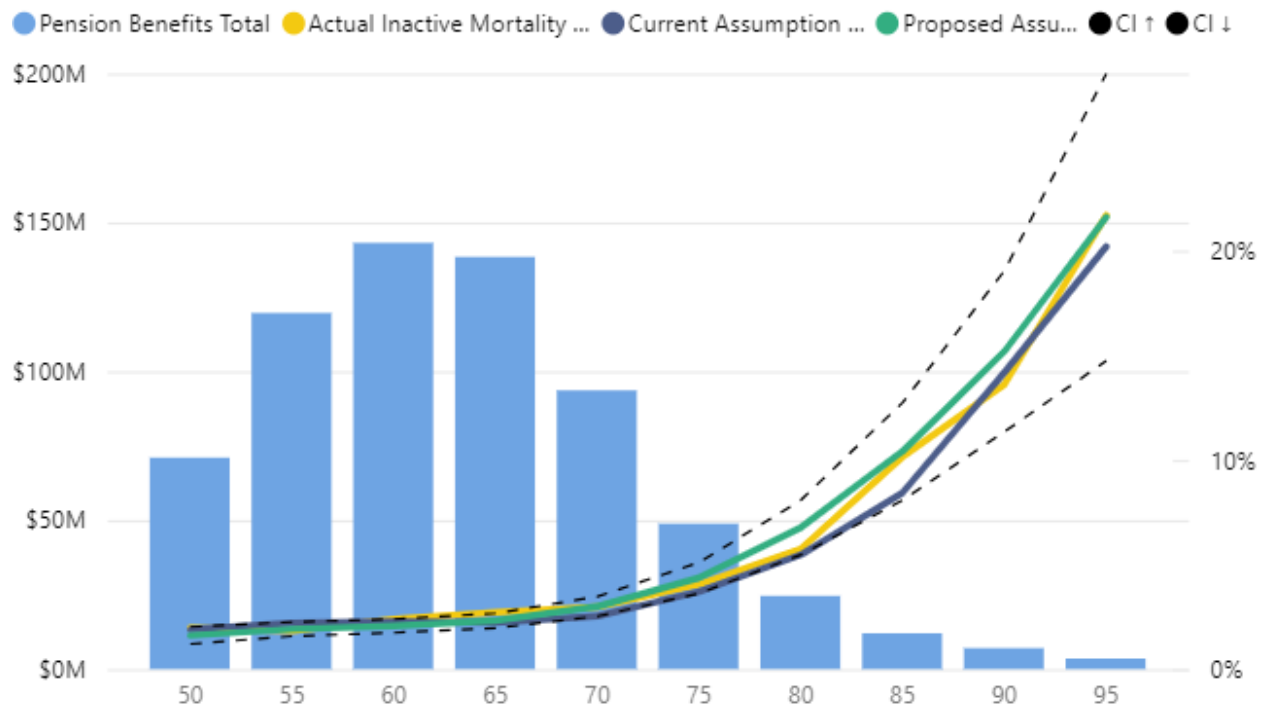
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

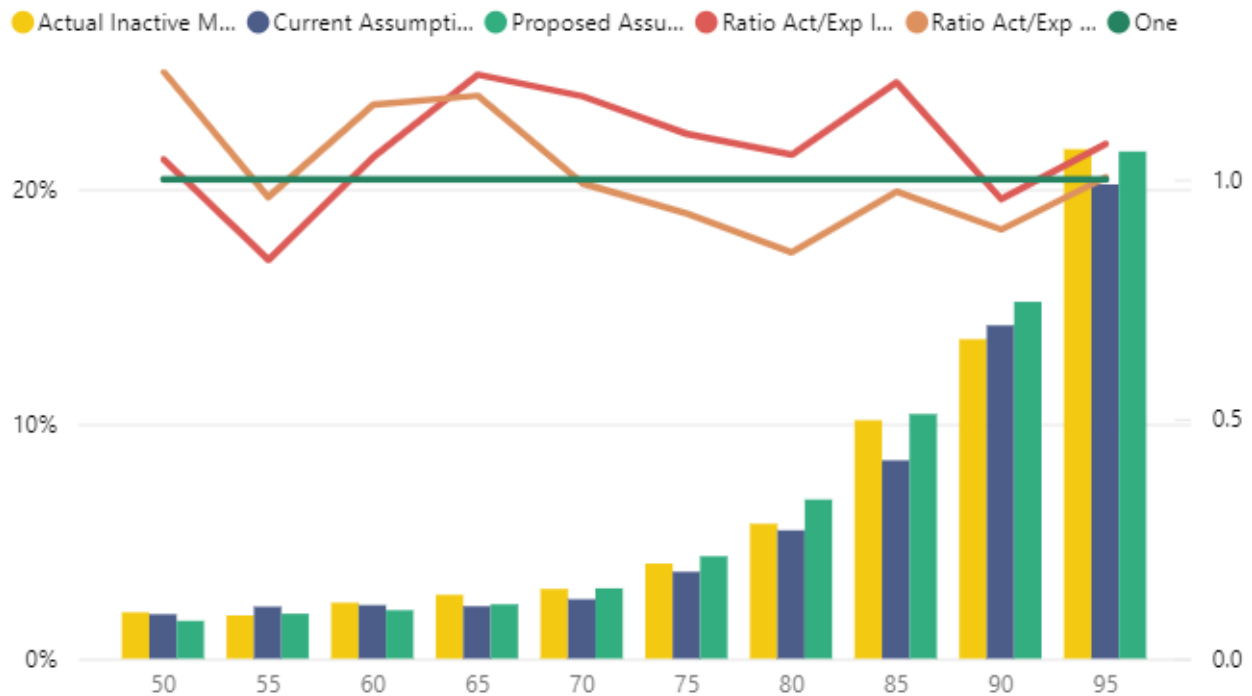
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
50	\$1.4M	\$1.3M	\$71.0M	1.9696%	1.8904%	1.04
55	\$2.2M	\$2.6M	\$119.6M	1.8399%	2.2107%	0.83
60	\$3.4M	\$3.3M	\$143.1M	2.3825%	2.2775%	1.05
65	\$3.8M	\$3.1M	\$138.4M	2.7175%	2.2298%	1.22
70	\$2.8M	\$2.4M	\$93.6M	2.9685%	2.5294%	1.17
75	\$2.0M	\$1.8M	\$48.8M	4.0481%	3.6977%	1.09
80	\$1.4M	\$1.3M	\$24.6M	5.7461%	5.4637%	1.05
85	\$1.2M	\$1.0M	\$12.0M	10.1535%	8.4456%	1.20
90	\$1.0M	\$1.0M	\$7.0M	13.6074%	14.1951%	0.96
95	\$0.8M	\$0.7M	\$3.5M	21.7020%	20.2025%	1.07
Total	\$19.9M	\$18.6M	\$661.8M	3.0051%	2.8076%	1.07

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
50	\$1.4M	\$1.1M	\$71.0M	1.9696%	1.6085%	1.22
55	\$2.2M	\$2.3M	\$119.6M	1.8399%	1.9113%	0.96
60	\$3.4M	\$3.0M	\$143.1M	2.3825%	2.0617%	1.16
65	\$3.8M	\$3.2M	\$138.4M	2.7175%	2.3137%	1.17
70	\$2.8M	\$2.8M	\$93.6M	2.9685%	2.9944%	0.99
75	\$2.0M	\$2.1M	\$48.8M	4.0481%	4.3597%	0.93
80	\$1.4M	\$1.7M	\$24.6M	5.7461%	6.7782%	0.85
85	\$1.2M	\$1.3M	\$12.0M	10.1535%	10.4182%	0.97
90	\$1.0M	\$1.1M	\$7.0M	13.6074%	15.2018%	0.90
95	\$0.8M	\$0.8M	\$3.5M	21.7020%	21.6034%	1.00
Total	\$19.9M	\$19.3M	\$661.8M	3.0051%	2.9116%	1.03

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



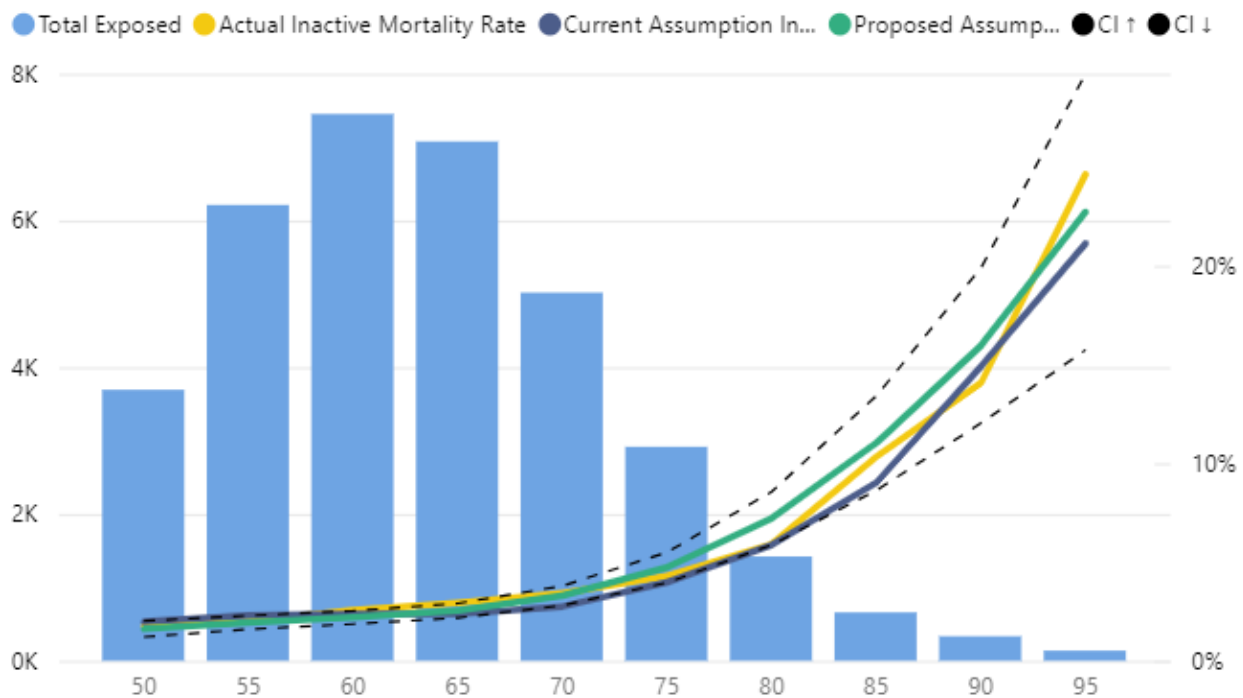
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for females on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.08 to 1.03 and decreased from 1.10 to 0.87 for only TRS.

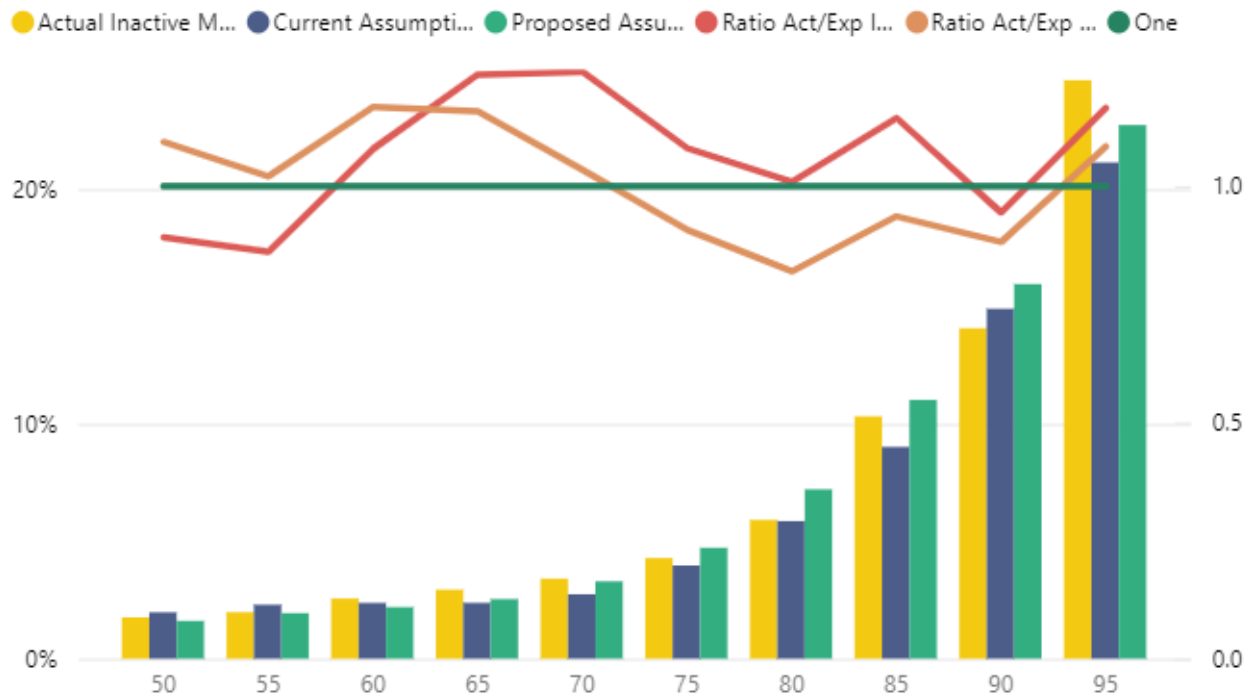
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
50	65	72.9	3,693	1.7601%	1.9735%	0.89
55	123	142.8	6,212	1.9800%	2.2983%	0.86
60	191	177.0	7,452	2.5631%	2.3753%	1.08
65	208	168.3	7,077	2.9391%	2.3778%	1.24
70	171	137.7	5,017	3.4084%	2.7437%	1.24
75	125	115.7	2,916	4.2867%	3.9679%	1.08
80	84	83.2	1,421	5.9113%	5.8585%	1.01
85	68	59.4	659	10.3187%	9.0192%	1.14
90	47	49.8	334	14.0719%	14.9037%	0.94
95	34	29.2	138	24.6377%	21.1339%	1.17
Total	1,116	1,035.9	34,919	3.1960%	2.9666%	1.08

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
50	65	59.4	3,693	1.7601%	1.6096%	1.09
55	123	120.5	6,212	1.9800%	1.9399%	1.02
60	191	163.5	7,452	2.5631%	2.1947%	1.17
65	208	179.6	7,077	2.9391%	2.5380%	1.16
70	171	165.3	5,017	3.4084%	3.2938%	1.03
75	125	137.7	2,916	4.2867%	4.7229%	0.91
80	84	102.5	1,421	5.9113%	7.2135%	0.82
85	68	72.6	659	10.3187%	11.0220%	0.94
90	47	53.3	334	14.0719%	15.9562%	0.88
95	34	31.4	138	24.6377%	22.7291%	1.08
Total	1,116	1,085.9	34,919	3.1960%	3.1097%	1.03

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

We have proposed new assumptions consistent with industry standards. In total, the proposed mortality tables are anticipated to decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
15	0.3819%	0.3483%	68	2.8007%	2.0012%
16	0.5167%	0.4712%	69	2.8946%	2.0043%
17	0.6964%	0.5141%	70	3.0268%	2.0073%
18	0.7863%	0.5351%	71	3.1148%	2.0103%
19	0.8312%	0.5569%	72	3.2684%	2.1811%
20	0.8353%	0.5649%	73	3.3926%	2.3760%
21	0.8659%	0.5961%	74	3.5875%	2.5968%
22	0.8978%	0.6295%	75	3.7271%	2.8417%
23	0.9464%	0.6597%	76	3.9657%	3.0808%
24	0.9977%	0.6908%	77	4.2691%	3.3373%
25	1.0424%	0.7150%	78	4.5349%	3.6085%
26	1.0960%	0.7387%	79	4.8252%	3.8944%
27	1.1348%	0.7520%	80	5.1378%	4.1909%
28	1.1774%	0.7625%	81	5.6917%	4.6921%
29	1.2163%	0.7686%	82	6.2841%	5.1536%
30	1.2878%	0.7763%	83	6.8835%	5.5061%
31	1.3554%	0.9885%	84	7.7954%	6.1180%
32	1.3755%	1.1922%	85	8.8286%	6.7342%
33	1.3953%	1.3874%	86	9.9032%	7.3088%
34	1.4153%	1.3942%	87	10.8837%	8.2536%
35	1.4357%	1.4012%	88	11.9567%	9.3264%
36	1.4563%	1.4082%	89	13.8059%	10.3734%
37	1.4772%	1.4152%	90	15.7270%	11.4459%
38	1.4985%	1.4223%	91	17.7012%	12.6271%
39	1.5200%	1.4294%	92	19.6428%	14.1350%
40	1.5418%	1.4366%	93	21.9234%	15.4424%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
41	1.5640%	1.4436%	94	24.0761%	16.9560%
42	1.5865%	1.4509%	95	26.0577%	18.4261%
43	1.6093%	1.4581%	96	28.3614%	20.1727%
44	1.6324%	1.4654%	97	30.3483%	21.6213%
45	1.6559%	1.5299%	98	31.8739%	23.3643%
46	1.6797%	1.6016%	99	33.6652%	23.8705%
47	1.7038%	1.6623%	100	35.0392%	23.9898%
48	1.7283%	1.7238%	101	36.0496%	24.9134%
49	1.7531%	1.7485%	102	37.0460%	26.0067%
50	1.7783%	1.7736%	103	37.7767%	27.2992%
51	1.8039%	1.7991%	104	38.1460%	28.7614%
52	1.9408%	1.8530%	105	38.3076%	30.3385%
53	2.0713%	1.8909%	106	38.4698%	31.9944%
54	2.2040%	1.9173%	107	38.6325%	33.6898%
55	2.3207%	1.9622%	108	38.8076%	35.3785%
56	2.4304%	1.9652%	109	38.9794%	37.0129%
57	2.4937%	1.9681%	110	50.0000%	50.0000%
58	2.5070%	1.9711%	111	50.0000%	50.0000%
59	2.5245%	1.9741%	112	50.0000%	50.0000%
60	2.5362%	1.9770%	113	50.0000%	50.0000%
61	2.5394%	1.9801%	114	50.0000%	50.0000%
62	2.5426%	1.9831%	115	50.0000%	50.0000%
63	2.5480%	1.9861%	116	50.0000%	50.0000%
64	2.5797%	1.9891%	117	50.0000%	50.0000%
65	2.6258%	1.9921%	118	50.0000%	50.0000%
66	2.6510%	1.9951%	119	50.0000%	50.0000%
67	2.7083%	1.9982%	120	100.0000%	100.0000%

¹ An adjustment factor of 0.94 is applied to the probabilities above to develop benefit weighted probabilities of mortality

² An adjustment factor of 0.962 is applied to the probabilities above to develop benefit weighted probabilities of mortality

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	3.3842%	2.3432%
16	0.0230%	0.0110%	69	3.5082%	2.4466%
17	0.0310%	0.0120%	70	3.6470%	2.5754%
18	0.4030%	0.2460%	71	3.8075%	2.7300%
19	0.4210%	0.2450%	72	3.9915%	2.9132%
20	0.4163%	0.2464%	73	4.2050%	3.1253%
21	0.3966%	0.2320%	74	4.4502%	3.3701%
22	0.3692%	0.2139%	75	4.7304%	3.6498%
23	0.3399%	0.1985%	76	5.0478%	3.9650%
24	0.3200%	0.1892%	77	5.4066%	4.3189%
25	0.3174%	0.1935%	78	5.8091%	4.7163%
26	0.3442%	0.2159%	79	6.2603%	5.1576%
27	0.3720%	0.2415%	80	6.7634%	5.6480%
28	0.4017%	0.2702%	81	7.3225%	6.1903%
29	0.4330%	0.3005%	82	7.9386%	6.7873%
30	0.4652%	0.3334%	83	8.6105%	7.4432%
31	0.4979%	0.3681%	84	9.3418%	8.1602%
32	0.5305%	0.4042%	85	10.1307%	8.9444%
33	0.5623%	0.4421%	86	10.9766%	9.7615%
34	0.5953%	0.4794%	87	11.8838%	10.5959%
35	0.6258%	0.5169%	88	12.8609%	11.4431%
36	0.6571%	0.5536%	89	14.0871%	12.2998%
37	0.6883%	0.5904%	90	15.4361%	13.1766%
38	0.7202%	0.6269%	91	16.8194%	14.0960%
39	0.7524%	0.6646%	92	18.2069%	15.0702%
40	0.7857%	0.7031%	93	19.6007%	16.1223%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.8220%	0.7434%	94	21.0087%	17.2666%
42	0.8627%	0.7863%	95	22.4349%	18.5246%
43	0.9083%	0.8336%	96	24.0164%	19.9812%
44	0.9628%	0.8866%	97	25.6872%	21.6140%
45	1.0252%	0.9470%	98	27.4698%	23.3793%
46	1.0990%	1.0145%	99	29.3703%	25.2723%
47	1.1836%	1.0920%	100	31.3559%	27.2907%
48	1.2797%	1.1808%	101	33.3920%	29.3896%
49	1.3871%	1.2823%	102	35.4093%	31.5085%
50	1.5068%	1.3956%	103	37.4123%	33.6377%
51	1.6080%	1.4626%	104	39.3600%	35.7445%
52	1.7161%	1.5364%	105	41.2510%	37.8251%
53	1.8294%	1.6172%	106	43.0828%	39.8479%
54	1.9470%	1.7002%	107	44.8334%	41.8058%
55	2.0663%	1.7817%	108	46.4949%	43.6934%
56	2.1843%	1.8568%	109	48.0767%	45.4898%
57	2.2969%	1.9225%	110	49.3439%	47.1868%
58	2.4053%	1.9756%	111	49.4725%	48.7883%
59	2.5068%	2.0164%	112	49.5965%	49.6759%
60	2.6030%	2.0471%	113	49.7207%	49.7804%
61	2.6945%	2.0683%	114	49.8602%	49.8851%
62	2.7854%	2.0863%	115	49.9850%	49.9900%
63	2.8779%	2.1053%	116	49.9950%	49.9950%
64	2.9721%	2.1278%	117	50.0000%	50.0000%
65	3.0682%	2.1591%	118	50.0000%	50.0000%
66	3.1673%	2.2023%	119	50.0000%	50.0000%
67	3.2721%	2.2632%	120	100.0000%	100.0000%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	3.7760%	2.5785%
16	0.0230%	0.0110%	69	3.9086%	2.6943%
17	0.0310%	0.0120%	70	4.0556%	2.8354%
18	0.4030%	0.2460%	71	4.2241%	3.0021%
19	0.4210%	0.2450%	72	4.4187%	3.1983%
20	0.4163%	0.2464%	73	4.6447%	3.4221%
21	0.3966%	0.2320%	74	4.9089%	3.6783%
22	0.3755%	0.2139%	75	5.2124%	3.9698%
23	0.3625%	0.2007%	76	5.5593%	4.2971%
24	0.3565%	0.1995%	77	5.9509%	4.6633%
25	0.3631%	0.2088%	78	6.3903%	5.0750%
26	0.3937%	0.2316%	79	6.8806%	5.5325%
27	0.4255%	0.2575%	80	7.4270%	6.0439%
28	0.4593%	0.2865%	81	8.0308%	6.6090%
29	0.4960%	0.3172%	82	8.6949%	7.2335%
30	0.5323%	0.3502%	83	9.4149%	7.9215%
31	0.5689%	0.3839%	84	10.1938%	8.6755%
32	0.6051%	0.4187%	85	11.0300%	9.5023%
33	0.6416%	0.4539%	86	11.9194%	10.3647%
34	0.6776%	0.4899%	87	12.8652%	11.2472%
35	0.7133%	0.5246%	88	13.8754%	12.1426%
36	0.7463%	0.5599%	89	14.9554%	13.0490%
37	0.7800%	0.5929%	90	16.1047%	13.9740%
38	0.8136%	0.6269%	91	17.3340%	14.9427%
39	0.8469%	0.6646%	92	18.7571%	15.9646%
40	0.8808%	0.7031%	93	20.2661%	17.0643%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.9172%	0.7434%	94	21.7776%	18.2532%
42	0.9565%	0.7863%	95	23.2870%	19.5565%
43	1.0009%	0.8336%	96	24.9333%	21.0589%
44	1.0532%	0.8866%	97	26.6451%	22.7137%
45	1.1137%	0.9470%	98	28.4453%	24.5248%
46	1.1852%	1.0145%	99	30.3399%	26.4685%
47	1.2679%	1.0920%	100	32.3001%	28.5273%
48	1.3636%	1.1808%	101	34.2993%	30.6491%
49	1.4729%	1.2823%	102	36.2704%	32.7813%
50	1.5960%	1.3965%	103	38.2225%	34.9113%
51	1.6935%	1.4626%	104	40.1159%	37.0070%
52	1.8010%	1.5364%	105	41.9494%	39.0659%
53	1.9190%	1.6172%	106	43.7225%	41.0568%
54	2.0454%	1.7002%	107	45.4141%	42.9728%
55	2.1777%	1.7817%	108	47.0172%	44.8128%
56	2.3143%	1.8641%	109	48.5432%	46.5543%
57	2.4490%	1.9445%	110	49.3439%	48.1911%
58	2.5810%	2.0167%	111	49.4725%	49.5766%
59	2.7081%	2.0806%	112	49.5965%	49.6759%
60	2.8308%	2.1350%	113	49.7207%	49.7804%
61	2.9500%	2.1820%	114	49.8602%	49.8851%
62	3.0673%	2.2227%	115	49.9850%	49.9900%
63	3.1837%	2.2630%	116	49.9950%	49.9950%
64	3.3002%	2.3036%	117	50.0000%	50.0000%
65	3.4170%	2.3515%	118	50.0000%	50.0000%
66	3.5333%	2.4098%	119	50.0000%	50.0000%
67	3.6527%	2.4849%	120	100.0000%	100.0000%

Postretirement Mortality – Contingent Beneficiaries

The SOA combined the experience of all contingent beneficiaries of teachers, general employees and public safety members in developing contingent survivor annuity mortality tables. We combined the experience of all NYCRS systems (TRS, BERS, NYCERS, POLICE and FIRE) in proposing a recommended assumption. We propose to use the PUB contingent survivor annuitant mortality tables, multiplied by adjustment factors. Separate tables exist on a headcount-weighted and amount-weighted basis in addition to gender.

For males, the proposed adjustment factors are 125% for amount-weighted and 120% for headcount-weighted. For females, the proposed adjustment factors are 120% for amount-weighted and 108% for headcount-weighted.

The contingent survivor assumption would apply upon the death of the member. While both the member and contingent survivor are both alive, we propose the healthy annuitant mortality table apply.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all members of NYCRS. The A/E decreased from 1.12 to 1.00 and decreased from 1.14 to 1.00 for only TRS.

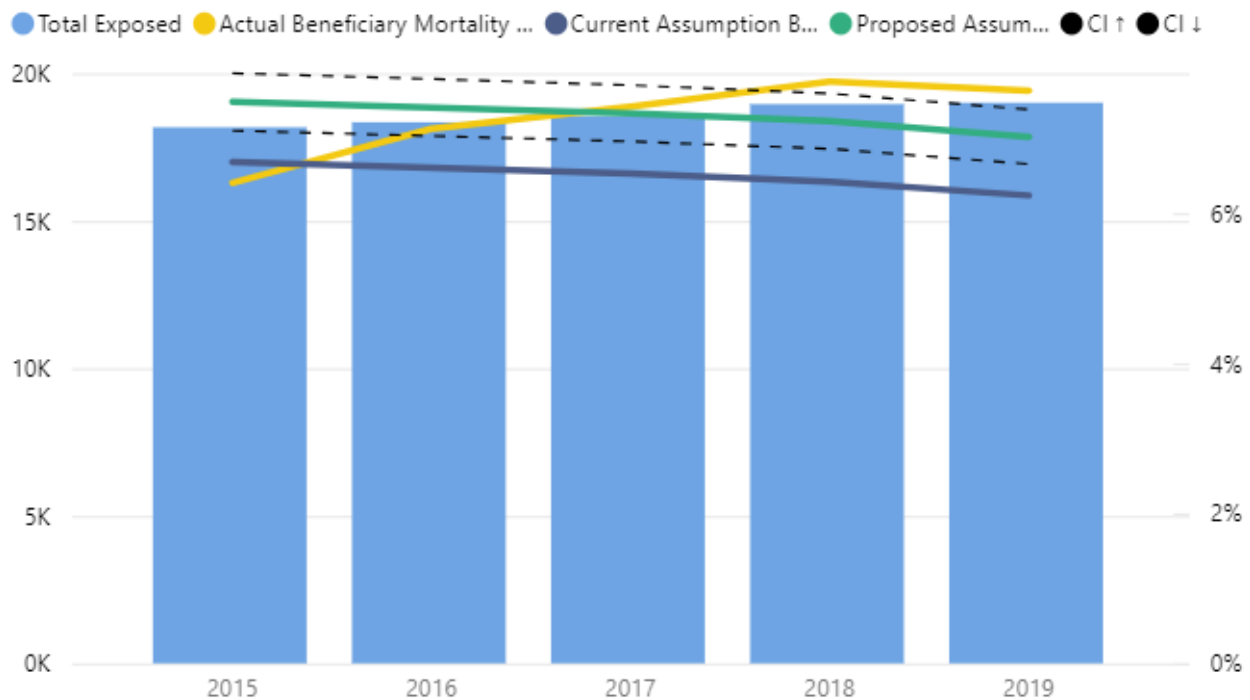
Current Assumption – Headcount-weighted

Plan Year	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
2015	1,163	1,213.4	18,168	6.4014%	6.6789%	0.96
2016	1,307	1,210.9	18,340	7.1265%	6.6027%	1.08
2017	1,376	1,210.4	18,541	7.4214%	6.5285%	1.14
2018	1,470	1,216.8	18,955	7.7552%	6.4197%	1.21
2019	1,450	1,184.7	19,001	7.6312%	6.2351%	1.22
Total	6,766	6,036.4	93,005	7.2749%	6.4904%	1.12

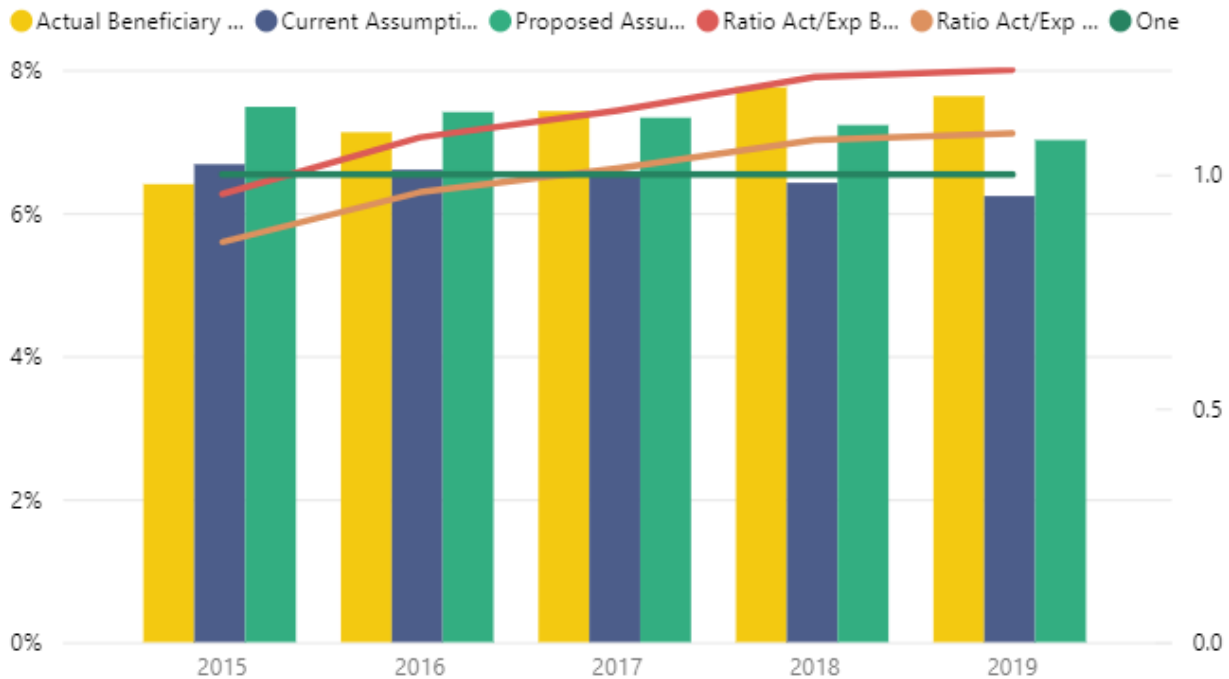
Proposed Assumption – Headcount-weighted

Plan Year	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
2015	1,163	1,359.3	18,168	6.4014%	7.4816%	▲ 0.86
2016	1,307	1,358.7	18,340	7.1265%	7.4084%	● 0.96
2017	1,376	1,359.0	18,541	7.4214%	7.3296%	● 1.01
2018	1,470	1,369.6	18,955	7.7552%	7.2257%	● 1.07
2019	1,450	1,333.4	19,001	7.6312%	7.0175%	● 1.09
Total	6,766	6,780.0	93,005	7.2749%	7.2899%	● 1.00

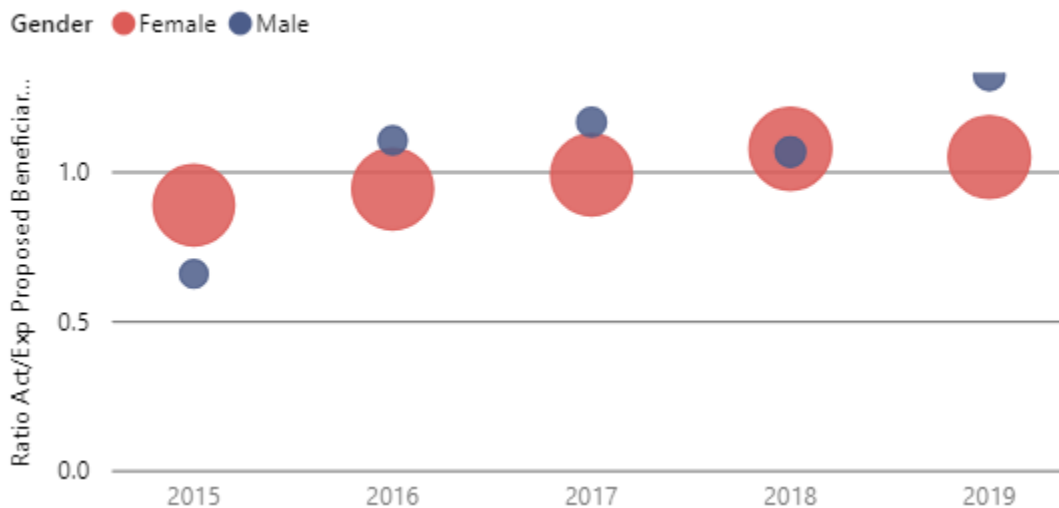
Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Year



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Beneficiary Mortality Proposed w/ Exposure Bubbles; by ...



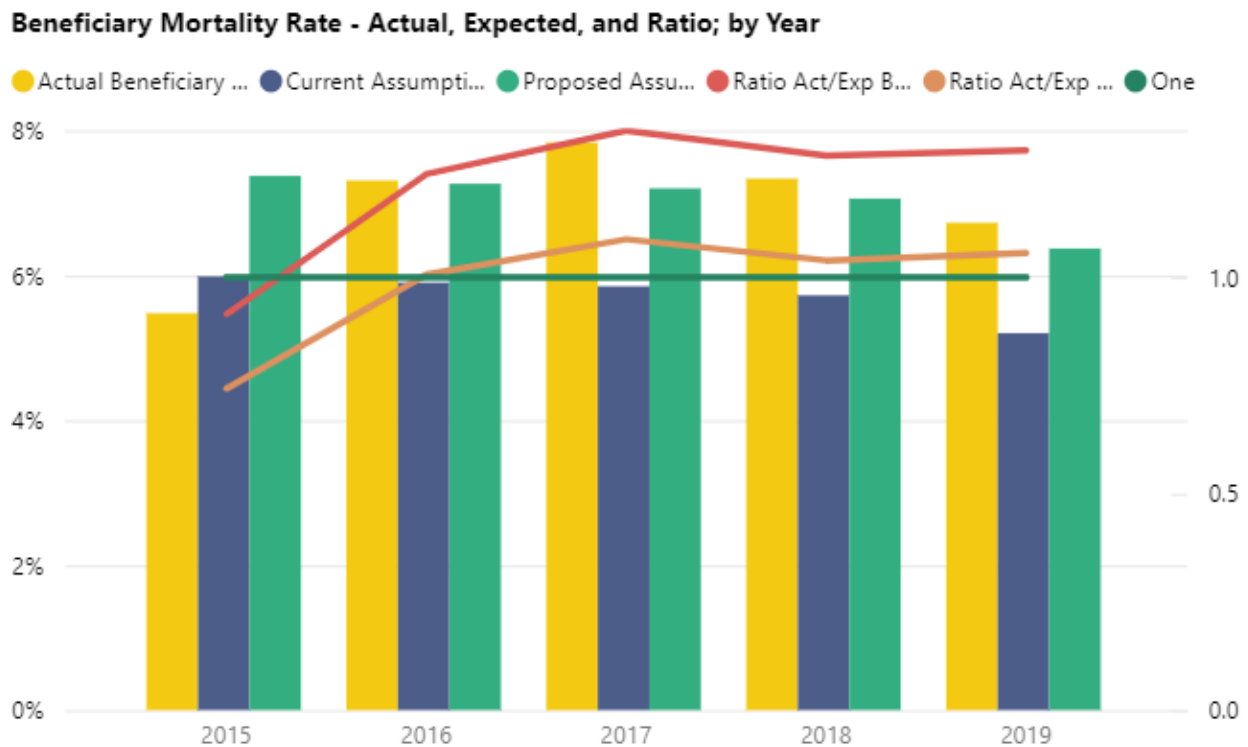
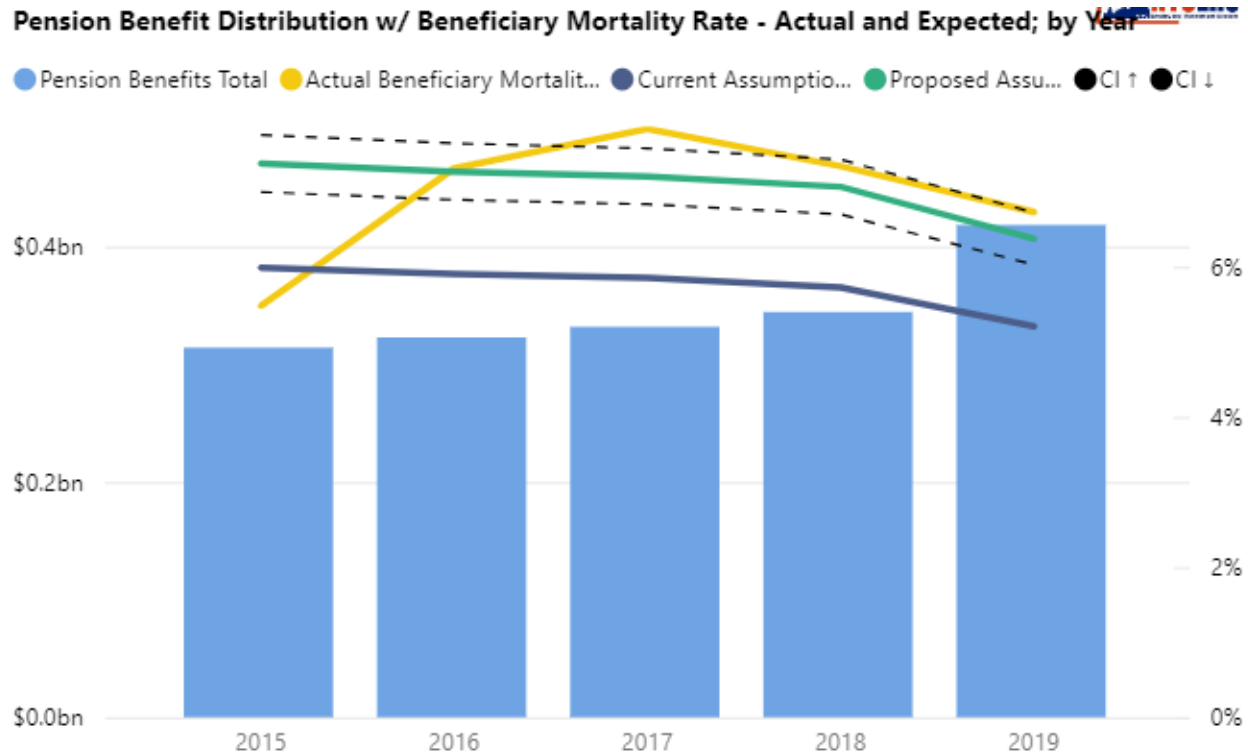
The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.22 to 0.99 and decreased from 1.28 to 1.03 for only TRS.

Current Assumption – Amount-weighted

Plan Year	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
2015	\$17.2M	\$18.8M	\$314.1M	5.4787%	5.9868%	0.92
2016	\$23.6M	\$19.0M	\$322.7M	7.3093%	5.9014%	1.24
2017	\$26.0M	\$19.4M	\$331.8M	7.8345%	5.8502%	1.34
2018	\$25.3M	\$19.7M	\$344.3M	7.3366%	5.7247%	1.28
2019	\$28.1M	\$21.8M	\$418.3M	6.7269%	5.2026%	1.29
Total	\$120.2M	\$98.7M	\$1,731.3M	6.9425%	5.7031%	1.22

Proposed Assumption – Amount-weighted

Plan Year	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
2015	\$17.2M	\$23.2M	\$314.1M	5.4787%	7.3734%	0.74
2016	\$23.6M	\$23.4M	\$322.7M	7.3093%	7.2656%	1.01
2017	\$26.0M	\$23.9M	\$331.8M	7.8345%	7.2019%	1.09
2018	\$25.3M	\$24.3M	\$344.3M	7.3366%	7.0609%	1.04
2019	\$28.1M	\$26.7M	\$418.3M	6.7269%	6.3717%	1.06
Total	\$120.2M	\$121.5M	\$1,731.3M	6.9425%	7.0162%	0.99



The following section displays results by gender.

Contingent Beneficiaries - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.52 to 1.11 and decreased from 1.54 to 1.12 for only TRS.

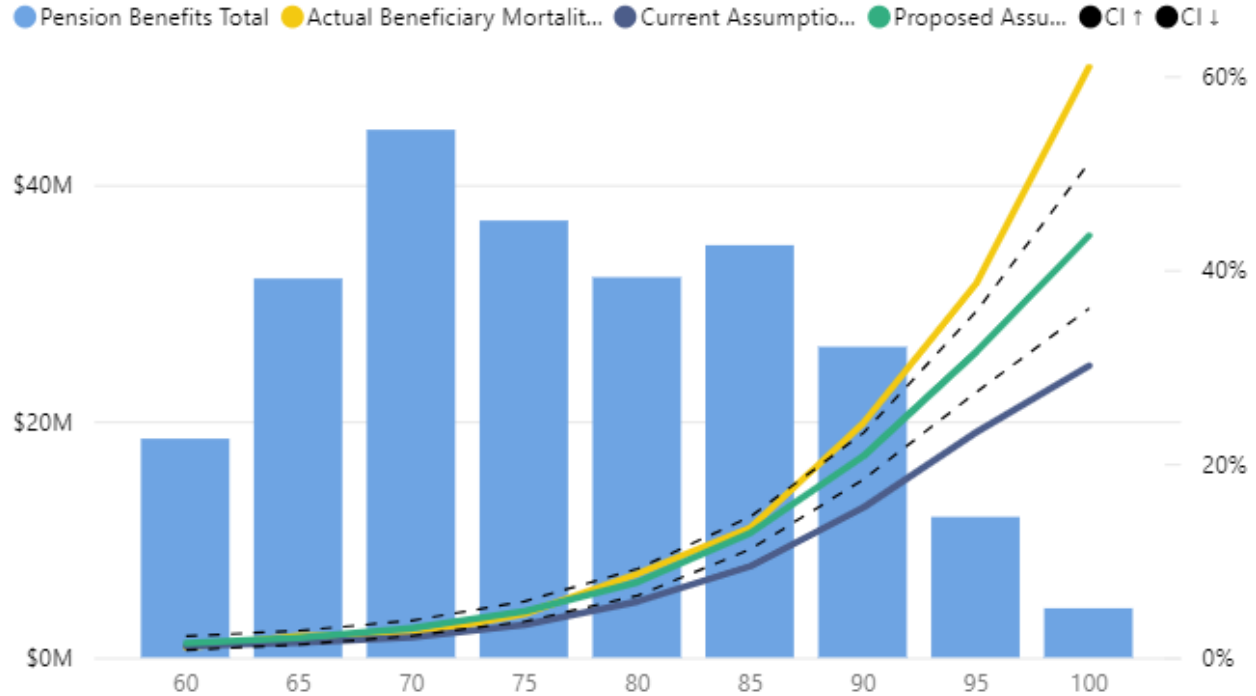
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

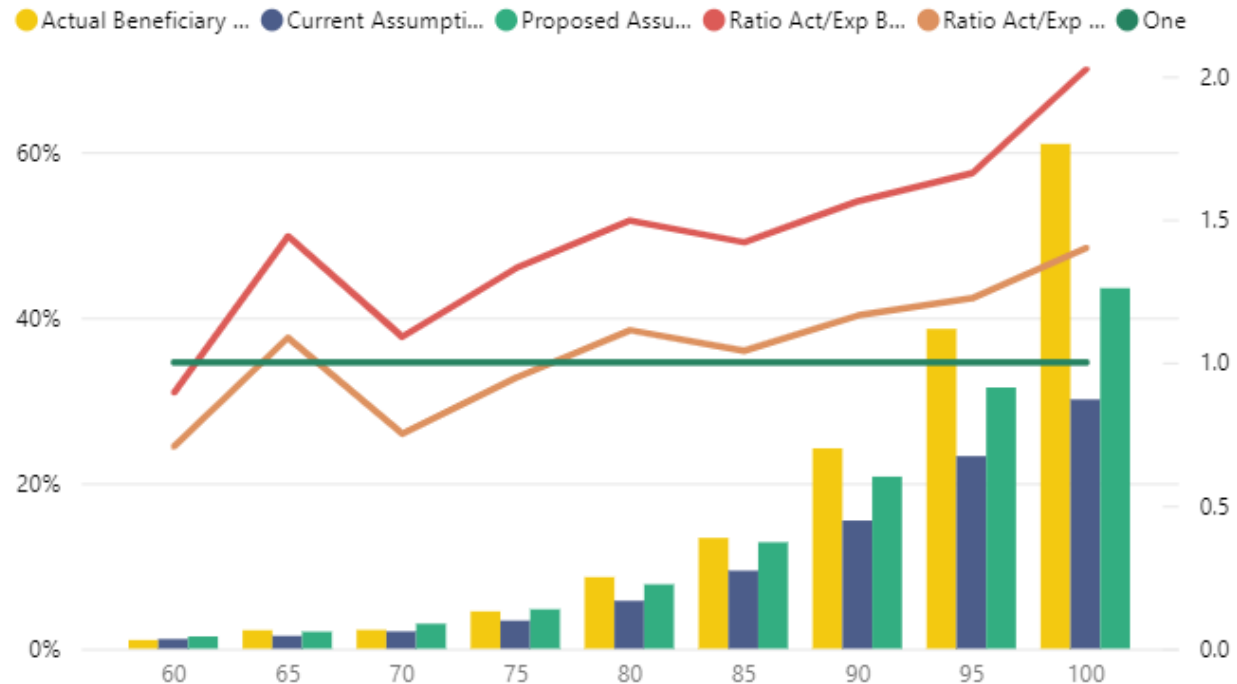
Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
60	\$0.2M	\$0.2M	\$18.5M	1.0416%	1.1637%	▲ 0.90
65	\$0.7M	\$0.5M	\$32.1M	2.2223%	1.5421%	▲ 1.44
70	\$1.0M	\$0.9M	\$44.7M	2.2615%	2.0760%	● 1.09
75	\$1.7M	\$1.3M	\$37.0M	4.4993%	3.3836%	▲ 1.33
80	\$2.8M	\$1.9M	\$32.2M	8.6385%	5.7759%	▲ 1.50
85	\$4.7M	\$3.3M	\$34.9M	13.3692%	9.4174%	▲ 1.42
90	\$6.4M	\$4.1M	\$26.3M	24.1876%	15.4684%	◆ 1.56
95	\$4.6M	\$2.8M	\$11.9M	38.6136%	23.2507%	◆ 1.66
100	\$2.5M	\$1.3M	\$4.2M	60.9581%	30.0988%	◆ 2.03
Total	\$24.5M	\$16.1M	\$241.6M	10.1452%	6.6706%	◆ 1.52

Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
60	\$0.2M	\$0.3M	\$18.5M	1.0416%	1.4728%	▲ 0.71
65	\$0.7M	\$0.7M	\$32.1M	2.2223%	2.0459%	● 1.09
70	\$1.0M	\$1.3M	\$44.7M	2.2615%	3.0124%	▲ 0.75
75	\$1.7M	\$1.8M	\$37.0M	4.4993%	4.7523%	● 0.95
80	\$2.8M	\$2.5M	\$32.2M	8.6385%	7.7645%	▲ 1.11
85	\$4.7M	\$4.5M	\$34.9M	13.3692%	12.8490%	● 1.04
90	\$6.4M	\$5.5M	\$26.3M	24.1876%	20.7707%	▲ 1.16
95	\$4.6M	\$3.8M	\$11.9M	38.6136%	31.5366%	▲ 1.22
100	\$2.5M	\$1.8M	\$4.2M	60.9581%	43.5346%	▲ 1.40
Total	\$24.5M	\$22.0M	\$241.6M	10.1452%	9.1203%	▲ 1.11

Pension Benefit Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Headcount-weighted

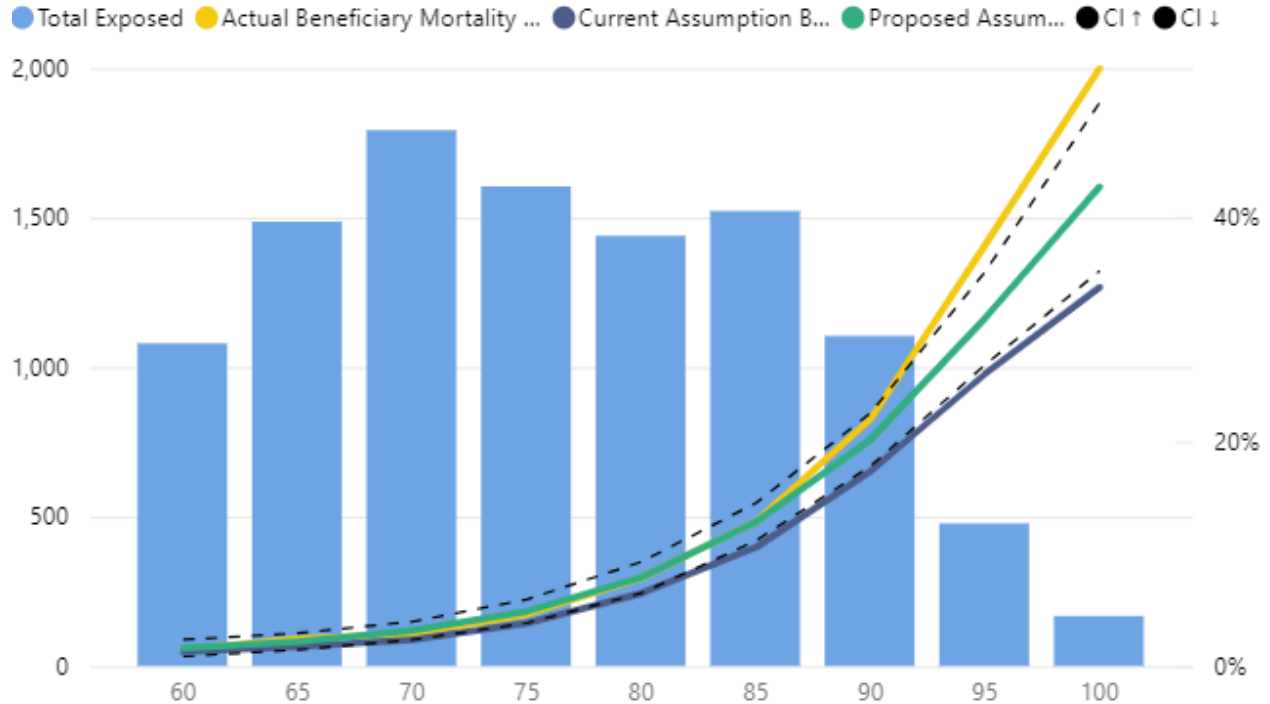
Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.30 to 1.07 and decreased from 1.29 to 1.06 for only TRS.

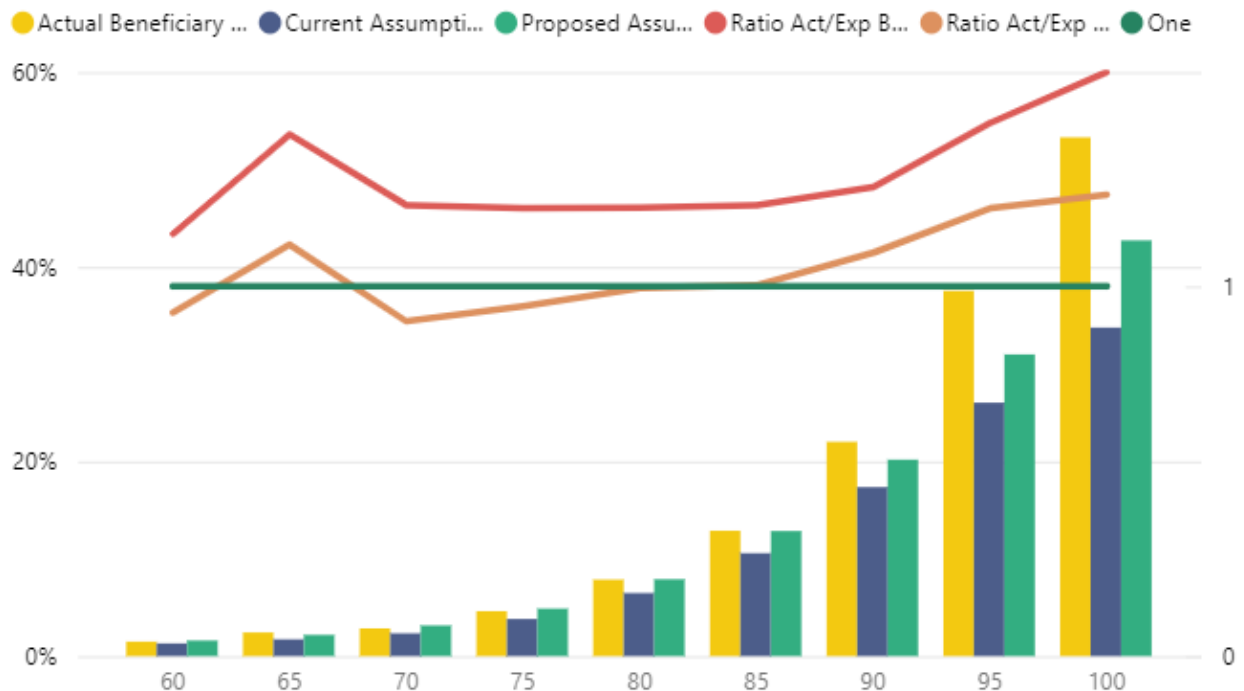
Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
60	16	14.0	1,079	1.4829%	1.2992%	▲ 1.14
65	36	25.5	1,486	2.4226%	1.7181%	▲ 1.41
70	51	41.8	1,792	2.8460%	2.3340%	▲ 1.22
75	74	61.1	1,604	4.6135%	3.8106%	▲ 1.21
80	113	93.2	1,439	7.8527%	6.4733%	▲ 1.21
85	196	160.8	1,522	12.8778%	10.5664%	▲ 1.22
90	243	191.6	1,104	22.0109%	17.3553%	▲ 1.27
95	179	124.2	477	37.5262%	26.0300%	▲ 1.44
100	89	56.4	167	53.2934%	33.7478%	◆ 1.58
Total	997	768.6	10,670	9.3440%	7.2033%	▲ 1.30

Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
60	16	17.2	1,079	1.4829%	1.5966%	● 0.93
65	36	32.3	1,486	2.4226%	2.1770%	▲ 1.11
70	51	56.3	1,792	2.8460%	3.1441%	● 0.91
75	74	78.2	1,604	4.6135%	4.8756%	● 0.95
80	113	113.6	1,439	7.8527%	7.8916%	● 1.00
85	196	195.5	1,522	12.8778%	12.8459%	● 1.00
90	243	222.8	1,104	22.0109%	20.1786%	● 1.09
95	179	147.8	477	37.5262%	30.9910%	▲ 1.21
100	89	71.3	167	53.2934%	42.7034%	▲ 1.25
Total	997	935.1	10,670	9.3440%	8.7639%	● 1.07

Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Contingent Beneficiaries - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.16 to 0.96 and decreased from 1.18 to 0.98 for only TRS.

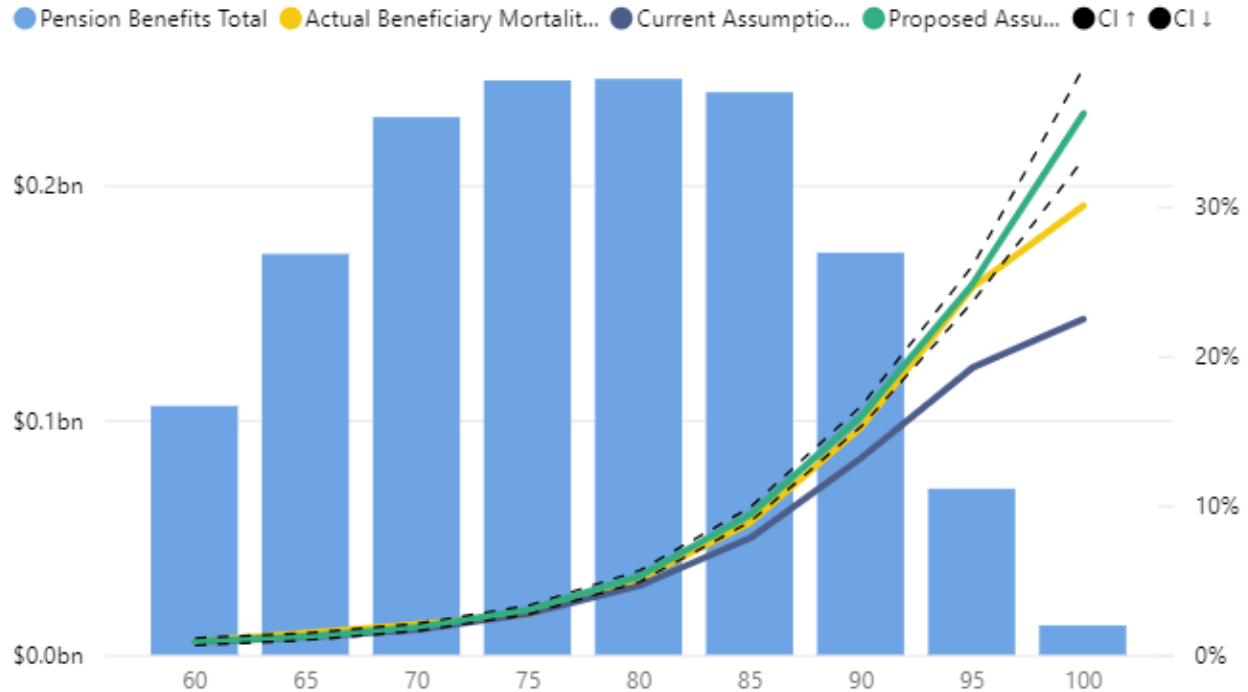
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

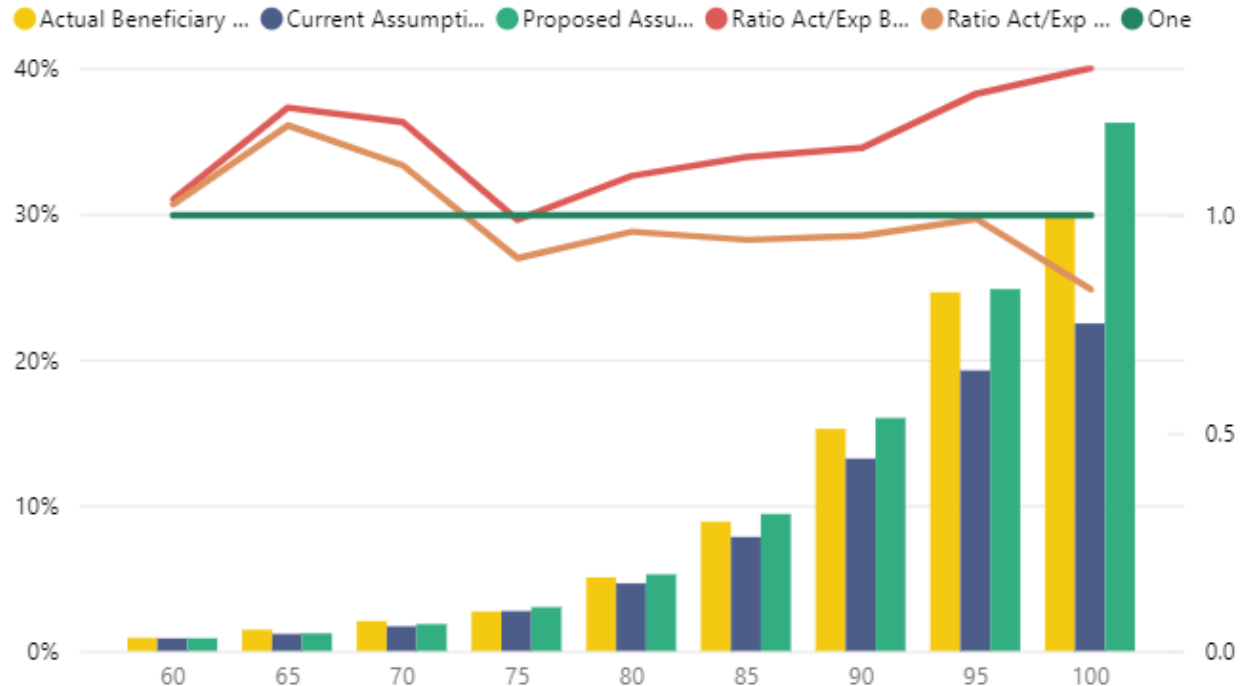
Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
60	\$1.0M	\$0.9M	\$106.0M	0.8984%	0.8666%	1.04
65	\$2.5M	\$2.0M	\$170.7M	1.4586%	1.1698%	1.25
70	\$4.7M	\$3.9M	\$229.0M	2.0543%	1.6923%	1.21
75	\$6.6M	\$6.7M	\$244.6M	2.7071%	2.7350%	0.99
80	\$12.4M	\$11.4M	\$245.3M	5.0535%	4.6336%	1.09
85	\$21.2M	\$18.7M	\$239.6M	8.8691%	7.8227%	1.13
90	\$26.1M	\$22.6M	\$171.3M	15.2405%	13.2015%	1.15
95	\$17.4M	\$13.6M	\$70.7M	24.6092%	19.2429%	1.28
100	\$3.8M	\$2.8M	\$12.5M	30.0705%	22.4709%	1.34
Total	\$95.7M	\$82.6M	\$1,489.6M	6.4231%	5.5462%	1.16

Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
60	\$1.0M	\$0.9M	\$106.0M	0.8984%	0.8763%	1.03
65	\$2.5M	\$2.1M	\$170.7M	1.4586%	1.2092%	1.21
70	\$4.7M	\$4.2M	\$229.0M	2.0543%	1.8436%	1.11
75	\$6.6M	\$7.3M	\$244.6M	2.7071%	3.0029%	0.90
80	\$12.4M	\$12.9M	\$245.3M	5.0535%	5.2520%	0.96
85	\$21.2M	\$22.5M	\$239.6M	8.8691%	9.3996%	0.94
90	\$26.1M	\$27.4M	\$171.3M	15.2405%	15.9868%	0.95
95	\$17.4M	\$17.6M	\$70.7M	24.6092%	24.8248%	0.99
100	\$3.8M	\$4.5M	\$12.5M	30.0705%	36.2393%	0.83
Total	\$95.7M	\$99.4M	\$1,489.6M	6.4231%	6.6750%	0.96

Pension Benefit Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



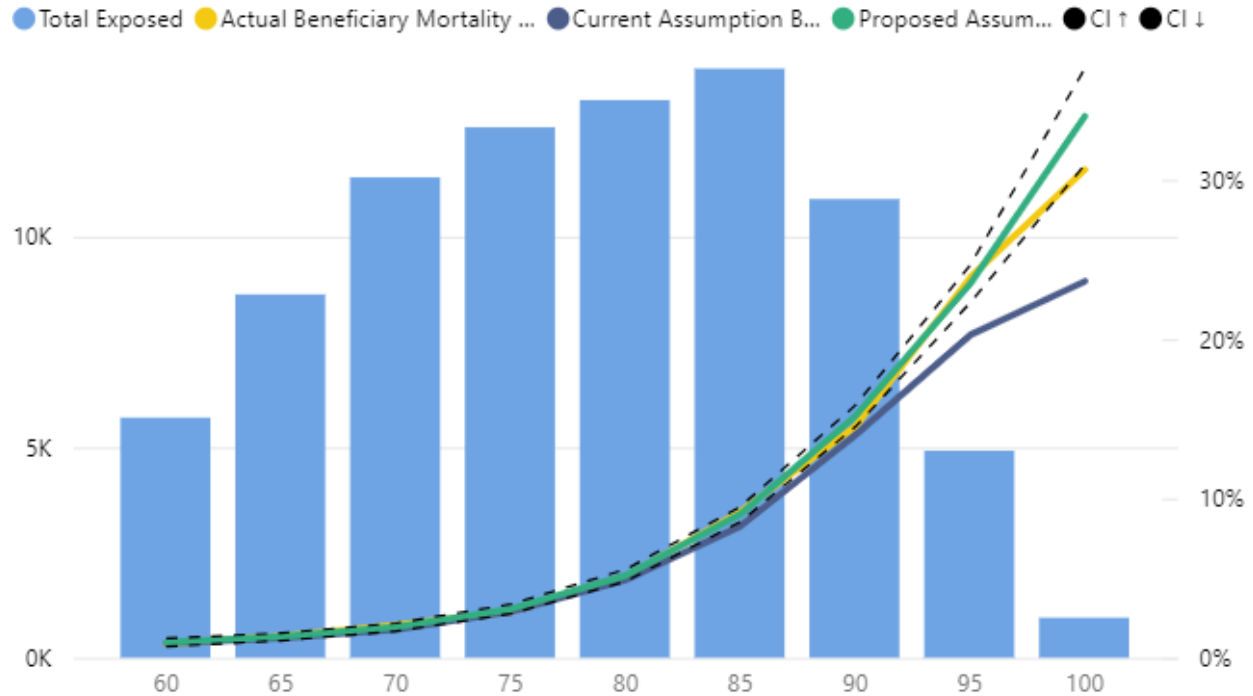
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.10 to 0.99 and decreased from 1.07 to 0.96 for only TRS.

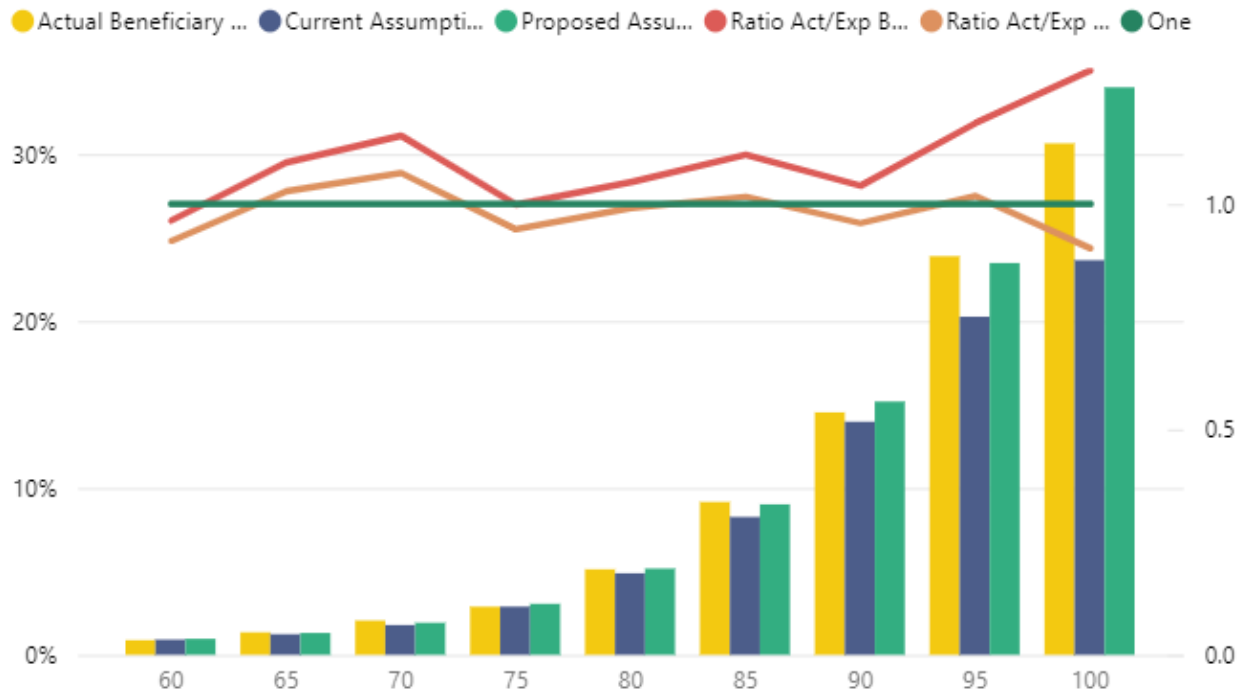
Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
60	50	51.9	5,702	0.8769%	0.9101%	0.96
65	116	106.2	8,629	1.3443%	1.2311%	1.09
70	234	203.2	11,408	2.0512%	1.7814%	1.15
75	363	363.5	12,598	2.8814%	2.8857%	1.00
80	678	646.9	13,244	5.1193%	4.8841%	1.05
85	1,281	1,155.2	13,993	9.1546%	8.2556%	1.11
90	1,582	1,520.7	10,894	14.5218%	13.9588%	1.04
95	1,174	995.6	4,917	23.8763%	20.2491%	1.18
100	291	224.5	950	30.6316%	23.6325%	1.30
Total	5,769	5,267.8	82,335	7.0067%	6.3980%	1.10

Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
60	50	54.5	5,702	0.8769%	0.9555%	0.92
65	116	112.8	8,629	1.3443%	1.3075%	1.03
70	234	219.0	11,408	2.0512%	1.9194%	1.07
75	363	384.6	12,598	2.8814%	3.0528%	0.94
80	678	684.0	13,244	5.1193%	5.1648%	0.99
85	1,281	1,260.9	13,993	9.1546%	9.0109%	1.02
90	1,582	1,652.4	10,894	14.5218%	15.1684%	0.96
95	1,174	1,153.7	4,917	23.8763%	23.4644%	1.02
100	291	322.9	950	30.6316%	33.9867%	0.90
Total	5,769	5,844.9	82,335	7.0067%	7.0989%	0.99

Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

We have proposed new assumptions consistent with industry standards. In total, the proposed mortality tables are anticipated to decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR BENEFICIARIES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
15	0.0105%	0.0092%	68	1.8256%	1.3605%
16	0.0142%	0.0112%	69	1.9386%	1.4332%
17	0.0191%	0.0122%	70	2.0542%	1.5007%
18	0.0222%	0.0133%	71	2.2359%	1.6745%
19	0.0240%	0.0143%	72	2.4230%	1.8463%
20	0.0251%	0.0145%	73	2.6165%	2.0157%
21	0.0268%	0.0153%	74	2.8157%	2.1838%
22	0.0284%	0.0161%	75	3.0220%	2.3492%
23	0.0301%	0.0171%	76	3.4928%	2.6652%
24	0.0315%	0.0183%	77	3.9787%	2.9831%
25	0.0327%	0.0195%	78	4.4792%	3.3011%
26	0.0342%	0.0208%	79	4.9963%	3.6207%
27	0.0354%	0.0221%	80	5.5282%	3.9391%
28	0.0371%	0.0236%	81	6.1051%	4.4386%
29	0.0394%	0.0252%	82	6.6894%	4.9473%
30	0.0427%	0.0270%	83	7.2805%	5.4665%
31	0.0495%	0.0330%	84	7.8749%	5.9942%
32	0.0562%	0.0384%	85	8.4753%	6.5354%
33	0.0625%	0.0431%	86	9.6136%	7.4659%
34	0.0682%	0.0471%	87	10.8005%	8.3995%
35	0.0743%	0.0511%	88	12.0443%	9.3428%
36	0.0780%	0.0542%	89	13.3397%	10.2918%
37	0.0818%	0.0579%	90	14.6958%	11.2477%
38	0.0861%	0.0618%	91	16.4185%	12.8868%
39	0.0917%	0.0666%	92	18.1416%	14.4887%
40	0.0997%	0.0719%	93	19.8574%	16.0801%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR BENEFICIARIES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
41	0.1394%	0.0775%	94	21.6187%	17.5854%
42	0.1774%	0.0859%	95	23.5884%	19.0626%
43	0.2143%	0.0968%	96	25.4266%	20.2474%
44	0.2507%	0.1111%	97	27.2119%	21.2937%
45	0.2875%	0.1287%	98	29.0202%	22.0663%
46	0.3207%	0.1501%	99	30.6654%	22.5443%
47	0.3534%	0.1748%	100	32.1584%	22.6473%
48	0.3849%	0.2022%	101	33.7521%	23.5294%
49	0.4150%	0.2319%	102	35.1259%	24.5619%
50	0.4431%	0.2633%	103	36.3671%	25.7825%
51	0.5156%	0.2999%	104	37.3834%	27.1635%
52	0.5928%	0.3376%	105	38.1051%	28.6530%
53	0.6740%	0.3762%	106	38.4698%	30.2169%
54	0.7583%	0.4151%	107	38.6325%	31.8182%
55	0.8440%	0.4540%	108	38.8076%	33.4131%
56	0.9048%	0.5132%	109	38.9794%	34.9566%
57	0.9604%	0.5735%	110	50.0000%	50.0000%
58	1.0101%	0.6353%	111	50.0000%	50.0000%
59	1.0536%	0.6981%	112	50.0000%	50.0000%
60	1.0919%	0.7631%	113	50.0000%	50.0000%
61	1.1835%	0.8329%	114	50.0000%	50.0000%
62	1.2676%	0.8908%	115	50.0000%	50.0000%
63	1.3473%	0.9493%	116	50.0000%	50.0000%
64	1.4238%	1.0146%	117	50.0000%	50.0000%
65	1.4985%	1.0876%	118	50.0000%	50.0000%
66	1.6059%	1.1681%	119	50.0000%	50.0000%
67	1.7146%	1.2609%	120	100.0000%	100.0000%

¹ An adjustment factor of 0.89 is applied to the probabilities above to develop benefit weighted probabilities of mortality

² An adjustment factor of 0.951 is applied to the probabilities above to develop benefit weighted probabilities of mortality

The following table shows the proposed assumptions.

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR BENEFICIARIES* BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0213%	0.0108%	68	2.1319%	1.2510%
16	0.0288%	0.0132%	69	2.2991%	1.3475%
17	0.0388%	0.0144%	70	2.4880%	1.4610%
18	0.0438%	0.0156%	71	2.7020%	1.5932%
19	0.0450%	0.0156%	72	2.9426%	1.7474%
20	0.0429%	0.0165%	73	3.2127%	1.9239%
21	0.0385%	0.0155%	74	3.5155%	2.1243%
22	0.0328%	0.0132%	75	3.8517%	2.3534%
23	0.0282%	0.0122%	76	4.2232%	2.6102%
24	0.0249%	0.0125%	77	4.6341%	2.9016%
25	0.0228%	0.0127%	78	5.0911%	3.2318%
26	0.0250%	0.0145%	79	5.5977%	3.6056%
27	0.0274%	0.0148%	80	6.1669%	4.0314%
28	0.0297%	0.0166%	81	6.8074%	4.5194%
29	0.0337%	0.0184%	82	7.5285%	5.0748%
30	0.0361%	0.0218%	83	8.3336%	5.7106%
31	0.0402%	0.0236%	84	9.2333%	6.4368%
32	0.0424%	0.0253%	85	10.2373%	7.2652%
33	0.0462%	0.0268%	86	11.3474%	8.2088%
34	0.0480%	0.0298%	87	12.5685%	9.2702%
35	0.0512%	0.0309%	88	13.9075%	10.4520%
36	0.0541%	0.0334%	89	15.3777%	11.7389%
37	0.0565%	0.0355%	90	17.1167%	13.1089%
38	0.0600%	0.0373%	91	18.9624%	14.5764%
39	0.0614%	0.0403%	92	20.8892%	16.1376%
40	0.0640%	0.0416%	93	22.8919%	17.7993%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR BENEFICIARIES* BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.0675%	0.0440%	94	24.9620%	19.5555%
42	0.0707%	0.0463%	95	27.0734%	21.4140%
43	0.0749%	0.0497%	96	29.3636%	23.4560%
44	0.0788%	0.0519%	97	31.7238%	25.6189%
45	0.6986%	0.3023%	98	34.1591%	27.9023%
46	0.7085%	0.3098%	99	36.6614%	30.2827%
47	0.7222%	0.3189%	100	39.1948%	32.7488%
48	0.7402%	0.3310%	101	41.7401%	35.2675%
49	0.7619%	0.3452%	102	44.2616%	37.8102%
50	0.8227%	0.3614%	103	46.7654%	40.3653%
51	0.8500%	0.3910%	104	49.2000%	42.8934%
52	0.8814%	0.4252%	105	51.5638%	45.3902%
53	0.9178%	0.4627%	106	53.8534%	47.8174%
54	0.9603%	0.5028%	107	56.0417%	50.1669%
55	1.0067%	0.5474%	108	58.1186%	52.4321%
56	1.0594%	0.5928%	109	60.0958%	54.5877%
57	1.1170%	0.6394%	110	61.6798%	56.6242%
58	1.1797%	0.6869%	111	61.8406%	58.5460%
59	1.2454%	0.7345%	112	61.9956%	59.6111%
60	1.3156%	0.7812%	113	62.1509%	59.7365%
61	1.3908%	0.8277%	114	62.3252%	59.8621%
62	1.4697%	0.8752%	115	62.4813%	59.9880%
63	1.5526%	0.9244%	116	62.4938%	59.9940%
64	1.6430%	0.9765%	117	62.5000%	60.0000%
65	1.7438%	1.0325%	118	62.5000%	60.0000%
66	1.8562%	1.0961%	119	62.5000%	60.0000%
67	1.9859%	1.1673%	120	100.0000%	100.0000%

* This table is to be utilized for beneficiary mortality after the retiree's death. Service retirement mortality is used for the beneficiary while the retiree is alive

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR BENEFICIARIES* BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0204%	0.0097%	68	2.2864%	1.3446%
16	0.0276%	0.0119%	69	2.4491%	1.4354%
17	0.0372%	0.0130%	70	2.6331%	1.5423%
18	0.0420%	0.0140%	71	2.8383%	1.6697%
19	0.0444%	0.0140%	72	3.0697%	1.8184%
20	0.0436%	0.0148%	73	3.3299%	1.9907%
21	0.0407%	0.0140%	74	3.6244%	2.1879%
22	0.0378%	0.0131%	75	3.9545%	2.4115%
23	0.0336%	0.0122%	76	4.3256%	2.6622%
24	0.0319%	0.0125%	77	4.7424%	2.9435%
25	0.0301%	0.0127%	78	5.2081%	3.2609%
26	0.0325%	0.0143%	79	5.7273%	3.6176%
27	0.0365%	0.0146%	80	6.3080%	4.0192%
28	0.0390%	0.0163%	81	6.9573%	4.4737%
29	0.0416%	0.0193%	82	7.6811%	4.9877%
30	0.0442%	0.0210%	83	8.4812%	5.5718%
31	0.0466%	0.0226%	84	9.3690%	6.2370%
32	0.0505%	0.0256%	85	10.3482%	6.9994%
33	0.0525%	0.0270%	86	11.4214%	7.8703%
34	0.0560%	0.0296%	87	12.5930%	8.8554%
35	0.0574%	0.0306%	88	13.8708%	9.9520%
36	0.0600%	0.0328%	89	15.2597%	11.1439%
37	0.0622%	0.0359%	90	16.7591%	12.4051%
38	0.0654%	0.0375%	91	18.4162%	13.7635%
39	0.0681%	0.0400%	92	20.2341%	15.2202%
40	0.0702%	0.0410%	93	22.2115%	16.7860%

NEW YORK CITY TEACHERS' RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR BENEFICIARIES* BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.0733%	0.0443%	94	24.3289%	18.4516%
42	0.0760%	0.0462%	95	26.5331%	20.2181%
43	0.0810%	0.0491%	96	28.9271%	22.1559%
44	0.0858%	0.0520%	97	31.3742%	24.1980%
45	0.7758%	0.3208%	98	33.8485%	26.3367%
46	0.7682%	0.3452%	99	36.3239%	28.5431%
47	0.7677%	0.3719%	100	38.7602%	30.8094%
48	0.7747%	0.4016%	101	41.1591%	33.1010%
49	0.7926%	0.4297%	102	43.5244%	35.4038%
50	0.8224%	0.4563%	103	45.8670%	37.7042%
51	0.8577%	0.4816%	104	48.1391%	39.9675%
52	0.8994%	0.5102%	105	50.3393%	42.1912%
53	0.9462%	0.5421%	106	52.4670%	44.3413%
54	0.9994%	0.5784%	107	54.4969%	46.4107%
55	1.0591%	0.6175%	108	56.4206%	48.3978%
56	1.1230%	0.6591%	109	58.2519%	50.2786%
57	1.1932%	0.7034%	110	59.2126%	52.0464%
58	1.2685%	0.7492%	111	59.3670%	53.5427%
59	1.3479%	0.7976%	112	59.5157%	53.6500%
60	1.4302%	0.8477%	113	59.6648%	53.7629%
61	1.5154%	0.9002%	114	59.8322%	53.8759%
62	1.6044%	0.9547%	115	59.9820%	53.9892%
63	1.6963%	1.0119%	116	59.9940%	53.9946%
64	1.7931%	1.0709%	117	60.0000%	54.0000%
65	1.8978%	1.1318%	118	60.0000%	54.0000%
66	2.0128%	1.1964%	119	60.0000%	54.0000%
67	2.1418%	1.2660%	120	100.0000%	100.0000%

* This table is to be utilized for beneficiary mortality after the retiree's death. Service retirement mortality is used for the beneficiary while the retiree is alive

Section III – Board of Education Retirement System of the City of New York (BERS)

Exposures and Decrement

To set the exposures and actual decrements for BERS, the following table details the age and service conditions for unreduced retirement and reduced retirement. If a member has not met any of these conditions for the indicated plan code by year, the member is considered a withdrawal exposure. Otherwise, if the member did meet any of these conditions, they would be considered a retirement exposure. Members with a status code of termination who, nonetheless, have met the conditions for retirement, are included as actual retirements.

Using the age and service slider, a user can drill down to view the results that reflect a variety of conditions by plan code, such as reduced retirement, retirement at first eligibility, or other conditions for retirement.

BERS Retirement Eligibility Chart									
Plan Code	Plan Description	Mandated	Formula	Unreduced Retirement		Unreduced Retirement		Reduced Retirement	
			Bump at 20 YOS	Condition 1 Age 1	Condition 1 Service 1	Condition 2 Age 2	Condition 2 Service 2	Condition Age	Condition Service
A	CPP (Plan A)	TRUE		55	25				
B	ISF	TRUE		55	25				
C	Modified CPP	TRUE		62	5			55	25
D	Modified ISF	TRUE		62	5				
F	Tier IV	TRUE	TRUE	62	5			55	5
G	Ch96 - Tier II	FALSE	TRUE	55	25	62	5		
H	Ch96 - Tier IV	FALSE	TRUE	55	25	62	5		
W	Ch96 - Tier IV PhyTax	FALSE	TRUE	50	25	62	5		
I	Ch96 - 57/10 Mandated	TRUE	TRUE	57	5				
J	Ch19/08 - 55/25 - Tier II	FALSE	TRUE	55	25	62	5		
K	Ch19/08 - 55/25 - Tier IV	FALSE	TRUE	55	25	62	5		
L	Special Officers - Tier IV	TRUE	FALSE	40	25	62	5		
M	Ch96 - Tier IV Mandated	TRUE	TRUE	57	5				
N	Ch96 - Tier IV Mandated PhyTax	TRUE	TRUE	50	25	57	5		
P	Ch19/08 - 55/27 Mandated	TRUE	TRUE	55	27	62	5		
Q	Ch504/09 - 55/27 Mandated	TRUE	TRUE	55	27	62	10	55	10
R	Ch18/12 - Tier 6	TRUE	TRUE	63	10			55	10
T	Special Officers - Tier 6	TRUE	FALSE	40	25	63	10		
U	Automechanics Tier 4	FALSE	FALSE	50	25	62	5		
V	Automechanics Tier 6	TRUE	FALSE	50	25	63	10		

Please note that withdrawal and retirement exposures for Plan Codes A – D and J were excluded from the tool because there are very few of them remaining at the end of the study period.

For certain plans such as the Tier 6 plans and the Ch 504/09 – 55/27 Mandated plan, the vesting requirement was reduced from 10 years to 5 years with the passage of Chapter 56, Laws of 2022. Since 10-year vesting was required during the study period, we have used 10 years in this report.

OA's retirement assumptions depend on whether a member can choose a certain retirement plan. If a member had a choice and elected the improved plan, the assumed rates of retirement are higher than those in which the member was mandated into the specific retirement plan. Higher rates of retirement apply to the indicated plan when the Mandated column is set to False. All Tier 6 plans are considered Mandated plans.

Members whose work involved physically taxing activities are subject to less stringent requirements to qualify for benefits in terms of retirement age. To facilitate the analysis of these members, we created two new codes:

- Plan Code N – for Tier IV Chapter 96 age 57 plan members, who were initially included in Plan Code I or Plan Code M. Plan Code I and Plan Code M are the same plan, but in some years the plan was referred to as Plan Code I and in other years as Plan Code M.
- Plan Code W – for Tier IV Chapter 96 optional 55 and 25 members, who were initially included in Plan Code H.

We understand that for certain elected plans with unreduced retirement benefits at age 55 and 25 or 27 years of service, the OA assumes immediate reduced retirement for members who have not met the stated condition for unreduced retirement but have met the condition for early retirement under the Tier IV basic plan (age 55 and completion of 5 years of service). In these situations, OA applies the rates of termination at these age/service conditions and not reduced rates of retirement. These members are included as a retirement exposure but both the current and proposed assumption reflects the reduced retirement assumption.

Rates of Salary Increase

The rates of salary increase reflect three components: 1) price inflation, 2) real wage inflation and 3) merit increases. The combination of price inflation and real wage inflation is known as wage inflation. The current wage inflation is 3%, which reflects a price inflation assumption of 2.5% and 0.5% real wage inflation.

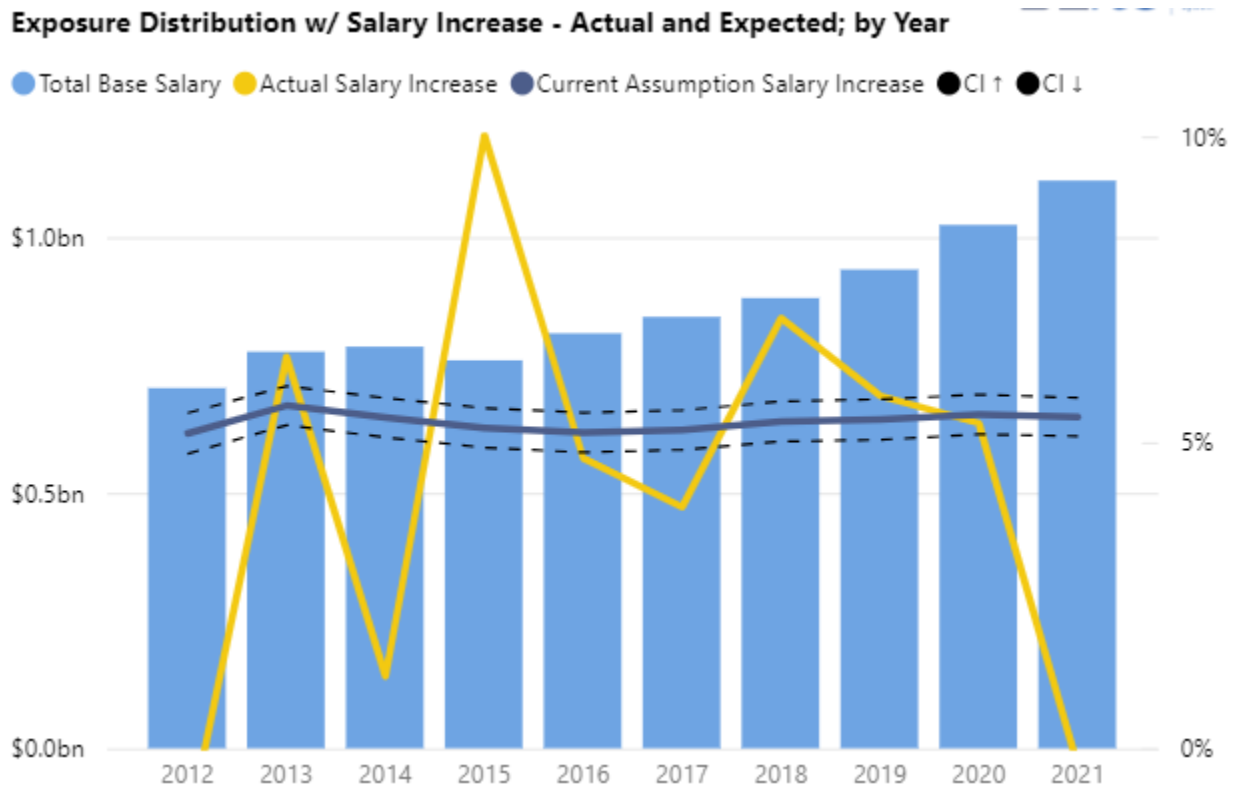
Based on the 2024 and 2023 OASDI Trustees report issued by Social Security, wage inflation from 2012 to 2020 had a cumulative compound average of 2.93%. Including the rate for 2021 of 9.04%, the average increased to 3.53%. However, in our analysis of the experience, we did not notice any large increases in wages during 2021. This is typical with government sector employees with union affiliations where salary increases are specified in contracts negotiated for a 3- to 5-year period. Thus, wage increases for these employees may not adjust as quickly as for other employment sectors included in the Social Security Trustees report.

For purposes of our analysis, we believe the 3% current wage inflation is representative of the actual experience during the study period. While inflation has been higher since 2021, we propose no changes to the inflation assumption of 2.5% and wage inflation assumptions of 3%. Therefore, we have developed proposed salary increases based on total salary increases during the indicated period. The merit portion is equal to the total less the 3% wage inflation.

For purposes of salary increases only members with a status code of A in consecutive years are included. Members with a LOA status code are excluded.

Although salary increases for government employees may respond less quickly to changes in inflation, using salary experience from many years in the past may not necessarily be indicative of future salary increases as they may not include changes negotiated in union contracts such as general increases, longevity payments, or other salary items. We reviewed the salary increases by year and determined what we believe was the most reasonable period to compare to the current assumption and develop proposed assumptions.

The following chart shows the experience by year for the age range 25 to 59 and for the service range 0 to 34.



Salary increases for BERS varied significantly from one year to the next. There was a substantial increase in 2015 and effectively there was no average increase in 2021, which is probably impacted by the pandemic. For BERS, we focused on the 5-year period from 2016 – 2020, which appears to be the most stable period.

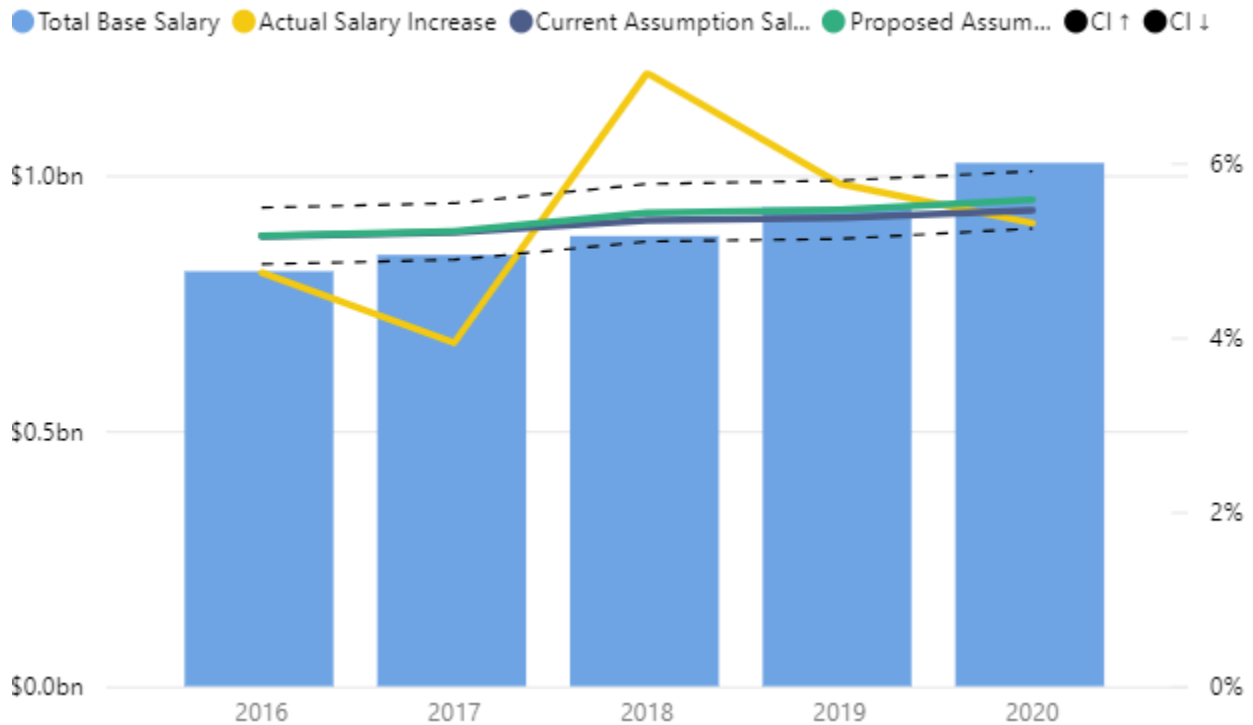
The current assumed rates of salary increases vary by service. The proposed assumption also varies by service. Overall, the proposed rates of salary increases are very similar to the current assumption.

The following table shows the experience for salary increases by year, for the age range (25 to 59), and for the service range (0 to 34) from 2016 - 2020. The actual rate of salary increases averaged 5.38% whereas the overall expected rate of increase averaged 5.31% based on the current assumptions and 5.38% based on the proposed assumptions.

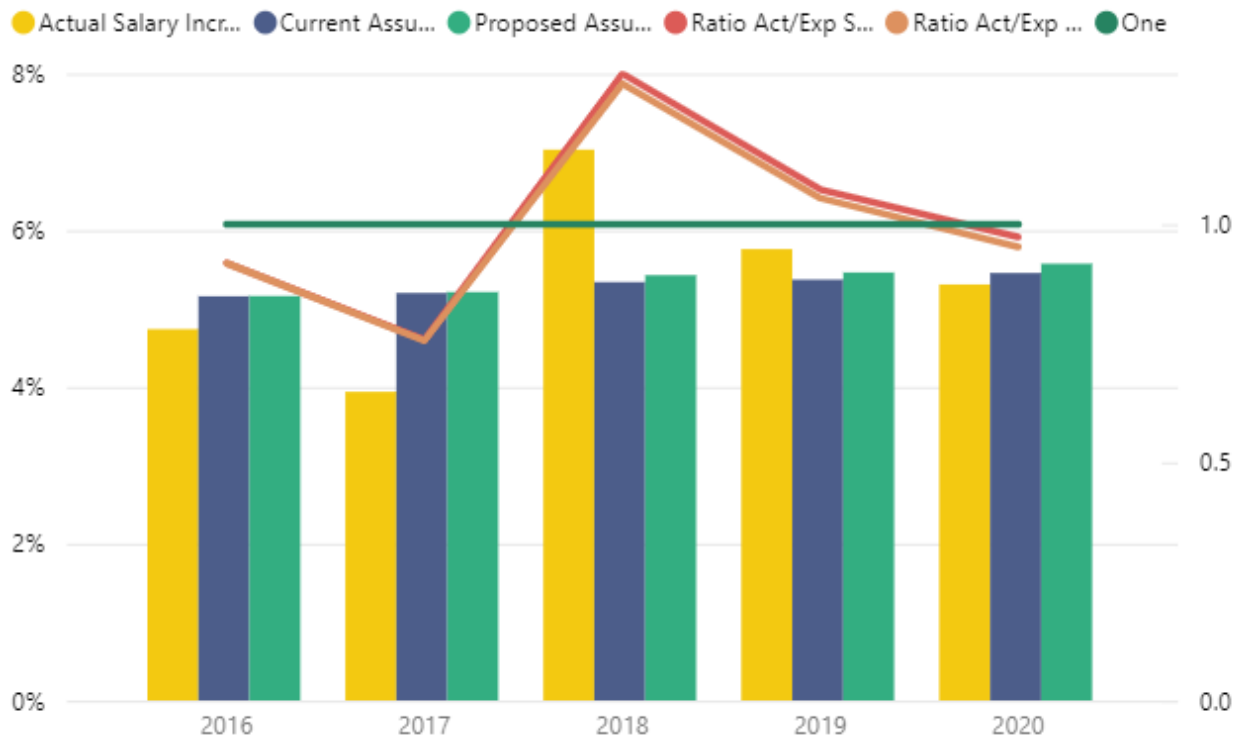
Plan Year	Exposed	Base Salary	Actual Salary	Expected Salary	Actual Salary Increase	Current Assumption Salary Increase	Ratio Act/Exp Salary Increase
2016	17,845	\$811.9M	\$850.4M	853.8M	4.74%	5.16%	0.92
2017	18,073	\$844.1M	\$877.4M	888.0M	3.94%	5.20%	0.76
2018	18,126	\$881.0M	\$943.0M	928.1M	7.03%	5.34%	1.32
2019	17,783	\$936.8M	\$990.8M	987.1M	5.76%	5.37%	1.07
2020	18,791	\$1,024.0M	\$1,078.3M	1,079.8M	5.31%	5.45%	0.97
Total	90,618	\$4,497.9M	\$4,739.9M	4,736.9M	5.38%	5.31%	1.01

Plan Year	Exposed	Base Salary	Actual Salary	Expected Salary Proposed	Actual Salary Increase	Proposed Assumption Salary Increase	Act/Exp Proposed Salary Increase
2016	17,845	\$811.9M	\$850.4M	853.9M	4.74%	5.16%	0.92
2017	18,073	\$844.1M	\$877.4M	888.1M	3.94%	5.21%	0.76
2018	18,126	\$881.0M	\$943.0M	928.9M	7.03%	5.43%	1.30
2019	17,783	\$936.8M	\$990.8M	988.0M	5.76%	5.46%	1.05
2020	18,791	\$1,024.0M	\$1,078.3M	1,081.0M	5.31%	5.57%	0.95
Total	90,618	\$4,497.9M	\$4,739.9M	4,739.8M	5.38%	5.38%	1.00

Exposure Distribution w/ Salary Increase - Actual and Expected; by Year



Salary Increase - Actual, Expected, and Ratio; by Year

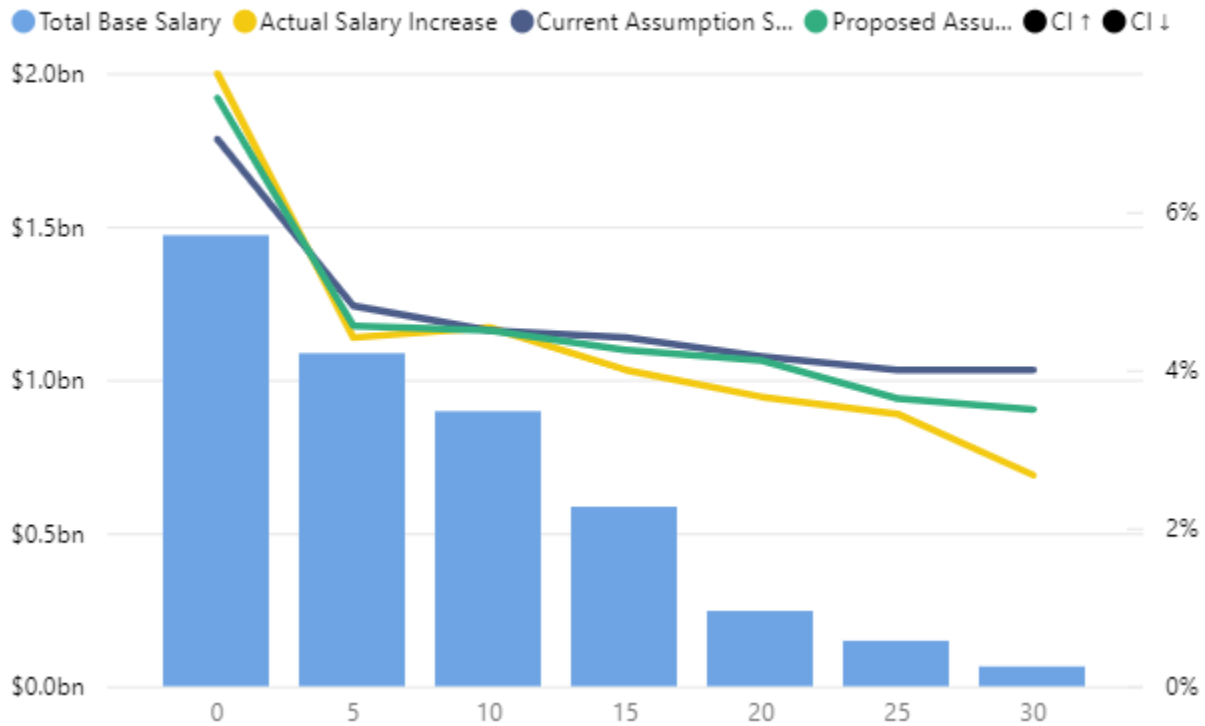


The following charts show the experience by service (0 to 34 years) from 2016 to 2020 first compared to the current assumption and then to the proposed assumption. This resulted in a decrease in the A/E ratio from 1.01 to 1.00 for ages 25 to 59.

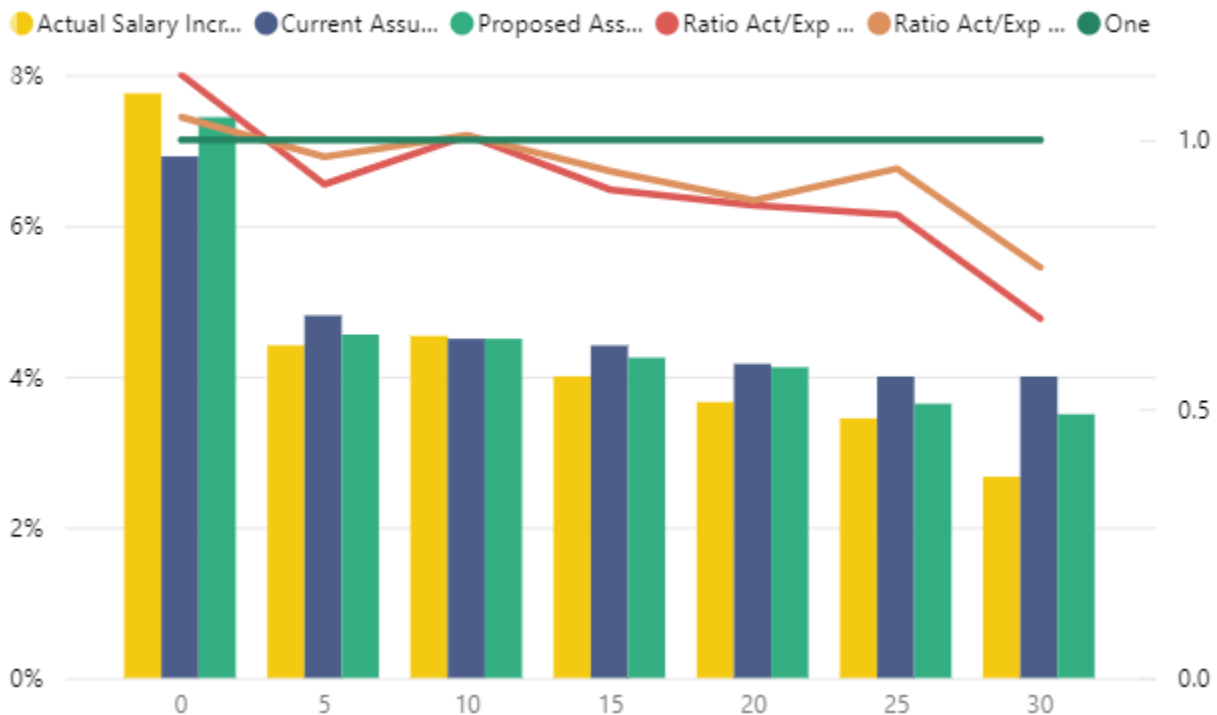
Service	Exposed	Base Salary	Actual Salary	Expected Salary	Actual Salary Increase	Current Assumption Salary Increase	Ratio Act/Exp Salary Increase
0	4,082	\$157.6M	\$182.3M	171.8M	15.70%	9.00%	1.74
1	8,506	\$365.1M	\$401.3M	394.3M	9.89%	8.00%	1.24
2	6,482	\$301.7M	\$323.3M	322.8M	7.16%	7.00%	1.02
3	7,846	\$340.7M	\$359.0M	361.1M	5.36%	6.00%	0.89
4	7,253	\$304.5M	\$317.8M	321.2M	4.37%	5.50%	0.79
5	5,408	\$245.1M	\$256.6M	257.4M	4.68%	5.00%	0.94
6	4,861	\$227.5M	\$237.2M	238.6M	4.26%	4.90%	0.87
7	4,476	\$214.0M	\$222.9M	224.3M	4.13%	4.80%	0.86
8	3,951	\$194.0M	\$202.9M	203.1M	4.60%	4.70%	0.98
9	3,924	\$206.8M	\$215.9M	216.3M	4.38%	4.60%	0.95
10	3,693	\$194.8M	\$203.0M	203.5M	4.24%	4.50%	0.94
11	3,705	\$199.3M	\$208.4M	208.3M	4.55%	4.50%	1.01
12	3,223	\$179.4M	\$187.7M	187.4M	4.64%	4.50%	1.03
13	2,893	\$167.2M	\$175.2M	174.8M	4.76%	4.50%	1.06
14	2,829	\$155.8M	\$162.9M	162.8M	4.51%	4.50%	1.00
15	2,745	\$143.9M	\$150.1M	150.4M	4.35%	4.50%	0.97
16	2,506	\$127.7M	\$132.2M	133.4M	3.54%	4.45%	0.80
17	2,201	\$118.0M	\$122.2M	123.2M	3.52%	4.40%	0.80
18	1,889	\$104.6M	\$109.2M	109.1M	4.41%	4.35%	1.01
19	1,486	\$91.7M	\$95.6M	95.6M	4.28%	4.30%	1.00
20	1,054	\$66.1M	\$69.1M	68.9M	4.55%	4.25%	1.07
21	905	\$58.4M	\$60.6M	60.8M	3.75%	4.20%	0.89
22	774	\$49.1M	\$50.6M	51.2M	2.93%	4.15%	0.71
23	613	\$40.4M	\$41.6M	42.0M	3.13%	4.10%	0.76
24	476	\$31.4M	\$32.5M	32.7M	3.43%	4.05%	0.85
25	501	\$34.6M	\$35.7M	35.9M	3.44%	4.00%	0.86
26	497	\$34.9M	\$36.1M	36.3M	3.44%	4.00%	0.86
27	440	\$32.3M	\$33.8M	33.5M	4.75%	4.00%	1.19
28	326	\$25.8M	\$26.4M	26.8M	2.32%	4.00%	0.58
29	257	\$21.2M	\$21.8M	22.0M	2.84%	4.00%	0.71
30	222	\$17.2M	\$17.6M	17.8M	2.51%	4.00%	0.63
31	227	\$18.1M	\$18.5M	18.9M	2.25%	4.00%	0.56
32	162	\$12.9M	\$13.3M	13.4M	3.42%	4.00%	0.86
33	122	\$9.7M	\$9.9M	10.1M	2.65%	4.00%	0.66
34	83	\$6.6M	\$6.8M	6.9M	2.86%	4.00%	0.71
Total	90,618	\$4,497.9M	\$4,739.9M	4,736.9M	5.38%	5.31%	1.01

Service	Exposed	Base Salary	Actual Salary	Expected Salary Proposed	Actual Salary Increase	Proposed Assumption Salary Increase	Act/Exp Proposed Salary Increase
0	4,082	\$157.6M	\$182.3M	176.5M	15.70%	12.00%	▲ 1.31
1	8,506	\$365.1M	\$401.3M	398.0M	9.89%	9.00%	● 1.10
2	6,482	\$301.7M	\$323.3M	322.8M	7.16%	7.00%	● 1.02
3	7,846	\$340.7M	\$359.0M	361.1M	5.36%	6.00%	▲ 0.89
4	7,253	\$304.5M	\$317.8M	320.5M	4.37%	5.25%	▲ 0.83
5	5,408	\$245.1M	\$256.6M	256.8M	4.68%	4.75%	● 0.98
6	4,861	\$227.5M	\$237.2M	237.7M	4.26%	4.50%	● 0.95
7	4,476	\$214.0M	\$222.9M	223.6M	4.13%	4.50%	● 0.92
8	3,951	\$194.0M	\$202.9M	202.8M	4.60%	4.50%	● 1.02
9	3,924	\$206.8M	\$215.9M	216.1M	4.38%	4.50%	● 0.97
10	3,693	\$194.8M	\$203.0M	203.5M	4.24%	4.50%	● 0.94
11	3,705	\$199.3M	\$208.4M	208.3M	4.55%	4.50%	● 1.01
12	3,223	\$179.4M	\$187.7M	187.4M	4.64%	4.50%	● 1.03
13	2,893	\$167.2M	\$175.2M	174.8M	4.76%	4.50%	● 1.06
14	2,829	\$155.8M	\$162.9M	162.8M	4.51%	4.50%	● 1.00
15	2,745	\$143.9M	\$150.1M	150.0M	4.35%	4.25%	● 1.02
16	2,506	\$127.7M	\$132.2M	133.1M	3.54%	4.25%	▲ 0.83
17	2,201	\$118.0M	\$122.2M	123.0M	3.52%	4.25%	▲ 0.83
18	1,889	\$104.6M	\$109.2M	109.0M	4.41%	4.25%	● 1.04
19	1,486	\$91.7M	\$95.6M	95.6M	4.28%	4.25%	● 1.01
20	1,054	\$66.1M	\$69.1M	68.9M	4.55%	4.25%	● 1.07
21	905	\$58.4M	\$60.6M	60.8M	3.75%	4.20%	▲ 0.89
22	774	\$49.1M	\$50.6M	51.2M	2.93%	4.10%	▲ 0.72
23	613	\$40.4M	\$41.6M	42.0M	3.13%	4.00%	▲ 0.78
24	476	\$31.4M	\$32.5M	32.6M	3.43%	3.90%	▲ 0.88
25	501	\$34.6M	\$35.7M	35.9M	3.44%	3.80%	● 0.91
26	497	\$34.9M	\$36.1M	36.2M	3.44%	3.70%	● 0.93
27	440	\$32.3M	\$33.8M	33.4M	4.75%	3.60%	▲ 1.32
28	326	\$25.8M	\$26.4M	26.7M	2.32%	3.50%	▲ 0.66
29	257	\$21.2M	\$21.8M	21.9M	2.84%	3.50%	▲ 0.81
30	222	\$17.2M	\$17.6M	17.8M	2.51%	3.50%	▲ 0.72
31	227	\$18.1M	\$18.5M	18.8M	2.25%	3.50%	▲ 0.64
32	162	\$12.9M	\$13.3M	13.3M	3.42%	3.50%	● 0.98
33	122	\$9.7M	\$9.9M	10.0M	2.65%	3.50%	▲ 0.76
34	83	\$6.6M	\$6.8M	6.9M	2.86%	3.50%	▲ 0.82
Total	90,618	\$4,497.9M	\$4,739.9M	4,739.8M	5.38%	5.38%	● 1.00

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service

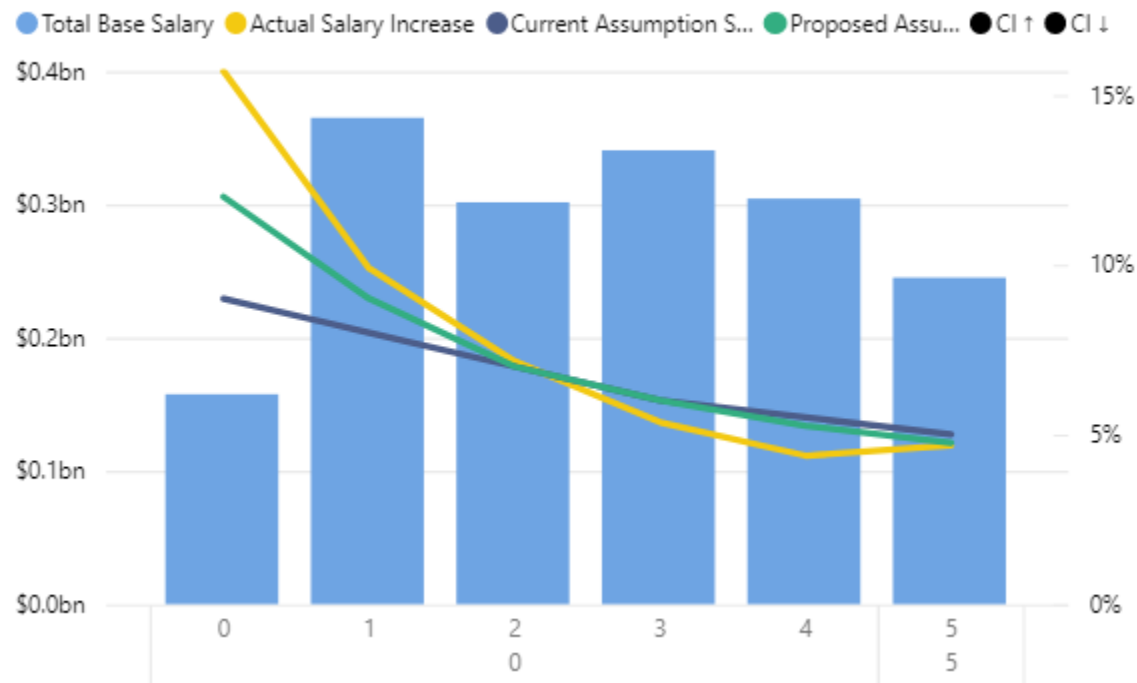


Salary Increase - Actual, Expected, and Ratio; by Service



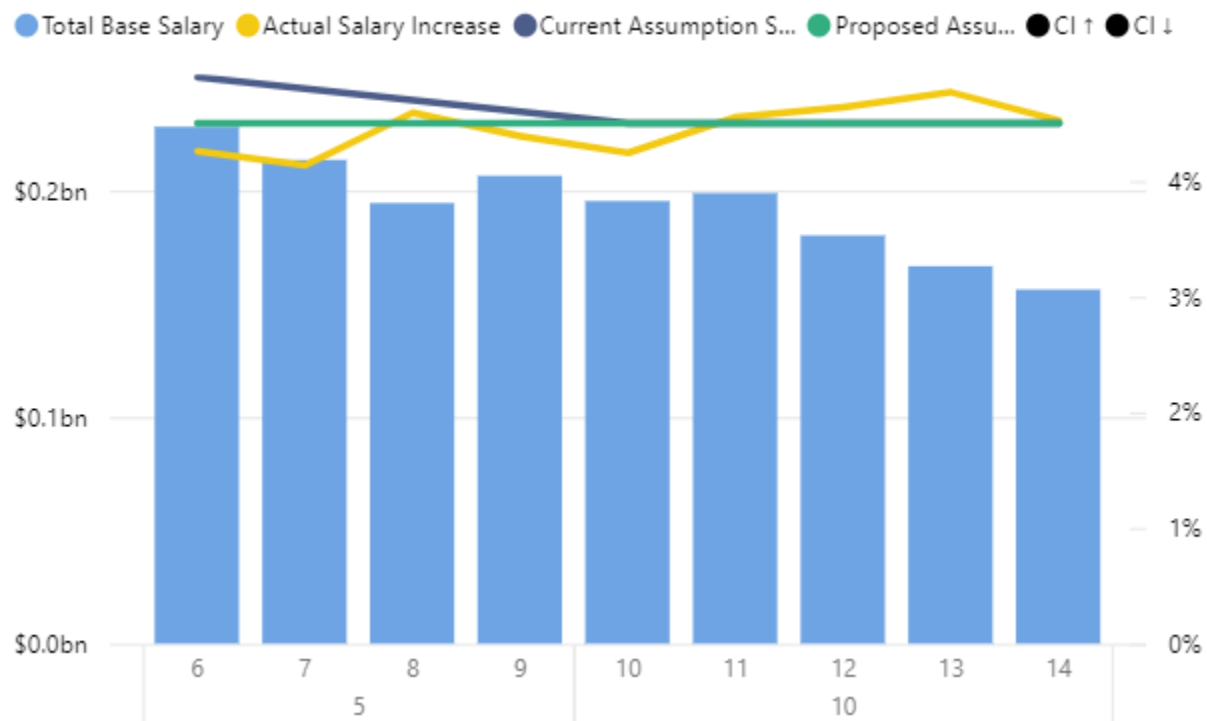
This chart shows the results by service for the service range 0 to 5 years, which increased the assumed rate of salary increases from 6.65% to 7.05% as compared to the actual rate of 7.32%. This resulted in a decrease in the A/E ratio from 1.10 to 1.04 for ages 25 to 59.

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



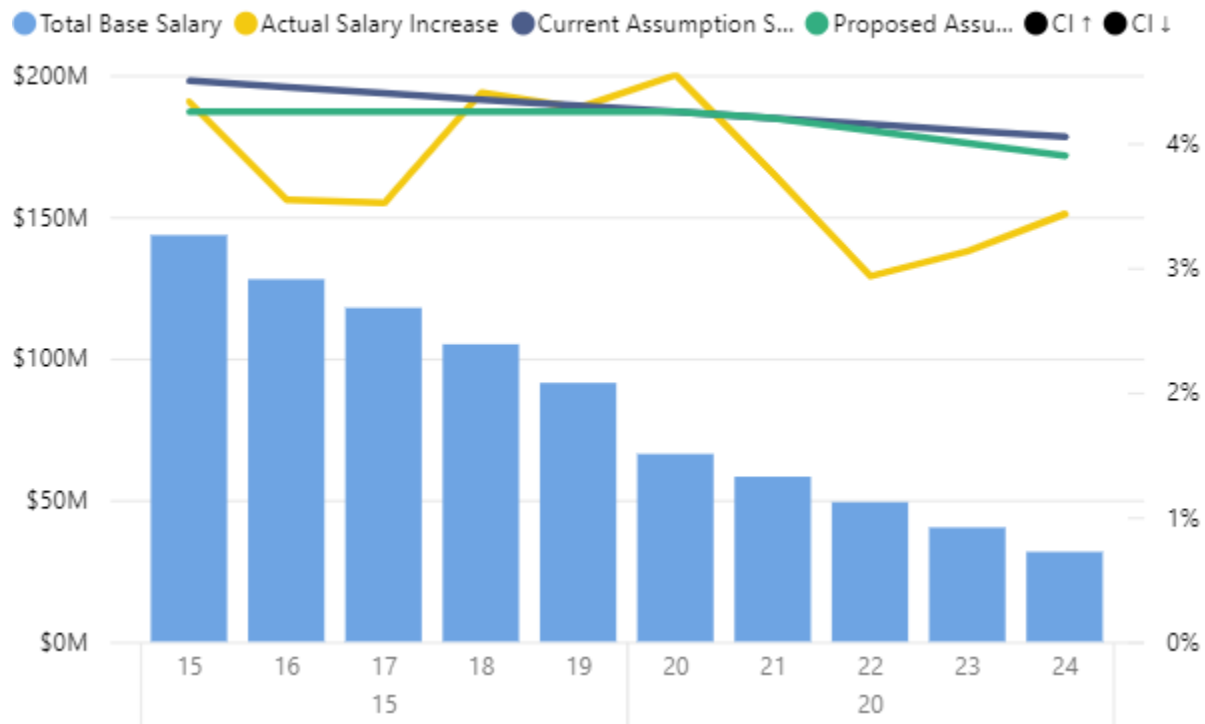
This chart shows the results by year for the service range 6 to 14 years, which decreased the assumed rate of salary increases from 4.62% to 4.50% as compared to the actual rate of 4.44%. This resulted in an increase in the A/E ratio from 0.96 to 0.99 for ages 25 to 59.

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



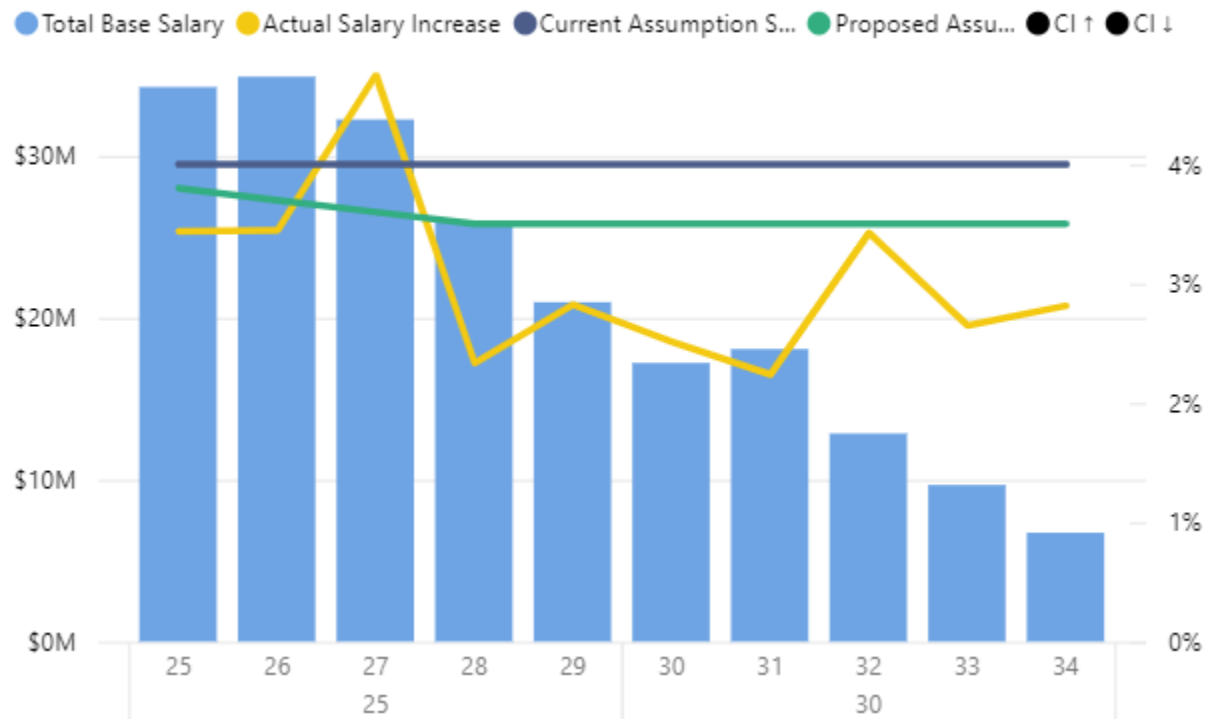
This chart shows the results by service for the service range 15 to 24 years, which decreased the assumed rate of salary increases from 4.34% to 4.21% as compared to the actual rate of 3.90%. This resulted in an increase in the A/E ratio from 0.90 to 0.93 for ages 25 to 59.

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



This chart shows the results by service for the service range 25 to 34 years, which decreased the assumed rate of salary increases from 4.00% to 3.60% as compared to the actual rate of 3.21%. This resulted in an increase in the A/E ratio from 0.80 to 0.89 for ages 25 to 59.

Exposure Distribution w/ Salary Increase - Actual and Expected; by Service



Summary

In total, the proposed rates of salary increases are higher than the current assumptions, primarily due to higher assumed salary increases during the first few years of employment. Thereafter, slightly lower salary increases are proposed. We would anticipate that this would decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT ASSUMPTION ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	6.00%	9.00%
1	5.00%	8.00%
2	4.00%	7.00%
3	3.00%	6.00%
4	2.50%	5.50%
5	2.00%	5.00%
6	1.90%	4.90%
7	1.80%	4.80%
8	1.70%	4.70%
9	1.60%	4.60%
10	1.50%	4.50%
11	1.50%	4.50%
12	1.50%	4.50%
13	1.50%	4.50%
14	1.50%	4.50%
15	1.50%	4.50%
16	1.45%	4.45%
17	1.40%	4.40%
18	1.35%	4.35%
19	1.30%	4.30%
20	1.25%	4.25%
21	1.20%	4.20%
22	1.15%	4.15%
23	1.10%	4.10%
24	1.05%	4.05%
25	1.00%	4.00%
26	1.00%	4.00%
27	1.00%	4.00%
28	1.00%	4.00%
29	1.00%	4.00%
30+	1.00%	4.00%

¹ Salary increase is the general wage increase of 3% plus the merit increase

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED ASSUMPTION ANNUAL RATES OF MERIT AND SALARY INCREASE		
Years of Service	Merit Increase	Salary Increase ¹
0	9.00%	12.00%
1	6.00%	9.00%
2	4.00%	7.00%
3	3.00%	6.00%
4	2.25%	5.25%
5	1.75%	4.75%
6	1.50%	4.50%
7	1.50%	4.50%
8	1.50%	4.50%
9	1.50%	4.50%
10	1.50%	4.50%
11	1.50%	4.50%
12	1.50%	4.50%
13	1.50%	4.50%
14	1.50%	4.50%
15	1.25%	4.25%
16	1.25%	4.25%
17	1.25%	4.25%
18	1.25%	4.25%
19	1.25%	4.25%
20	1.25%	4.25%
21	1.20%	4.20%
22	1.10%	4.10%
23	1.00%	4.00%
24	0.90%	3.90%
25	0.80%	3.80%
26	0.70%	3.70%
27	0.60%	3.60%
28	0.50%	3.50%
29	0.50%	3.50%
30+	0.50%	3.50%

Withdrawal

The current withdrawal assumption varies by gender and service. The proposed assumption varies by age in addition to service while a unisex table is proposed. Overall, this results in an increase in the assumed rates of withdrawal, especially at 5 or fewer years of service with lower assumed rates of withdrawal at higher years of service.

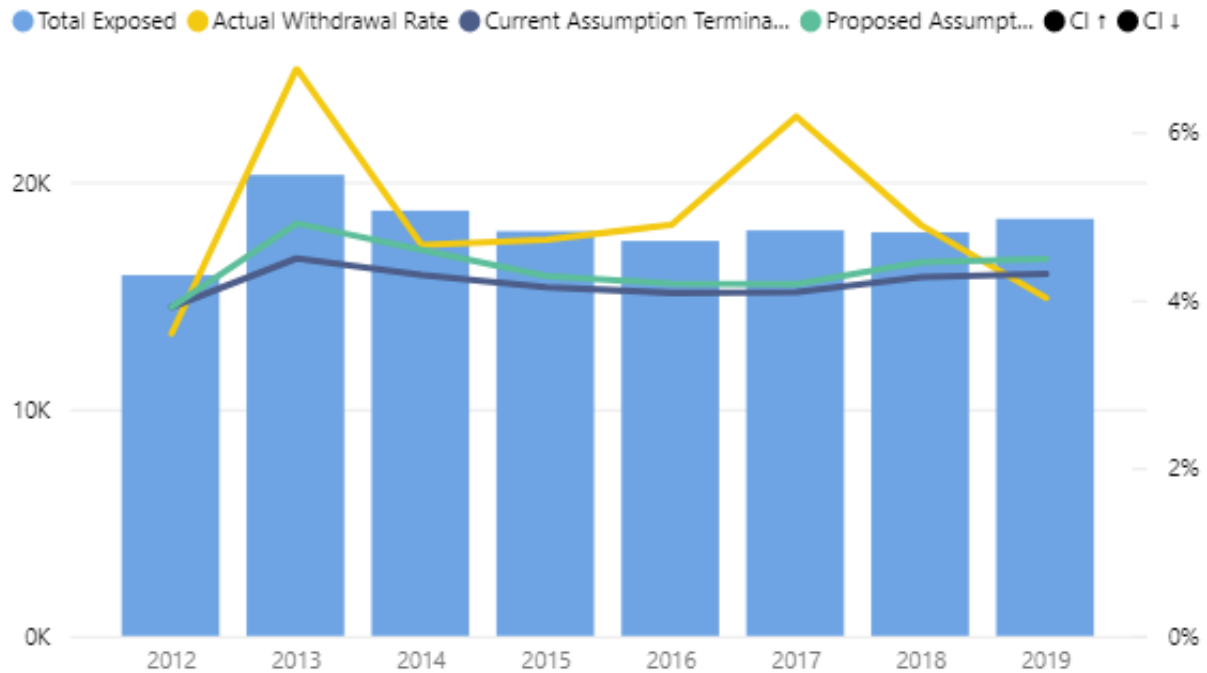
The analysis reflected years from 2012 - 2019 as the rate of termination during 2020 and 2021 may be artificially low due to members with a LOA status code. A record with a LOA status code is included as an exposure and not a decrement.

The following table shows the experience for withdrawal by year, for the age range (20 to 59), and for the service range (0 to 29). The actual rate of withdrawal averaged 5.04% whereas the overall expected rate of withdrawal averaged 4.17% based on the current assumptions and 4.43% based on the proposed assumptions.

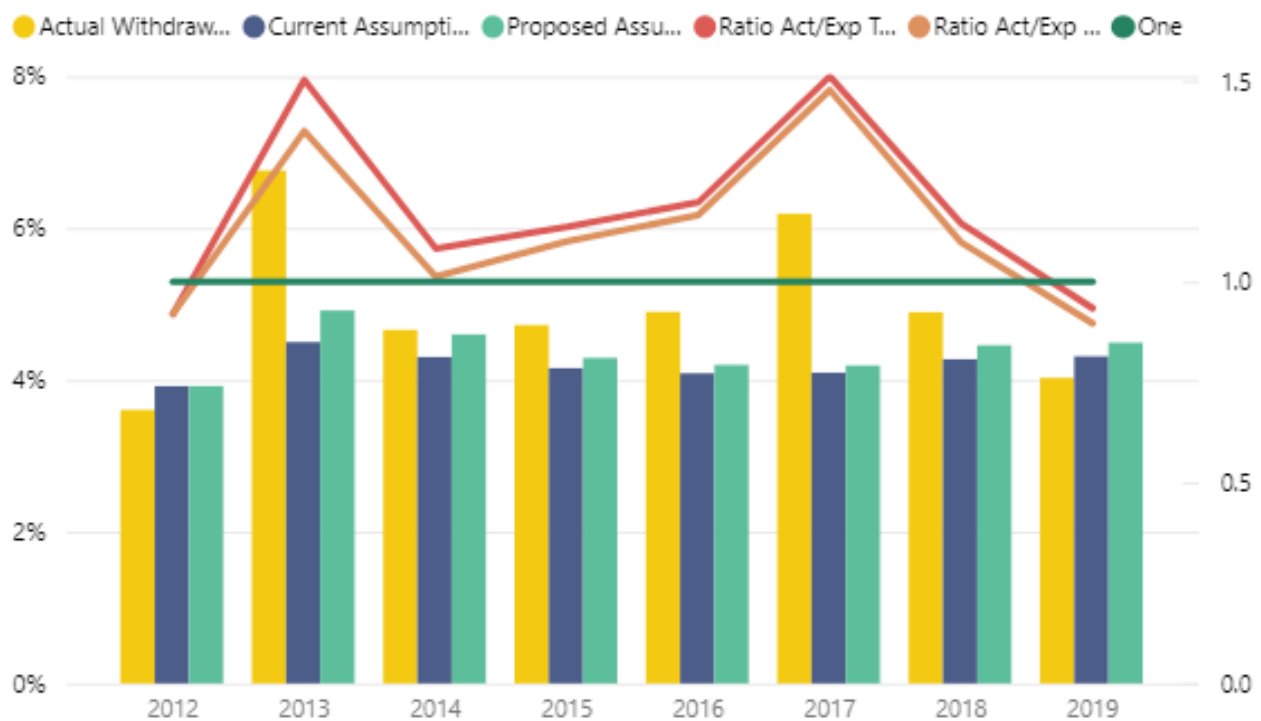
Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	547	597.0	15,376	3.56%	3.88%	0.92
2013	1,311	868.7	19,492	6.73%	4.46%	1.51
2014	835	763.4	17,949	4.65%	4.25%	1.09
2015	812	699.9	17,040	4.77%	4.11%	1.16
2016	832	668.7	16,558	5.02%	4.04%	1.24
2017	1,054	684.9	16,933	6.22%	4.04%	1.54
2018	835	714.2	16,882	4.95%	4.23%	1.17
2019	703	741.6	17,386	4.04%	4.27%	0.95
Total	6,929	5,738.5	137,616	5.04%	4.17%	1.21

Plan Year	Actual Withdrawals	Expected Withdrawals Proposed	Total Exposed	Actual Withdrawal Rate	Proposed Assumption Termination	Act/Exp Proposed Term
2012	547	604.0	15,376	3.56%	3.93%	0.91
2013	1,311	964.5	19,492	6.73%	4.95%	1.36
2014	835	830.1	17,949	4.65%	4.62%	1.01
2015	812	735.0	17,040	4.77%	4.31%	1.10
2016	832	699.3	16,558	5.02%	4.22%	1.19
2017	1,054	714.9	16,933	6.22%	4.22%	1.47
2018	835	758.7	16,882	4.95%	4.49%	1.10
2019	703	788.4	17,386	4.04%	4.53%	0.89
Total	6,929	6,094.9	137,616	5.04%	4.43%	1.14

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Year



Withdrawal Rate - Actual, Expected, and Ratio; by Year

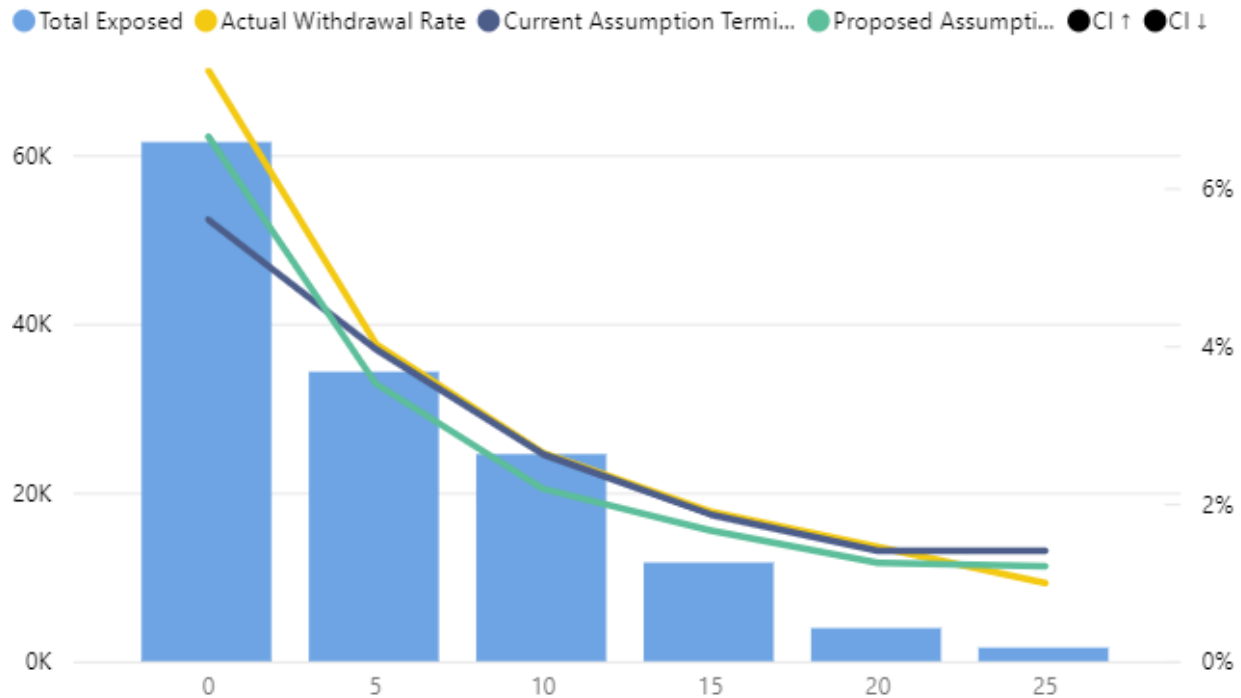


The following charts show the experience by service (0 to 29 years) in the experience study period first compared to the current assumption and then to the proposed assumption. This resulted in a decrease in the A/E ratio from 1.21 to 1.14 for ages 20 to 59. For ages 20 to 39, the A/E ratio decreased from 1.78 to 1.17 and for ages 40 to 59, the A/E ratio increased from 0.93 to 1.11.

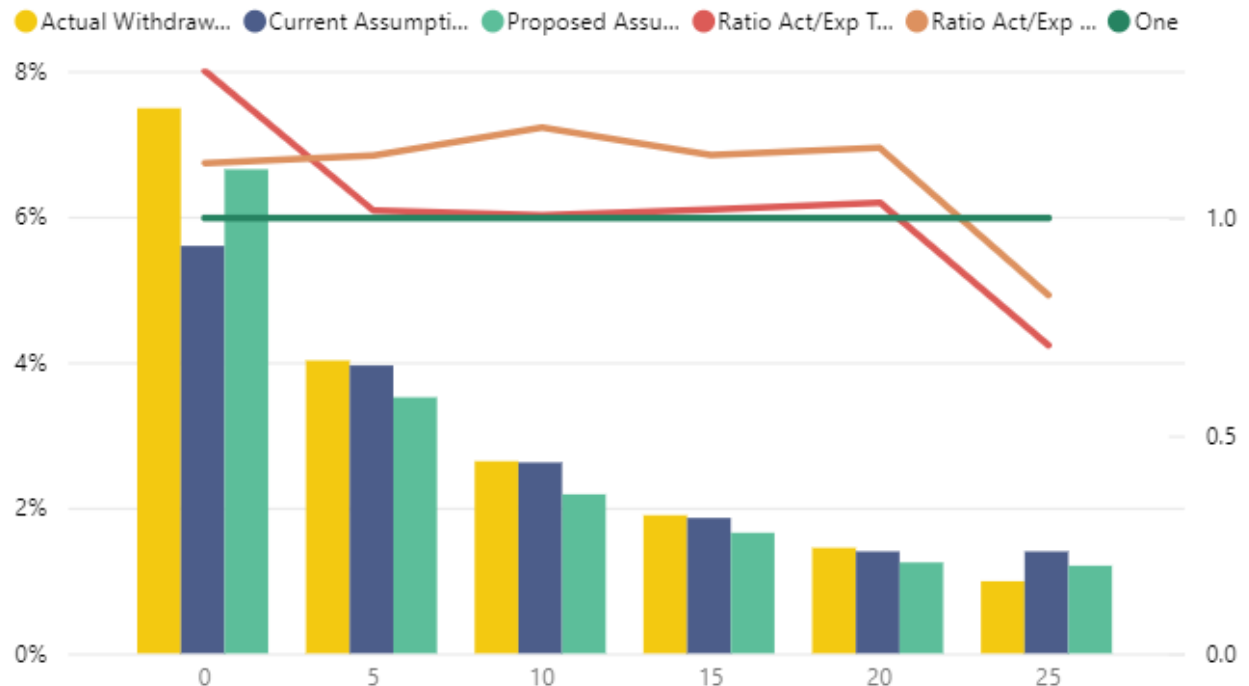
Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	954	635.9	10,029	9.51%	6.34%	1.50
1	1,205	894.3	15,060	8.00%	5.94%	1.35
2	927	745.1	13,360	6.94%	5.58%	1.24
3	735	574.6	11,048	6.65%	5.20%	1.28
4	785	593.0	12,013	6.53%	4.94%	1.32
5	394	356.8	7,754	5.08%	4.60%	1.10
6	357	332.6	7,835	4.56%	4.25%	1.07
7	219	249.8	6,450	3.40%	3.87%	0.88
8	242	229.8	6,473	3.74%	3.55%	1.05
9	168	187.7	5,792	2.90%	3.24%	0.90
10	180	169.9	5,717	3.15%	2.97%	1.06
11	151	141.3	5,158	2.93%	2.74%	1.07
12	130	133.9	5,170	2.51%	2.59%	0.97
13	103	105.7	4,326	2.38%	2.44%	0.97
14	84	92.9	4,180	2.01%	2.22%	0.90
15	59	70.4	3,353	1.76%	2.10%	0.84
16	61	54.5	2,867	2.13%	1.90%	1.12
17	43	40.9	2,271	1.89%	1.80%	1.05
18	29	31.5	1,853	1.57%	1.70%	0.92
19	30	20.4	1,360	2.21%	1.50%	1.47
20	17	14.6	1,045	1.63%	1.40%	1.16
21	18	12.0	856	2.10%	1.40%	1.50
22	5	11.3	805	0.62%	1.40%	0.44
23	7	8.9	638	1.10%	1.40%	0.78
24	10	8.2	588	1.70%	1.40%	1.21
25	7	6.3	450	1.56%	1.40%	1.11
26	3	5.4	388	0.77%	1.40%	0.55
27	2	4.5	324	0.62%	1.40%	0.44
28	2	3.6	260	0.77%	1.40%	0.55
29	2	2.7	193	1.04%	1.40%	0.74
Total	6,929	5,738.5	137,616	5.04%	4.17%	1.21

Service	Actual Withdrawals	Expected Withdrawals Proposed	Total Exposed	Actual Withdrawal Rate	Proposed Assumption Termination	Act/Exp Proposed Term
0	954	834.0	10,029	9.51%	8.32%	▲ 1.14
1	1,205	1,142.5	15,060	8.00%	7.59%	● 1.05
2	927	872.1	13,360	6.94%	6.53%	● 1.06
3	735	637.2	11,048	6.65%	5.77%	▲ 1.15
4	785	603.8	12,013	6.53%	5.03%	▲ 1.30
5	394	346.4	7,754	5.08%	4.47%	▲ 1.14
6	357	309.3	7,835	4.56%	3.95%	▲ 1.15
7	219	216.5	6,450	3.40%	3.36%	● 1.01
8	242	182.3	6,473	3.74%	2.82%	▲ 1.33
9	168	152.0	5,792	2.90%	2.62%	▲ 1.11
10	180	142.1	5,717	3.15%	2.49%	▲ 1.27
11	151	120.4	5,158	2.93%	2.33%	▲ 1.25
12	130	112.9	5,170	2.51%	2.18%	▲ 1.15
13	103	83.5	4,326	2.38%	1.93%	▲ 1.23
14	84	77.4	4,180	2.01%	1.85%	● 1.09
15	59	58.9	3,353	1.76%	1.76%	● 1.00
16	61	48.5	2,867	2.13%	1.69%	▲ 1.26
17	43	36.9	2,271	1.89%	1.62%	▲ 1.17
18	29	29.0	1,853	1.57%	1.57%	● 1.00
19	30	20.6	1,360	2.21%	1.51%	▲ 1.46
20	17	13.2	1,045	1.63%	1.26%	▲ 1.29
21	18	10.8	856	2.10%	1.26%	◆ 1.67
22	5	10.0	805	0.62%	1.25%	◆ 0.50
23	7	7.9	638	1.10%	1.24%	▲ 0.89
24	10	7.2	588	1.70%	1.23%	▲ 1.39
25	7	5.5	450	1.56%	1.22%	▲ 1.27
26	3	4.7	388	0.77%	1.21%	▲ 0.64
27	2	3.9	324	0.62%	1.20%	▲ 0.52
28	2	3.1	260	0.77%	1.19%	▲ 0.65
29	2	2.3	193	1.04%	1.18%	▲ 0.87
Total	6,929	6,094.9	137,616	5.04%	4.43%	▲ 1.14

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



Withdrawal Rate - Actual, Expected, and Ratio; by Service w/Proposed



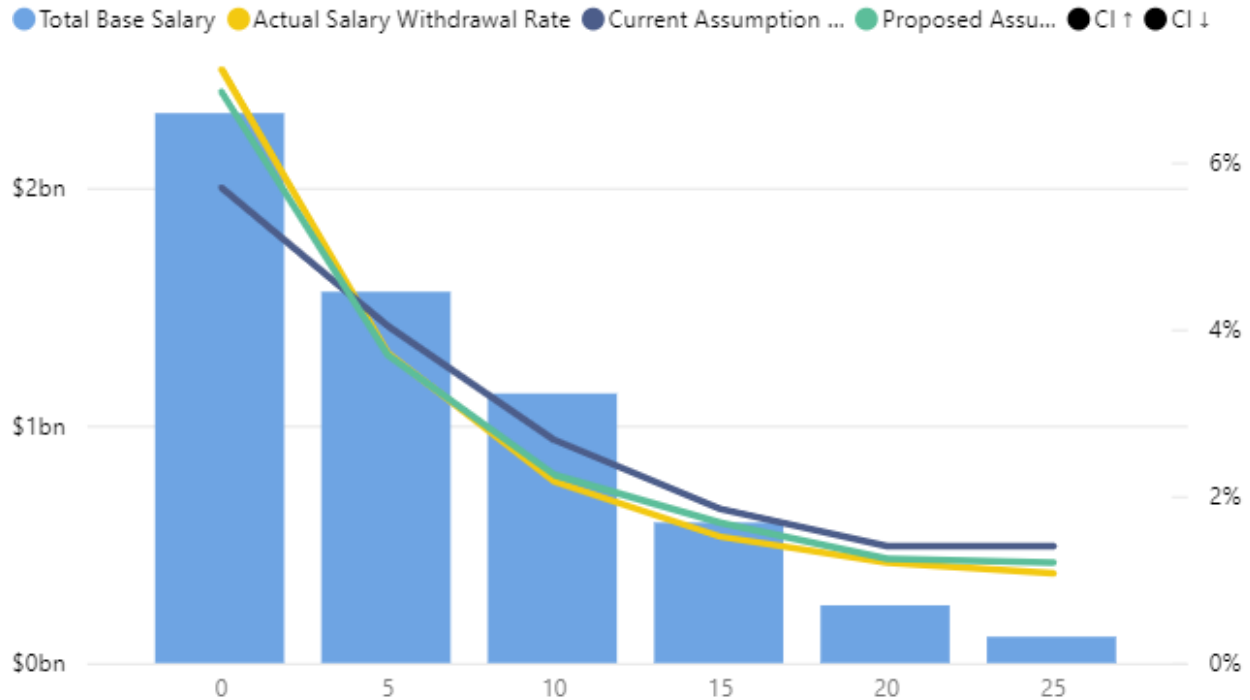
In our analysis, we noticed that members with higher salaries had lower rates of termination than members with lower salaries at the same service level. We therefore weighted the termination rates by each member's salary in developing the proposed assumptions.

The following charts show the experience weighted by salary by service (0 to 29 years) in the experience study period first compared to the current assumption and then to the proposed assumption. The actual rate of withdrawal weighted by salary averaged 4.37% whereas the overall expected rate of withdrawal averaged 4.05% based on the current assumptions and 4.30% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.08 to 1.02 for ages 20 to 59. For ages 20 to 39, the A/E ratio decreased from 1.60 to 1.07 and for ages 40 to 59, the A/E ratio increased from 0.79 to 0.96.

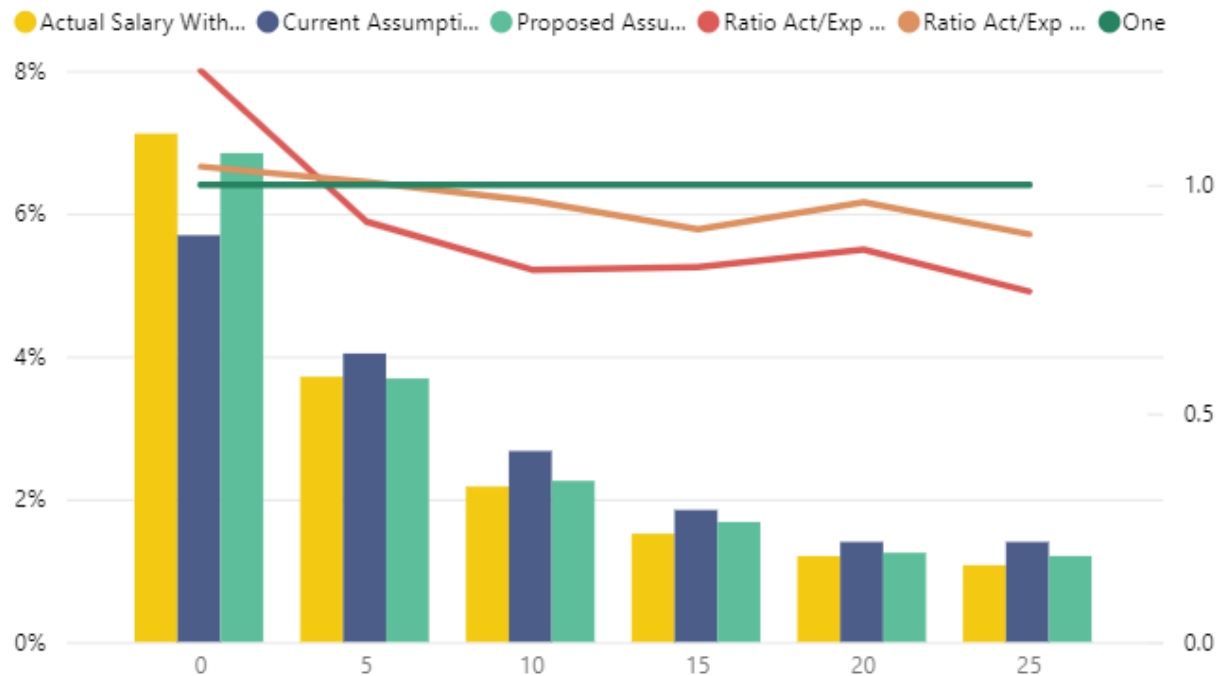
Service	Actual Salary Released	Expected Salary Released	Total Base Salary Exposed	Actual Salary Withdrawal Rate	Current Assumption Sal Wght Termination	Ratio Act/Exp Sal Wght Term
0	\$28,100K	\$20,584K	\$317,132K	8.86%	6.49%	▲ 1.37
1	\$43,099K	\$33,968K	\$558,498K	7.72%	6.08%	▲ 1.27
2	\$35,474K	\$29,988K	\$524,756K	6.76%	5.71%	▲ 1.18
3	\$28,564K	\$23,210K	\$437,499K	6.53%	5.31%	▲ 1.23
4	\$29,510K	\$24,060K	\$476,503K	6.19%	5.05%	▲ 1.23
5	\$16,743K	\$15,787K	\$336,628K	4.97%	4.69%	● 1.06
6	\$14,819K	\$15,334K	\$352,403K	4.21%	4.35%	● 0.97
7	\$8,814K	\$11,739K	\$294,796K	2.99%	3.98%	▲ 0.75
8	\$10,498K	\$10,812K	\$296,198K	3.54%	3.65%	● 0.97
9	\$7,162K	\$9,446K	\$282,726K	2.53%	3.34%	▲ 0.76
10	\$6,723K	\$8,149K	\$267,125K	2.52%	3.05%	▲ 0.82
11	\$6,345K	\$6,712K	\$239,102K	2.65%	2.81%	● 0.95
12	\$4,768K	\$6,270K	\$237,765K	2.01%	2.64%	▲ 0.76
13	\$3,875K	\$4,909K	\$198,845K	1.95%	2.47%	▲ 0.79
14	\$2,976K	\$4,285K	\$191,655K	1.55%	2.24%	▲ 0.69
15	\$2,455K	\$3,295K	\$156,899K	1.56%	2.10%	▲ 0.75
16	\$2,243K	\$2,677K	\$140,907K	1.59%	1.90%	▲ 0.84
17	\$2,012K	\$2,087K	\$115,950K	1.74%	1.80%	● 0.96
18	\$1,058K	\$1,695K	\$99,734K	1.06%	1.70%	▲ 0.62
19	\$1,194K	\$1,169K	\$77,919K	1.53%	1.50%	● 1.02
20	\$710K	\$857K	\$61,185K	1.16%	1.40%	▲ 0.83
21	\$917K	\$738K	\$52,719K	1.74%	1.40%	▲ 1.24
22	\$279K	\$690K	\$49,251K	0.57%	1.40%	◆ 0.40
23	\$389K	\$572K	\$40,828K	0.95%	1.40%	▲ 0.68
24	\$623K	\$544K	\$38,843K	1.60%	1.40%	▲ 1.15
25	\$539K	\$411K	\$29,367K	1.83%	1.40%	▲ 1.31
26	\$120K	\$364K	\$25,993K	0.46%	1.40%	◆ 0.33
27	\$194K	\$310K	\$22,151K	0.88%	1.40%	▲ 0.63
28	\$202K	\$264K	\$18,871K	1.07%	1.40%	▲ 0.76
29	\$134K	\$202K	\$14,448K	0.93%	1.40%	▲ 0.66
Total	\$260,538K	\$241,128K	\$5,956,697K	4.37%	4.05%	● 1.08

Service	Actual Salary Released	Expected Salary Released Proposed	Total Base Salary Exposed	Actual Salary Withdrawal Rate	Proposed Assumption Sal Wght Termination	Act/Exp Proposed Sal Wght Term
0	\$28,100K	\$27,324K	\$317,132K	8.86%	8.62%	● 1.03
1	\$43,099K	\$43,930K	\$558,498K	7.72%	7.87%	● 0.98
2	\$35,474K	\$35,593K	\$524,756K	6.76%	6.78%	● 1.00
3	\$28,564K	\$26,412K	\$437,499K	6.53%	6.04%	● 1.08
4	\$29,510K	\$25,152K	\$476,503K	6.19%	5.28%	▲ 1.17
5	\$16,743K	\$15,935K	\$336,628K	4.97%	4.73%	● 1.05
6	\$14,819K	\$14,760K	\$352,403K	4.21%	4.19%	● 1.00
7	\$8,814K	\$10,461K	\$294,796K	2.99%	3.55%	▲ 0.84
8	\$10,498K	\$8,775K	\$296,198K	3.54%	2.96%	▲ 1.20
9	\$7,162K	\$7,727K	\$282,726K	2.53%	2.73%	● 0.93
10	\$6,723K	\$6,906K	\$267,125K	2.52%	2.59%	● 0.97
11	\$6,345K	\$5,782K	\$239,102K	2.65%	2.42%	● 1.10
12	\$4,768K	\$5,341K	\$237,765K	2.01%	2.25%	▲ 0.89
13	\$3,875K	\$3,940K	\$198,845K	1.95%	1.98%	● 0.98
14	\$2,976K	\$3,621K	\$191,655K	1.55%	1.89%	▲ 0.82
15	\$2,455K	\$2,812K	\$156,899K	1.56%	1.79%	▲ 0.87
16	\$2,243K	\$2,426K	\$140,907K	1.59%	1.72%	● 0.92
17	\$2,012K	\$1,918K	\$115,950K	1.74%	1.65%	● 1.05
18	\$1,058K	\$1,585K	\$99,734K	1.06%	1.59%	▲ 0.67
19	\$1,194K	\$1,189K	\$77,919K	1.53%	1.53%	● 1.00
20	\$710K	\$775K	\$61,185K	1.16%	1.27%	● 0.92
21	\$917K	\$664K	\$52,719K	1.74%	1.26%	▲ 1.38
22	\$279K	\$614K	\$49,251K	0.57%	1.25%	◆ 0.45
23	\$389K	\$504K	\$40,828K	0.95%	1.23%	▲ 0.77
24	\$623K	\$475K	\$38,843K	1.60%	1.22%	▲ 1.31
25	\$539K	\$357K	\$29,367K	1.83%	1.22%	◆ 1.51
26	\$120K	\$315K	\$25,993K	0.46%	1.21%	◆ 0.38
27	\$194K	\$266K	\$22,151K	0.88%	1.20%	▲ 0.73
28	\$202K	\$224K	\$18,871K	1.07%	1.19%	● 0.90
29	\$134K	\$171K	\$14,448K	0.93%	1.19%	▲ 0.78
Total	\$260,538K	\$255,956K	\$5,956,697K	4.37%	4.30%	● 1.02

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service

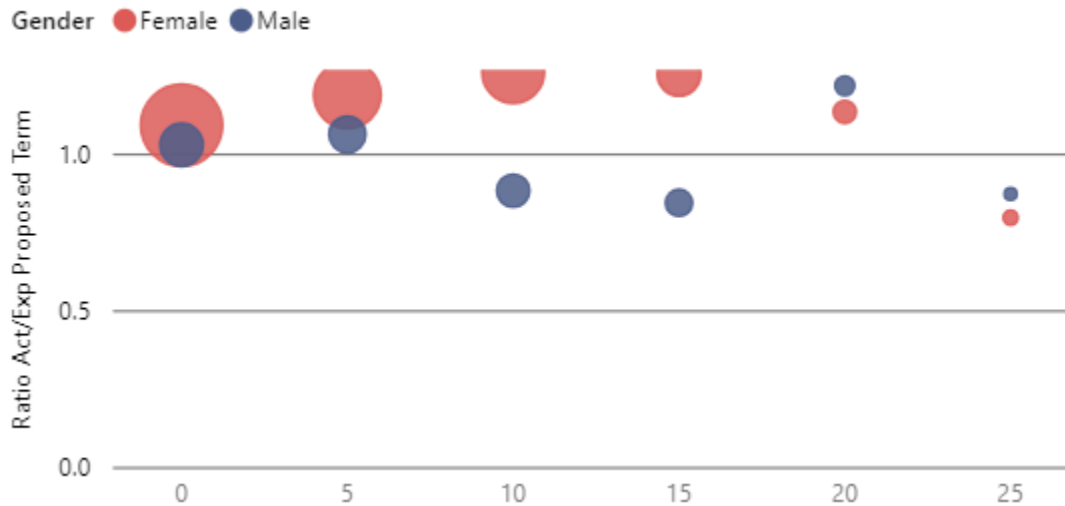


Withdrawal Rate - Actual, Expected, and Ratio; by Service



The following chart shows the actual experience by gender versus the proposed assumption. Although there is some indication that the experience varies by gender, it varied more so by age and service and thus, a unisex table is proposed.

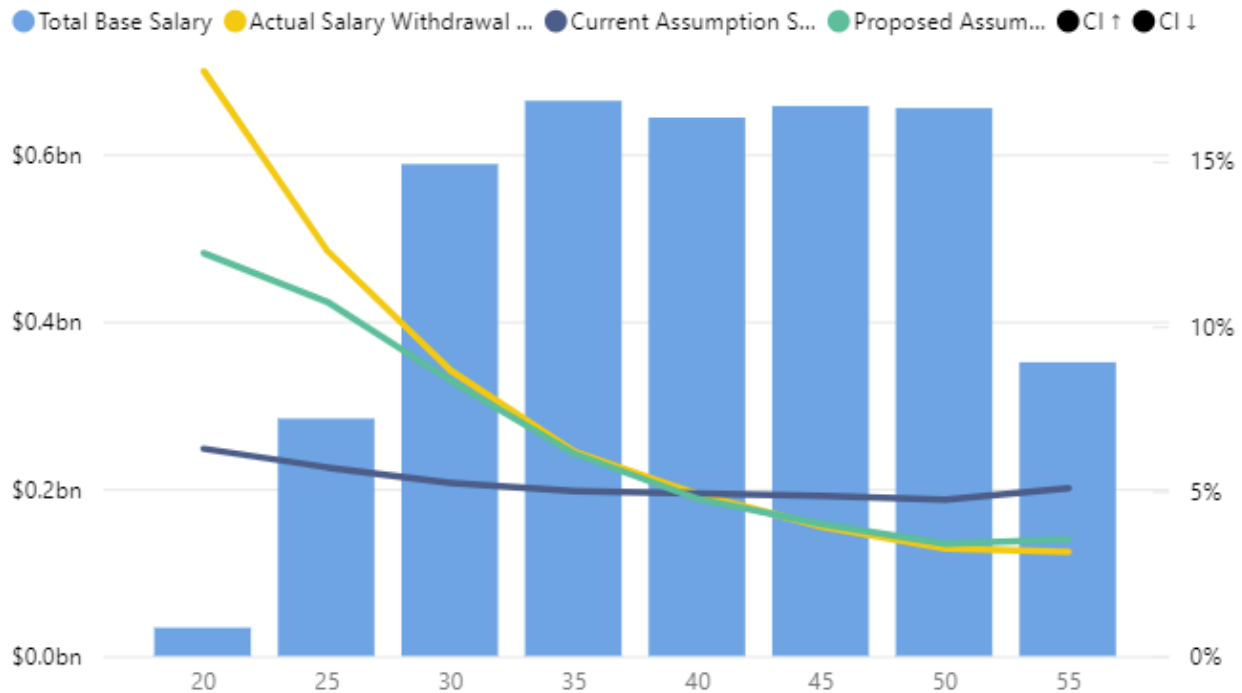
Actual vs. Expected - Withdrawal Proposed w/ Exposure Bubbles; by Service



The proposed assumption varies by age in addition to service as we observed lower rates of withdrawal for older members at the same service periods. The following charts show the results by age over 10-year service periods.

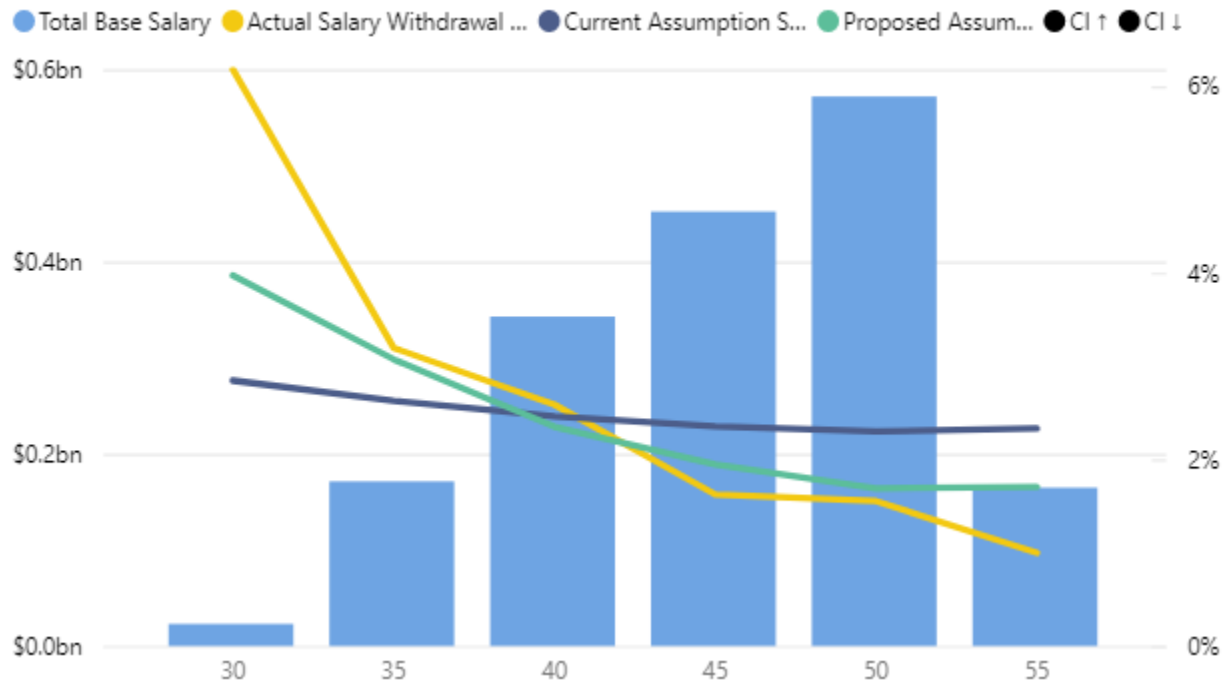
This chart shows the results weighted by salary by age for the service range 0 to 9 years, which increased the assumed rate of withdrawal from 5.03% to 5.57% as compared to the actual rate of 5.75%. This resulted in a decrease in the A/E ratio from 1.14 to 1.03 for ages 20 to 59. For ages 20 to 39, the A/E ratio decreased from 1.61 to 1.07 and for ages 40 to 59, the A/E ratio increased from 0.80 to 0.98.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



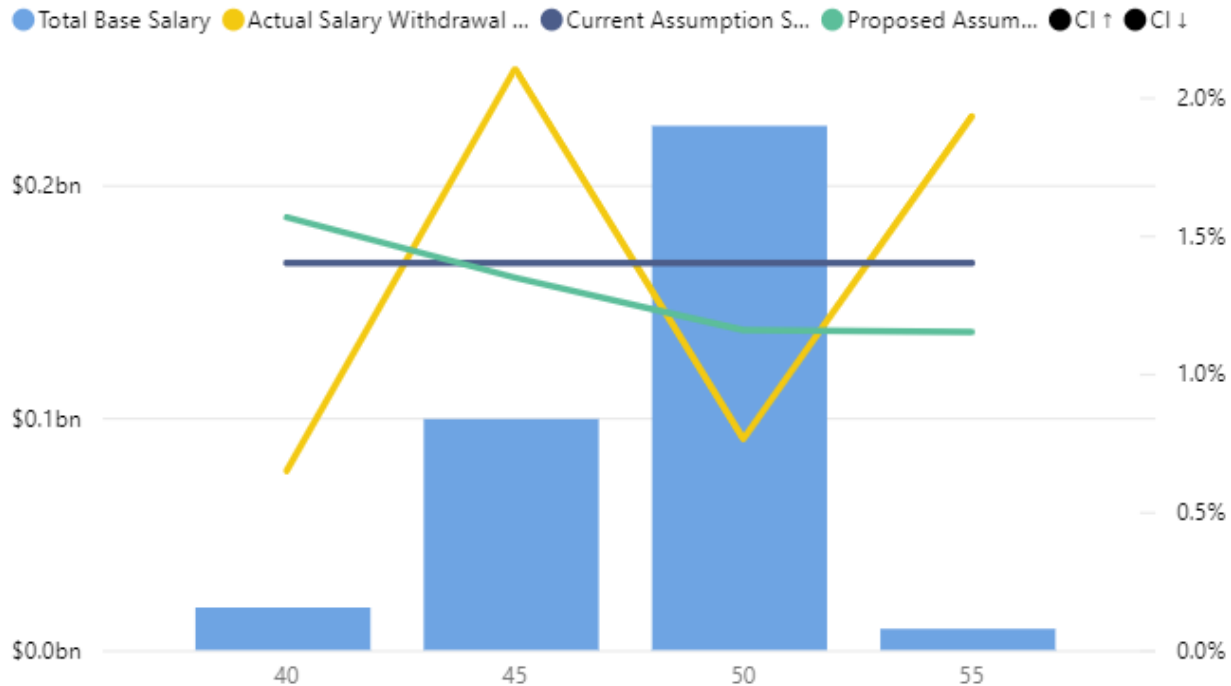
This chart shows the results weighted by salary by age for the service range 10 to 19 years, which decreased the assumed rate of withdrawal from 2.39% to 2.06% as compared to the actual rate of 1.95%. This resulted in an increase in the A/E ratio from 0.82 to 0.95 for ages 30 to 59. For ages 30 to 39, the A/E ratio decreased from 1.34 to 1.12 and for ages 40 to 59, the A/E ratio increased from 0.74 to 0.91.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



This chart shows the results weighted by salary by age for the service range 20 to 29 years, which decreased the assumed rate of withdrawal from 1.40% to 1.23% as compared to the actual rate of 1.17%. This resulted in an increase in the A/E ratio from 0.83 to 0.95 for ages 40 to 59.

Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Age



Summary

In total, the proposed rates of withdrawal have increased the anticipated number of terminations. Typically, higher rates of withdrawal will result in a decrease in plan liabilities. However, lower assumptions are proposed for longer service members and older members increasing plan liabilities for these members. The actual impact will depend on the demographics of the active membership.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF TERMINATION		
Years of Service	Males	Females
0	8.40%	5.60%
1	7.70%	5.30%
2	7.20%	5.00%
3	6.70%	4.70%
4	6.20%	4.50%
5	5.70%	4.20%
6	5.20%	3.90%
7	4.70%	3.60%
8	4.30%	3.30%
9	3.90%	3.00%
10	3.50%	2.80%
11	3.20%	2.60%
12	2.90%	2.50%
13	2.60%	2.40%
14	2.30%	2.20%
15	2.10%	2.10%
16	1.90%	1.90%
17	1.80%	1.80%
18	1.70%	1.70%
19	1.50%	1.50%
20	1.40%	1.40%
21	1.40%	1.40%
22	1.40%	1.40%
23	1.40%	1.40%
24	1.40%	1.40%
25	1.40%	1.40%

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF TERMINATION						
Sample Service Periods ¹						
Age	0	5	10	15	20	25
25 ²	13.50%	9.00%	5.50%	3.55%	2.65%	2.65%
26	13.15%	8.75%	5.35%	3.40%	2.50%	2.50%
27	12.75%	8.50%	5.25%	3.25%	2.40%	2.40%
28	12.35%	8.25%	5.10%	3.05%	2.25%	2.25%
29	12.00%	8.05%	4.95%	2.90%	2.15%	2.15%
30	11.60%	7.80%	4.80%	2.80%	2.05%	2.05%
31	11.25%	7.60%	4.70%	2.70%	2.00%	2.00%
32	10.85%	7.30%	4.55%	2.65%	1.95%	1.95%
33	10.50%	7.10%	4.40%	2.60%	1.90%	1.90%
34	10.10%	6.85%	4.25%	2.55%	1.90%	1.90%
35	9.75%	6.45%	4.15%	2.45%	1.80%	1.80%
36	9.35%	6.30%	4.00%	2.40%	1.75%	1.75%
37	8.60%	5.80%	3.60%	2.30%	1.70%	1.70%
38	7.85%	5.35%	3.30%	2.20%	1.65%	1.65%
39	7.70%	5.00%	3.10%	2.20%	1.60%	1.60%
40	7.50%	4.75%	2.95%	2.20%	1.60%	1.60%
41	7.30%	4.50%	2.85%	2.15%	1.60%	1.60%
42	7.10%	4.25%	2.75%	2.15%	1.60%	1.60%
43	6.95%	4.05%	2.65%	2.10%	1.55%	1.55%
44	6.75%	3.80%	2.50%	2.05%	1.55%	1.55%
45	6.55%	3.70%	2.40%	2.05%	1.50%	1.50%
46	6.35%	3.55%	2.35%	1.95%	1.45%	1.45%
47	6.20%	3.45%	2.25%	1.85%	1.40%	1.40%
48	6.00%	3.30%	2.15%	1.80%	1.30%	1.30%
49	5.80%	3.20%	2.05%	1.70%	1.25%	1.25%
50	5.60%	3.10%	2.00%	1.60%	1.20%	1.20%
51	5.45%	3.10%	2.00%	1.55%	1.15%	1.15%
52	5.25%	3.10%	2.00%	1.55%	1.15%	1.15%
53	5.05%	3.10%	2.00%	1.55%	1.15%	1.15%
54 ³	4.85%	3.10%	2.00%	1.55%	1.15%	1.15%

¹ See full age / service table for rates at all service periods

² Applies to ages 25 and younger

³ Applies to ages 54 and older

Retirement

The current retirement assumption varies by age and eligibility for unreduced retirement with higher rates occurring at first eligibility. Furthermore, higher rates of retirement are assumed for members who had the option to elect an improved program. The proposed assumption varies by service in addition to these elements. Primarily lower rates of retirement are assumed prior to 20 or 25 years of service with even lower rates prior to 10 years of service.

Lower rates of retirement are proposed for members with less than 10 years of service since these members are not eligible for retiree health benefits. Higher rates of retirement are proposed for members with at least 20 years of service or 25 years of service for the improved plan members to reflect the higher benefit accrual rate.

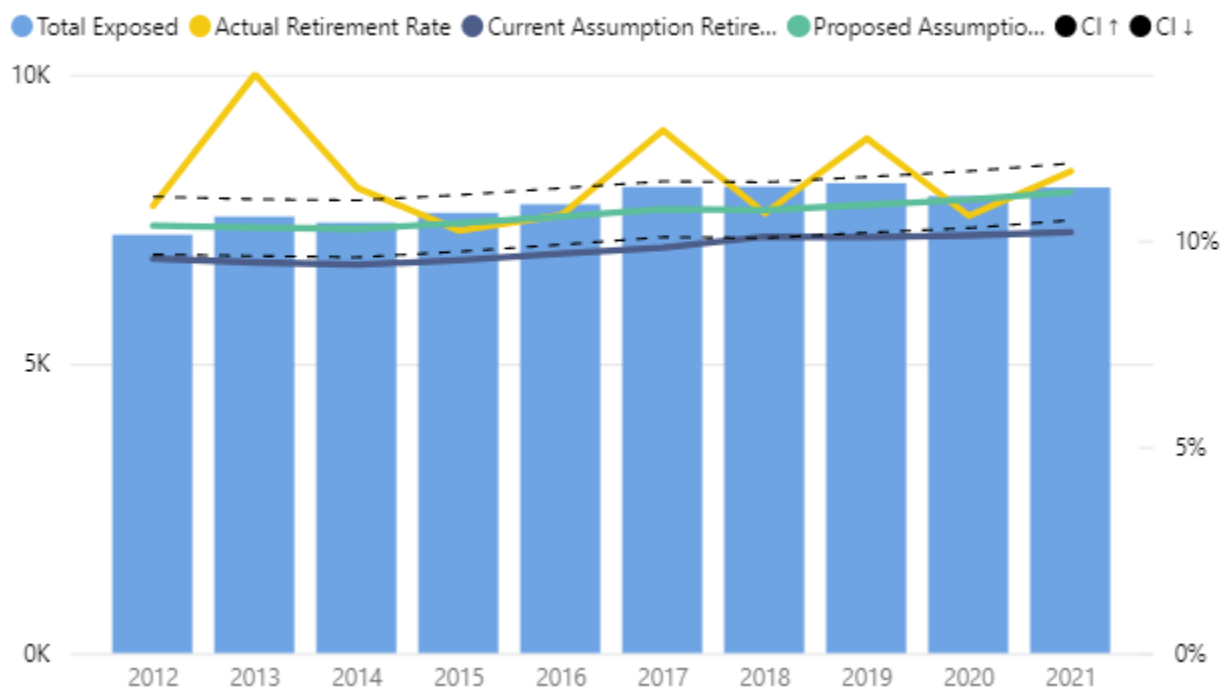
Since Tier 6 became effective on April 1, 2012, and required 10 years of service for vesting, there is little to no retirement experience associated with these plans. Chapter 56 Laws of 2022 changed the vesting requirements for the Tier 6 plans and the Ch 504/09 – 55/27 [Mandatory] plan to five years of service. Since the vesting requirement was 10 years during the study period, we used the 10-year requirement in this report.

The following table shows the experience for retirement by year, for the age range (55 to 79), and for the service range (5 to 39) for all plans and all types of retirement. The actual rate of retirement averaged 11.51% whereas the overall expected rate of retirement averaged 9.81% based on the current assumptions and 10.66% based on the proposed assumptions.

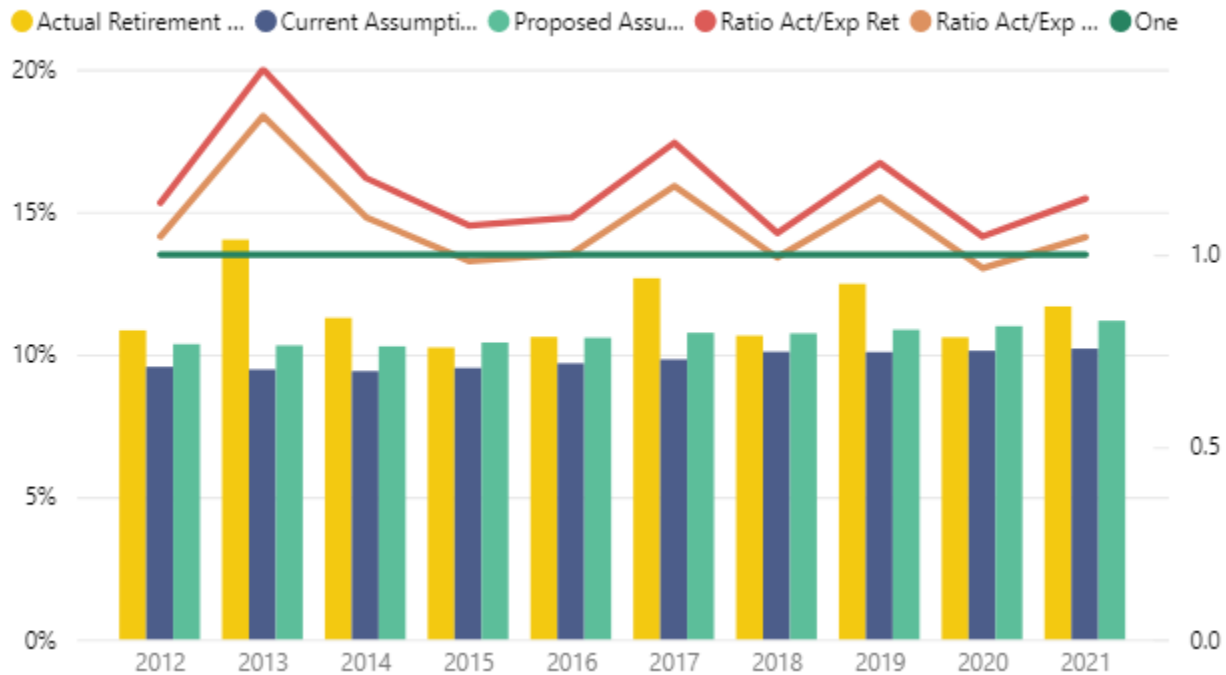
Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	784	691.3	7,230	10.84%	9.56%	▲ 1.13
2013	1,058	714.3	7,543	14.03%	9.47%	▲ 1.48
2014	839	699.9	7,437	11.28%	9.41%	▲ 1.20
2015	779	724.4	7,607	10.24%	9.52%	● 1.08
2016	823	751.0	7,755	10.61%	9.68%	● 1.10
2017	1,021	791.3	8,056	12.67%	9.82%	▲ 1.29
2018	859	813.3	8,060	10.66%	10.09%	● 1.06
2019	1,013	818.5	8,120	12.48%	10.08%	▲ 1.24
2020	837	799.5	7,897	10.60%	10.12%	● 1.05
2021	940	820.7	8,046	11.68%	10.20%	▲ 1.15
Total	8,953	7,624.2	77,751	11.51%	9.81%	▲ 1.17

Plan Year	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Ratio Act/Exp Proposed Ret
2012	784	749.0	7,230	10.84%	10.36%	1.05
2013	1,058	777.9	7,543	14.03%	10.31%	1.36
2014	839	764.7	7,437	11.28%	10.28%	1.10
2015	779	792.4	7,607	10.24%	10.42%	0.98
2016	823	820.8	7,755	10.61%	10.58%	1.00
2017	1,021	866.6	8,056	12.67%	10.76%	1.18
2018	859	865.3	8,060	10.66%	10.74%	0.99
2019	1,013	882.2	8,120	12.48%	10.86%	1.15
2020	837	868.0	7,897	10.60%	10.99%	0.96
2021	940	899.5	8,046	11.68%	11.18%	1.05
Total	8,953	8,286.3	77,751	11.51%	10.66%	1.08

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Year



Retirement Rate - Actual, Expected, and Ratio; by Year



Analysis

We will review the experience for the following plan codes because data was limited for other plan codes. Proposed assumptions were extrapolated to these other codes based on the experience of these plans, adjusted for retirement eligibility requirements.

1. Tier IV (plan code F) – normal retirement age is 62 with reduced retirement benefits at age 55 using mandated plan retirement rates.
2. Chapter 96 Age 57 Plan (Plan Codes I and M) – normal retirement age is 57 using mandated plan retirement rates.
3. Chapter 19 55/25 Plan (Plan Code K) – normal retirement is age 55 with 25 years of service using elected improved plan retirement rates.
 - a. Due to limited exposures, we included other plans in the analysis:
 - i. Plan H: Ch96 – Tier IV
 - ii. Plan L: Special Officers (no age requirement)
 - iii. Plan N: Ch96 – Tier IV Mandated Physically Taxing (age 50 minimum requirement)
 - iv. Plan W: Ch96 – Tier IV Physically Taxing (age 50 minimum requirement)

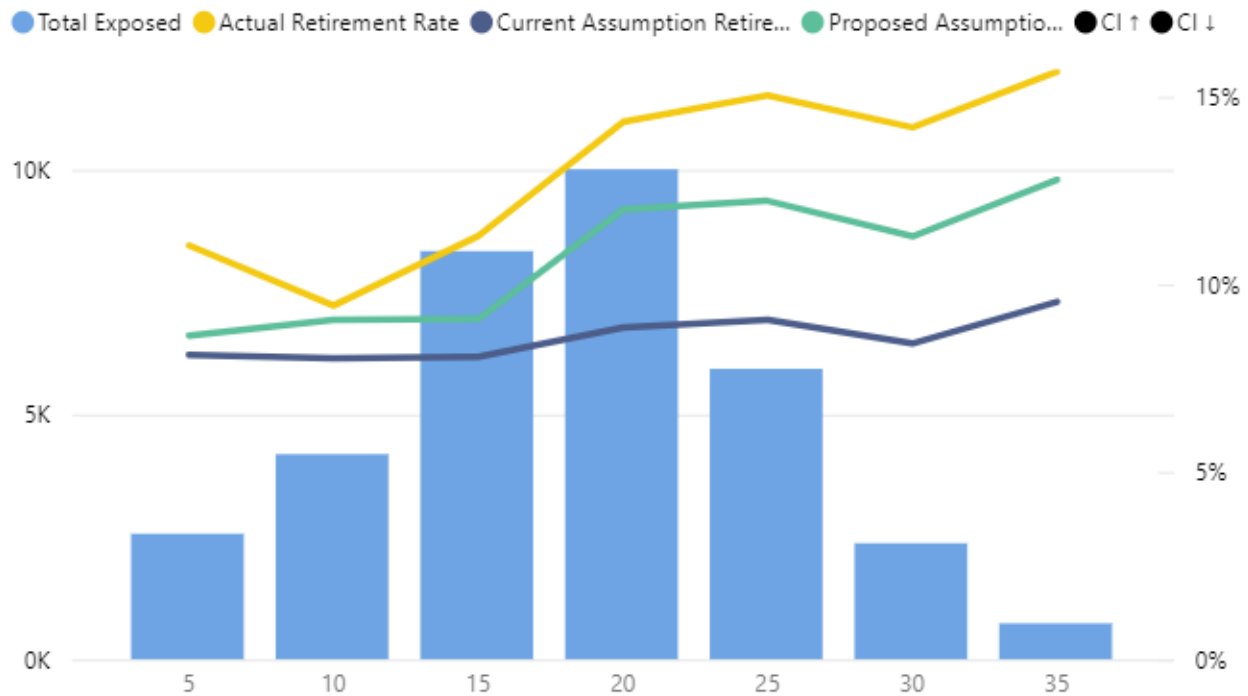
Basic Tier IV Plan (Plan F)

The following table shows the experience of Basic Tier IV Plan by service based on the age range (55 to 79) and service range (5 to 39) for the period 2012 – 2021 for all types of retirement. The actual rate of retirement averaged 12.88% whereas the overall expected rate of retirement averaged 8.52% based on the current assumptions and 10.67% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.51 to 1.21.

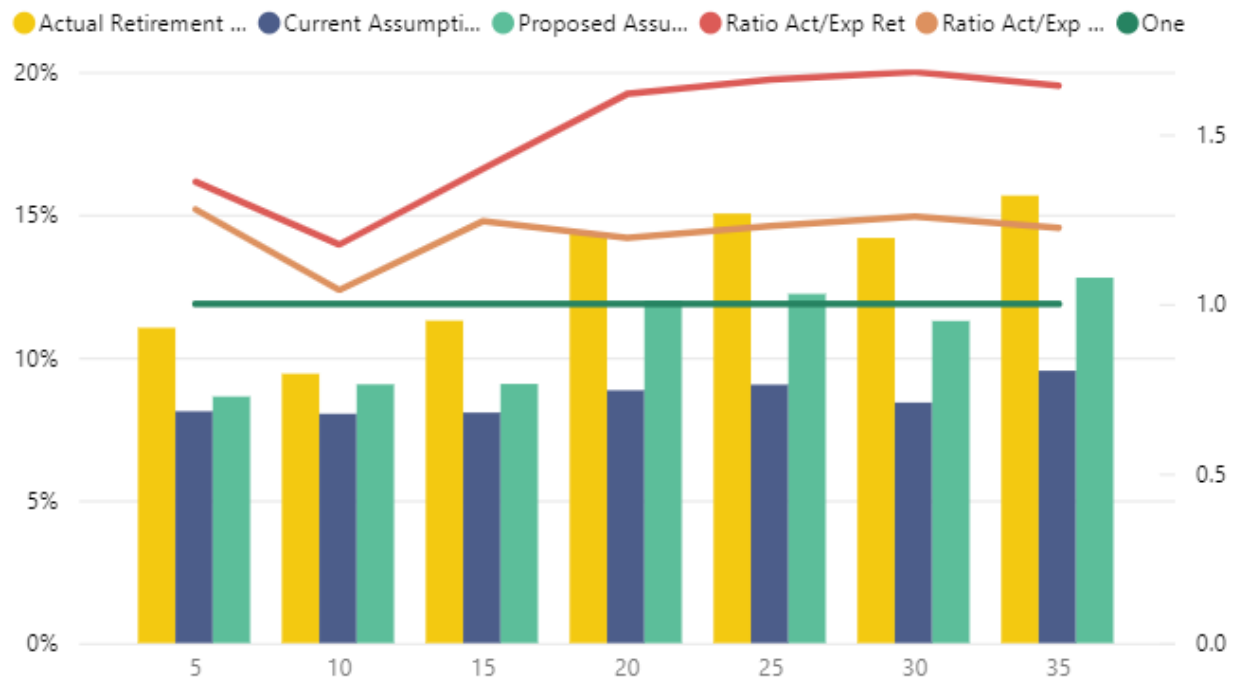
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	98	48.8	505	19.41%	9.66%	2.01
6	46	38.2	508	9.06%	7.52%	1.20
7	33	36.8	492	6.71%	7.48%	0.90
8	62	43.4	548	11.31%	7.92%	1.43
9	44	41.0	513	8.58%	7.99%	1.07
10	68	49.6	630	10.79%	7.87%	1.37
11	79	57.9	752	10.51%	7.70%	1.36
12	72	66.6	847	8.50%	7.86%	1.08
13	84	74.4	913	9.20%	8.15%	1.13
14	92	87.7	1,046	8.80%	8.39%	1.05
15	127	92.3	1,163	10.92%	7.93%	1.38
16	173	117.7	1,506	11.49%	7.81%	1.47
17	184	129.1	1,653	11.13%	7.81%	1.43
18	224	164.8	2,031	11.03%	8.12%	1.36
19	233	168.7	1,984	11.74%	8.50%	1.38
20	294	181.7	2,103	13.98%	8.64%	1.62
21	292	174.1	1,958	14.91%	8.89%	1.68
22	294	192.8	2,169	13.55%	8.89%	1.52
23	295	174.8	1,944	15.17%	8.99%	1.69
24	258	161.9	1,832	14.08%	8.84%	1.59
25	226	141.3	1,537	14.70%	9.19%	1.60
26	222	135.7	1,463	15.17%	9.27%	1.64
27	187	109.5	1,223	15.29%	8.96%	1.71
28	137	84.1	948	14.45%	8.87%	1.63
29	121	66.3	764	15.84%	8.67%	1.83
30	78	54.6	642	12.15%	8.51%	1.43
31	79	44.6	543	14.55%	8.22%	1.77
32	65	39.3	489	13.29%	8.03%	1.65
33	54	32.9	374	14.44%	8.79%	1.64
34	60	28.0	320	18.75%	8.76%	2.14
35	38	21.7	245	15.51%	8.86%	1.75
36	23	19.0	202	11.39%	9.41%	1.21
37	26	12.6	137	18.98%	9.21%	2.06
38	20	9.5	89	22.47%	10.70%	2.10
39	8	7.2	62	12.90%	11.53%	1.12
Total	4,396	2,908.5	34,135	12.88%	8.52%	1.51

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
5	98	61.3	505	19.41%	12.13%	1.60
6	46	38.7	508	9.06%	7.62%	1.19
7	33	37.4	492	6.71%	7.60%	0.88
8	62	43.0	548	11.31%	7.84%	1.44
9	44	41.0	513	8.58%	7.99%	1.07
10	68	57.5	630	10.79%	9.12%	1.18
11	79	66.1	752	10.51%	8.79%	1.20
12	72	75.3	847	8.50%	8.88%	0.96
13	84	83.3	913	9.20%	9.13%	1.01
14	92	97.2	1,046	8.80%	9.29%	0.95
15	127	103.6	1,163	10.92%	8.91%	1.23
16	173	133.4	1,506	11.49%	8.86%	1.30
17	184	146.2	1,653	11.13%	8.84%	1.26
18	224	185.6	2,031	11.03%	9.14%	1.21
19	233	187.6	1,984	11.74%	9.45%	1.24
20	294	249.4	2,103	13.98%	11.86%	1.18
21	292	236.3	1,958	14.91%	12.07%	1.24
22	294	258.7	2,169	13.55%	11.93%	1.14
23	295	236.0	1,944	15.17%	12.14%	1.25
24	258	219.8	1,832	14.08%	12.00%	1.17
25	226	191.0	1,537	14.70%	12.43%	1.18
26	222	182.7	1,463	15.17%	12.49%	1.22
27	187	148.3	1,223	15.29%	12.13%	1.26
28	137	113.4	948	14.45%	11.97%	1.21
29	121	90.1	764	15.84%	11.79%	1.34
30	78	73.8	642	12.15%	11.50%	1.06
31	79	58.6	543	14.55%	10.80%	1.35
32	65	52.6	489	13.29%	10.76%	1.23
33	54	44.3	374	14.44%	11.83%	1.22
34	60	37.8	320	18.75%	11.80%	1.59
35	38	29.1	245	15.51%	11.87%	1.31
36	23	25.2	202	11.39%	12.48%	0.91
37	26	17.0	137	18.98%	12.43%	1.53
38	20	12.9	89	22.47%	14.47%	1.55
39	8	9.8	62	12.90%	15.76%	0.82
Total	4,396	3,643.8	34,135	12.88%	10.67%	1.21

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



Retirement Rate - Actual, Expected, and Ratio; by Service



The following table shows the experience of Basic Tier IV Plan by age based on the age range (55 to 79) and service range (5 to 39) for the period 2012 – 2021 for all types of retirement.

Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

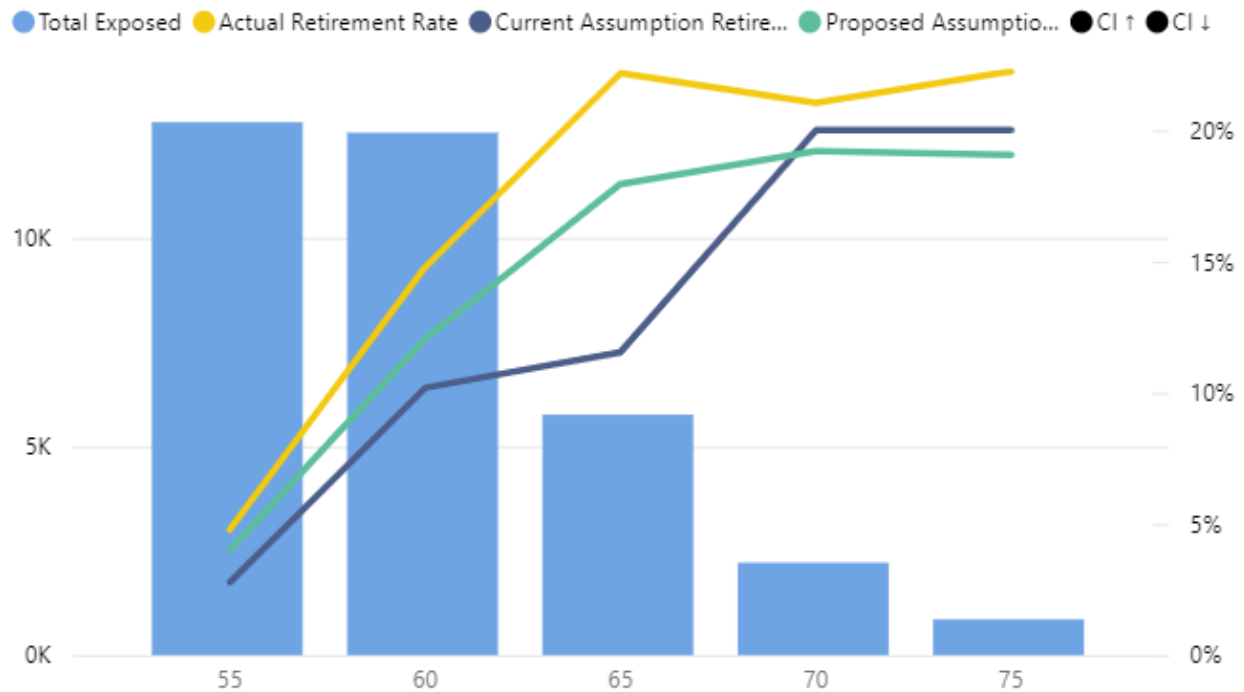
209

This work product was prepared solely for New York City Comptroller's Office for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

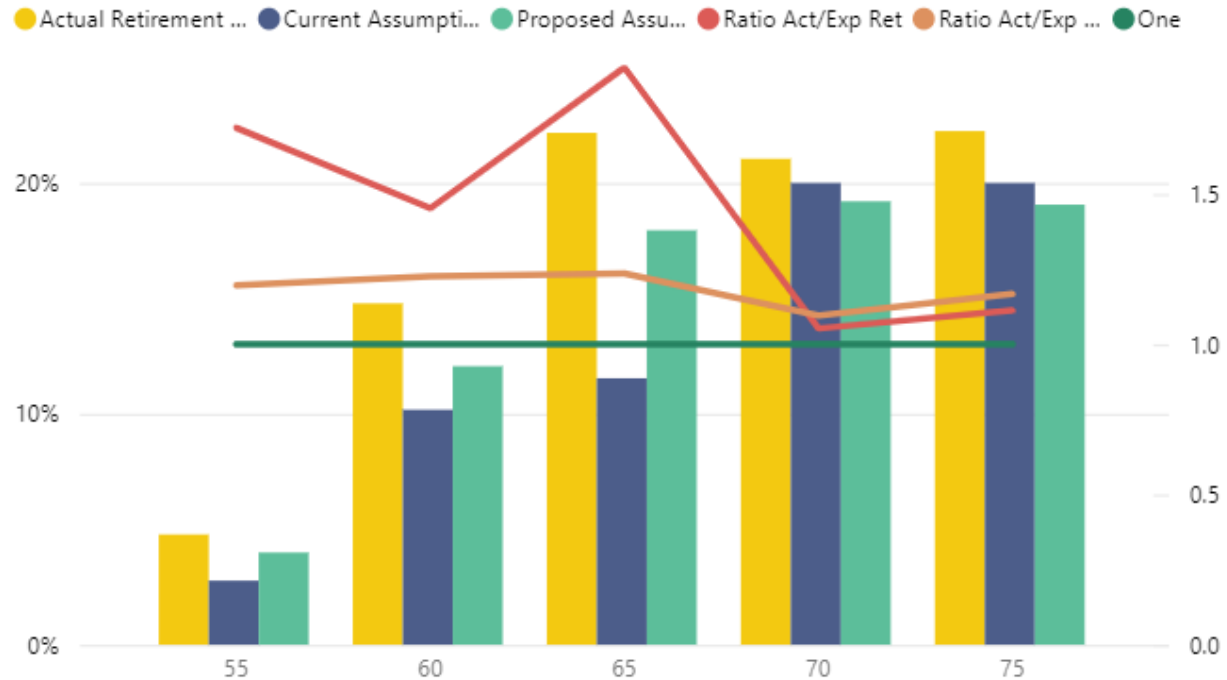
Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	137	58.0	2,322	5.90%	2.50%	2.36
56	101	59.6	2,384	4.24%	2.50%	1.69
57	108	63.7	2,550	4.24%	2.50%	1.69
58	117	67.6	2,706	4.32%	2.50%	1.73
59	147	105.6	2,815	5.22%	3.75%	1.39
60	144	143.4	2,868	5.02%	5.00%	1.00
61	359	181.4	2,902	12.37%	6.25%	1.98
62	647	543.2	2,716	23.82%	20.00%	1.19
63	376	215.4	2,140	17.57%	10.07%	1.75
64	326	191.6	1,900	17.16%	10.09%	1.70
65	367	255.4	1,695	21.65%	15.07%	1.44
66	351	140.1	1,391	25.23%	10.07%	2.51
67	241	108.5	1,076	22.40%	10.08%	2.22
68	183	88.0	872	20.99%	10.09%	2.08
69	136	73.5	730	18.63%	10.06%	1.85
70	135	129.0	645	20.93%	20.00%	1.05
71	120	104.2	521	23.03%	20.00%	1.15
72	87	84.0	420	20.71%	20.00%	1.04
73	73	71.0	355	20.56%	20.00%	1.03
74	51	54.6	273	18.68%	20.00%	0.93
75	48	47.2	236	20.34%	20.00%	1.02
76	55	41.6	208	26.44%	20.00%	1.32
77	36	33.6	168	21.43%	20.00%	1.07
78	30	26.6	133	22.56%	20.00%	1.13
79	21	21.8	109	19.27%	20.00%	0.96
Total	4,396	2,908.5	34,135	12.88%	8.52%	1.51

Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
55	137	116.1	2,322	5.90%	5.00%	▲ 1.18
56	101	83.4	2,384	4.24%	3.50%	▲ 1.21
57	108	89.2	2,550	4.24%	3.50%	▲ 1.21
58	117	94.7	2,706	4.32%	3.50%	▲ 1.24
59	147	126.7	2,815	5.22%	4.50%	▲ 1.16
60	144	143.4	2,868	5.02%	5.00%	● 1.00
61	359	232.2	2,902	12.37%	8.00%	◆ 1.55
62	647	617.5	2,716	23.82%	22.74%	● 1.05
63	376	274.6	2,140	17.57%	12.83%	▲ 1.37
64	326	243.3	1,900	17.16%	12.80%	▲ 1.34
65	367	303.1	1,695	21.65%	17.86%	▲ 1.21
66	351	248.8	1,391	25.23%	17.86%	▲ 1.41
67	241	193.5	1,076	22.40%	17.99%	▲ 1.25
68	183	157.2	872	20.99%	18.03%	▲ 1.16
69	136	132.0	730	18.63%	18.08%	● 1.03
70	135	123.2	645	20.93%	19.10%	● 1.10
71	120	100.1	521	23.03%	19.22%	▲ 1.20
72	87	81.1	420	20.71%	19.32%	● 1.07
73	73	68.6	355	20.56%	19.32%	● 1.06
74	51	52.1	273	18.68%	19.06%	● 0.98
75	48	45.0	236	20.34%	19.06%	● 1.07
76	55	39.9	208	26.44%	19.16%	▲ 1.38
77	36	31.8	168	21.43%	18.90%	▲ 1.13
78	30	25.3	133	22.56%	19.00%	▲ 1.19
79	21	20.9	109	19.27%	19.15%	● 1.01
Total	4,396	3,643.8	34,135	12.88%	10.67%	▲ 1.21

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age

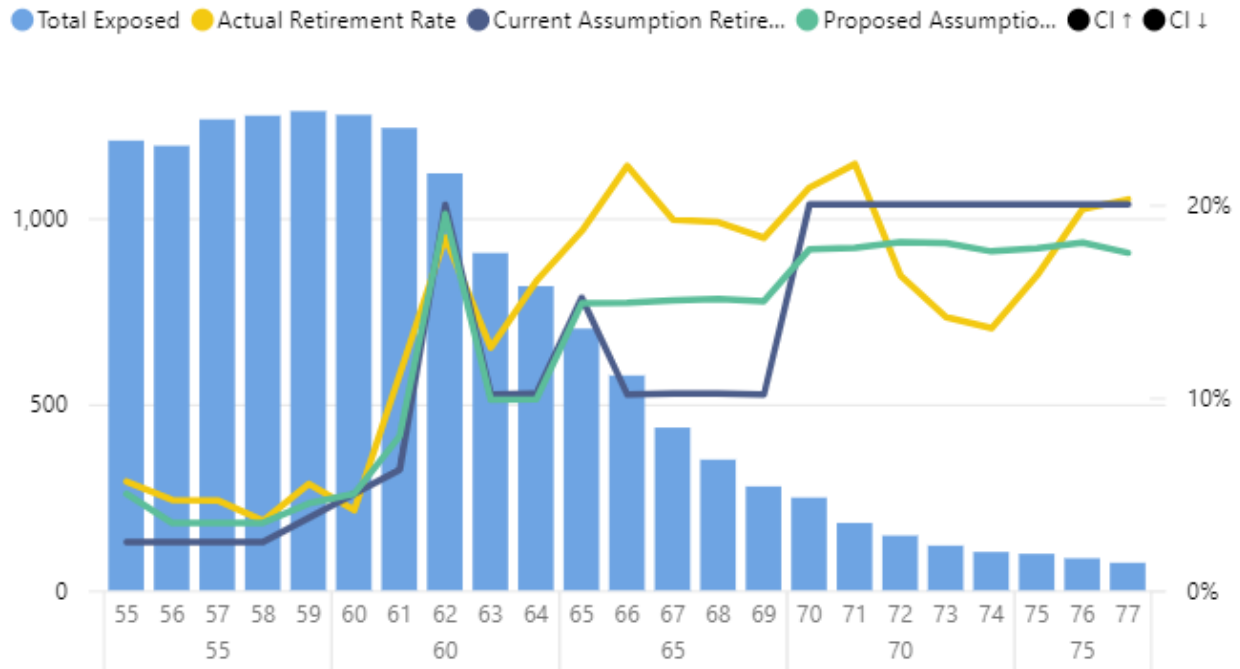


Retirement Rate - Actual, Expected, and Ratio; by Age



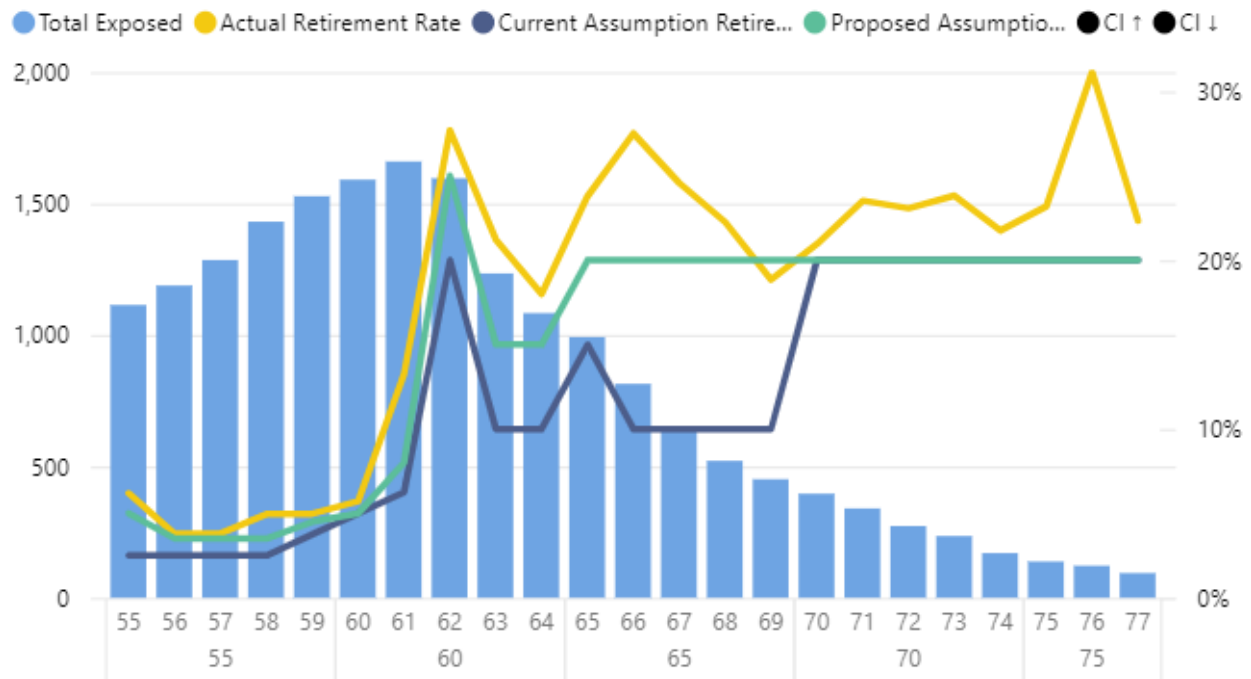
This chart shows the results by age for the service range 5 to 19 years, which increased the assumed rate of retirement from 8.06% to 8.99% as compared to the actual rate of 10.73%. This resulted in a decrease in the A/E ratio from 1.33 to 1.19 for ages 55 to 79. For early retirement ages 55 to 61, the A/E ratio decreased from 1.57 to 1.19 and for normal retirement ages 62 to 79, the A/E ratio decreased from 1.25 to 1.19.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



This chart shows the results by age for the service range 20 to 39 years, which increased the assumed rate of retirement from 8.88% to 12.01% as compared to the actual rate of 14.58%. This resulted in a decrease in the A/E ratio from 1.64 to 1.21 for ages 55 to 79. For early retirement ages 55 to 61, the A/E ratio decreased from 1.70 to 1.31 and for normal retirement ages 62 to 79, the A/E ratio decreased from 1.63 to 1.19.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



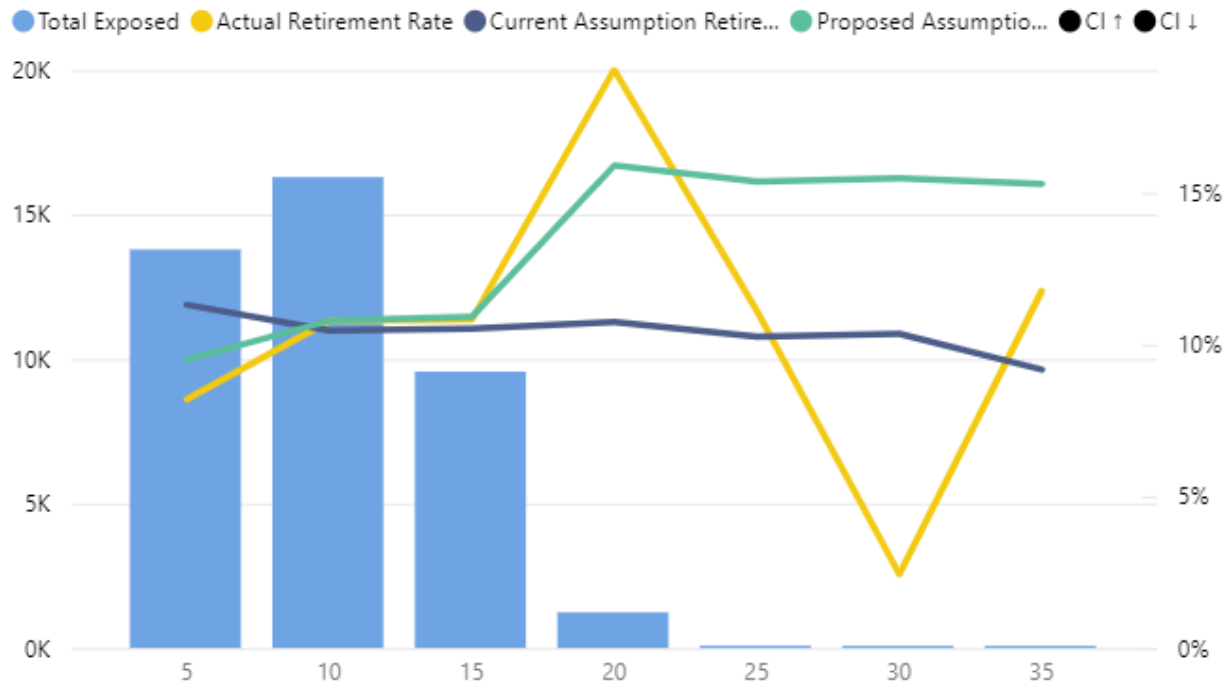
Age 57 Plan (Plans I and M)

The following table shows the experience of Age 57 Plans (plan selections Ch96 – 57/10 Mandated and Ch96 – Tier IV Mandated), by service based on the age range (57 to 79) and service range (5 to 39) for the period 2012 – 2021. The actual rate of retirement averaged 10.16% whereas the overall expected rate of retirement averaged 10.77% based on the current assumptions and 10.56% based on the proposed assumptions. This resulted in an increase in the A/E ratio from 0.94 to 0.96.

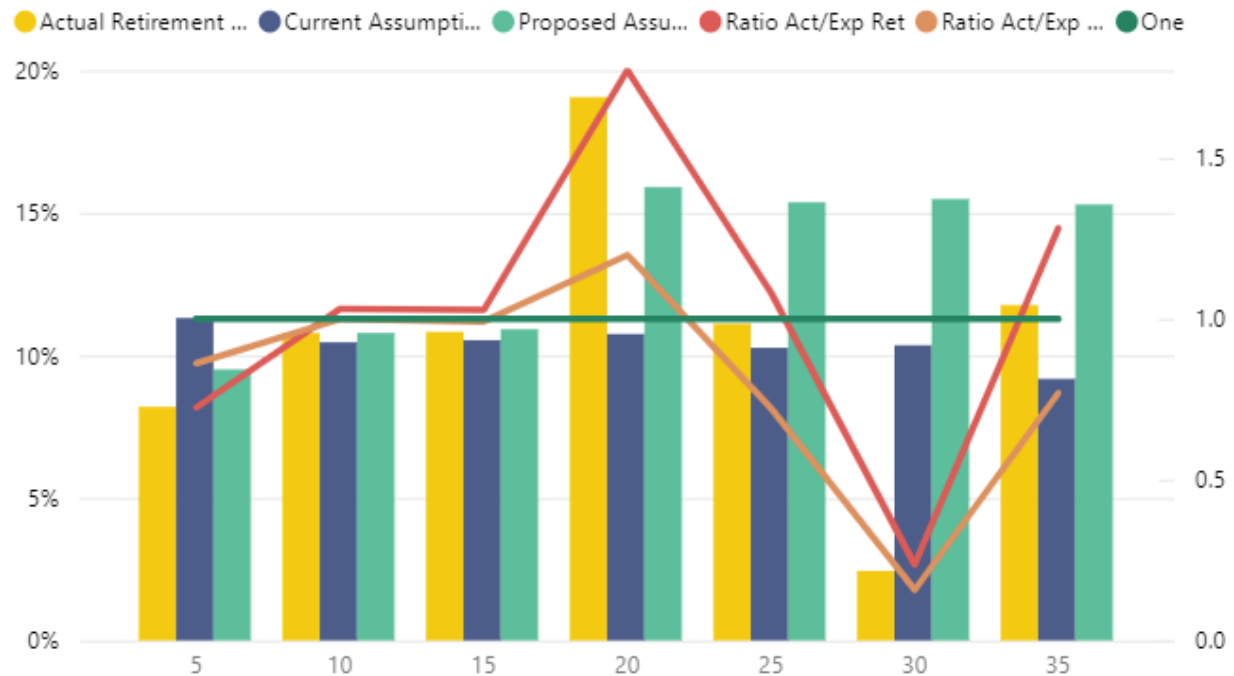
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	299	383.4	2,390	12.51%	16.04%	▲ 0.78
6	186	271.9	2,650	7.02%	10.26%	▲ 0.68
7	208	288.3	2,791	7.45%	10.33%	▲ 0.72
8	201	308.5	2,996	6.71%	10.30%	▲ 0.65
9	236	308.3	2,963	7.96%	10.40%	▲ 0.77
10	393	335.7	3,223	12.19%	10.42%	▲ 1.17
11	374	329.5	3,159	11.84%	10.43%	▲ 1.13
12	325	359.8	3,416	9.51%	10.53%	● 0.90
13	334	327.4	3,165	10.55%	10.34%	● 1.02
14	331	351.3	3,325	9.95%	10.56%	● 0.94
15	314	305.0	2,913	10.78%	10.47%	● 1.03
16	278	254.0	2,407	11.55%	10.55%	● 1.09
17	212	199.6	1,898	11.17%	10.52%	● 1.06
18	141	145.3	1,374	10.26%	10.57%	● 0.97
19	90	103.3	972	9.26%	10.63%	▲ 0.87
20	131	65.8	612	21.41%	10.74%	◆ 1.99
21	51	34.7	325	15.69%	10.67%	▲ 1.47
22	30	17.7	165	18.18%	10.72%	◆ 1.70
23	13	10.2	93	13.98%	10.98%	▲ 1.27
24	10	4.2	38	26.32%	11.07%	◆ 2.38
25	4	2.2	20	20.00%	10.88%	◆ 1.84
26	1	2.2	19	5.26%	11.63%	◆ 0.45
27	2	1.4	15	13.33%	9.37%	▲ 1.42
28	0	1.6	15	0.00%	10.37%	◆ 0.00
29	2	1.0	12	16.67%	8.08%	◆ 2.06
30	0	1.0	10	0.00%	10.10%	◆ 0.00
31	0	1.2	11	0.00%	10.73%	◆ 0.00
32	0	0.7	8	0.00%	9.31%	◆ 0.00
33	0	0.7	7	0.00%	10.43%	◆ 0.00
34	1	0.6	5	20.00%	11.60%	◆ 1.72
35	0	0.4	5	0.00%	8.60%	◆ 0.00
36	0	0.5	6	0.00%	8.83%	◆ 0.00
37	2	0.5	5	40.00%	10.00%	◆ 4.00
38	0	0.1	1	0.00%	10.00%	◆ 0.00
Total	4,169	4,418.1	41,014	10.16%	10.77%	● 0.94

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
5	299	328.5	2,390	12.51%	13.75%	0.91
6	186	224.6	2,650	7.02%	8.48%	0.83
7	208	241.3	2,791	7.45%	8.65%	0.86
8	201	257.8	2,996	6.71%	8.61%	0.78
9	236	259.3	2,963	7.96%	8.75%	0.91
10	393	346.0	3,223	12.19%	10.74%	1.14
11	374	338.4	3,159	11.84%	10.71%	1.11
12	325	368.4	3,416	9.51%	10.78%	0.88
13	334	342.9	3,165	10.55%	10.83%	0.97
14	331	361.3	3,325	9.95%	10.87%	0.92
15	314	315.8	2,913	10.78%	10.84%	0.99
16	278	262.9	2,407	11.55%	10.92%	1.06
17	212	207.4	1,898	11.17%	10.93%	1.02
18	141	150.2	1,374	10.26%	10.93%	0.94
19	90	107.7	972	9.26%	11.08%	0.84
20	131	97.6	612	21.41%	15.94%	1.34
21	51	51.4	325	15.69%	15.82%	0.99
22	30	26.0	165	18.18%	15.79%	1.15
23	13	14.8	93	13.98%	15.91%	0.88
24	10	6.3	38	26.32%	16.45%	1.60
25	4	3.3	20	20.00%	16.50%	1.21
26	1	3.3	19	5.26%	17.37%	0.30
27	2	2.1	15	13.33%	14.00%	0.95
28	0	2.3	15	0.00%	15.00%	0.00
29	2	1.5	12	16.67%	12.50%	1.33
30	0	1.5	10	0.00%	14.50%	0.00
31	0	1.8	11	0.00%	16.36%	0.00
32	0	1.3	8	0.00%	15.63%	0.00
33	0	1.1	7	0.00%	15.71%	0.00
34	1	0.8	5	20.00%	15.00%	1.33
35	0	0.7	5	0.00%	14.00%	0.00
36	0	0.9	6	0.00%	15.00%	0.00
37	2	0.9	5	40.00%	17.00%	2.35
38	0	0.2	1	0.00%	15.00%	0.00
Total	4,169	4,330.0	41,014	10.16%	10.56%	0.96

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



Retirement Rate - Actual, Expected, and Ratio; by Service

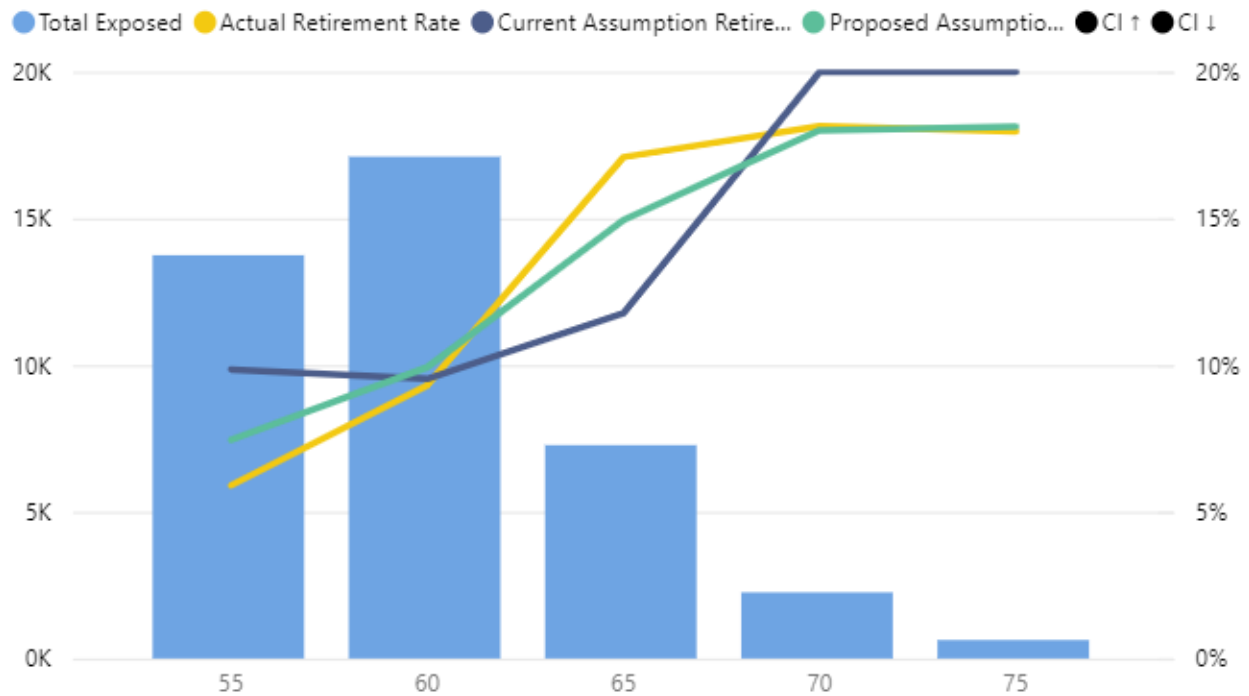


The following table shows the experience of Age 57 Plans (plan selections Ch96 – 57/10 Mandated and Ch96 – Tier IV Mandated), by age based on the age range (57 to 79) and service range (5 to 39) for the period 2012 – 2021.

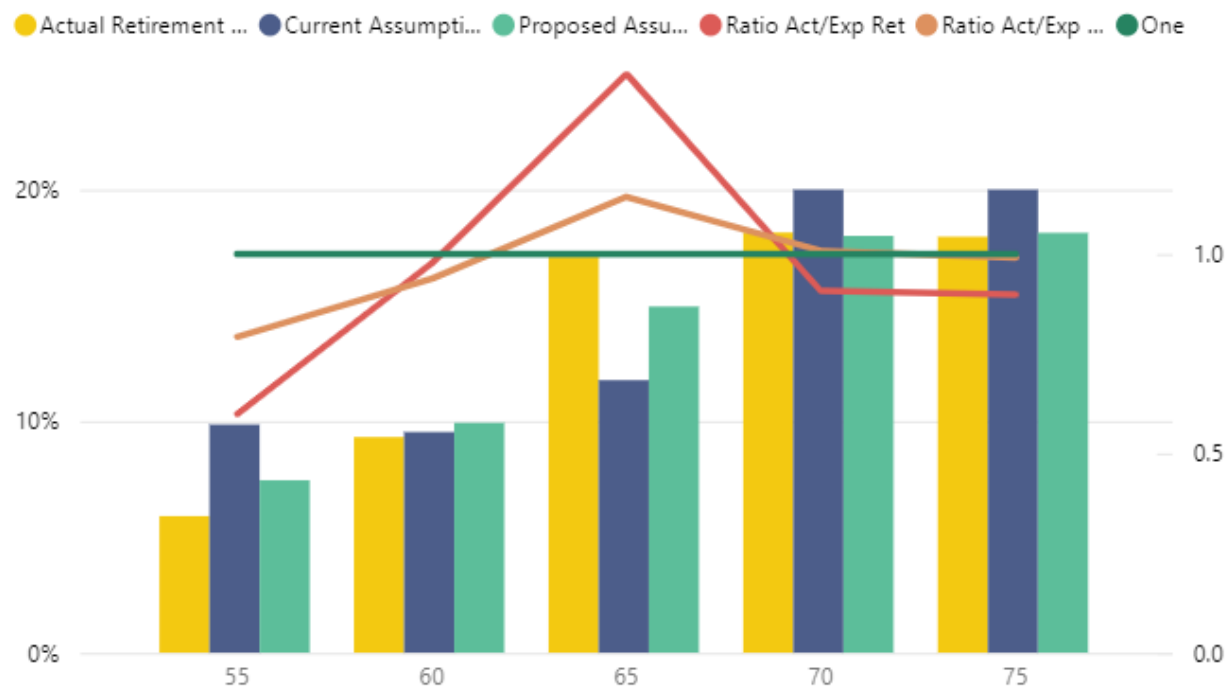
Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
57	398	724.8	4,832	8.24%	15.00%	▲ 0.55
58	212	320.9	4,537	4.67%	7.07%	▲ 0.66
59	201	309.0	4,379	4.59%	7.06%	▲ 0.65
60	185	292.5	4,170	4.44%	7.01%	▲ 0.63
61	305	403.2	3,931	7.76%	10.26%	▲ 0.76
62	539	372.0	3,524	15.30%	10.56%	▲ 1.45
63	290	298.5	2,909	9.97%	10.26%	● 0.97
64	274	264.2	2,574	10.64%	10.26%	● 1.04
65	363	332.7	2,173	16.71%	15.31%	● 1.09
66	345	181.1	1,770	19.49%	10.23%	◆ 1.90
67	214	137.9	1,344	15.92%	10.26%	◆ 1.55
68	176	112.8	1,097	16.04%	10.28%	◆ 1.56
69	145	91.5	889	16.31%	10.29%	◆ 1.59
70	132	141.6	708	18.64%	20.00%	● 0.93
71	100	107.8	539	18.55%	20.00%	● 0.93
72	79	83.4	417	18.94%	20.00%	● 0.95
73	52	67.0	335	15.52%	20.00%	▲ 0.78
74	46	51.2	256	17.97%	20.00%	▲ 0.90
75	31	39.6	198	15.66%	20.00%	▲ 0.78
76	22	30.6	153	14.38%	20.00%	▲ 0.72
77	25	25.8	129	19.38%	20.00%	● 0.97
78	19	17.4	87	21.84%	20.00%	● 1.09
79	16	12.6	63	25.40%	20.00%	▲ 1.27
Total	4,169	4,418.1	41,014	10.16%	10.77%	● 0.94

Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
57	398	468.2	4,832	8.24%	9.69%	▲ 0.85
58	212	282.3	4,537	4.67%	6.22%	▲ 0.75
59	201	273.3	4,379	4.59%	6.24%	▲ 0.74
60	185	261.0	4,170	4.44%	6.26%	▲ 0.71
61	305	377.6	3,931	7.76%	9.61%	▲ 0.81
62	539	516.3	3,524	15.30%	14.65%	● 1.04
63	290	288.1	2,909	9.97%	9.90%	● 1.01
64	274	255.7	2,574	10.64%	9.93%	● 1.07
65	363	326.7	2,173	16.71%	15.04%	▲ 1.11
66	345	262.5	1,770	19.49%	14.83%	▲ 1.31
67	214	200.7	1,344	15.92%	14.93%	● 1.07
68	176	164.1	1,097	16.04%	14.96%	● 1.07
69	145	133.3	889	16.31%	15.00%	● 1.09
70	132	127.4	708	18.64%	18.00%	● 1.04
71	100	96.9	539	18.55%	17.97%	● 1.03
72	79	75.2	417	18.94%	18.04%	● 1.05
73	52	60.6	335	15.52%	18.07%	▲ 0.86
74	46	45.9	256	17.97%	17.93%	● 1.00
75	31	35.9	198	15.66%	18.12%	▲ 0.86
76	22	27.7	153	14.38%	18.09%	▲ 0.79
77	25	23.6	129	19.38%	18.29%	● 1.06
78	19	15.8	87	21.84%	18.10%	▲ 1.21
79	16	11.4	63	25.40%	18.10%	▲ 1.40
Total	4,169	4,330.0	41,014	10.16%	10.56%	● 0.96

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age

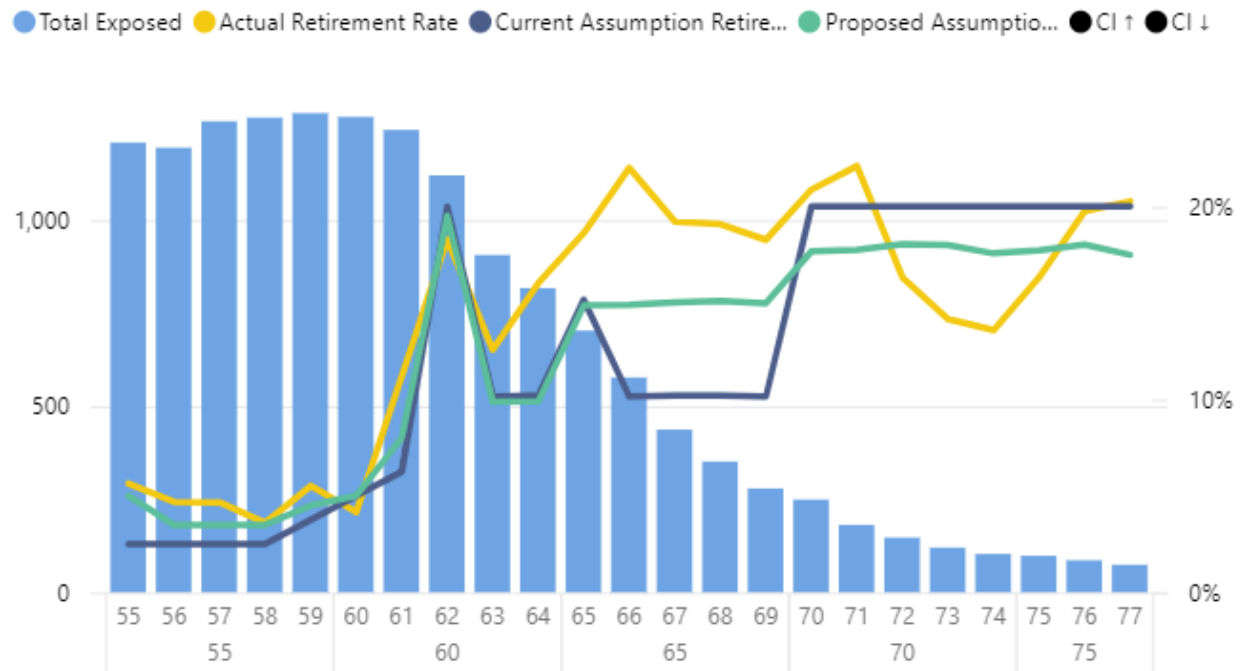


Retirement Rate - Actual, Expected, and Ratio; by Age



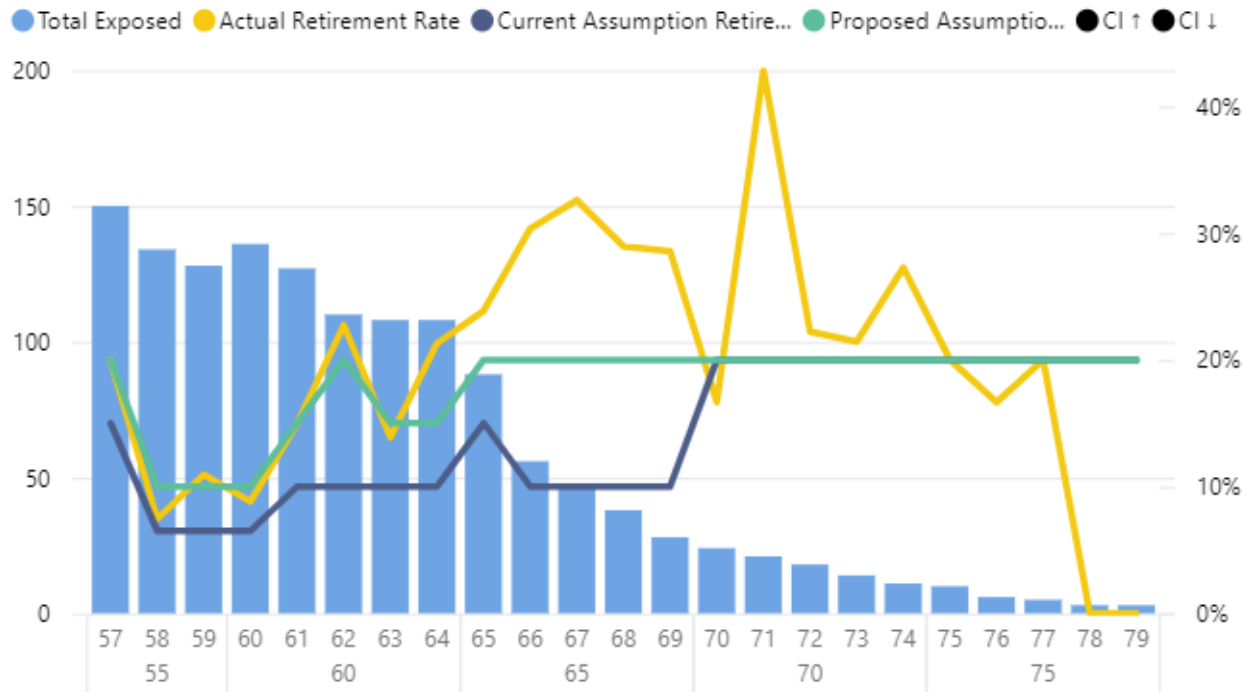
This chart shows the results by age for the service range 5 to 19 years, which decreased the assumed rate of retirement from 10.78% to 10.37% as compared to the actual rate of 9.89%. This resulted in an increase in the A/E ratio from 0.92 to 0.95 for ages 57 to 79.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



This chart shows the results by age for the service range 20 to 39 years, which increased the assumed rate of retirement from 10.69% to 15.85% as compared to the actual rate of 18.00%. This resulted in a decrease in the A/E ratio from 1.68 to 1.14 for ages 57 to 79.

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



Age 55 and 25 Plan (Plan K)

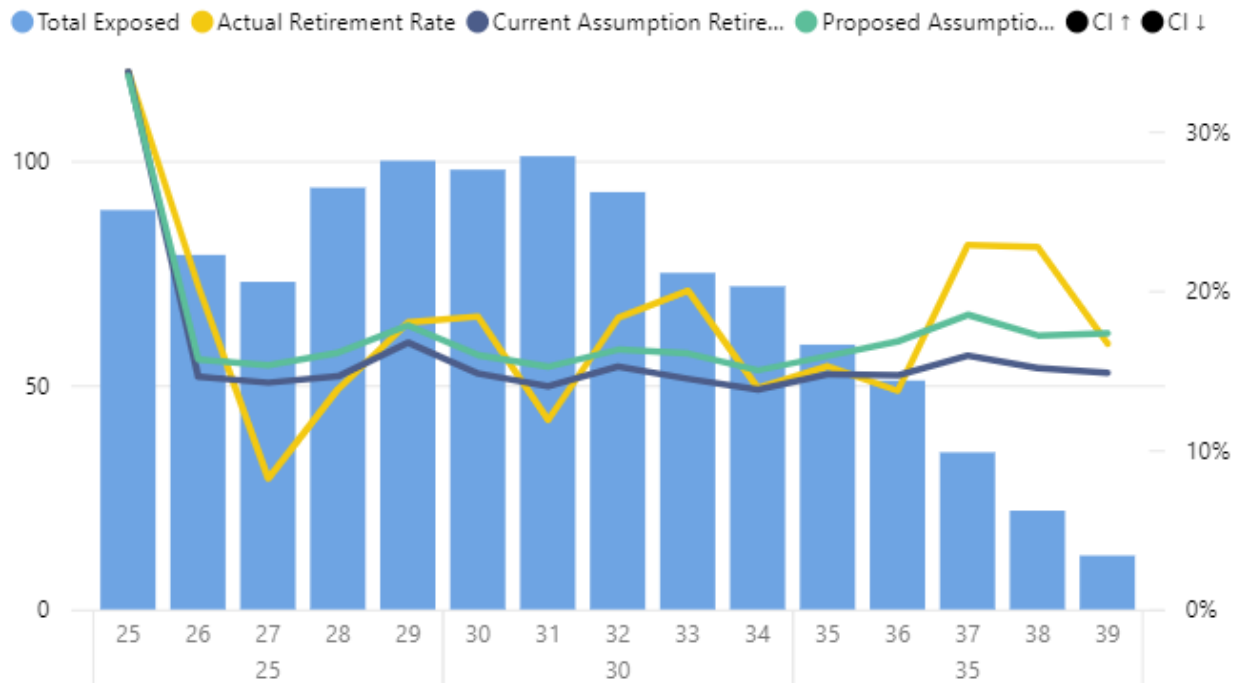
Due to the limited amount of exposures for the Age 55 and 25 Plan (Plan K), we also included other plans that require 25 years of service for retirement. These plans are Plan H: Ch96 – Tier IV, Plan L: Special Officers (no age requirement), Plan N: Ch96 – Tier IV Mandated Physically Taxing (age 50 minimum requirement) and Plan W: Ch96 – Tier IV Physically Taxing (age 50 minimum requirement).

The following table shows the experience of these plans by service based on the age range (55 to 69) and service range (25 to 39) for the period 2012 – 2021. The actual rate of retirement averaged 17.66% whereas the overall expected rate of retirement averaged 16.42% based on the current assumptions and 17.64% based on the proposed assumptions.

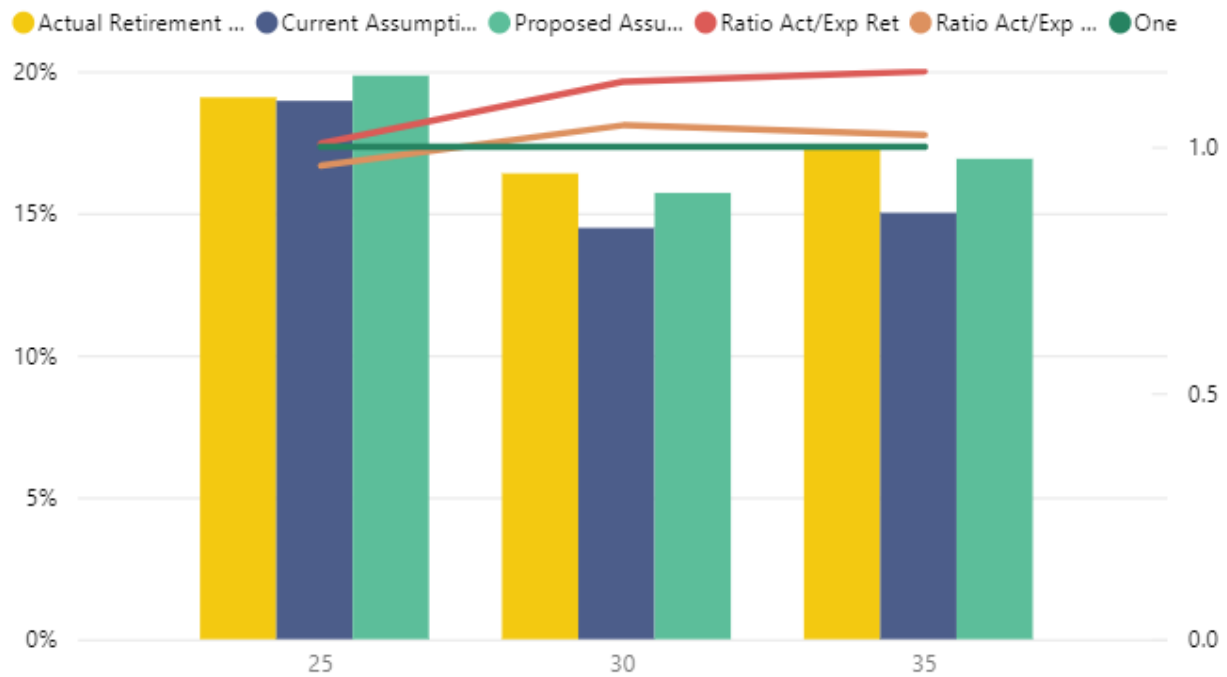
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
25	30	30.1	89	33.71%	33.78%	1.00
26	16	11.5	79	20.25%	14.60%	1.39
27	6	10.4	73	8.22%	14.23%	0.58
28	13	13.7	93	13.98%	14.70%	0.95
29	18	16.8	101	17.82%	16.63%	1.07
30	18	14.4	97	18.56%	14.82%	1.25
31	12	14.3	102	11.76%	13.98%	0.84
32	17	14.2	93	18.28%	15.23%	1.20
33	15	10.9	75	20.00%	14.47%	1.38
34	10	9.9	72	13.89%	13.79%	1.01
35	9	8.7	59	15.25%	14.76%	1.03
36	7	7.5	51	13.73%	14.68%	0.94
37	8	5.6	35	22.86%	15.91%	1.44
38	5	3.3	22	22.73%	15.14%	1.50
39	2	1.8	12	16.67%	14.83%	1.12
Total	186	172.9	1,053	17.66%	16.42%	1.08

Service	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
25	30	29.9	89	33.71%	33.60%	1.00
26	16	12.4	79	20.25%	15.68%	1.29
27	6	11.2	73	8.22%	15.33%	0.54
28	13	15.0	93	13.98%	16.17%	0.86
29	18	17.9	101	17.82%	17.73%	1.01
30	18	15.5	97	18.56%	15.99%	1.16
31	12	15.5	102	11.76%	15.19%	0.77
32	17	15.1	93	18.28%	16.29%	1.12
33	15	12.0	75	20.00%	16.05%	1.25
34	10	10.8	72	13.89%	15.00%	0.93
35	9	9.4	59	15.25%	15.90%	0.96
36	7	8.6	51	13.73%	16.80%	0.82
37	8	6.5	35	22.86%	18.49%	1.24
38	5	3.8	22	22.73%	17.18%	1.32
39	2	2.1	12	16.67%	17.33%	0.96
Total	186	185.7	1,053	17.66%	17.64%	1.00

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



Retirement Rate - Actual, Expected, and Ratio; by Service

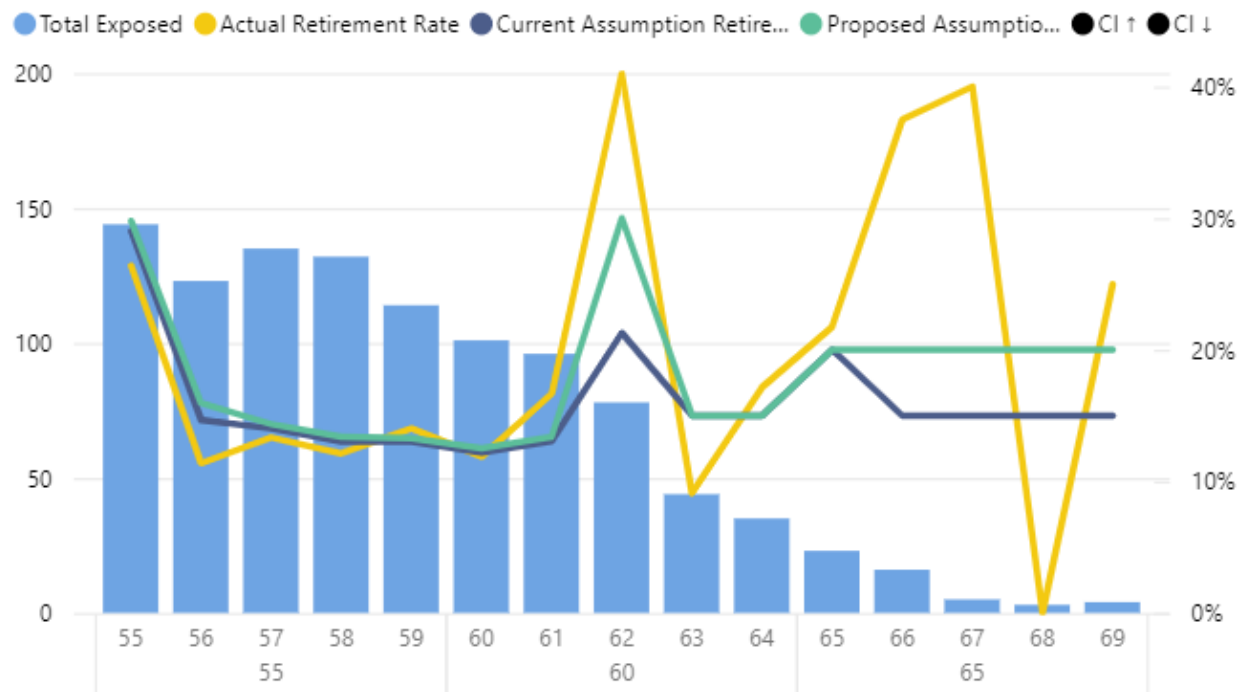


The following table shows the experience of these 55 & 25 plans by age based on the age range (55 to 69) and service range (25 to 39) for the period 2012 – 2021. The actual rate of retirement averaged 17.71% whereas the overall expected rate of retirement averaged 17.02% based on the current assumptions and 17.83% based on the proposed assumptions.

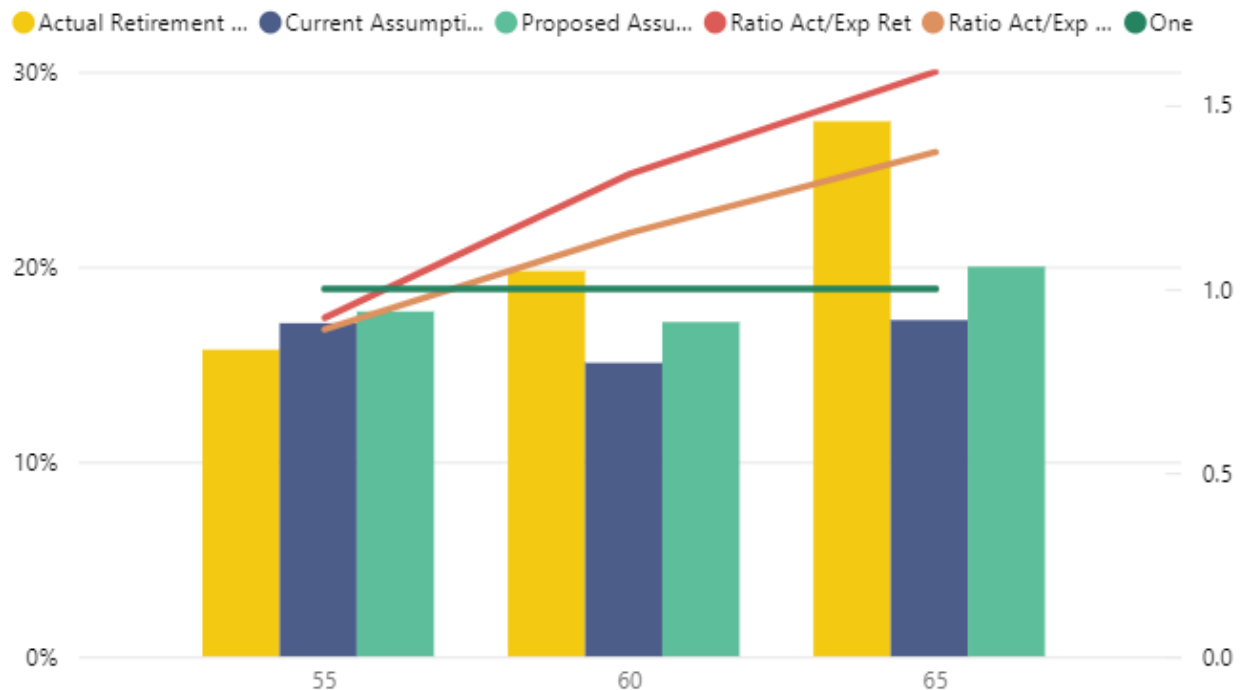
Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	38	41.8	144	26.39%	29.02%	0.91
56	14	18.0	123	11.38%	14.66%	0.78
57	18	18.9	135	13.33%	14.02%	0.95
58	16	17.2	132	12.12%	13.03%	0.93
59	16	14.8	114	14.04%	13.03%	1.08
60	12	12.3	101	11.88%	12.19%	0.97
61	16	12.6	96	16.67%	13.07%	1.27
62	32	16.6	78	41.03%	21.28%	1.93
63	4	6.6	44	9.09%	15.00%	0.61
64	6	5.2	35	17.14%	15.00%	1.14
65	5	4.6	23	21.74%	20.00%	1.09
66	6	2.4	16	37.50%	15.00%	2.50
67	2	0.8	5	40.00%	15.00%	2.67
68	0	0.5	3	0.00%	15.00%	0.00
69	1	0.6	4	25.00%	15.00%	1.67
Total	186	172.9	1,053	17.66%	16.42%	1.08

Age	Actual Retirements	Expected Retirements Proposed	Total Exposed	Actual Retirement Rate	Proposed Assumption Retirement	Act/Exp Proposed Ret
55	38	42.9	144	26.39%	29.79%	0.89
56	14	19.6	123	11.38%	15.94%	0.71
57	18	19.5	135	13.33%	14.43%	0.92
58	16	17.6	132	12.12%	13.37%	0.91
59	16	15.1	114	14.04%	13.27%	1.06
60	12	12.6	101	11.88%	12.50%	0.95
61	16	12.9	96	16.67%	13.39%	1.25
62	32	23.4	78	41.03%	30.00%	1.37
63	4	6.6	44	9.09%	15.00%	0.61
64	6	5.2	35	17.14%	15.00%	1.14
65	5	4.6	23	21.74%	20.00%	1.09
66	6	3.2	16	37.50%	20.00%	1.88
67	2	1.0	5	40.00%	20.00%	2.00
68	0	0.6	3	0.00%	20.00%	0.00
69	1	0.8	4	25.00%	20.00%	1.25
Total	186	185.7	1,053	17.66%	17.64%	1.00

Exposure Distribution w/ Retirement Rate - Actual and Expected; by Age



Retirement Rate - Actual, Expected, and Ratio; by Age



Summary

In total, the proposed rates of retirement have increased the anticipated number of retirements due to higher assumptions proposed for members with at least 20 years of service, which increase the number of members retiring with a 2% benefit accrual. We believe this would lead to higher plan liabilities. This will be offset by lower assumptions for members retiring with less than 10 years of service. The actual impact will depend on the demographics of the active membership.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF SERVICE RETIREMENT					
Age	Reduced Service Retirement	Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program		Unreduced Service Retirement Probabilities For Members Who Elected an Improved Retirement Program	
		Year 1	Ultimate	Year 1	Ultimate
55	2.50%	15.00%	6.50%	35.00%	12.00%
56	2.50%	15.00%	6.50%	35.00%	12.00%
57	2.50%	15.00%	6.50%	35.00%	12.00%
58	2.50%	15.00%	6.50%	35.00%	12.00%
59	3.75%	15.00%	6.50%	35.00%	12.00%
60	5.00%	15.00%	6.50%	35.00%	12.00%
61	6.25%	15.00%	10.00%	35.00%	12.00%
62	0.00% ¹	20.00% ²	10.00%	50.00%	20.00%
63	0.00%	15.00% ³	10.00%	35.00%	15.00%
64	0.00%	15.00%	10.00%	35.00%	15.00%
65	0.00%	20.00%	15.00%	50.00%	20.00%
66	0.00%	15.00%	10.00%	35.00%	15.00%
67	0.00%	15.00%	10.00%	35.00%	15.00%
68	0.00%	15.00%	10.00%	35.00%	15.00%
69	0.00%	15.00%	10.00%	35.00%	15.00%
70	0.00%	20.00%	20.00%	35.00%	15.00%
71	0.00%	20.00%	20.00%	35.00%	15.00%
72	0.00%	20.00%	20.00%	35.00%	15.00%
73	0.00%	20.00%	20.00%	35.00%	15.00%
74	0.00%	20.00%	20.00%	35.00%	15.00%
75	0.00%	20.00%	20.00%	35.00%	15.00%
76	0.00%	20.00%	20.00%	35.00%	15.00%
77	0.00%	20.00%	20.00%	35.00%	15.00%
78	0.00%	20.00%	20.00%	35.00%	15.00%
79	0.00%	20.00%	20.00%	35.00%	15.00%
80	N/A	100.00%	100.00%	100.00%	100.00%

¹ 7.50% only applies to Tier 6 members; 0.00% otherwise.

² 20.00% for Tier 1, 2, & 4 members and 15.00% for Tier 6 members.

³ 15.00% for Tier 1, 2, & 4 members and 20.00% for Tier 6 members.

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF SERVICE RETIREMENT					
Age	Reduced Service Retirement ¹	Unreduced Service Retirement Probabilities For Members Who Did Not Elect an Improved Retirement Program			
		5 YOS	6 - 9 YOS	10 - 19 YOS	>= 20 YOS ²
55 ³	5.00%	N/A	N/A	N/A	10.00%
56	3.50%	N/A	N/A	N/A	10.00%
57	3.50%	10.00%	8.00%	10.00%	10.00%
58	3.50%	6.50%	5.25%	6.50%	10.00%
59	4.50%	6.50%	5.25%	6.50%	10.00%
60	5.00%	6.50%	5.25%	6.50%	10.00%
61	8.00%	10.00%	8.00%	10.00%	15.00%
62	0.00% ⁴	20.00%	12.00% ⁵	15.00% ⁶	20.00%
63	0.00%	15.00%	8.00%	10.00% ⁷	15.00%
64	0.00%	15.00%	8.00%	10.00%	15.00%
65	0.00%	25.00%	12.00%	15.00%	20.00%
66	0.00%	25.00%	12.00%	15.00%	20.00%
67	0.00%	25.00%	12.00%	15.00%	20.00%
68	0.00%	25.00%	12.00%	15.00%	20.00%
69	0.00%	25.00%	12.00%	15.00%	20.00%
70	0.00%	25.00%	17.50%	17.50%	20.00%
71	0.00%	25.00%	17.50%	17.50%	20.00%
72	0.00%	25.00%	17.50%	17.50%	20.00%
73	0.00%	25.00%	17.50%	17.50%	20.00%
74	0.00%	25.00%	17.50%	17.50%	20.00%
75	0.00%	25.00%	17.50%	17.50%	20.00%
76	0.00%	25.00%	17.50%	17.50%	20.00%
77	0.00%	25.00%	17.50%	17.50%	20.00%
78	0.00%	25.00%	17.50%	17.50%	20.00%
79	0.00%	25.00%	17.50%	17.50%	20.00%
80+	N/A	100.00%	100.00%	100.00%	100.00%

¹ Reduced retirement rates apply to Improved Plan members eligible for early retirement under Tier 4 or 6 Basic Plan.

² For mandated members, the following rates apply in the year that the indicated age / service combination is attained: **Basic Plan:** 62 / 20 - 25%; **Age 57 Plan:** 57 / 20 - 20%
Age 55 / 27 Plan: 55 / 27 and 62 / 20 - 25%; **Physically Taxing Plans:** 50 / 25 and 57 / 20 - 25%
Other Plans: 0 / 25 and 62 / 20 - 25%; **Tier 6:** 63 / 20 - 25%

³ Age 55 rates apply to ages below 55, if applicable

⁴ 10.00% for Tier 6 members

^{5,6} 16% and 20% for Tier 4 (other than 57 Plan) members, respectively

⁷ 20% for Tier 6 members

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF SERVICE RETIREMENT				
Age	Unreduced Service Retirement Probabilities For Members Who Elected an Improved Retirement Program			
	< 10 YOS	10 - 24 YOS	>= 25 YOS First Eligibility	>= 25 YOS Ultimate
55 ³	N/A	N/A	35.00%	12.00%
56	N/A	N/A	35.00%	12.00%
57	N/A	N/A	35.00%	12.00%
58	N/A	N/A	35.00%	12.00%
59	N/A	N/A	35.00%	12.00%
60	N/A	N/A	35.00%	12.00%
61	N/A	N/A	35.00%	12.00%
62	12.00%	15.00%	35.00%	30.00%
63	10.00%	12.50%	N/A	15.00%
64	10.00%	12.50%	N/A	15.00%
65	14.00%	17.50%	N/A	20.00%
66	14.00%	17.50%	N/A	20.00%
67	14.00%	17.50%	N/A	20.00%
68	14.00%	17.50%	N/A	20.00%
69	14.00%	17.50%	N/A	20.00%
70	17.50%	17.50%	N/A	20.00%
71	17.50%	17.50%	N/A	20.00%
72	17.50%	17.50%	N/A	20.00%
73	17.50%	17.50%	N/A	20.00%
74	17.50%	17.50%	N/A	20.00%
75	17.50%	17.50%	N/A	20.00%
76	17.50%	17.50%	N/A	20.00%
77	17.50%	17.50%	N/A	20.00%
78	17.50%	17.50%	N/A	20.00%
79	17.50%	17.50%	N/A	20.00%
80+	100.00%	100.00%	N/A	100.00%

³ Age 55 rates apply to ages below 55, if applicable

Disability

Current ordinary disability assumptions vary by age and gender but do not apply during the 10-year eligibility service period. Furthermore, an additional rate applies to accidental disability during all service periods. Both ordinary and accidental disability benefits are equal to $1/60$ times the final average salary for each year of service accrued but no less than $1/3$ of the member's final average salary. The benefit is payable during the lifetime of the member, whether or not optional forms of payment are selected. For members who have accrued at least 20 years of service, the service retirement benefit is greater than the disability retirement benefit if the member has met the conditions for an unreduced retirement benefit.

Due to this fact, rates of ordinary disability were determined excluding the experience for members eligible for unreduced retirement and the 2% benefit accrual formula. However, there were still ordinary disability retirements recorded even after attaining this threshold. Therefore, we propose to apply 50% of the rates of ordinary disability apply upon attainment of age 62 and completion of 20 years of service or other criteria to receive an unreduced retirement benefit that varies by Plan (57 and 20 for Plans I and M, 55 and 25 for Plan K, etc.). If eligible for early retirement, we propose that the greater of the early retirement benefit and the ordinary disability retirement be valued.

In addition, the rates of ordinary disability would not apply during the 10-year eligibility service period.

In performing the experience analysis, it is necessary to reassign disability retirement codes retroactively to reflect the eventual approval of a disability retirement. Members with a disability code in a given year had all inactive status codes in prior years changed to a disability status code. Adjustments were made as far back as 2012.

It is difficult to determine how future years would impact the experience during the study period as we believe that this type of retroactive adjustment will be required in subsequent iterations of this study. The consequence will be a restatement of the number of disability retirements experienced during this study period, specifically 2019 – 2021.

For this purpose, our analysis reflected years from 2012 – 2019.

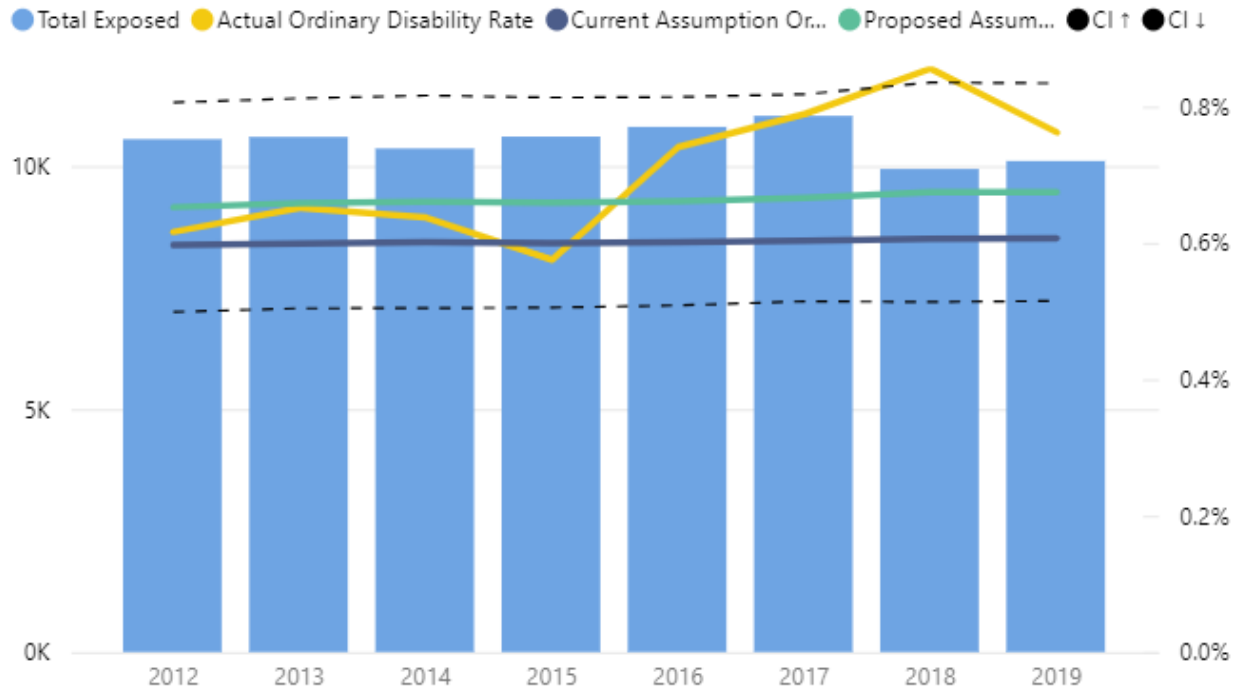
Ordinary Disability

The following table shows the experience for ordinary disability retirement by year, for the age range 30 to 69 and the service range 10 to 29. The actual rate of ordinary disability averaged 0.7025% whereas the overall expected rate of ordinary disability averaged 0.6016% based on the current assumptions and 0.6630% based on the proposed assumptions.

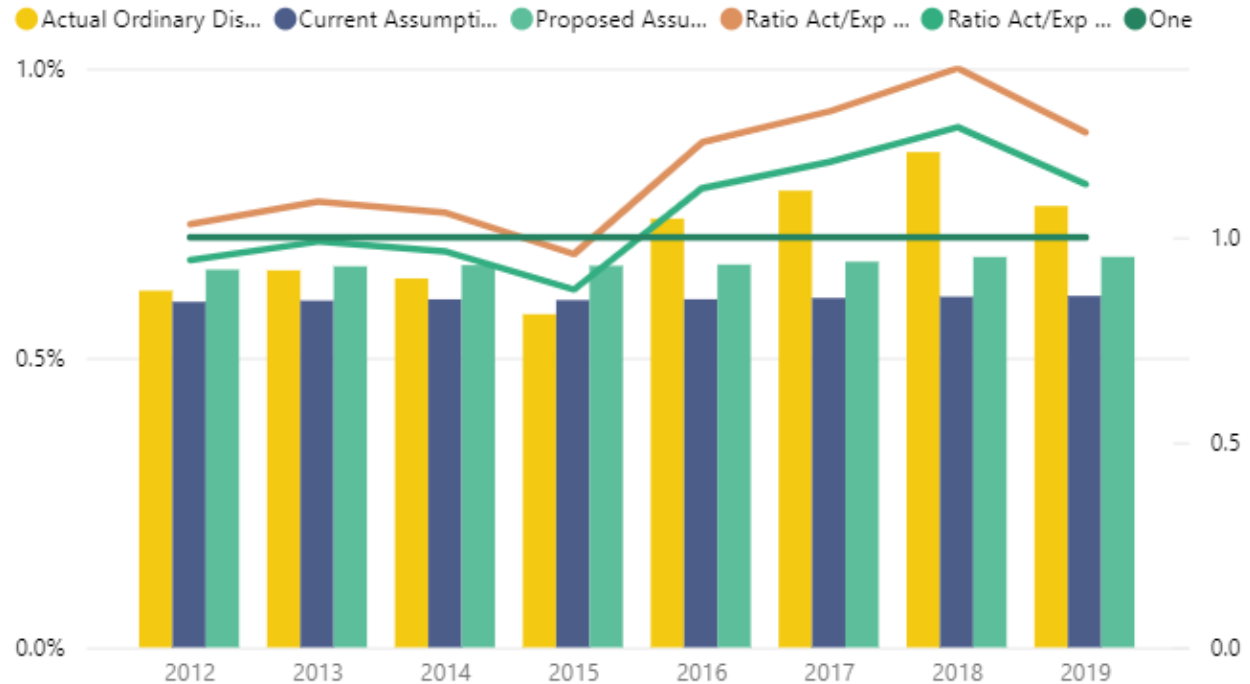
Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	65	63.0	10,552	0.6160%	0.5967%	1.03
2013	69	63.5	10,598	0.6511%	0.5988%	1.09
2014	66	62.3	10,360	0.6371%	0.6010%	1.06
2015	61	63.6	10,604	0.5753%	0.5997%	0.96
2016	80	65.0	10,804	0.7405%	0.6012%	1.23
2017	87	66.6	11,031	0.7887%	0.6034%	1.31
2018	85	60.2	9,938	0.8553%	0.6056%	1.41
2019	77	61.3	10,102	0.7622%	0.6069%	1.26
Total	590	505.3	83,989	0.7025%	0.6016%	1.17

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Act/Exp Proposed Ordinary Disability
2012	65	68.8	10,552	0.6160%	0.6523%	0.94
2013	69	69.7	10,598	0.6511%	0.6580%	0.99
2014	66	68.4	10,360	0.6371%	0.6601%	0.97
2015	61	69.9	10,604	0.5753%	0.6591%	0.87
2016	80	71.4	10,804	0.7405%	0.6611%	1.12
2017	87	73.5	11,031	0.7887%	0.6661%	1.18
2018	85	67.0	9,938	0.8553%	0.6742%	1.27
2019	77	68.1	10,102	0.7622%	0.6745%	1.13
Total	590	556.9	83,989	0.7025%	0.6630%	1.06

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Year



Ordinary Disability Rate - Actual, Expected, and Ratio; by Year



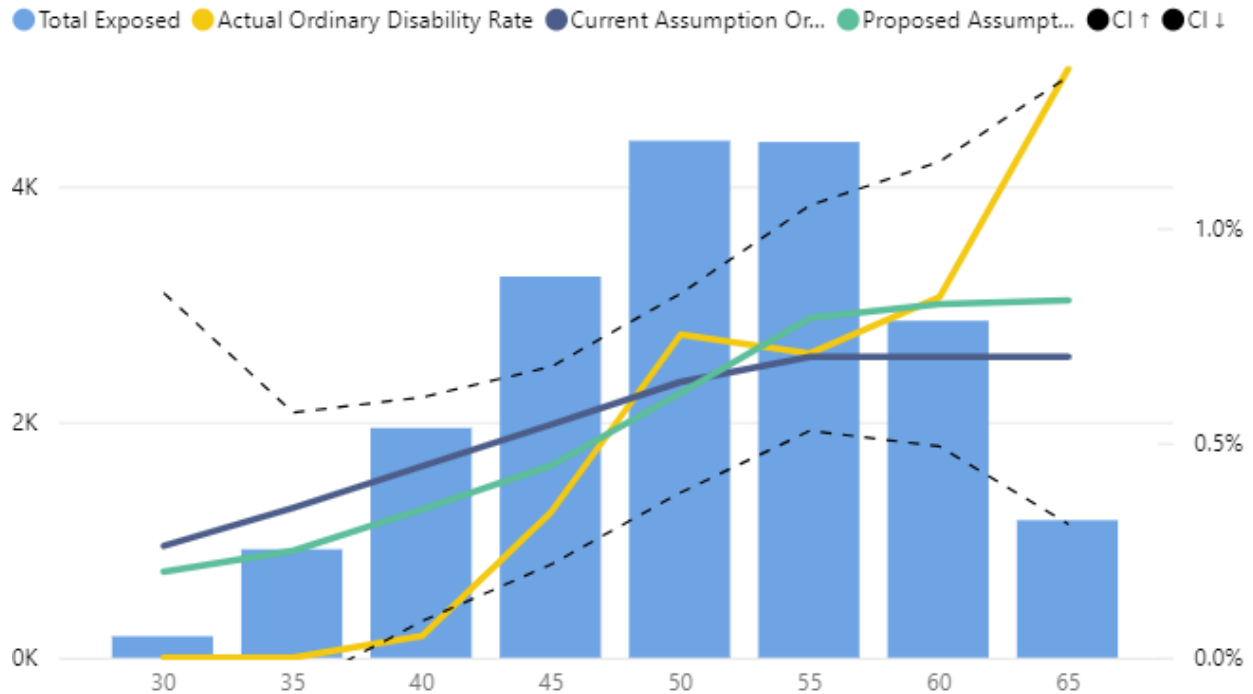
Males

The following table shows the experience of male members by age based on the age range (30 to 69) and service range (10 to 29) for the period 2012 – 2019 for all plans. The actual rate of ordinary disability averaged 0.6080% whereas the overall expected rate of ordinary disability averaged 0.6128% based on the current assumptions and 0.6224% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 0.99 to 0.98. For members with less than 20 years of service, the A/E ratio decreased from 1.11 to 1.07 and for members with at least 20 years of service, the A/E ratio increased from 0.77 to 0.79.

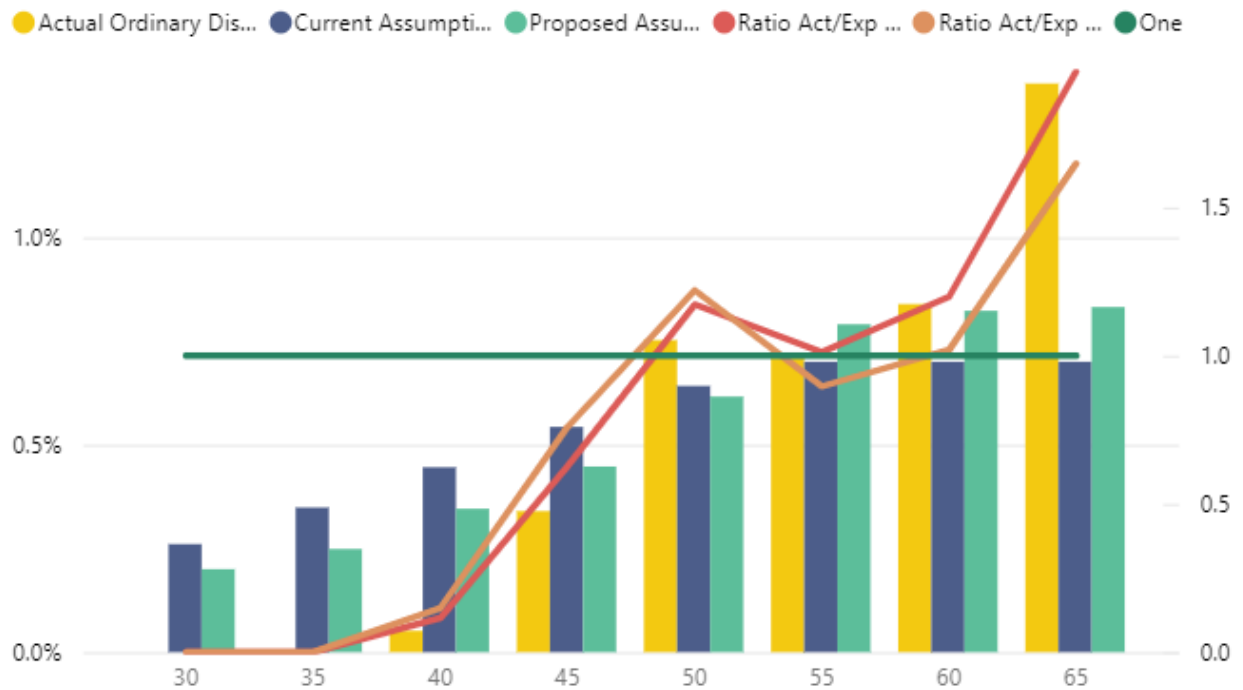
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.0	7	0.0000%	0.2000%	0.00
31	0	0.0	14	0.0000%	0.2200%	0.00
32	0	0.1	29	0.0000%	0.2400%	0.00
33	0	0.1	51	0.0000%	0.2600%	0.00
34	0	0.2	81	0.0000%	0.2800%	0.00
35	0	0.3	106	0.0000%	0.3000%	0.00
36	0	0.5	143	0.0000%	0.3200%	0.00
37	0	0.6	184	0.0000%	0.3400%	0.00
38	0	0.8	225	0.0000%	0.3600%	0.00
39	0	1.0	262	0.0000%	0.3800%	0.00
40	1	1.1	287	0.3484%	0.4000%	0.87
41	0	1.4	333	0.0000%	0.4200%	0.00
42	0	1.7	381	0.0000%	0.4400%	0.00
43	0	2.0	445	0.0000%	0.4600%	0.00
44	0	2.4	504	0.0000%	0.4800%	0.00
45	2	2.8	552	0.3623%	0.5000%	0.72
46	3	3.1	591	0.5076%	0.5200%	0.98
47	2	3.5	646	0.3096%	0.5400%	0.57
48	2	4.0	720	0.2778%	0.5600%	0.50
49	2	4.2	726	0.2755%	0.5800%	0.47
50	5	4.8	793	0.6305%	0.6000%	1.05
51	4	5.2	838	0.4773%	0.6200%	0.77
52	5	5.6	881	0.5675%	0.6400%	0.89
53	8	6.2	935	0.8556%	0.6600%	1.30
54	11	6.4	940	1.1702%	0.6800%	1.72
55	5	6.4	920	0.5435%	0.7000%	0.78
56	3	6.2	887	0.3382%	0.7000%	0.48
57	11	6.2	890	1.2360%	0.7000%	1.77
58	4	6.0	859	0.4657%	0.7000%	0.67
59	8	5.7	821	0.9744%	0.7000%	1.39
60	5	5.2	738	0.6775%	0.7000%	0.97
61	5	4.8	679	0.7364%	0.7000%	1.05
62	5	4.2	595	0.8403%	0.7000%	1.20
63	5	3.2	462	1.0823%	0.7000%	1.55
64	4	2.7	386	1.0363%	0.7000%	1.48
65	7	2.3	333	2.1021%	0.7000%	3.00
66	2	1.9	274	0.7299%	0.7000%	1.04
67	5	1.6	228	2.1930%	0.7000%	3.13
68	0	1.2	178	0.0000%	0.7000%	0.00
69	2	1.1	154	1.2987%	0.7000%	1.86
Total	116	116.9	19,078	0.6080%	0.6128%	0.99

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Act/Exp Proposed Ordinary Disability
30	0	0.0	7	0.0000%	0.2000%	0.00
31	0	0.0	14	0.0000%	0.2000%	0.00
32	0	0.1	29	0.0000%	0.2000%	0.00
33	0	0.1	51	0.0000%	0.2000%	0.00
34	0	0.2	81	0.0000%	0.2000%	0.00
35	0	0.2	106	0.0000%	0.2000%	0.00
36	0	0.3	143	0.0000%	0.2200%	0.00
37	0	0.4	184	0.0000%	0.2400%	0.00
38	0	0.6	225	0.0000%	0.2600%	0.00
39	0	0.7	262	0.0000%	0.2800%	0.00
40	1	0.9	287	0.3484%	0.3000%	1.16
41	0	1.1	333	0.0000%	0.3200%	0.00
42	0	1.3	381	0.0000%	0.3400%	0.00
43	0	1.6	445	0.0000%	0.3600%	0.00
44	0	1.9	504	0.0000%	0.3800%	0.00
45	2	2.2	552	0.3623%	0.4000%	0.91
46	3	2.5	591	0.5076%	0.4200%	1.21
47	2	2.8	646	0.3096%	0.4400%	0.70
48	2	3.3	720	0.2778%	0.4600%	0.60
49	2	3.6	726	0.2755%	0.5000%	0.55
50	5	4.2	793	0.6305%	0.5356%	1.18
51	4	4.8	838	0.4773%	0.5748%	0.83
52	5	5.4	881	0.5675%	0.6126%	0.93
53	8	6.1	935	0.8556%	0.6515%	1.31
54	11	6.5	940	1.1702%	0.6892%	1.70
55	5	6.6	920	0.5435%	0.7191%	0.76
56	3	6.8	887	0.3382%	0.7646%	0.44
57	11	7.0	890	1.2360%	0.7901%	1.56
58	4	7.1	859	0.4657%	0.8320%	0.56
59	8	7.0	821	0.9744%	0.8553%	1.14
60	5	6.5	738	0.6775%	0.8799%	0.77
61	5	6.1	679	0.7364%	0.9010%	0.82
62	5	4.3	595	0.8403%	0.7267%	1.16
63	5	3.5	462	1.0823%	0.7626%	1.42
64	4	3.1	386	1.0363%	0.7972%	1.30
65	7	2.7	333	2.1021%	0.8108%	2.59
66	2	2.3	274	0.7299%	0.8522%	0.86
67	5	1.9	228	2.1930%	0.8487%	2.58
68	0	1.5	178	0.0000%	0.8287%	0.00
69	2	1.3	154	1.2987%	0.8214%	1.58
Total	116	118.7	19,078	0.6080%	0.6224%	0.98

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Age



Ordinary Disability Rate - Actual, Expected, and Ratio; by Age



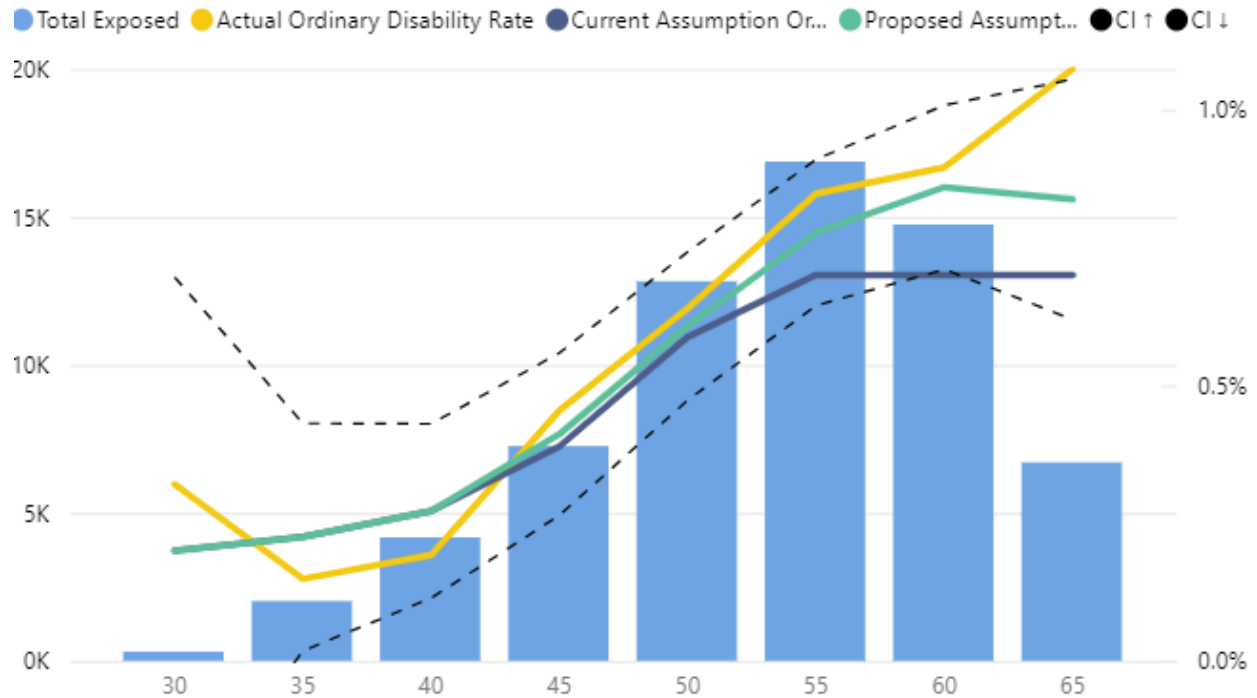
Females

The following table shows the experience of female members by age based on the age range (30 to 69) and service range (10 to 29) for the period 2012 – 2019 for all plans. The actual rate of ordinary disability averaged 0.7302% whereas the overall expected rate of ordinary disability averaged 0.5983% based on the current assumptions and 0.6750% based on the proposed assumptions. This resulted in a decrease in the A/E ratio from 1.22 to 1.08. For members with less than 20 years of service, the A/E ratio decreased from 1.30 to 1.11 and for members with at least 20 years of service, the A/E ratio increased from 0.91 to 0.95.

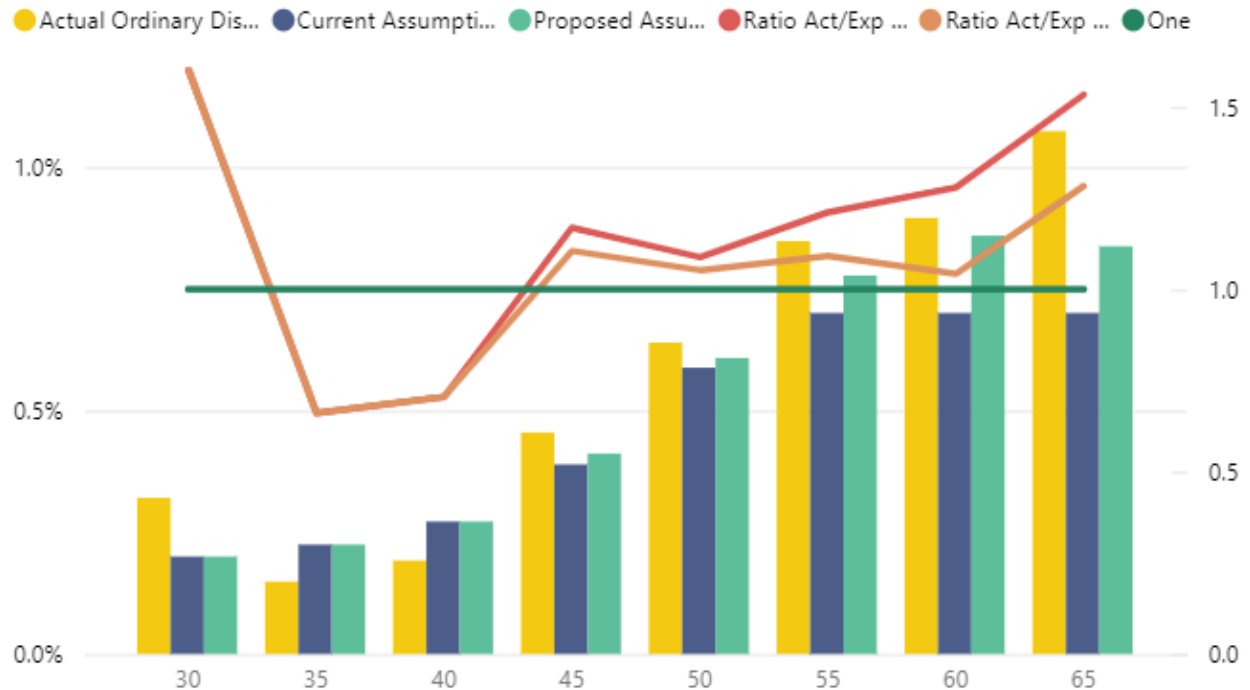
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.0	15	0.0000%	0.2000%	0.00
31	0	0.1	29	0.0000%	0.2000%	0.00
32	0	0.1	50	0.0000%	0.2000%	0.00
33	0	0.2	79	0.0000%	0.2000%	0.00
34	1	0.3	139	0.7194%	0.2000%	3.60
35	1	0.4	224	0.4464%	0.2000%	2.23
36	0	0.6	306	0.0000%	0.2100%	0.00
37	0	0.9	405	0.0000%	0.2200%	0.00
38	2	1.2	500	0.4000%	0.2300%	1.74
39	0	1.4	587	0.0000%	0.2400%	0.00
40	3	1.7	683	0.4392%	0.2500%	1.76
41	3	2.0	752	0.3989%	0.2600%	1.53
42	2	2.2	826	0.2421%	0.2700%	0.90
43	0	2.6	917	0.0000%	0.2800%	0.00
44	0	2.9	994	0.0000%	0.2900%	0.00
45	6	3.4	1,123	0.5343%	0.3000%	1.78
46	5	4.4	1,303	0.3837%	0.3400%	1.13
47	3	5.4	1,434	0.2092%	0.3800%	0.55
48	12	6.7	1,588	0.7557%	0.4200%	1.80
49	7	8.3	1,810	0.3867%	0.4600%	0.84
50	12	10.3	2,064	0.5814%	0.5000%	1.16
51	16	12.6	2,326	0.6879%	0.5400%	1.27
52	9	14.8	2,556	0.3521%	0.5800%	0.61
53	18	17.6	2,838	0.6342%	0.6200%	1.02
54	27	20.1	3,041	0.8879%	0.6600%	1.35
55	35	22.9	3,274	1.0690%	0.7000%	1.53
56	21	23.1	3,293	0.6377%	0.7000%	0.91
57	25	23.9	3,414	0.7323%	0.7000%	1.05
58	25	24.0	3,429	0.7291%	0.7000%	1.04
59	37	24.2	3,460	1.0694%	0.7000%	1.53
60	27	24.2	3,455	0.7815%	0.7000%	1.12
61	41	23.9	3,414	1.2009%	0.7000%	1.72
62	25	21.8	3,114	0.8028%	0.7000%	1.15
63	23	17.5	2,501	0.9196%	0.7000%	1.31
64	16	15.8	2,261	0.7077%	0.7000%	1.01
65	22	14.0	2,002	1.0989%	0.7000%	1.57
66	15	11.3	1,620	0.9259%	0.7000%	1.32
67	17	8.6	1,230	1.3821%	0.7000%	1.97
68	10	7.2	1,023	0.9775%	0.7000%	1.40
69	8	5.8	832	0.9615%	0.7000%	1.37
Total	474	388.4	64,911	0.7302%	0.5983%	1.22

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities Proposed	Total Exposed	Actual Ordinary Disability Rate	Proposed Assumption Ordinary Disability	Act/Exp Proposed Ordinary Disability
30	0	0.0	15	0.0000%	0.2000%	0.00
31	0	0.1	29	0.0000%	0.2000%	0.00
32	0	0.1	50	0.0000%	0.2000%	0.00
33	0	0.2	79	0.0000%	0.2000%	0.00
34	1	0.3	139	0.7194%	0.2000%	3.60
35	1	0.4	224	0.4464%	0.2000%	2.23
36	0	0.6	306	0.0000%	0.2100%	0.00
37	0	0.9	405	0.0000%	0.2200%	0.00
38	2	1.2	500	0.4000%	0.2300%	1.74
39	0	1.4	587	0.0000%	0.2400%	0.00
40	3	1.7	683	0.4392%	0.2500%	1.76
41	3	2.0	752	0.3989%	0.2600%	1.53
42	2	2.2	826	0.2421%	0.2700%	0.90
43	0	2.6	917	0.0000%	0.2800%	0.00
44	0	2.9	994	0.0000%	0.2900%	0.00
45	6	3.4	1,123	0.5343%	0.3000%	1.78
46	5	4.6	1,303	0.3837%	0.3500%	1.10
47	3	5.7	1,434	0.2092%	0.4000%	0.52
48	12	7.1	1,588	0.7557%	0.4500%	1.68
49	7	9.0	1,810	0.3867%	0.5000%	0.77
50	12	10.7	2,064	0.5814%	0.5200%	1.12
51	16	13.0	2,326	0.6879%	0.5600%	1.23
52	9	15.3	2,556	0.3521%	0.5999%	0.59
53	18	18.2	2,838	0.6342%	0.6398%	0.99
54	27	20.7	3,041	0.8879%	0.6798%	1.31
55	35	22.8	3,274	1.0690%	0.6971%	1.53
56	21	24.3	3,293	0.6377%	0.7378%	0.86
57	25	26.4	3,414	0.7323%	0.7743%	0.95
58	25	27.9	3,429	0.7291%	0.8145%	0.90
59	37	29.6	3,460	1.0694%	0.8550%	1.25
60	27	30.9	3,455	0.7815%	0.8935%	0.87
61	41	31.2	3,414	1.2009%	0.9135%	1.31
62	25	25.1	3,114	0.8028%	0.8064%	1.00
63	23	20.6	2,501	0.9196%	0.8255%	1.11
64	16	18.8	2,261	0.7077%	0.8326%	0.85
65	22	16.9	2,002	1.0989%	0.8432%	1.30
66	15	13.6	1,620	0.9259%	0.8392%	1.10
67	17	10.3	1,230	1.3821%	0.8337%	1.66
68	10	8.5	1,023	0.9775%	0.8324%	1.17
69	8	6.9	832	0.9615%	0.8281%	1.16
Total	474	438.1	64,911	0.7302%	0.6750%	1.08

Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Age



Ordinary Disability Rate - Actual, Expected, and Ratio; by Age



Summary

Retirement eligibility and the change in the benefit accrual rate upon completing 20 years of service have a significant impact on the number of members who apply for disability retirement. By reducing rates of ordinary disability retirement at these criteria, we believe it will increase plan liabilities. Furthermore, increasing the rates of ordinary disability for other members, albeit slightly, will also result in higher plan liabilities.

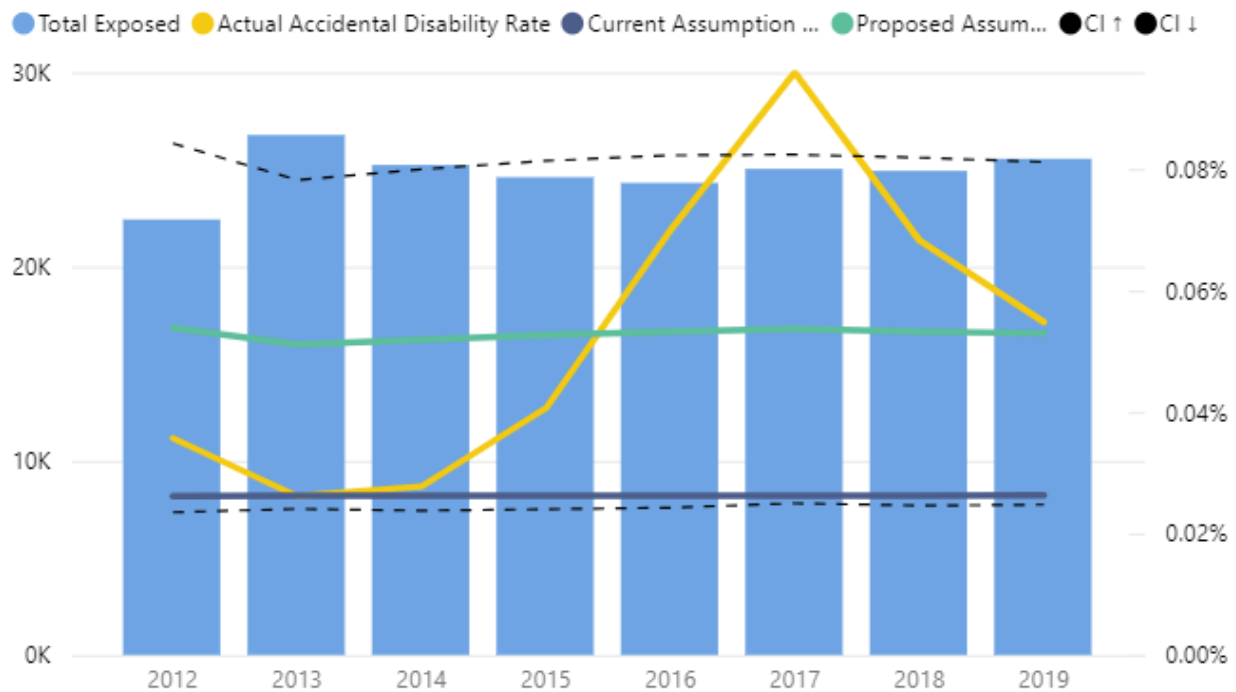
Accidental Disability

The current accidental assumption varies by gender. The proposed assumption also varies by gender, but also varies by age. The following charts show the experience for accidental disability retirement by year for the age range 25 to 69 and for the service range 0 to 34. The actual rate of accidental disability averaged 0.0523% whereas the overall expected rate of accidental disability averaged 0.0262% based on the current assumptions and 0.0528% based on the proposed assumptions.

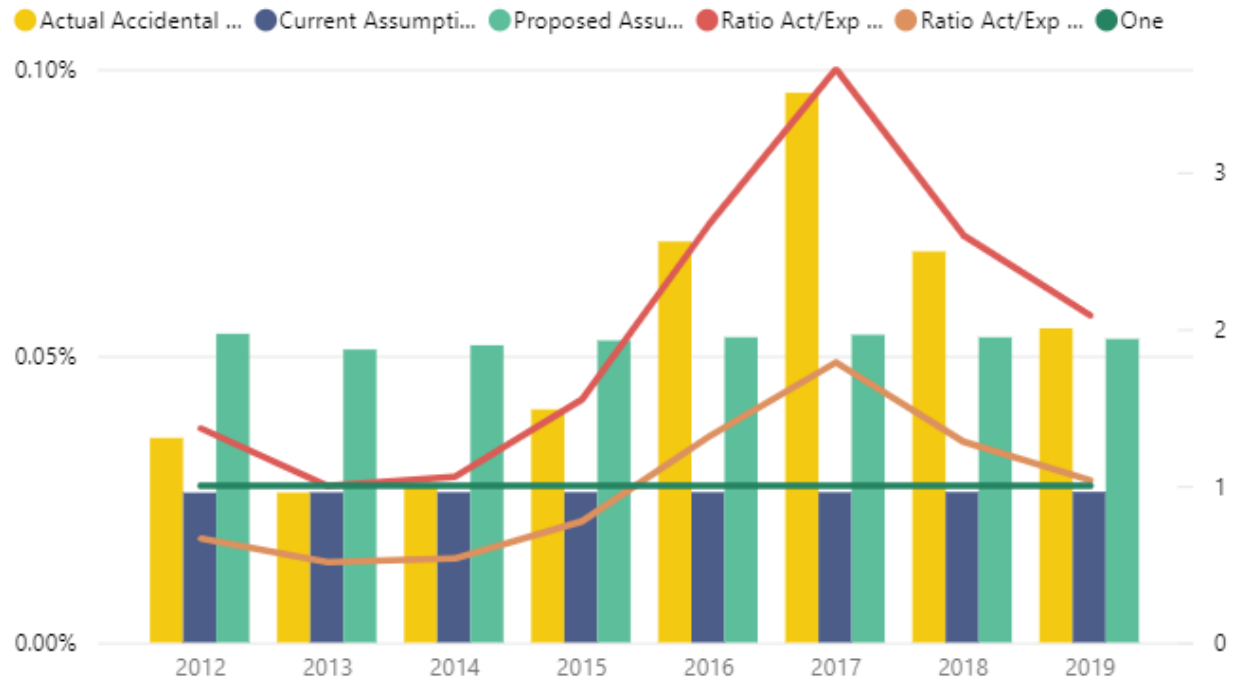
Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	8	5.9	22,426	0.0357%	0.0261%	▲ 1.37
2013	7	7.0	26,779	0.0261%	0.0262%	● 1.00
2014	7	6.6	25,236	0.0277%	0.0262%	● 1.06
2015	10	6.4	24,603	0.0406%	0.0262%	◆ 1.55
2016	17	6.4	24,310	0.0699%	0.0262%	◆ 2.67
2017	24	6.6	25,033	0.0959%	0.0262%	◆ 3.66
2018	17	6.5	24,930	0.0682%	0.0262%	◆ 2.60
2019	14	6.7	25,552	0.0548%	0.0263%	◆ 2.09
Total	104	52.1	198,869	0.0523%	0.0262%	◆ 2.00

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities Proposed	Total Exposed	Actual Accidental Disability Rate	Proposed Assumption Accidental Disability	Act/Exp Proposed Accidental Disability
2012	8	12.1	22,426	0.0357%	0.0538%	▲ 0.66
2013	7	13.7	26,779	0.0261%	0.0511%	▲ 0.51
2014	7	13.1	25,236	0.0277%	0.0518%	▲ 0.54
2015	10	13.0	24,603	0.0406%	0.0527%	▲ 0.77
2016	17	12.9	24,310	0.0699%	0.0532%	▲ 1.31
2017	24	13.4	25,033	0.0959%	0.0537%	◆ 1.79
2018	17	13.3	24,930	0.0682%	0.0532%	▲ 1.28
2019	14	13.5	25,552	0.0548%	0.0529%	● 1.04
Total	104	105.0	198,869	0.0523%	0.0528%	● 0.99

Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Year

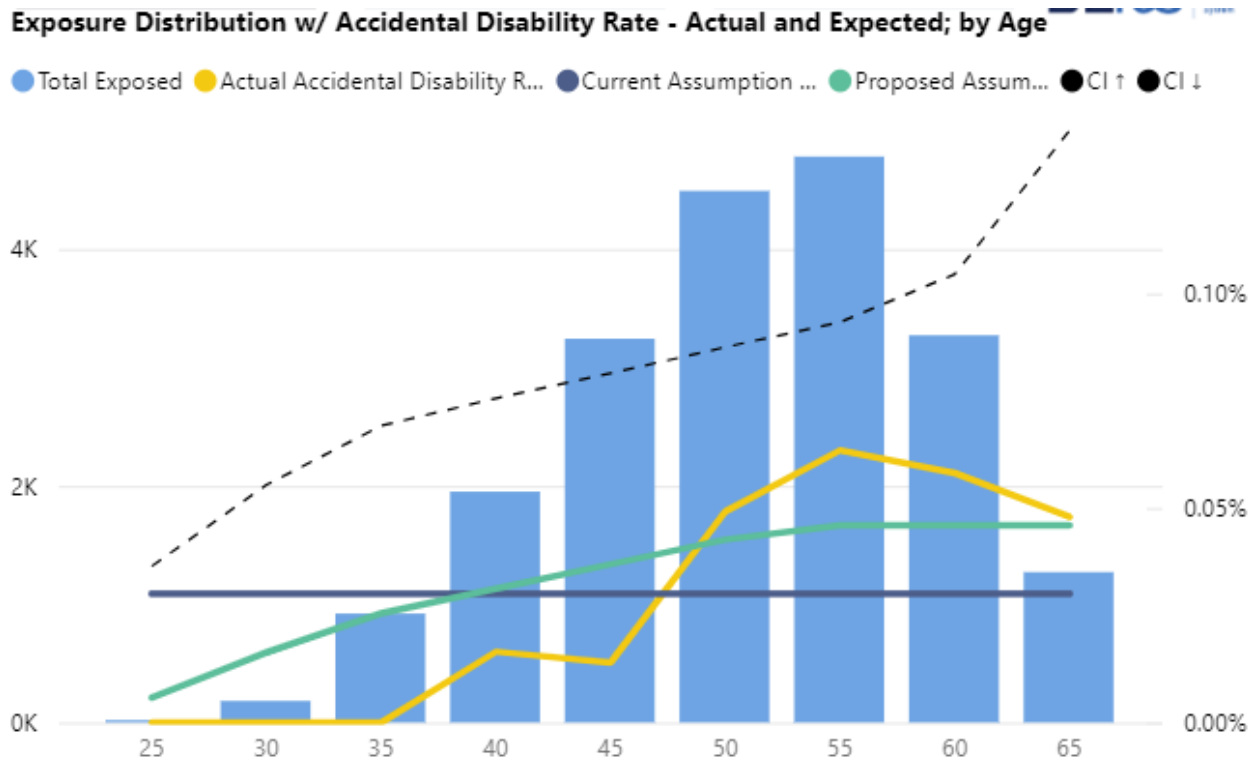


Accidental Disability Rate - Actual, Expected, and Ratio; by Year

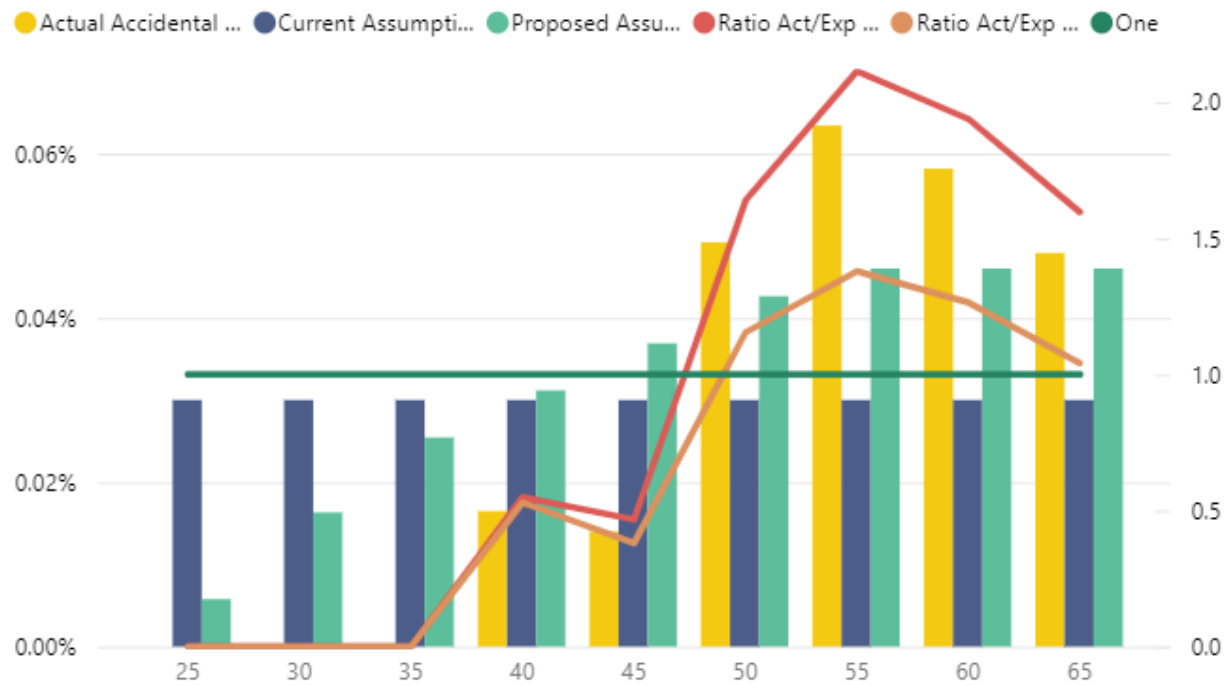


Males

The following charts show the experience of male members for accidental disability retirement by year for the age range 25 to 69 and for the service range 0 to 34. The actual rate of accidental disability averaged 0.0312% whereas the overall expected rate of accidental disability averaged 0.0300% based on the current assumptions and 0.0355% based on the proposed assumptions.



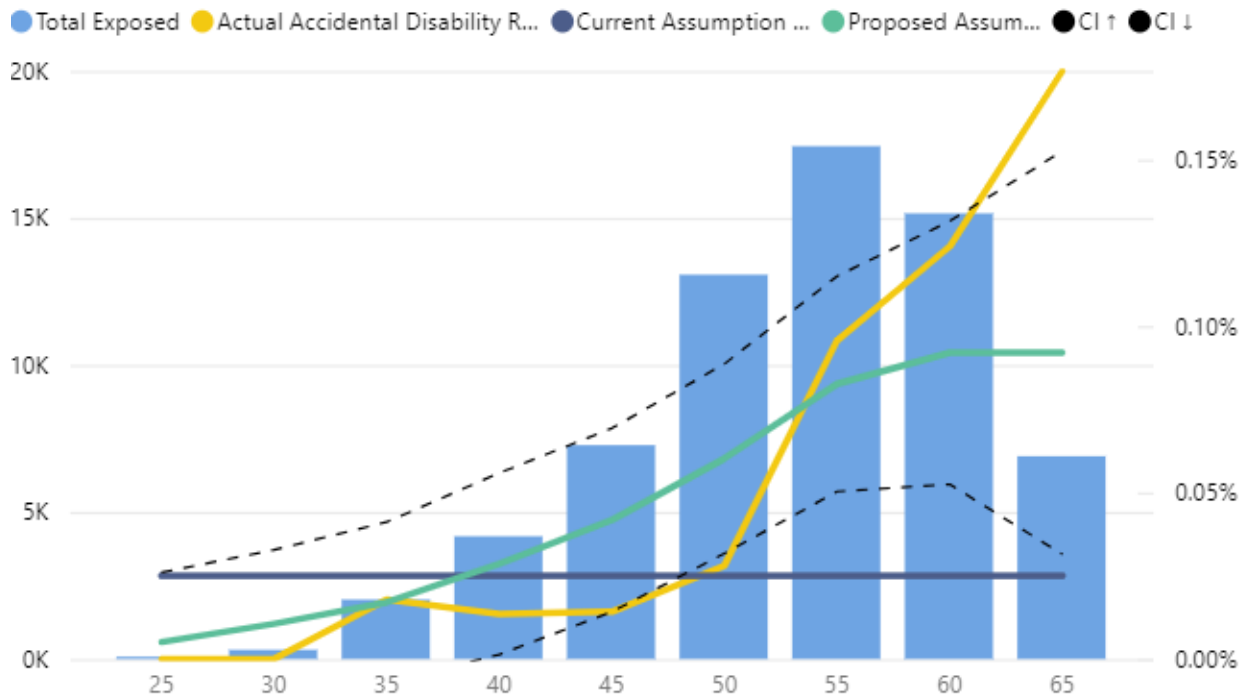
Accidental Disability Rate - Actual, Expected, and Ratio; by Age



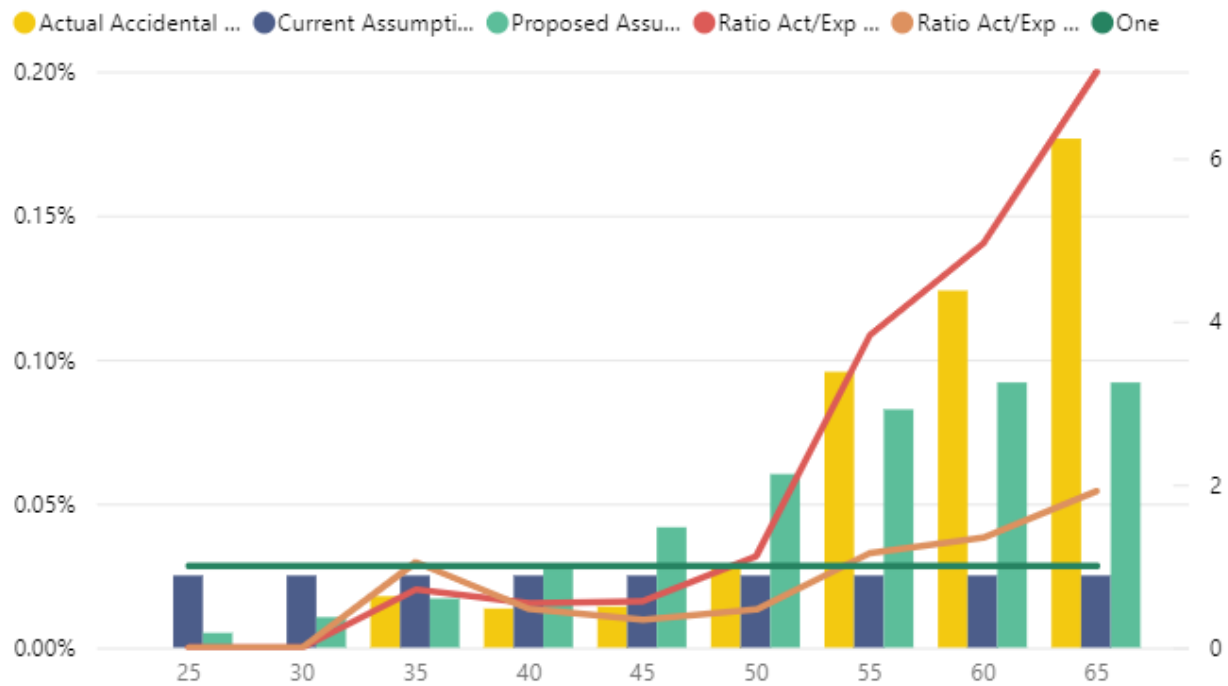
Females

The following charts show the experience of female members for accidental disability retirement by year for the age range 25 to 69 and for the service range 0 to 34. The actual rate of accidental disability averaged 0.0590% whereas the overall expected rate of accidental disability averaged 0.0250% based on the current assumptions and 0.0583% based on the proposed assumptions.

Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Age



Accidental Disability Rate - Actual, Expected, and Ratio; by Age



Summary

The proposed rates have increased the anticipated number of accidental disability retirements, which will result in an increase in plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM				
CURRENT				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
15	0.20%	0.20%	0.030%	0.025%
16	0.20%	0.20%	0.030%	0.025%
17	0.20%	0.20%	0.030%	0.025%
18	0.20%	0.20%	0.030%	0.025%
19	0.20%	0.20%	0.030%	0.025%
20	0.20%	0.20%	0.030%	0.025%
21	0.20%	0.20%	0.030%	0.025%
22	0.20%	0.20%	0.030%	0.025%
23	0.20%	0.20%	0.030%	0.025%
24	0.20%	0.20%	0.030%	0.025%
25	0.20%	0.20%	0.030%	0.025%
26	0.20%	0.20%	0.030%	0.025%
27	0.20%	0.20%	0.030%	0.025%
28	0.20%	0.20%	0.030%	0.025%
29	0.20%	0.20%	0.030%	0.025%
30	0.20%	0.20%	0.030%	0.025%
31	0.22%	0.20%	0.030%	0.025%
32	0.24%	0.20%	0.030%	0.025%
33	0.26%	0.20%	0.030%	0.025%
34	0.28%	0.20%	0.030%	0.025%
35	0.30%	0.20%	0.030%	0.025%
36	0.32%	0.21%	0.030%	0.025%
37	0.34%	0.22%	0.030%	0.025%
38	0.36%	0.23%	0.030%	0.025%
39	0.38%	0.24%	0.030%	0.025%
40	0.40%	0.25%	0.030%	0.025%
41	0.42%	0.26%	0.030%	0.025%
42	0.44%	0.27%	0.030%	0.025%
43	0.46%	0.28%	0.030%	0.025%
44	0.48%	0.29%	0.030%	0.025%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM				
CURRENT				
PROBABILITIES OF DISABILITY RETIREMENT				
	Ordinary Disability		Accidental Disability	
Age	Males	Females	Males	Females
45	0.50%	0.30%	0.030%	0.025%
46	0.52%	0.34%	0.030%	0.025%
47	0.54%	0.38%	0.030%	0.025%
48	0.56%	0.42%	0.030%	0.025%
49	0.58%	0.46%	0.030%	0.025%
50	0.60%	0.50%	0.030%	0.025%
51	0.62%	0.54%	0.030%	0.025%
52	0.64%	0.58%	0.030%	0.025%
53	0.66%	0.62%	0.030%	0.025%
54	0.68%	0.66%	0.030%	0.025%
55	0.70%	0.70%	0.030%	0.025%
56	0.70%	0.70%	0.030%	0.025%
57	0.70%	0.70%	0.030%	0.025%
58	0.70%	0.70%	0.030%	0.025%
59	0.70%	0.70%	0.030%	0.025%
60	0.70%	0.70%	0.030%	0.025%
61	0.70%	0.70%	0.030%	0.025%
62	0.70%	0.70%	0.030%	0.025%
63	0.70%	0.70%	0.030%	0.025%
64	0.70%	0.70%	0.030%	0.025%
65	0.70%	0.70%	0.030%	0.025%
66	0.70%	0.70%	0.030%	0.025%
67	0.70%	0.70%	0.030%	0.025%
68	0.70%	0.70%	0.030%	0.025%
69	0.70%	0.70%	0.030%	0.025%
70	0.70%	0.70%	0.030%	0.025%
71	0.70%	0.70%	0.030%	0.025%
72	0.70%	0.70%	0.030%	0.025%
73	0.70%	0.70%	0.030%	0.025%
74	0.70%	0.70%	0.030%	0.025%
75	0.70%	0.70%	0.030%	0.025%
76	0.70%	0.70%	0.030%	0.025%
77	0.70%	0.70%	0.030%	0.025%
78	0.70%	0.70%	0.030%	0.025%
79	0.70%	0.70%	0.030%	0.025%
80	N/A	N/A	N/A	N/A

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF DISABILITY RETIREMENT ¹				
	Ordinary Disability ^{2,3}		Accidental Disability	
Age	Males	Females	Males	Females
15	0.20%	0.20%	0.0023%	0.0023%
16	0.20%	0.20%	0.0023%	0.0023%
17	0.20%	0.20%	0.0023%	0.0023%
18	0.20%	0.20%	0.0023%	0.0023%
19	0.20%	0.20%	0.0023%	0.0023%
20	0.20%	0.20%	0.0023%	0.0023%
21	0.20%	0.20%	0.0023%	0.0023%
22	0.20%	0.20%	0.0023%	0.0023%
23	0.20%	0.20%	0.0023%	0.0023%
24	0.20%	0.20%	0.0023%	0.0023%
25	0.20%	0.20%	0.0023%	0.0023%
26	0.20%	0.20%	0.0023%	0.0035%
27	0.20%	0.20%	0.0046%	0.0046%
28	0.20%	0.20%	0.0069%	0.0058%
29	0.20%	0.20%	0.0092%	0.0069%
30	0.20%	0.20%	0.0115%	0.0081%
31	0.20%	0.20%	0.0138%	0.0092%
32	0.20%	0.20%	0.0161%	0.0104%
33	0.20%	0.20%	0.0184%	0.0115%
34	0.20%	0.20%	0.0207%	0.0127%
35	0.20%	0.20%	0.0230%	0.0138%
36	0.22%	0.21%	0.0242%	0.0150%
37	0.24%	0.22%	0.0253%	0.0161%
38	0.26%	0.23%	0.0265%	0.0184%
39	0.28%	0.24%	0.0276%	0.0207%
40	0.30%	0.25%	0.0288%	0.0230%
41	0.32%	0.26%	0.0299%	0.0253%
42	0.34%	0.27%	0.0311%	0.0276%
43	0.36%	0.28%	0.0322%	0.0311%
44	0.38%	0.29%	0.0334%	0.0345%
45	0.40%	0.30%	0.0345%	0.0368%
46	0.42%	0.35%	0.0357%	0.0391%
47	0.44%	0.40%	0.0368%	0.0414%
48	0.46%	0.45%	0.0380%	0.0437%
49	0.50%	0.50%	0.0391%	0.0460%
50	0.54%	0.52%	0.0403%	0.0506%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF DISABILITY RETIREMENT ¹				
	Ordinary Disability ^{2,3}		Accidental Disability	
Age	Males	Females	Males	Females
51	0.58%	0.56%	0.0414%	0.0552%
52	0.62%	0.60%	0.0426%	0.0598%
53	0.66%	0.64%	0.0437%	0.0644%
54	0.70%	0.68%	0.0449%	0.0690%
55	0.74%	0.70%	0.0460%	0.0736%
56	0.78%	0.74%	0.0460%	0.0782%
57	0.82%	0.78%	0.0460%	0.0828%
58	0.86%	0.82%	0.0460%	0.0874%
59	0.88%	0.86%	0.0460%	0.0920%
60	0.90%	0.90%	0.0460%	0.0920%
61	0.92%	0.92%	0.0460%	0.0920%
62	0.94%	0.94%	0.0460%	0.0920%
63	0.96%	0.96%	0.0460%	0.0920%
64	0.98%	0.98%	0.0460%	0.0920%
65	1.00%	1.00%	0.0460%	0.0920%
66	1.00%	1.00%	0.0460%	0.0920%
67	1.00%	1.00%	0.0460%	0.0920%
68	1.00%	1.00%	0.0460%	0.0920%
69	1.00%	1.00%	0.0460%	0.0920%
70	1.00%	1.00%	0.0460%	0.0920%
71	1.00%	1.00%	0.0460%	0.0920%
72	1.00%	1.00%	0.0460%	0.0920%
73	1.00%	1.00%	0.0460%	0.0920%
74	1.00%	1.00%	0.0460%	0.0920%
75	1.00%	1.00%	0.0460%	0.0920%
76	1.00%	1.00%	0.0460%	0.0920%
77	1.00%	1.00%	0.0460%	0.0920%
78	1.00%	1.00%	0.0460%	0.0920%
79	1.00%	1.00%	0.0460%	0.0920%
80	N/A	N/A	N/A	N/A

Greater of disability benefit and retirement benefit is valued if eligible for early or service retirement

² No rates of ordinary disability apply prior to completion of 10 years of service

³ At attainment of the following age/service combinations, multiply rates above by 50%:

Basic Plan (Plan F): Age 62 and 20 years of service

Age 57 Plan (Plans I&M): Age 57 and 20 years of service

Tier 6 (Plan R): Age 63 and 20 years of service

55/27 (Plans P&Q): Age 62 and 20 years of service or Age 55 and 27 years of service

55/25 (Plans K&H): Age 62 and 20 years of service or Age 55 and 25 years of service

Physically Taxing Plans (Plans N&W): Age 62 and 20 years of service or Age 50 and 25 years of service

Pre-retirement Death

Plan codes excluded in the analysis of other contingencies are part of the analysis of pre-retirement death.

Mortality assumptions involve two components: a base table and a mortality improvement scale. The mortality improvement scale adjusts the mortality rates of the base table to reflect that generally rates of mortality are anticipated to improve over time.

The Society of Actuaries (SOA) has published mortality improvement scales (MP scales) each year from 2014 to 2021. In the last several actuarial valuations, OA has used the mortality improvement scale that coincides with the valuation date. For example, OA used the MP-2020 scale in its June 30, 2020 lag actuarial valuation. In this analysis, we used the most recent improvement scale (MP-2021) published by the SOA as of the date of this analysis. Please note that the SOA has not published an updated MP scale due to the pandemic.

The SOA MP-2021 improvement scale is based on data through 2019 (before the onset of Covid) from the Social Security Administration (SSA). Even though the aggregate (for all ages) long-term trend has been towards mortality improvements, this is not always the case for each age. Therefore, there are situations where the expected mortality rate in a later year is higher than base rate.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and treatment of excess deaths due to the Covid pandemic, which occurred in 2020 – 2022. The analysis to develop our recommendations exclude the mortality experience of members during the pandemic and reflect the experience from 2012 - 2019.

In this study the base table of the current assumption corresponds to the year 2012; expected mortality rates in future years are obtained from the base table and the MP-2021 scale. For example, the 2017 (July 1, 2016 – June 30, 2017) mortality rates are derived from the base table (2012) adjusted with four years of improvements until 2016. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

For the proposed assumption, proposed rates were initially determined as of the mid-year of the study period or fiscal year 2016. MP-2021 was then used to adjust those rates to earlier and later years. The proposed mortality rates shown in the following section have been adjusted to reflect a base year of 2019. We recommend that MP-2021 continue to be used to reflect mortality improvements both before and after the measurement date.

In reviewing the current assumption, we compared the actual experience to published tables from the SOA. The most recent tables published by the SOA reflected experience for public plan retirement systems separated into Teachers (PubT), General employees (PubG) and Public Safety (PubS) members. Adjustments were made to the standard SOA tables to match the experience of the system or the current tables, and for consistency with recommended postretirement mortality tables, to determine if the SOA tables provided a better fit.

Ordinary Death

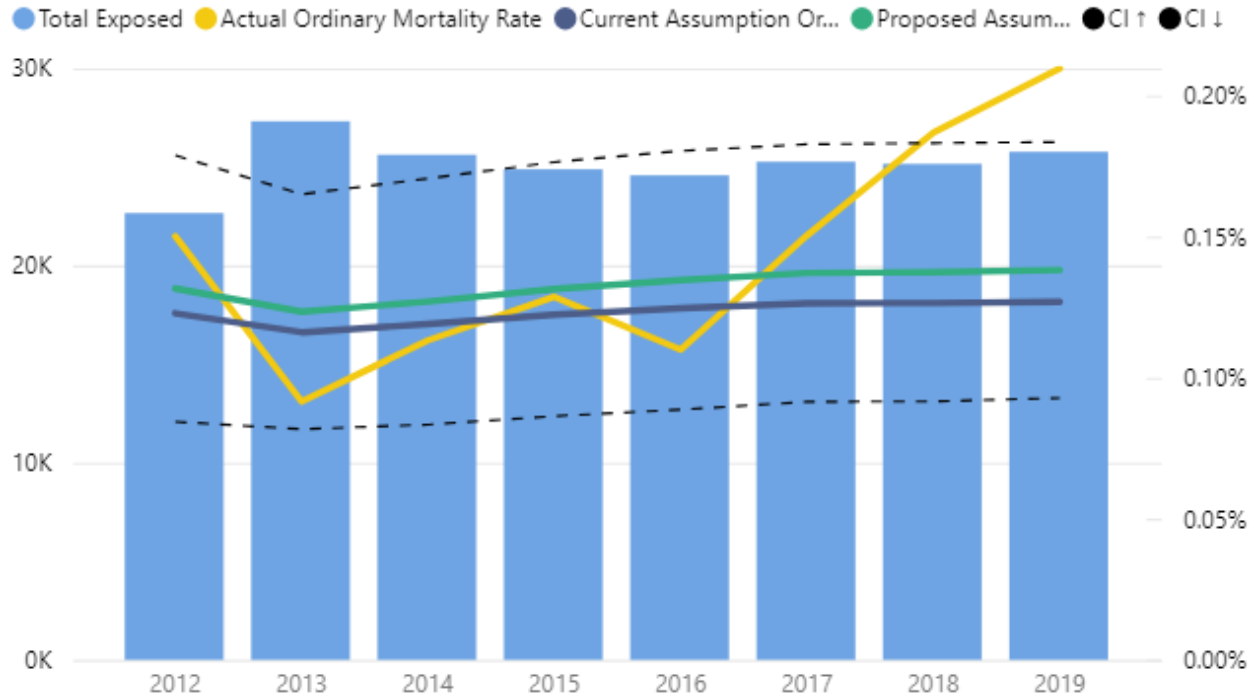
For BERS, we compared the experience to PubG tables without further adjustments. We propose to use the PubG table, which is consistent with the proposed healthy annuitant mortality table.

The following tables show the experience of ordinary death by year, for the age range (20 to 69) during the period 2012 – 2019 based on the current and proposed assumptions for both males and females combined. The A/E ratio decreased from 1.16 to 1.07.

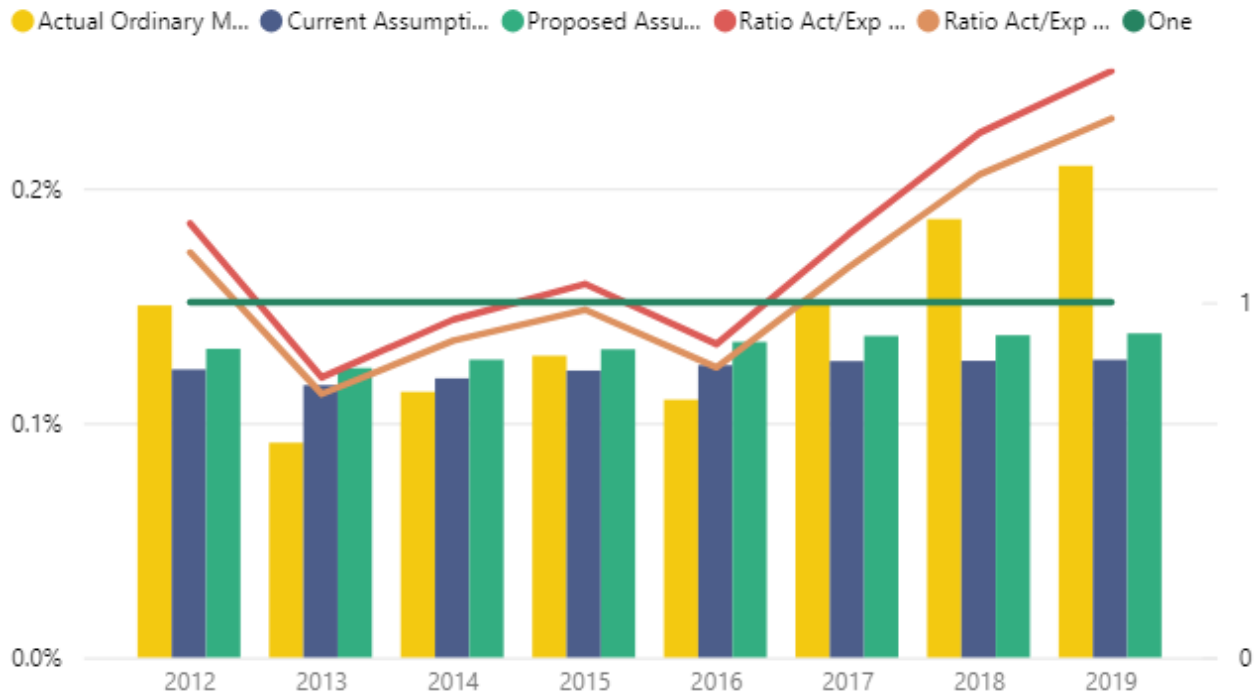
Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
2012	35	27.9	22,684	0.1543%	0.1229%	▲ 1.26
2013	25	31.8	27,340	0.0914%	0.1162%	▲ 0.79
2014	29	30.6	25,657	0.1130%	0.1191%	● 0.95
2015	32	30.5	24,927	0.1284%	0.1225%	● 1.05
2016	27	30.7	24,614	0.1097%	0.1247%	▲ 0.88
2017	38	32.0	25,309	0.1501%	0.1266%	▲ 1.19
2018	47	31.9	25,182	0.1866%	0.1266%	▲ 1.47
2019	54	32.8	25,802	0.2093%	0.1271%	◆ 1.65
Total	287	248.1	201,515	0.1424%	0.1231%	▲ 1.16

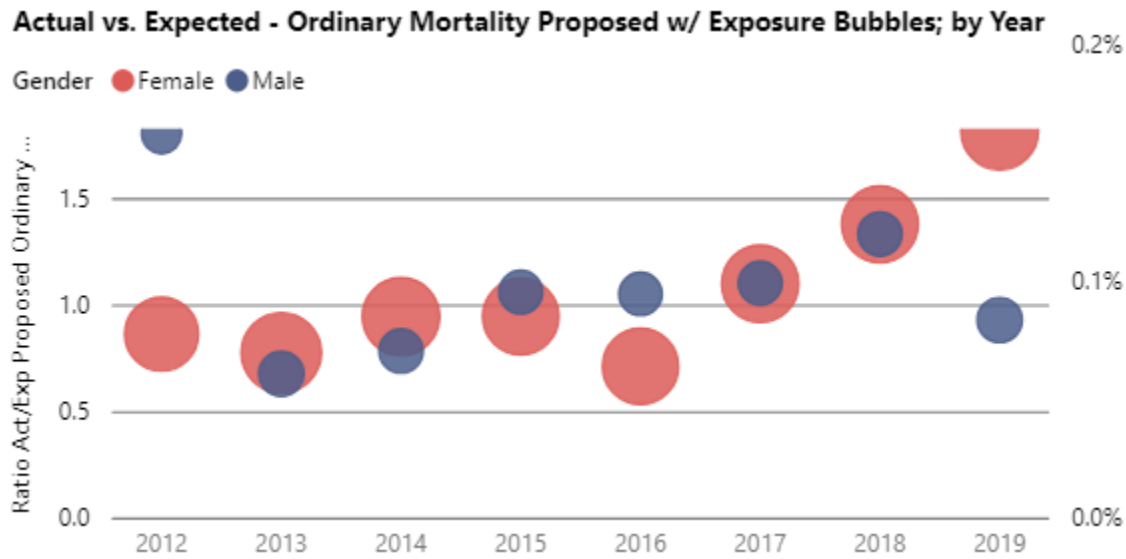
Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
2012	35	29.89	22,684	0.1543%	0.1318%	▲ 1.17
2013	25	33.77	27,340	0.0914%	0.1235%	▲ 0.74
2014	29	32.64	25,657	0.1130%	0.1272%	▲ 0.89
2015	32	32.82	24,927	0.1284%	0.1317%	● 0.98
2016	27	33.18	24,614	0.1097%	0.1348%	▲ 0.81
2017	38	34.79	25,309	0.1501%	0.1374%	● 1.09
2018	47	34.65	25,182	0.1866%	0.1376%	▲ 1.36
2019	54	35.72	25,802	0.2093%	0.1385%	◆ 1.51
Total	287	267.45	201,515	0.1424%	0.1327%	● 1.07

Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Year



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Year





The following section displays results by gender.

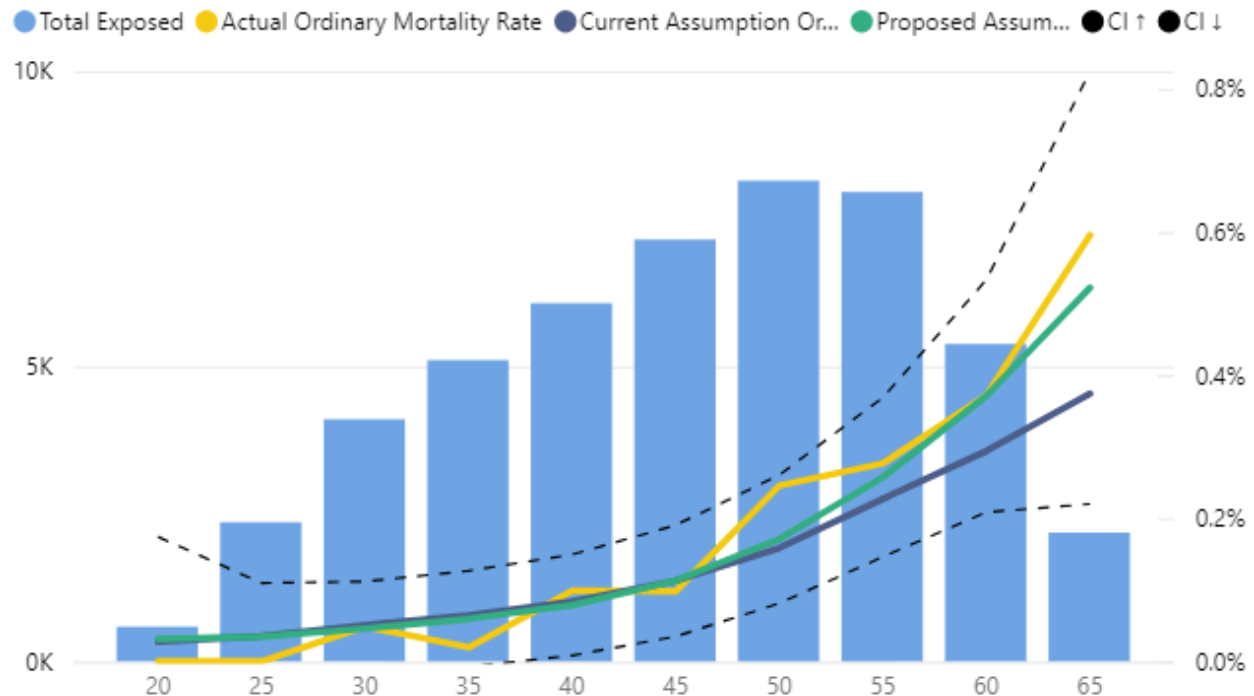
Males

The following charts show the experience of ordinary death by age band, for the age range (20 to 69) during the period 2012 – 2019 based on the current and proposed assumptions. The A/E ratio decreased from 1.23 to 1.08. Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

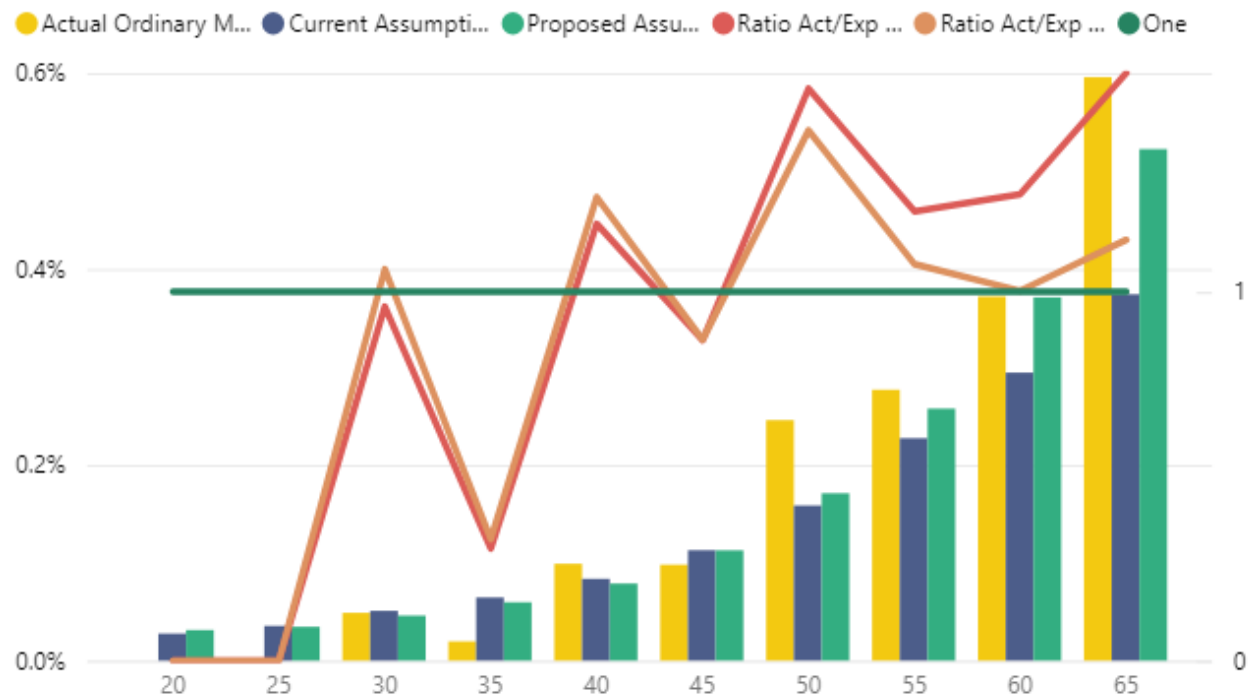
Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	0	0.2	587	0.0000%	0.0276%	0.00
25	0	0.8	2,357	0.0000%	0.0355%	0.00
30	2	2.1	4,103	0.0487%	0.0508%	0.96
35	1	3.3	5,104	0.0196%	0.0645%	0.30
40	6	5.1	6,069	0.0989%	0.0835%	1.18
45	7	8.1	7,148	0.0979%	0.1127%	0.87
50	20	12.9	8,145	0.2455%	0.1583%	1.55
55	22	18.1	7,958	0.2765%	0.2271%	1.22
60	21	15.9	5,420	0.3875%	0.2941%	1.32
65	13	8.4	2,236	0.5814%	0.3742%	1.55
Total	92	74.8	49,127	0.1873%	0.1522%	1.23

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
20	0	0.18	587	0.0000%	0.0312%	0.00
25	0	0.81	2,357	0.0000%	0.0345%	0.00
30	2	1.89	4,103	0.0487%	0.0459%	1.06
35	1	3.04	5,104	0.0196%	0.0595%	0.33
40	6	4.78	6,069	0.0989%	0.0787%	1.26
45	7	8.05	7,148	0.0979%	0.1126%	0.87
50	20	13.92	8,145	0.2455%	0.1709%	1.44
55	22	20.48	7,958	0.2765%	0.2574%	1.07
60	21	20.12	5,420	0.3875%	0.3711%	1.04
65	13	11.68	2,236	0.5814%	0.5225%	1.11
Total	92	84.94	49,127	0.1873%	0.1729%	1.08

Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Age



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Age



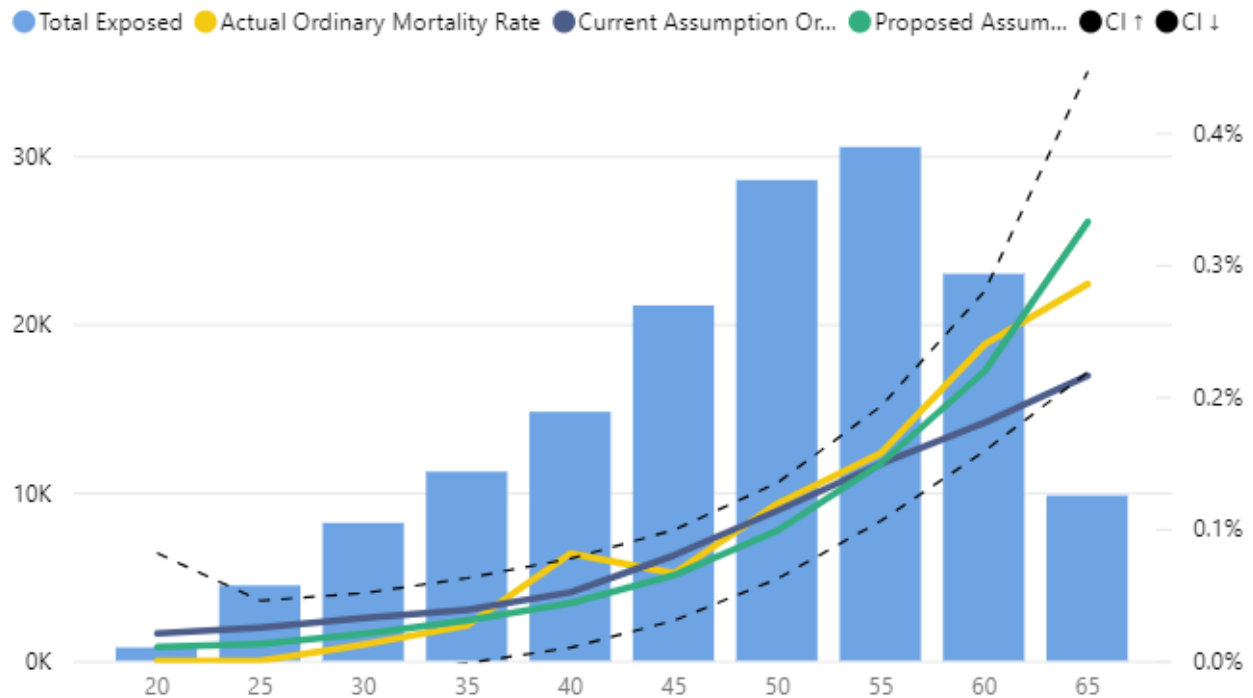
Females

The following charts show the experience of ordinary death by age band, for the age range (20 to 69) during the period 2012 – 2019 based on the current and proposed assumptions. The A/E ratio decreased from 1.12 to 1.07. Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

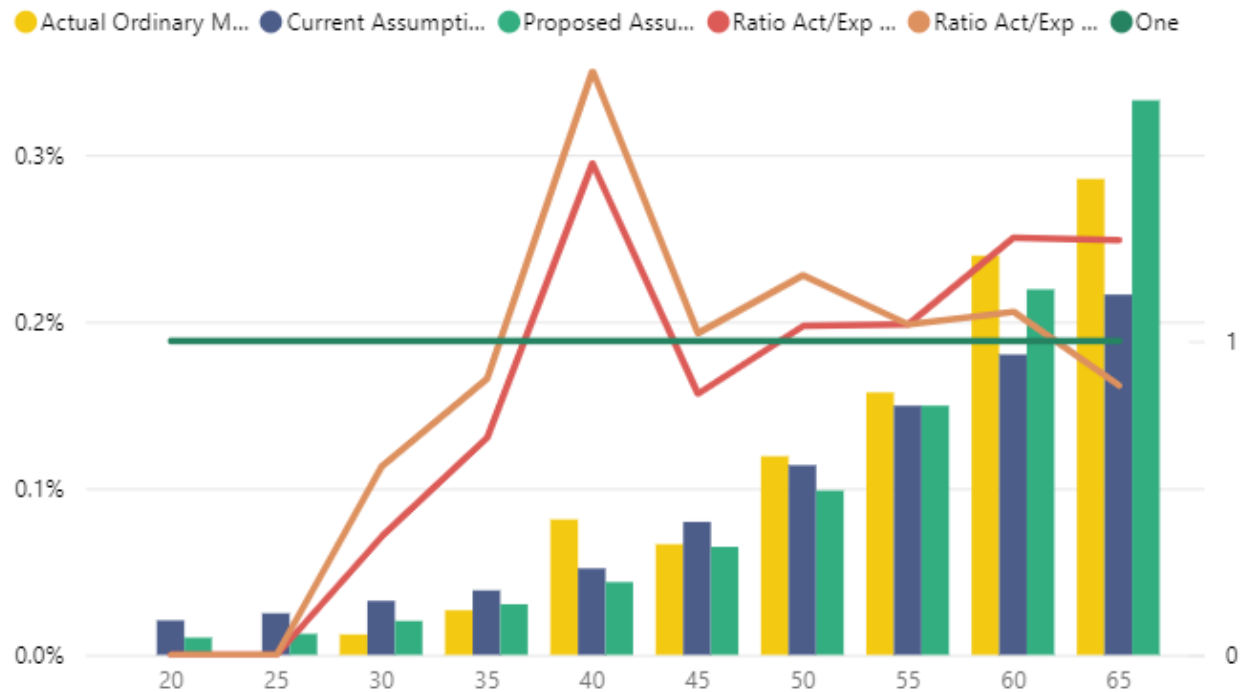
Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	0	0.2	784	0.0000%	0.0206%	0.00
25	0	1.1	4,472	0.0000%	0.0249%	0.00
30	1	2.7	8,187	0.0122%	0.0324%	0.38
35	3	4.3	11,229	0.0267%	0.0386%	0.69
40	12	7.7	14,781	0.0812%	0.0518%	1.57
45	14	16.8	21,100	0.0664%	0.0797%	0.83
50	34	32.5	28,545	0.1191%	0.1137%	1.05
55	48	45.6	30,506	0.1573%	0.1494%	1.05
60	55	41.4	22,974	0.2394%	0.1801%	1.33
65	28	21.2	9,810	0.2854%	0.2160%	1.32
Total	195	173.3	152,388	0.1280%	0.1138%	1.12

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths Proposed	Total Exposed	Actual Ordinary Mortality Rate	Proposed Assumption Ordinary Mortality	Act/Exp Proposed Ordinary Mortality
20	0	0.08	784	0.0000%	0.0103%	0.00
25	0	0.56	4,472	0.0000%	0.0126%	0.00
30	1	1.67	8,187	0.0122%	0.0203%	0.60
35	3	3.41	11,229	0.0267%	0.0304%	0.88
40	12	6.45	14,781	0.0812%	0.0437%	1.86
45	14	13.66	21,100	0.0664%	0.0648%	1.02
50	34	28.12	28,545	0.1191%	0.0985%	1.21
55	48	45.59	30,506	0.1573%	0.1494%	1.05
60	55	50.35	22,974	0.2394%	0.2192%	1.09
65	28	32.62	9,810	0.2854%	0.3325%	0.86
Total	195	182.51	152,388	0.1280%	0.1198%	1.07

Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Age



Ordinary Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

The proposed assumption increased the anticipated number of deaths occurring prior to retirement, which will result in a decrease in plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF ACTIVE MEMBER MORTALITY			
	Ordinary Death		
Age	Males	Females	Accidental Death
15	0.027%	0.020%	0.000%
16	0.027%	0.020%	0.000%
17	0.027%	0.020%	0.000%
18	0.027%	0.020%	0.000%
19	0.027%	0.020%	0.000%
20	0.027%	0.020%	0.000%
21	0.027%	0.020%	0.000%
22	0.027%	0.020%	0.000%
23	0.027%	0.020%	0.000%
24	0.027%	0.020%	0.000%
25	0.027%	0.020%	0.000%
26	0.029%	0.021%	0.000%
27	0.032%	0.023%	0.000%
28	0.035%	0.024%	0.000%
29	0.037%	0.025%	0.000%
30	0.040%	0.027%	0.000%
31	0.043%	0.028%	0.000%
32	0.045%	0.029%	0.000%
33	0.048%	0.031%	0.000%
34	0.051%	0.032%	0.000%
35	0.053%	0.033%	0.000%
36	0.056%	0.035%	0.000%
37	0.059%	0.036%	0.000%
38	0.061%	0.037%	0.000%
39	0.064%	0.039%	0.000%
40	0.067%	0.040%	0.000%
41	0.073%	0.045%	0.000%
42	0.080%	0.051%	0.000%
43	0.087%	0.056%	0.000%
44	0.093%	0.061%	0.000%
45	0.100%	0.067%	0.000%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF ACTIVE MEMBER MORTALITY			
	Ordinary Death		
Age	Males	Females	Accidental Death
46	0.107%	0.073%	0.000%
47	0.113%	0.080%	0.000%
48	0.120%	0.087%	0.000%
49	0.127%	0.093%	0.000%
50	0.133%	0.100%	0.000%
51	0.147%	0.107%	0.000%
52	0.160%	0.113%	0.000%
53	0.173%	0.120%	0.000%
54	0.187%	0.127%	0.000%
55	0.200%	0.133%	0.000%
56	0.213%	0.140%	0.000%
57	0.227%	0.147%	0.000%
58	0.240%	0.153%	0.000%
59	0.253%	0.160%	0.000%
60	0.267%	0.167%	0.000%
61	0.280%	0.173%	0.000%
62	0.293%	0.180%	0.000%
63	0.307%	0.187%	0.000%
64	0.320%	0.193%	0.000%
65	0.333%	0.200%	0.000%
66	0.360%	0.213%	0.000%
67	0.387%	0.227%	0.000%
68	0.413%	0.240%	0.000%
69	0.440%	0.253%	0.000%
70	0.500%	0.300%	0.000%
71	0.580%	0.350%	0.000%
72	0.660%	0.400%	0.000%
73	0.740%	0.450%	0.000%
74	0.820%	0.500%	0.000%
75	0.900%	0.550%	0.000%
76	1.020%	0.640%	0.000%
77	1.140%	0.730%	0.000%
78	1.260%	0.820%	0.000%
79	1.380%	1.000%	0.000%
80	0	0	0

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF ACTIVE MEMBER MORTALITY BASE YEAR 2019			
	Ordinary Death		
Age	Males	Females	Accidental Death
15	0.017%	0.009%	0.000%
16	0.023%	0.011%	0.000%
17	0.031%	0.012%	0.000%
18	0.036%	0.013%	0.000%
19	0.038%	0.013%	0.000%
20	0.037%	0.014%	0.000%
21	0.037%	0.013%	0.000%
22	0.035%	0.012%	0.000%
23	0.033%	0.011%	0.000%
24	0.032%	0.010%	0.000%
25	0.032%	0.011%	0.000%
26	0.035%	0.012%	0.000%
27	0.038%	0.014%	0.000%
28	0.041%	0.015%	0.000%
29	0.044%	0.017%	0.000%
30	0.047%	0.019%	0.000%
31	0.051%	0.021%	0.000%
32	0.054%	0.024%	0.000%
33	0.057%	0.025%	0.000%
34	0.060%	0.027%	0.000%
35	0.064%	0.030%	0.000%
36	0.068%	0.032%	0.000%
37	0.070%	0.035%	0.000%
38	0.074%	0.036%	0.000%
39	0.077%	0.038%	0.000%
40	0.080%	0.040%	0.000%
41	0.083%	0.043%	0.000%
42	0.087%	0.045%	0.000%
43	0.090%	0.047%	0.000%
44	0.095%	0.050%	0.000%
45	0.100%	0.054%	0.000%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF ACTIVE MEMBER MORTALITY BASE YEAR 2019			
	Ordinary Death		
Age	Males	Females	Accidental Death
46	0.106%	0.058%	0.000%
47	0.112%	0.062%	0.000%
48	0.121%	0.066%	0.000%
49	0.130%	0.072%	0.000%
50	0.140%	0.078%	0.000%
51	0.152%	0.086%	0.000%
52	0.165%	0.094%	0.000%
53	0.180%	0.104%	0.000%
54	0.196%	0.114%	0.000%
55	0.214%	0.126%	0.000%
56	0.234%	0.138%	0.000%
57	0.257%	0.151%	0.000%
58	0.281%	0.164%	0.000%
59	0.306%	0.179%	0.000%
60	0.332%	0.195%	0.000%
61	0.359%	0.210%	0.000%
62	0.386%	0.226%	0.000%
63	0.414%	0.243%	0.000%
64	0.443%	0.263%	0.000%
65	0.472%	0.283%	0.000%
66	0.502%	0.307%	0.000%
67	0.535%	0.334%	0.000%
68	0.570%	0.365%	0.000%
69	0.612%	0.400%	0.000%
70	0.657%	0.440%	0.000%
71	0.710%	0.486%	0.000%
72	0.769%	0.538%	0.000%
73	0.837%	0.596%	0.000%
74	0.913%	0.663%	0.000%
75	0.999%	0.737%	0.000%
76	1.094%	0.819%	0.000%
77	1.201%	0.910%	0.000%
78	1.318%	1.013%	0.000%
79	1.448%	1.126%	0.000%
80	0.000%	0.000%	0.000%

Postretirement Mortality

In addition to gender, the post-retirement mortality assumption depends on the type of inactive member:

- 1) Service Retirees
- 2) Disabled Retirees
- 3) Contingent Beneficiaries

The MEST contains all retirees on one page and beneficiaries on another page. On the retiree page, the experience can be examined by status to review disabled retirees versus service retirees. Service retirees include members who have commenced their pension benefit from a terminated vested status in addition to members who have retired from active status. There is a separate MEST containing the postretirement mortality experience of members across all NYCRS systems, which allowed us to review experience and develop proposed assumptions over multiple systems where it was advantageous to do so.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and treatment of excess deaths due to the Covid pandemic, which occurred in 2020 – 2022. The analysis to develop our recommendations excludes the mortality experience of members during the pandemic and reflects the experience from 2015 - 2019. Experience prior to 2015 was excluded as benefit amounts were not available in the historical database prior to this period.

Most mortality studies have found that higher benefits are positively correlated with smaller mortality rates and longer life expectancy. Accordingly, the OA utilizes adjustment factors to convert post-retirement mortality weighted by headcounts to post-retirement mortality weighted by benefit amounts. The current assumption adjustment factors used by the OA are:

Post-Retirement Mortality Adjustment Factor To Convert from Headcount-Weighted to Amount-Weighted		
	Males	Females
Service Retiree	0.980	0.980
Disabled Retiree	0.980	0.980
Contingent Beneficiary	0.890	0.951

Mortality assumptions involve two components: a base table and a mortality improvement scale. The mortality improvement scale adjusts the mortality rates of the base table to reflect that generally rates of mortality are anticipated to improve over time. As noted in the pre-retirement death section, we used the most recent improvement scale (MP-2021) published by the SOA as of the date of this analysis. Please note that the SOA has not published an updated MP scale due to the pandemic.

In this study the base table of the current assumption corresponds to the year 2012; expected mortality rates in future years are obtained from the base table and the MP-2021 scale. For example, the 2017 (July 1, 2016 – June 30, 2017) mortality rates are derived from the base table (2012) adjusted with four years of improvements until 2016. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

For the proposed assumption, proposed rates were initially determined as of the mid-year of the study period or fiscal year 2017. MP-2021 was then used to adjust those rates to earlier and later years. The proposed mortality rates shown in the following section have been adjusted to reflect a base year of 2019. We recommend that MP-2021 continue to be used to reflect mortality improvements both before and after the measurement date.

In reviewing the current assumption, we compared the actual experience to published tables from the SOA. The most recent tables published by the SOA reflected experience for public plan retirement systems separated into Teachers (PubT), General employees (PubG) and Public Safety (PubS) members. The SOA publishes versions of each of these tables where the mortality rates are weighted by the amount of the pension benefit (“amount-weighted”) or weighted by the number of members (headcount-weighted). We compared the amount-weighted experience to the amount-weighted SOA table and the headcount-weighted experience to the headcount-weighted SOA table. Adjustments were made to the applicable standard SOA tables to match the experience of the system to determine if the SOA tables provided a better statistical fit to the experience. For BERS, we used the PubG tables in our analysis.

The SOA combined the experience of teachers and general employees in developing disability annuity mortality tables. Due to lack of credibility, a relatively lower disability incidence rate and consistency with the SOA tables, we combined the experience of TRS, BERS and NYCERS (general, sanitation, transit, and TBTA) in proposing a recommended assumption.

The SOA also combined the experience of all contingent beneficiaries (teachers, general employees and public safety members) into a single table. We combined the experience of all NYCERS systems (TRS, BERS, NYCERS, POLICE and FIRE) in proposing a recommended assumption. The contingent survivor assumption would apply upon the death of the member. While both the member and contingent survivor are both alive, we propose the healthy annuitant mortality table apply.

In the actuarial valuation of pension benefits, we recommend that amount-weighted mortality rates be used. Headcount-weighted mortality rates may be used for other purposes, such as a retiree medical valuation.

Postretirement Mortality – Service Retirees

For BERS, we propose the PubG table without further adjustment which increases the assumed number of deaths. Separate tables exist on a headcount-weighted and amount-weighted basis.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions. The A/E decreased from 1.04 to 0.90. Due to the significantly lower number of deaths recorded in 2015, we excluded this year in our analysis. Excluding this year, the A/E decreased from 1.19 to 1.02.

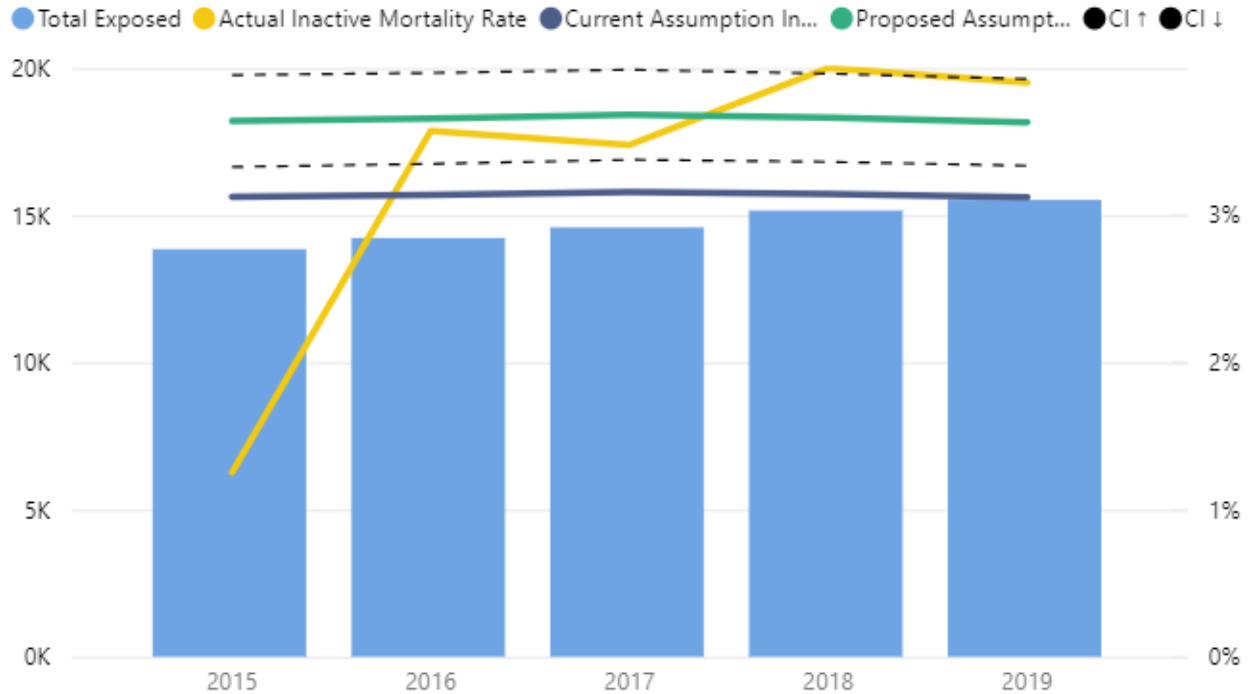
Current Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	173	431.5	13,841	1.2499%	3.1174%	0.40
2016	507	445.5	14,224	3.5644%	3.1319%	1.14
2017	506	459.5	14,582	3.4700%	3.1513%	1.10
2018	605	475.3	15,156	3.9918%	3.1359%	1.27
2019	604	483.2	15,516	3.8928%	3.1143%	1.25
Total	2,395	2,295.0	73,319	3.2665%	3.1301%	1.04

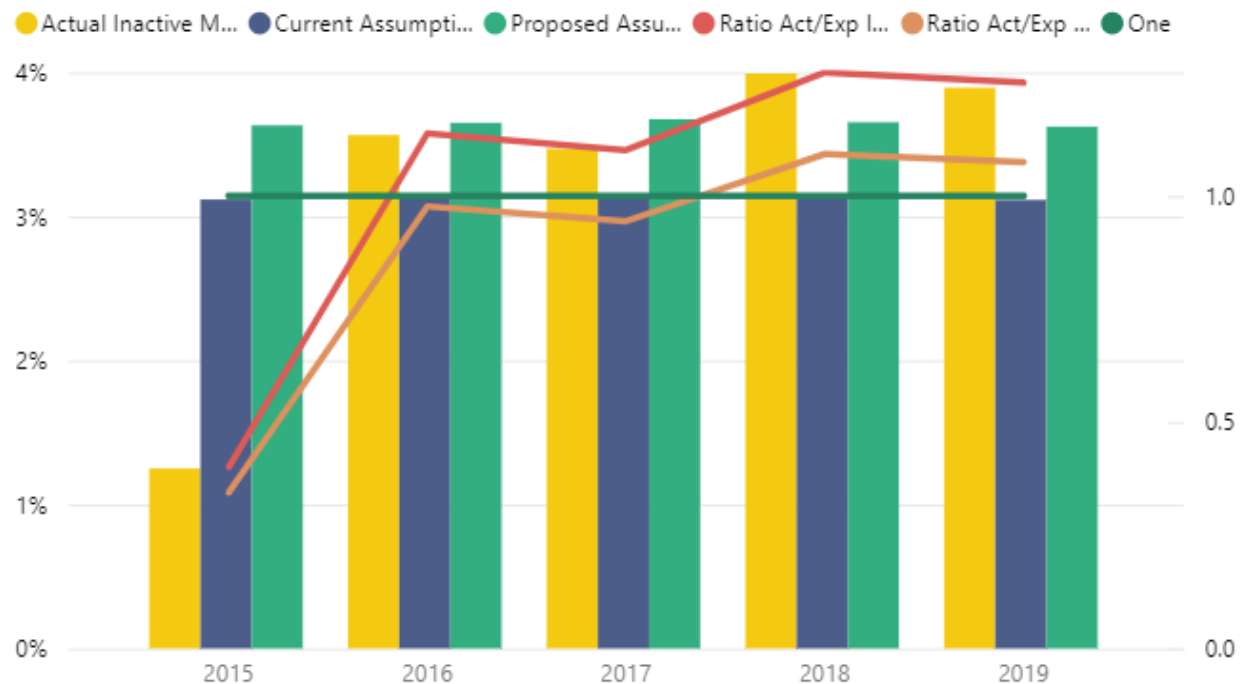
Proposed Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
2015	173	502.7	13,841	1.2499%	3.6321%	0.34
2016	507	519.1	14,224	3.5644%	3.6496%	0.98
2017	506	535.9	14,582	3.4700%	3.6749%	0.94
2018	605	553.8	15,156	3.9918%	3.6540%	1.09
2019	604	562.2	15,516	3.8928%	3.6231%	1.07
Total	2,395	2,673.7	73,319	3.2665%	3.6466%	0.90

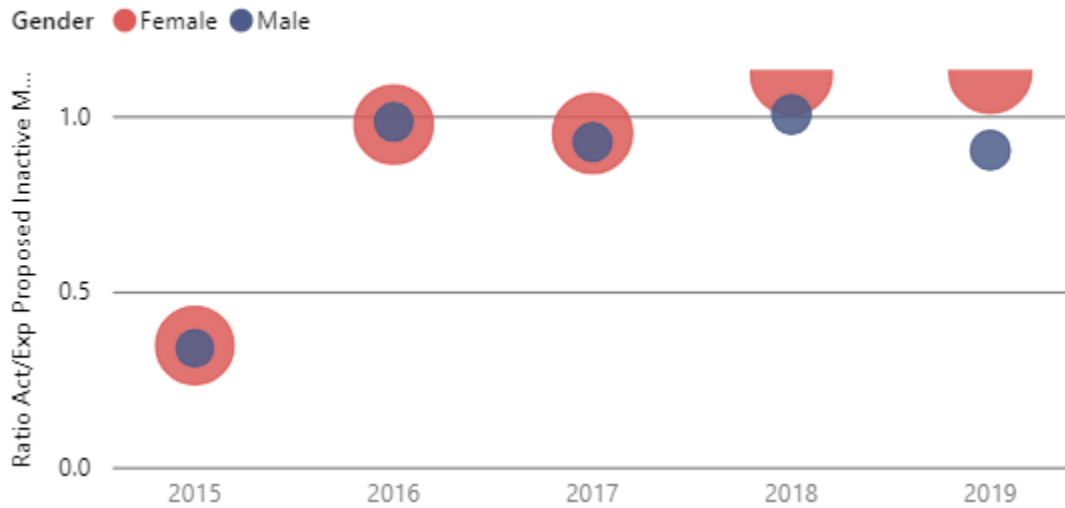
Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Exposure Bubbles; by Year



The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions. The A/E decreased from 1.03 to 0.95. Due to the significantly lower number of deaths recorded in 2015, we excluded this year in our analysis. Excluding this year, the A/E decreased from 1.17 to 1.08.

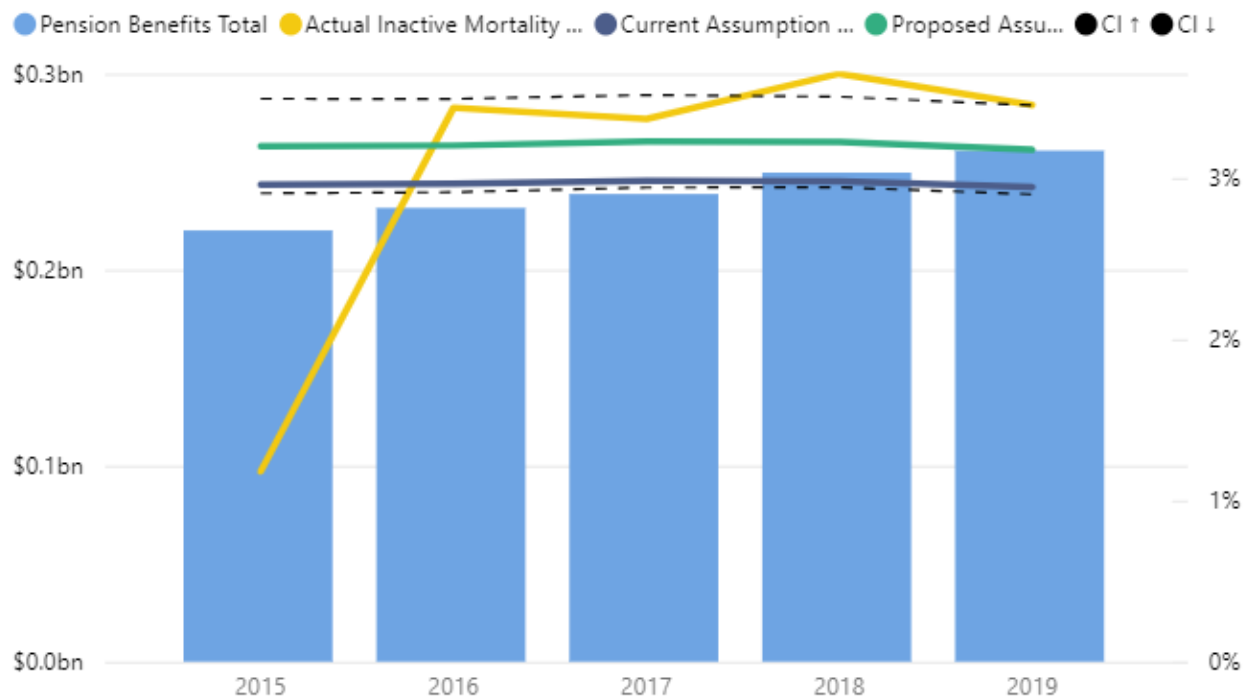
Current Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
2015	\$2.6M	\$6.5M	\$220.0M	1.1801%	2.9583%	0.40
2016	\$8.0M	\$6.9M	\$231.5M	3.4358%	2.9645%	1.16
2017	\$8.0M	\$7.1M	\$238.6M	3.3672%	2.9841%	1.13
2018	\$9.1M	\$7.4M	\$249.5M	3.6474%	2.9803%	1.22
2019	\$9.0M	\$7.7M	\$260.7M	3.4523%	2.9439%	1.17
Total	\$36.7M	\$35.6M	\$1,200.4M	3.0563%	2.9661%	1.03

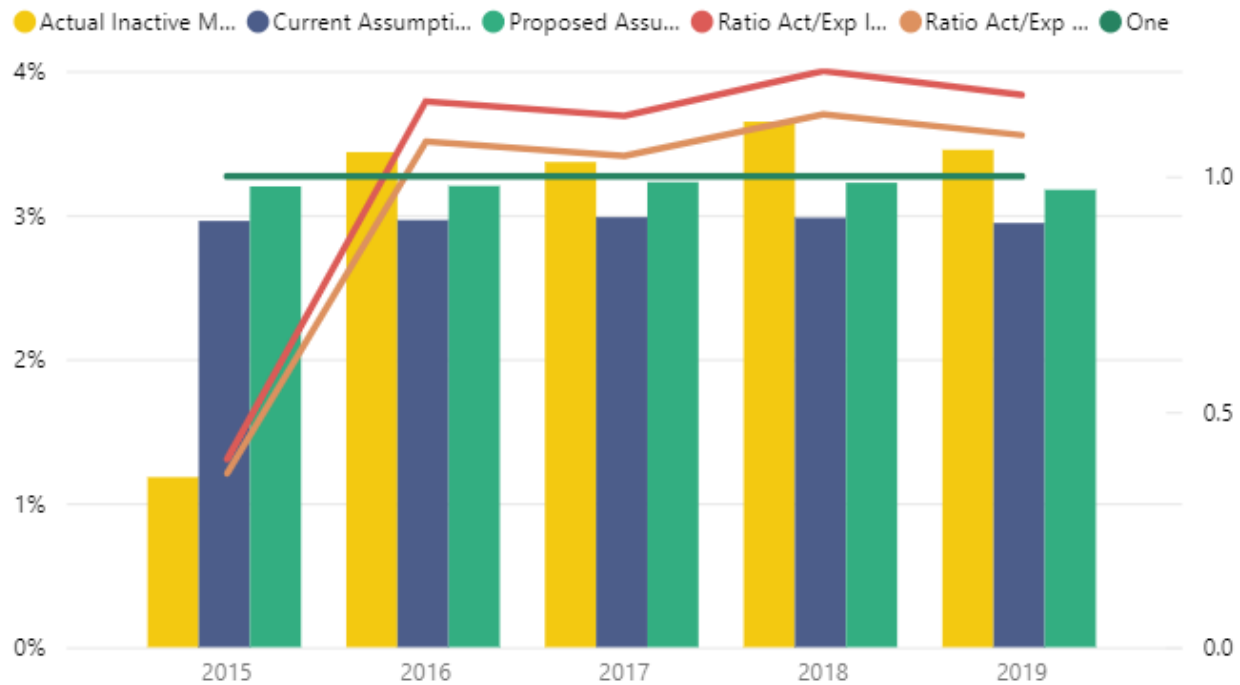
Proposed Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
2015	\$2.6M	\$7.0M	\$220.0M	1.1801%	3.1982%	0.37
2016	\$8.0M	\$7.4M	\$231.5M	3.4358%	3.2015%	1.07
2017	\$8.0M	\$7.7M	\$238.6M	3.3672%	3.2281%	1.04
2018	\$9.1M	\$8.0M	\$249.5M	3.6474%	3.2234%	1.13
2019	\$9.0M	\$8.3M	\$260.7M	3.4523%	3.1750%	1.09
Total	\$36.7M	\$38.5M	\$1,200.4M	3.0563%	3.2050%	0.95

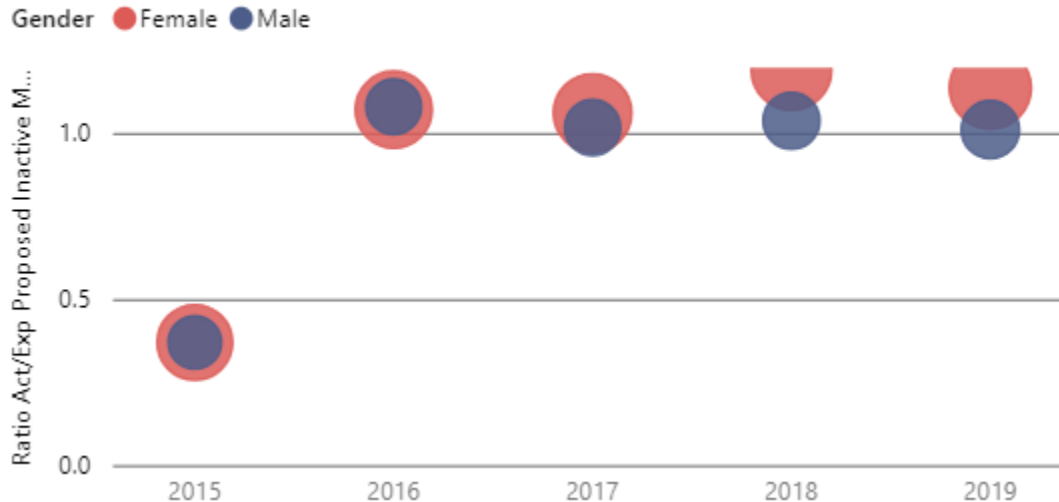
Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Benefit Bubbles; by Year













The following section displays results by gender.











Service Retirees - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2016 – 2019 for males on the current and proposed assumptions. The A/E decreased from 1.05 to 1.03.

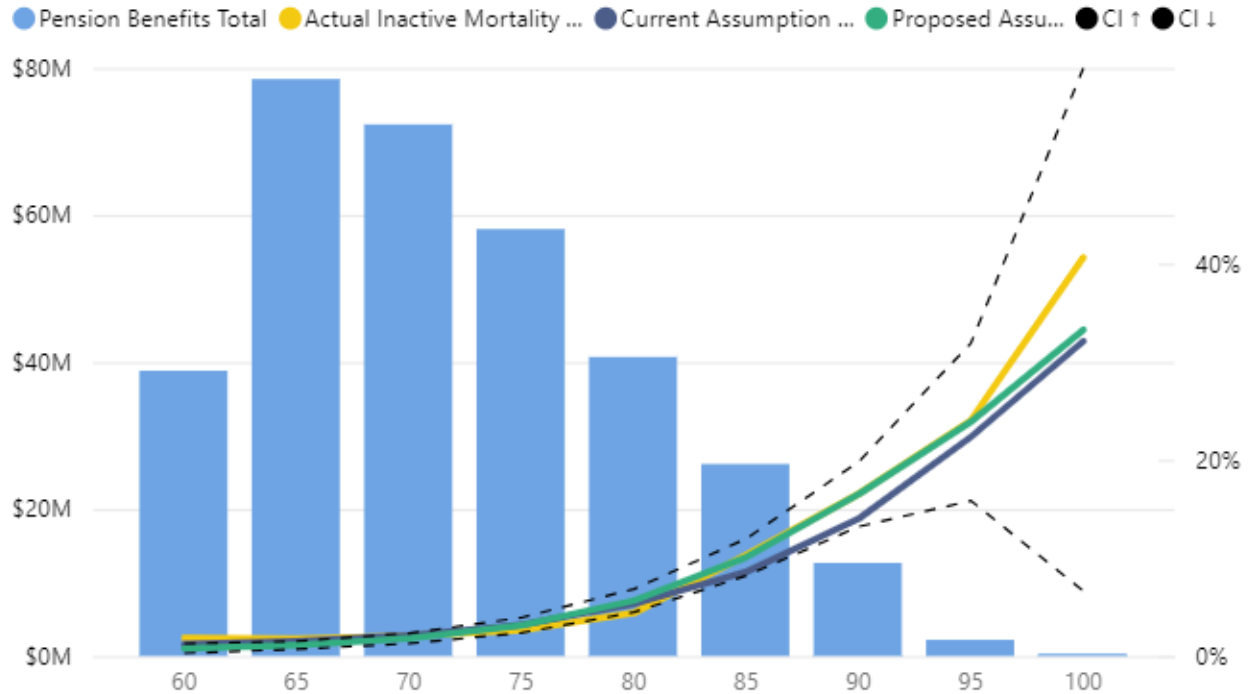
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

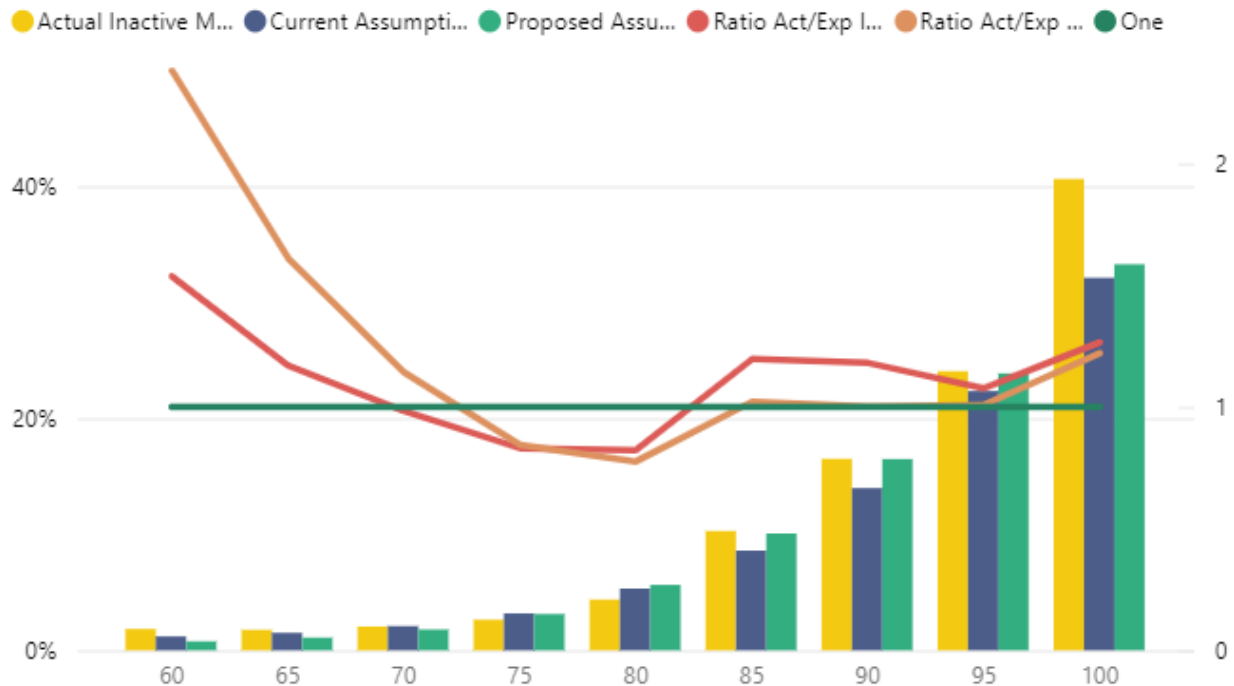
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
60	\$0.7M	\$0.5M	\$38.8M	1.8359%	1.1947%	 1.54
65	\$1.4M	\$1.2M	\$78.5M	1.7649%	1.5075%	 1.17
70	\$1.5M	\$1.5M	\$72.3M	2.0495%	2.0848%	 0.98
75	\$1.5M	\$1.8M	\$58.1M	2.6393%	3.1795%	 0.83
80	\$1.8M	\$2.2M	\$40.7M	4.3730%	5.3188%	 0.82
85	\$2.7M	\$2.2M	\$26.1M	10.2822%	8.5904%	 1.20
90	\$2.1M	\$1.8M	\$12.7M	16.5077%	13.9824%	 1.18
95	\$0.5M	\$0.5M	\$2.2M	24.0527%	22.3443%	 1.08
100	\$0.1M	\$0.1M	\$0.3M	40.6256%	32.1047%	 1.27
Total	\$12.3M	\$11.8M	\$329.6M	3.7358%	3.5687%	 1.05

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
60	\$0.7M	\$0.3M	\$38.8M	1.8359%	0.7703%	 2.38
65	\$1.4M	\$0.9M	\$78.5M	1.7649%	1.0951%	 1.61
70	\$1.5M	\$1.3M	\$72.3M	2.0495%	1.7941%	 1.14
75	\$1.5M	\$1.8M	\$58.1M	2.6393%	3.1319%	 0.84
80	\$1.8M	\$2.3M	\$40.7M	4.3730%	5.6371%	 0.78
85	\$2.7M	\$2.6M	\$26.1M	10.2822%	10.0676%	 1.02
90	\$2.1M	\$2.1M	\$12.7M	16.5077%	16.4850%	 1.00
95	\$0.5M	\$0.5M	\$2.2M	24.0527%	23.8651%	 1.01
100	\$0.1M	\$0.1M	\$0.3M	40.6256%	33.2754%	 1.22
Total	\$12.3M	\$11.9M	\$329.6M	3.7358%	3.6120%	 1.03

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Headcount-weighted

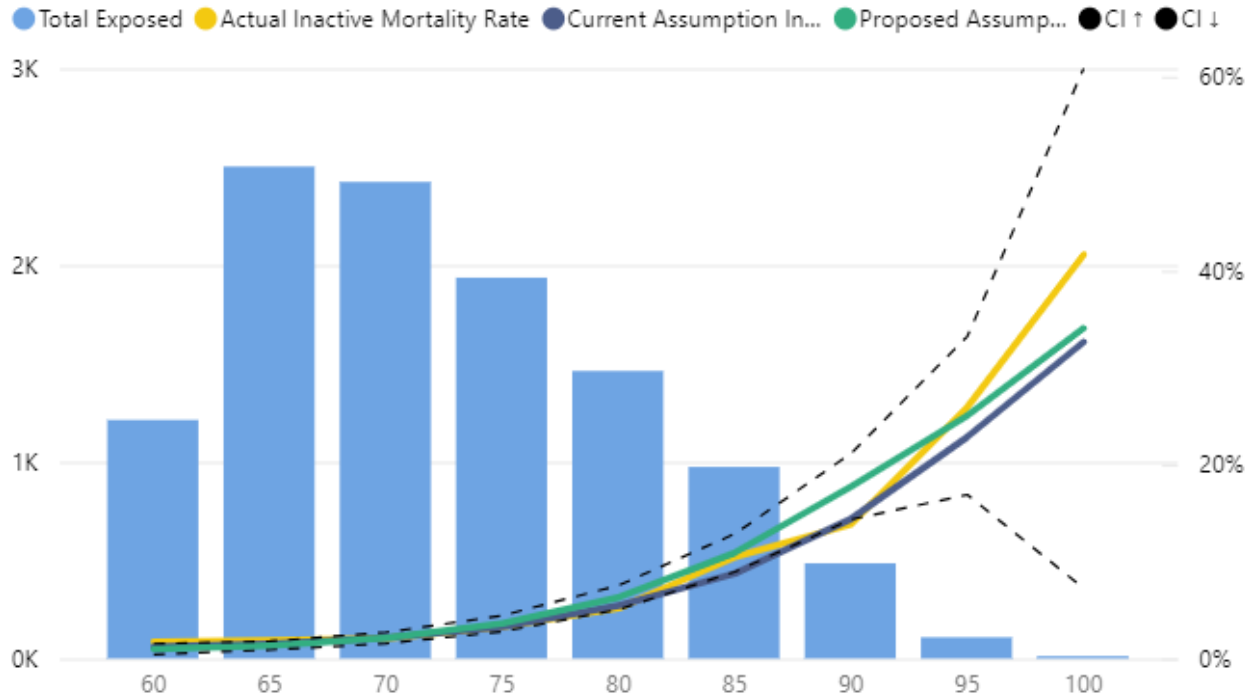
Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2016 – 2019 for males on the current and proposed assumptions. The A/E decreased from 1.06 to 0.95.

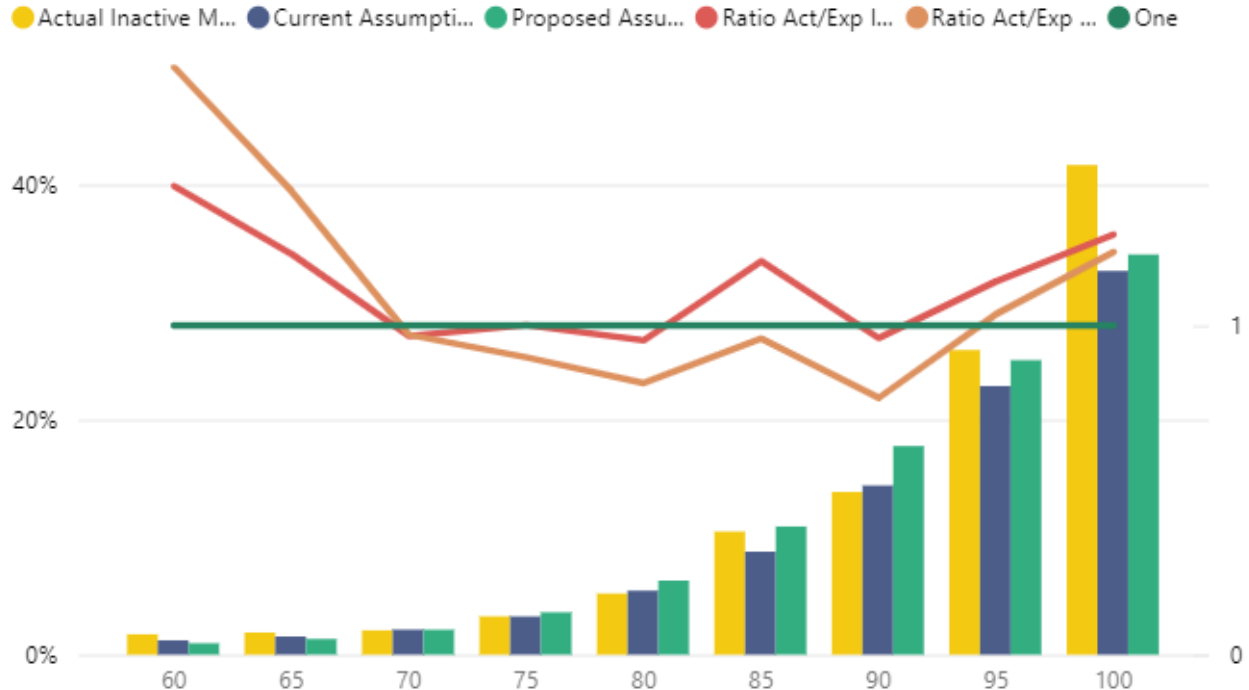
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
60	21	14.8	1,213	1.7312%	1.2161%	▲ 1.42
65	47	38.6	2,501	1.8792%	1.5435%	▲ 1.22
70	50	51.6	2,423	2.0636%	2.1314%	● 0.97
75	63	62.9	1,936	3.2541%	3.2505%	● 1.00
80	76	79.6	1,462	5.1984%	5.4441%	● 0.95
85	102	85.3	974	10.4723%	8.7619%	▲ 1.20
90	67	69.7	484	13.8430%	14.3936%	● 0.96
95	28	24.7	108	25.9259%	22.8555%	▲ 1.13
100	5	3.9	12	41.6667%	32.6517%	▲ 1.28
Total	459	431.1	11,113	4.1303%	3.8795%	● 1.06

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
60	21	11.8	1,213	1.7312%	0.9699%	◆ 1.79
65	47	33.4	2,501	1.8792%	1.3344%	▲ 1.41
70	50	51.4	2,423	2.0636%	2.1231%	● 0.97
75	63	69.8	1,936	3.2541%	3.6033%	● 0.90
80	76	92.1	1,462	5.1984%	6.3001%	▲ 0.83
85	102	106.2	974	10.4723%	10.9047%	● 0.96
90	67	85.9	484	13.8430%	17.7500%	▲ 0.78
95	28	27.1	108	25.9259%	25.0589%	● 1.03
100	5	4.1	12	41.6667%	34.0518%	▲ 1.22
Total	459	481.7	11,113	4.1303%	4.3347%	● 0.95

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Service Retirees - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2016 – 2019 for females on the current and proposed assumptions. The A/E decreased from 1.26 to 1.12.

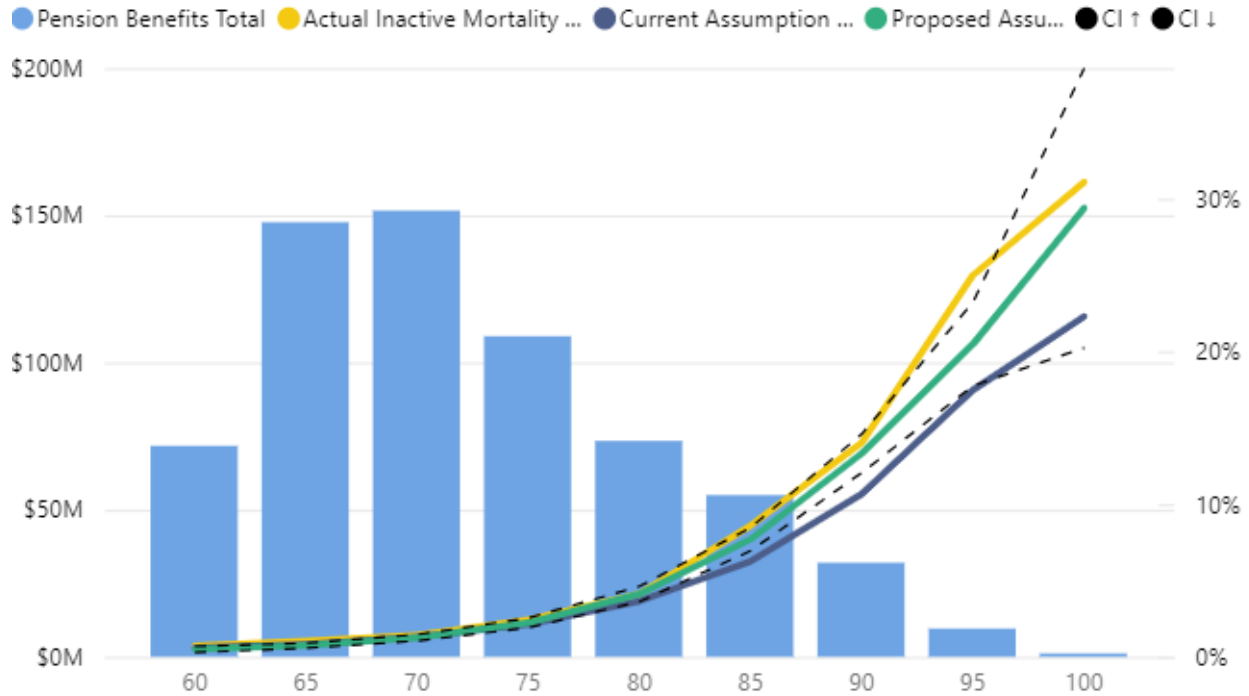
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

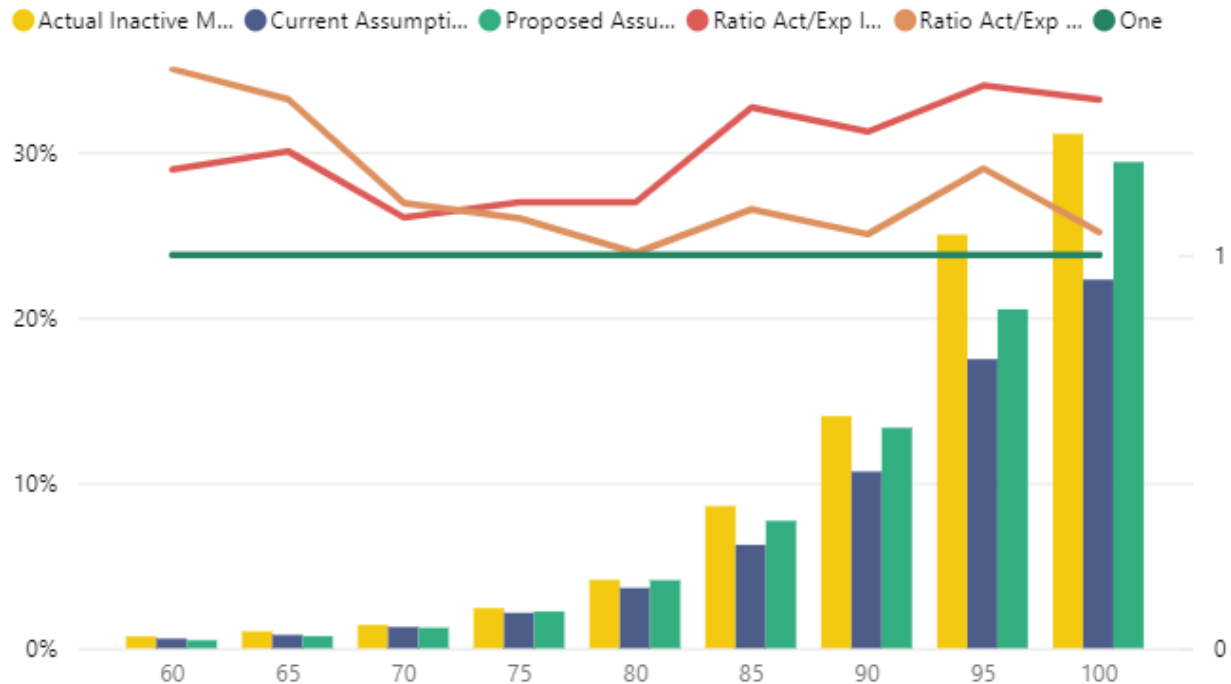
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
60	\$0.5M	\$0.4M	\$71.7M	0.7117%	0.5845%	▲ 1.22
65	\$1.5M	\$1.2M	\$147.6M	1.0197%	0.8067%	▲ 1.26
70	\$2.1M	\$1.9M	\$151.6M	1.4066%	1.2834%	● 1.10
75	\$2.6M	\$2.3M	\$108.9M	2.4285%	2.1406%	▲ 1.13
80	\$3.0M	\$2.7M	\$73.3M	4.1351%	3.6457%	▲ 1.13
85	\$4.7M	\$3.4M	\$54.9M	8.5973%	6.2510%	▲ 1.38
90	\$4.5M	\$3.4M	\$32.0M	14.0298%	10.6785%	▲ 1.31
95	\$2.4M	\$1.7M	\$9.6M	25.0012%	17.4734%	▲ 1.43
100	\$0.3M	\$0.3M	\$1.1M	31.0896%	22.2834%	▲ 1.40
Total	\$21.8M	\$17.3M	\$650.7M	3.3465%	2.6634%	▲ 1.26

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
60	\$0.5M	\$0.3M	\$71.7M	0.7117%	0.4833%	▲ 1.47
65	\$1.5M	\$1.1M	\$147.6M	1.0197%	0.7303%	▲ 1.40
70	\$2.1M	\$1.9M	\$151.6M	1.4066%	1.2426%	▲ 1.13
75	\$2.6M	\$2.4M	\$108.9M	2.4285%	2.2212%	● 1.09
80	\$3.0M	\$3.0M	\$73.3M	4.1351%	4.1143%	● 1.01
85	\$4.7M	\$4.2M	\$54.9M	8.5973%	7.7031%	▲ 1.12
90	\$4.5M	\$4.3M	\$32.0M	14.0298%	13.3275%	● 1.05
95	\$2.4M	\$2.0M	\$9.6M	25.0012%	20.4895%	▲ 1.22
100	\$0.3M	\$0.3M	\$1.1M	31.0896%	29.3918%	● 1.06
Total	\$21.8M	\$19.5M	\$650.7M	3.3465%	3.0011%	▲ 1.12

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



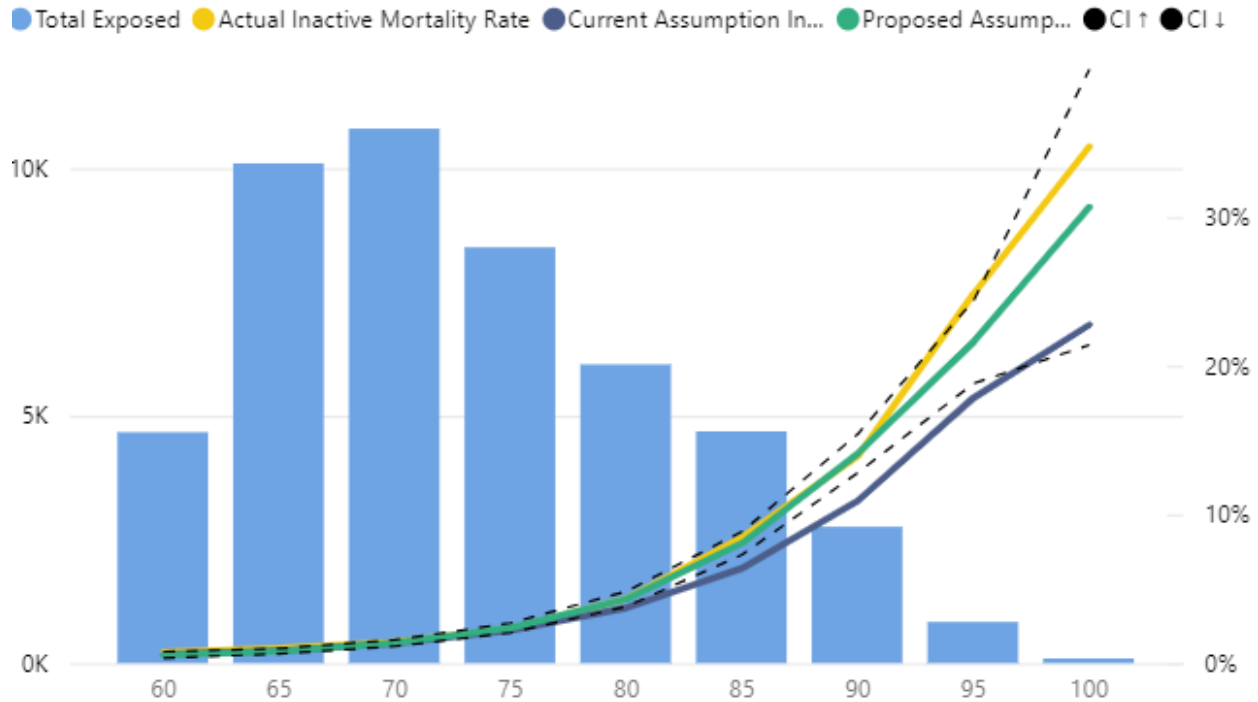
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2016 – 2019 for females on the current and proposed assumptions. The A/E decreased from 1.23 to 1.04.

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
60	35	27.8	4,666	0.7501%	0.5956%	▲ 1.26
65	100	83.4	10,097	0.9904%	0.8264%	▲ 1.20
70	154	141.8	10,798	1.4262%	1.3129%	● 1.09
75	193	184.5	8,401	2.2973%	2.1964%	● 1.05
80	261	224.5	6,036	4.3241%	3.7190%	▲ 1.16
85	396	299.1	4,683	8.4561%	6.3875%	▲ 1.32
90	384	300.9	2,756	13.9332%	10.9196%	▲ 1.28
95	207	148.7	833	24.8499%	17.8482%	▲ 1.39
100	33	21.6	95	34.7368%	22.7505%	◆ 1.53
Total	1,763	1,432.4	48,365	3.6452%	2.9616%	▲ 1.23

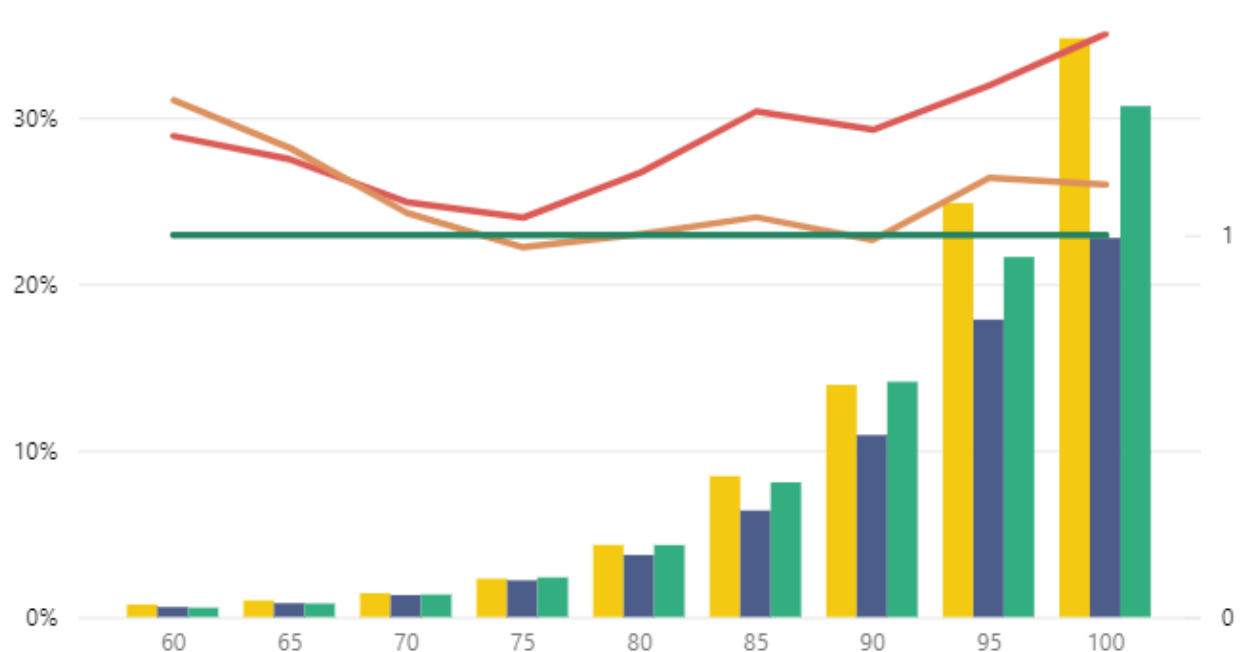
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
60	35	25.9	4,666	0.7501%	0.5544%	▲ 1.35
65	100	81.4	10,097	0.9904%	0.8064%	▲ 1.23
70	154	145.5	10,798	1.4262%	1.3472%	● 1.06
75	193	199.4	8,401	2.2973%	2.3733%	● 0.97
80	261	260.6	6,036	4.3241%	4.3168%	● 1.00
85	396	378.4	4,683	8.4561%	8.0796%	● 1.05
90	384	389.0	2,756	13.9332%	14.1154%	● 0.99
95	207	180.0	833	24.8499%	21.6068%	▲ 1.15
100	33	29.1	95	34.7368%	30.6665%	▲ 1.13
Total	1,763	1,689.2	48,365	3.6452%	3.4926%	● 1.04

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age

Legend: Actual Inactive M... (Yellow Bar), Current Assumpti... (Dark Blue Line), Proposed Assu... (Green Line), Ratio Act/Exp I... (Red Line), Ratio Act/Exp ... (Orange Line), One (Green Line).



Summary

We have proposed new assumptions consistent with industry standards to better reflect recent non-pandemic experience. In total, the proposed mortality tables are anticipated to increase plan liabilities for younger retirement ages up to about age 70 for males and age 60 for females, and then anticipated to decrease plan liabilities for older retirement ages. In total, the proposed mortality tables are anticipated to decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
15	0.0105%	0.0090%	68	1.6659%	0.9362%
16	0.0142%	0.0110%	69	1.7932%	1.0193%
17	0.0191%	0.0120%	70	1.9258%	1.1035%
18	0.0222%	0.0130%	71	2.0702%	1.2437%
19	0.0240%	0.0140%	72	2.2162%	1.3853%
20	0.0251%	0.0142%	73	2.3643%	1.5280%
21	0.0268%	0.0150%	74	2.5141%	1.6727%
22	0.0284%	0.0158%	75	2.6665%	1.8182%
23	0.0301%	0.0168%	76	3.0461%	2.0628%
24	0.0315%	0.0179%	77	3.4300%	2.3088%
25	0.0327%	0.0191%	78	3.8175%	2.5551%
26	0.0342%	0.0204%	79	4.2104%	2.8024%
27	0.0354%	0.0217%	80	4.6069%	3.0489%
28	0.0371%	0.0231%	81	5.1554%	3.4450%
29	0.0394%	0.0247%	82	5.7232%	3.8502%
30	0.0427%	0.0265%	83	6.3098%	4.2655%
31	0.0495%	0.0316%	84	6.9124%	4.6895%
32	0.0562%	0.0360%	85	7.5337%	5.1258%
33	0.0625%	0.0398%	86	8.3597%	5.8556%
34	0.0682%	0.0427%	87	9.1919%	6.5878%
35	0.0743%	0.0455%	88	10.0369%	7.3277%
36	0.0780%	0.0474%	89	10.8896%	8.0720%
37	0.0818%	0.0497%	90	11.7567%	8.8218%
38	0.0861%	0.0521%	91	13.4856%	10.1869%
39	0.0917%	0.0551%	92	15.2819%	11.5772%
40	0.0997%	0.0588%	93	17.1377%	13.0290%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE TABLE					
Age	Males ¹	Females ²	Age	Males ¹	Females ²
41	0.1422%	0.0633%	94	19.0983%	14.4884%
42	0.1848%	0.0702%	95	21.2134%	16.0080%
43	0.2279%	0.0792%	96	23.2990%	17.8232%
44	0.2725%	0.0907%	97	25.4356%	19.4807%
45	0.3194%	0.1052%	98	27.7079%	20.8097%
46	0.3686%	0.1228%	99	29.9402%	21.7553%
47	0.4207%	0.1427%	100	32.1584%	22.1859%
48	0.4752%	0.1652%	101	33.7521%	23.0680%
49	0.5320%	0.1896%	102	35.1259%	24.0803%
50	0.5908%	0.2151%	103	36.3671%	25.2770%
51	0.6563%	0.2401%	104	37.3834%	26.6309%
52	0.7203%	0.2647%	105	38.1051%	28.0912%
53	0.7821%	0.2889%	106	38.4698%	29.6244%
54	0.8405%	0.3120%	107	38.6325%	31.1943%
55	0.8938%	0.3338%	108	38.8076%	32.7579%
56	0.9368%	0.3689%	109	38.9794%	34.2712%
57	0.9718%	0.4030%	110	50.0000%	50.0000%
58	0.9982%	0.4360%	111	50.0000%	50.0000%
59	1.0164%	0.4677%	112	50.0000%	50.0000%
60	1.0277%	0.4987%	113	50.0000%	50.0000%
61	1.0989%	0.5398%	114	50.0000%	50.0000%
62	1.1606%	0.5722%	115	50.0000%	50.0000%
63	1.2158%	0.6041%	116	50.0000%	50.0000%
64	1.2656%	0.6395%	117	50.0000%	50.0000%
65	1.3111%	0.6785%	118	50.0000%	50.0000%
66	1.4252%	0.7529%	119	50.0000%	50.0000%
67	1.5432%	0.8397%	120	100.0000%	100.0000%

¹ An adjustment factor of 0.98 is applied to the probabilities above to develop benefit weighted probabilities of mortality

² An adjustment factor of 0.98 is applied to the probabilities above to develop benefit weighted probabilities of mortality

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	1.1802%	0.7744%
16	0.0230%	0.0110%	69	1.2950%	0.8589%
17	0.0310%	0.0120%	70	1.4267%	0.9565%
18	0.0360%	0.0130%	71	1.5765%	1.0699%
19	0.0380%	0.0130%	72	1.7495%	1.2007%
20	0.0374%	0.0137%	73	1.9466%	1.3506%
21	0.0370%	0.0129%	74	2.1740%	1.5219%
22	0.0346%	0.0121%	75	2.4335%	1.7168%
23	0.0333%	0.0113%	76	2.7304%	1.9366%
24	0.0321%	0.0104%	77	3.0690%	2.1862%
25	0.0320%	0.0106%	78	3.4551%	2.4701%
26	0.0354%	0.0121%	79	3.8936%	2.7915%
27	0.0377%	0.0136%	80	4.3942%	3.1592%
28	0.0413%	0.0151%	81	4.9629%	3.5790%
29	0.0437%	0.0166%	82	5.6094%	4.0591%
30	0.0473%	0.0195%	83	6.3339%	4.6063%
31	0.0509%	0.0210%	84	7.1449%	5.2330%
32	0.0543%	0.0237%	85	8.0474%	5.9479%
33	0.0575%	0.0250%	86	9.0375%	6.7628%
34	0.0604%	0.0274%	87	10.1189%	7.6838%
35	0.0642%	0.0296%	88	11.2952%	8.7148%
36	0.0676%	0.0316%	89	12.5695%	9.8499%
37	0.0704%	0.0345%	90	13.9346%	11.0764%
38	0.0740%	0.0359%	91	15.3820%	12.3756%
39	0.0769%	0.0382%	92	16.8922%	13.7246%
40	0.0804%	0.0402%	93	18.4620%	15.1226%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.0834%	0.0432%	94	20.0847%	16.5674%
42	0.0871%	0.0448%	95	21.7423%	18.0706%
43	0.0904%	0.0475%	96	23.5452%	19.7130%
44	0.0946%	0.0501%	97	25.4105%	21.4541%
45	0.0998%	0.0538%	98	27.3416%	23.3031%
46	0.1060%	0.0577%	99	29.3339%	25.2510%
47	0.1124%	0.0618%	100	31.3559%	27.2907%
48	0.1211%	0.0662%	101	33.3920%	29.3896%
49	0.1302%	0.0719%	102	35.4093%	31.5085%
50	0.2798%	0.2089%	103	37.4123%	33.6377%
51	0.3015%	0.2220%	104	39.3600%	35.7445%
52	0.3266%	0.2382%	105	41.2510%	37.8251%
53	0.3543%	0.2554%	106	43.0828%	39.8479%
54	0.3865%	0.2733%	107	44.8334%	41.8058%
55	0.4213%	0.2925%	108	46.4949%	43.6934%
56	0.4595%	0.3124%	109	48.0767%	45.4898%
57	0.5007%	0.3335%	110	49.3439%	47.1868%
58	0.5444%	0.3542%	111	49.4725%	48.7883%
59	0.5916%	0.3771%	112	49.5965%	49.6759%
60	0.6396%	0.4019%	113	49.7207%	49.7804%
61	0.6893%	0.4302%	114	49.8602%	49.8851%
62	0.7419%	0.4618%	115	49.9850%	49.9900%
63	0.7957%	0.4989%	116	49.9950%	49.9950%
64	0.8544%	0.5393%	117	50.0000%	50.0000%
65	0.9203%	0.5867%	118	50.0000%	50.0000%
66	0.9949%	0.6402%	119	50.0000%	50.0000%
67	1.0813%	0.7021%	120	100.0000%	100.0000%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	1.4251%	0.8492%
16	0.0230%	0.0110%	69	1.5544%	0.9394%
17	0.0310%	0.0120%	70	1.7034%	1.0447%
18	0.0360%	0.0130%	71	1.8727%	1.1633%
19	0.0390%	0.0140%	72	2.0656%	1.2996%
20	0.0394%	0.0148%	73	2.2867%	1.4544%
21	0.0401%	0.0140%	74	2.5388%	1.6307%
22	0.0388%	0.0143%	75	2.8262%	1.8317%
23	0.0387%	0.0135%	76	3.1543%	2.0605%
24	0.0387%	0.0138%	77	3.5265%	2.3220%
25	0.0400%	0.0153%	78	3.9484%	2.6188%
26	0.0436%	0.0169%	79	4.4249%	2.9551%
27	0.0474%	0.0185%	80	4.9621%	3.3369%
28	0.0513%	0.0201%	81	5.5678%	3.7699%
29	0.0553%	0.0217%	82	6.2480%	4.2603%
30	0.0591%	0.0246%	83	7.0072%	4.8208%
31	0.0642%	0.0262%	84	7.8523%	5.4634%
32	0.0678%	0.0290%	85	8.7912%	6.2048%
33	0.0725%	0.0316%	86	9.8243%	7.0606%
34	0.0768%	0.0340%	87	10.9552%	8.0397%
35	0.0806%	0.0361%	88	12.1915%	9.1445%
36	0.0852%	0.0392%	89	13.5363%	10.3676%
37	0.0890%	0.0407%	90	14.9878%	11.6897%
38	0.0921%	0.0431%	91	16.5141%	13.0844%
39	0.0958%	0.0452%	92	18.0793%	14.5237%
40	0.0987%	0.0481%	93	19.6749%	16.0048%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR SERVICE RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.1022%	0.0496%	94	21.2942%	17.5214%
42	0.1051%	0.0521%	95	22.9231%	19.0871%
43	0.1100%	0.0556%	96	24.6848%	20.7859%
44	0.1146%	0.0590%	97	26.4982%	22.5760%
45	0.1201%	0.0625%	98	28.3764%	24.4698%
46	0.1268%	0.0662%	99	30.3208%	26.4549%
47	0.1347%	0.0711%	100	32.3001%	28.5273%
48	0.1430%	0.0774%	101	34.2993%	30.6491%
49	0.1538%	0.0841%	102	36.2704%	32.7813%
50	0.4722%	0.3651%	103	38.2225%	34.9113%
51	0.4950%	0.3706%	104	40.1159%	37.0070%
52	0.5211%	0.3776%	105	41.9494%	39.0659%
53	0.5505%	0.3866%	106	43.7225%	41.0568%
54	0.5832%	0.3969%	107	45.4141%	42.9728%
55	0.6197%	0.4091%	108	47.0172%	44.8128%
56	0.6590%	0.4214%	109	48.5432%	46.5543%
57	0.7001%	0.4353%	110	49.3439%	48.1911%
58	0.7446%	0.4512%	111	49.4725%	49.5766%
59	0.7908%	0.4677%	112	49.5965%	49.6759%
60	0.8403%	0.4867%	113	49.7207%	49.7804%
61	0.8905%	0.5098%	114	49.8602%	49.8851%
62	0.9437%	0.5371%	115	49.9850%	49.9900%
63	1.0003%	0.5687%	116	49.9950%	49.9950%
64	1.0629%	0.6067%	117	50.0000%	50.0000%
65	1.1339%	0.6527%	118	50.0000%	50.0000%
66	1.2161%	0.7069%	119	50.0000%	50.0000%
67	1.3125%	0.7723%	120	100.0000%	100.0000%

Postretirement Mortality – Disability Retirees

The SOA combined the experience of teachers and general employees in developing disability annuity mortality tables. Due to lack of credibility, a relatively lower disability incidence rate and consistency with the SOA tables, we combined the experience of TRS, BERS and NYCERS (general, sanitation, transit, and TBTA) in proposing a recommended assumption. We propose to use the PUB disabled annuitant non-public safety mortality table, without any adjustment. Separate tables exist on a headcount-weighted and amount-weighted basis.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (50 to 99) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.06 to 1.01 and decreased from 1.12 to 0.93 for only BERS.

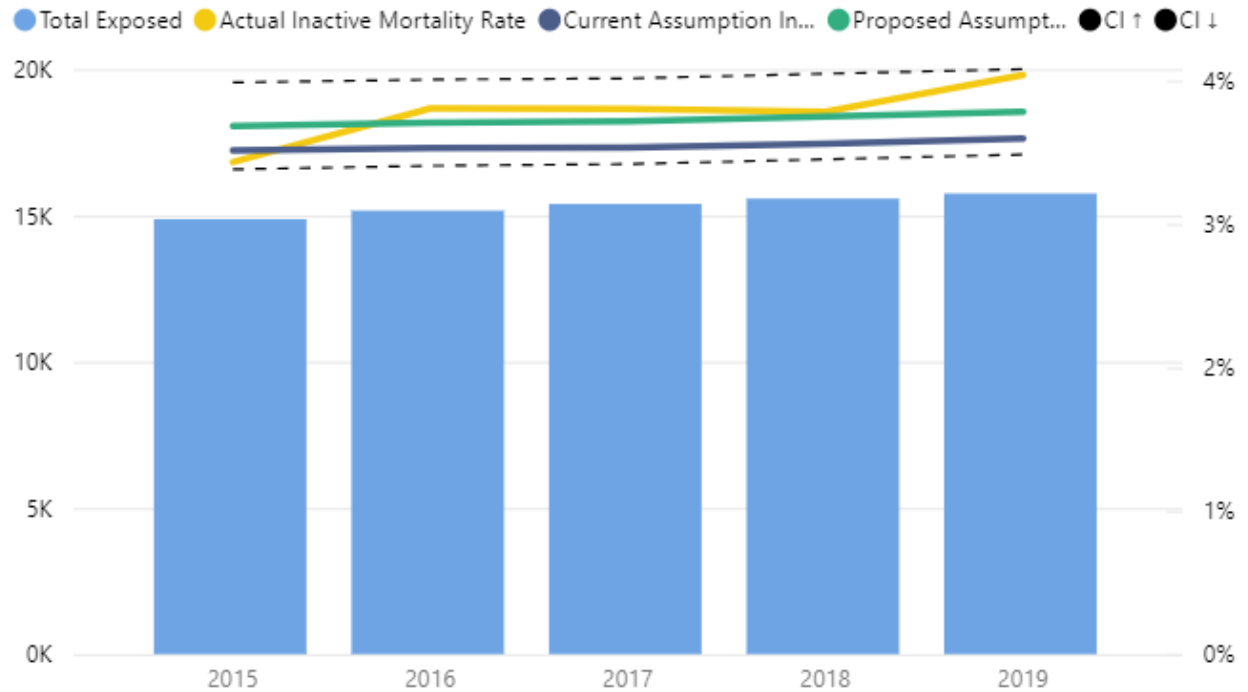
Current Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	510	522.3	14,868	3.4302%	3.5130%	0.98
2016	577	535.1	15,161	3.8058%	3.5298%	1.08
2017	585	543.9	15,390	3.8012%	3.5339%	1.08
2018	589	554.3	15,575	3.7817%	3.5591%	1.06
2019	636	566.1	15,749	4.0384%	3.5948%	1.12
Total	2,897	2,721.8	76,743	3.7749%	3.5466%	1.06

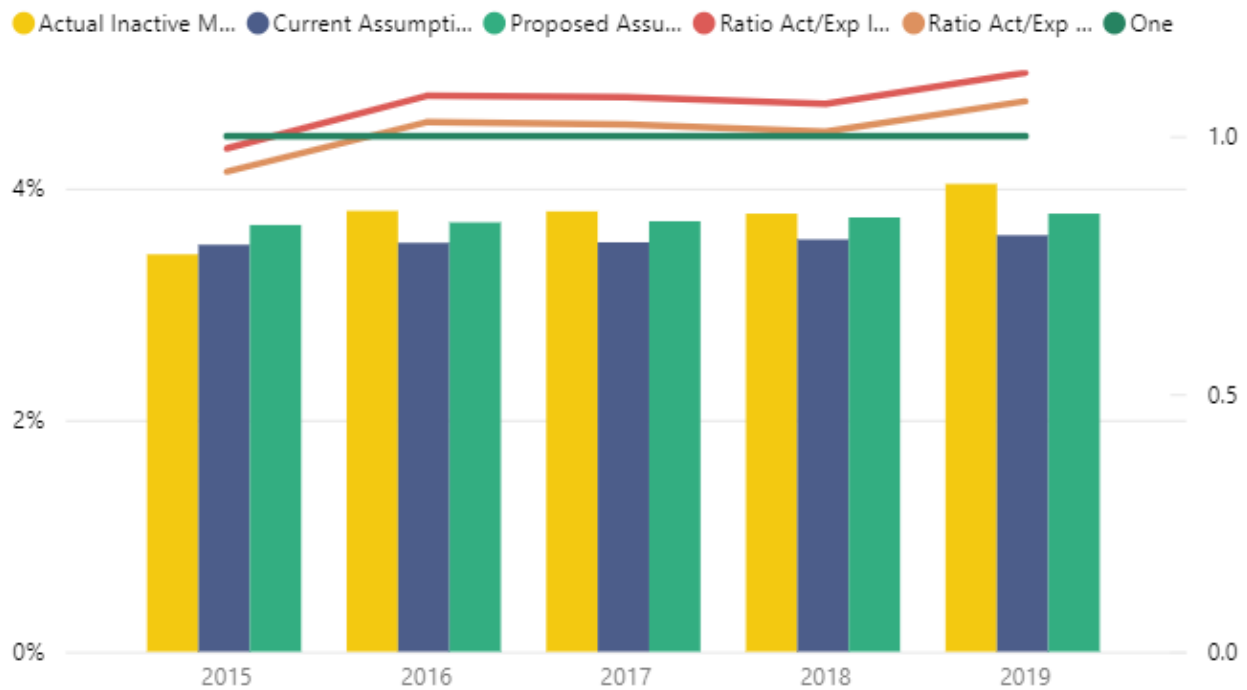
Proposed Assumption – Headcount-weighted

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
2015	510	547.7	14,868	3.4302%	3.6834%	0.93
2016	577	561.9	15,161	3.8058%	3.7061%	1.03
2017	585	571.9	15,390	3.8012%	3.7160%	1.02
2018	589	583.9	15,575	3.7817%	3.7491%	1.01
2019	636	595.6	15,749	4.0384%	3.7817%	1.07
Total	2,897	2,860.9	76,743	3.7749%	3.7279%	1.01

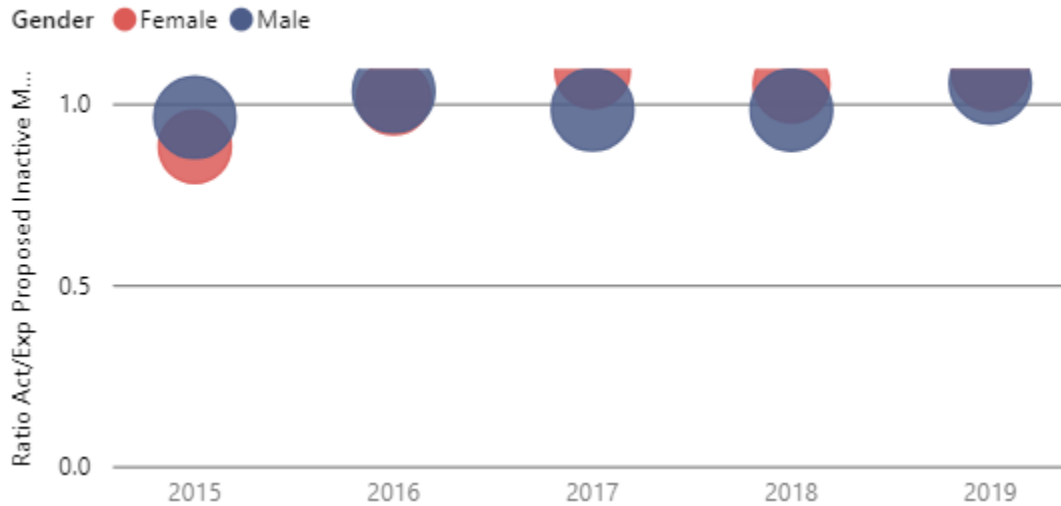
Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Inactive Mortality Proposed w/ Exposure Bubbles; by Year



The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (50 to 99) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.03 to 1.01 and decreased from 1.33 to 1.16 for only BERS.

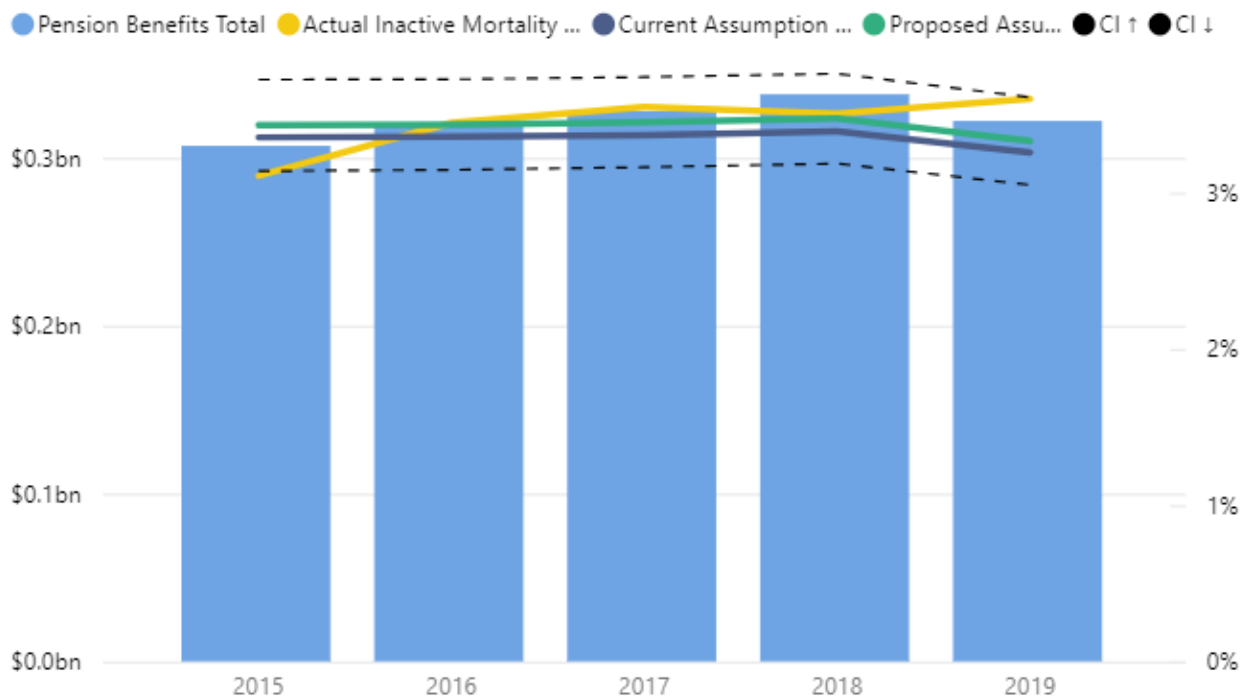
Current Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
2015	\$9.5M	\$10.3M	\$307.1M	3.1077%	3.3531%	0.93
2016	\$11.0M	\$10.8M	\$320.1M	3.4462%	3.3589%	1.03
2017	\$11.6M	\$11.0M	\$327.6M	3.5471%	3.3676%	1.05
2018	\$11.8M	\$11.5M	\$337.7M	3.5058%	3.3914%	1.03
2019	\$11.6M	\$10.5M	\$321.9M	3.6001%	3.2563%	1.11
Total	\$55.6M	\$54.0M	\$1,614.5M	3.4454%	3.3459%	1.03

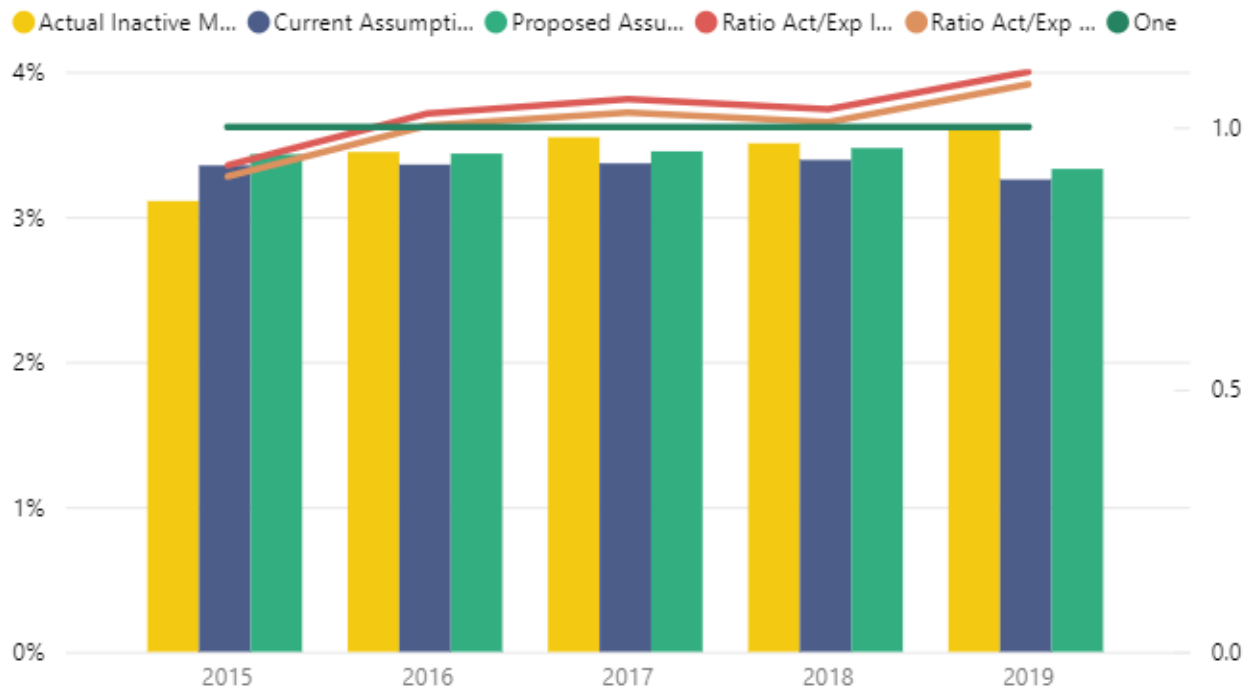
Proposed Assumption – Amount-weighted

Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
2015	\$9.5M	\$10.5M	\$307.1M	3.1077%	3.4304%	0.91
2016	\$11.0M	\$11.0M	\$320.1M	3.4462%	3.4350%	1.00
2017	\$11.6M	\$11.3M	\$327.6M	3.5471%	3.4507%	1.03
2018	\$11.8M	\$11.7M	\$337.7M	3.5058%	3.4732%	1.01
2019	\$11.6M	\$10.7M	\$321.9M	3.6001%	3.3294%	1.08
Total	\$55.6M	\$55.3M	\$1,614.5M	3.4454%	3.4243%	1.01

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Year



Inactive Mortality Rate - Actual, Expected, and Ratio; by Year



The following section displays results by gender.

Disabled Retirees - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for males on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.01 to 0.99 and decreased from 1.36 to 1.13 for only BERS.

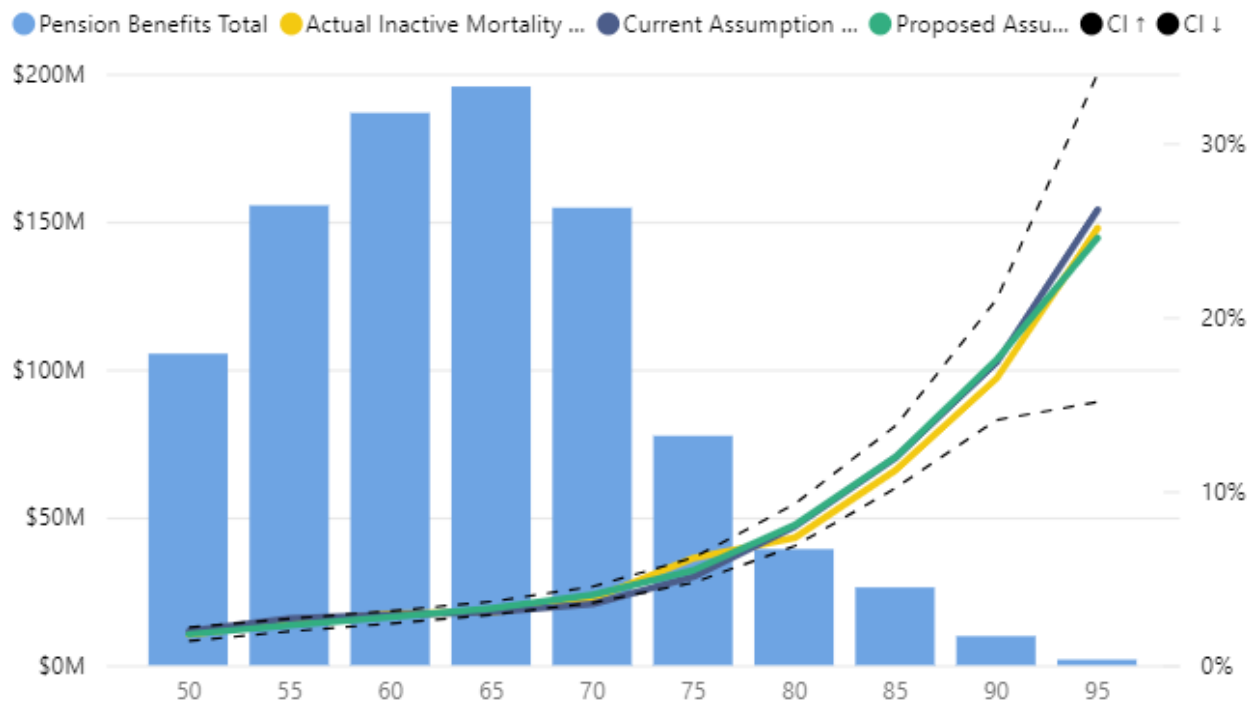
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

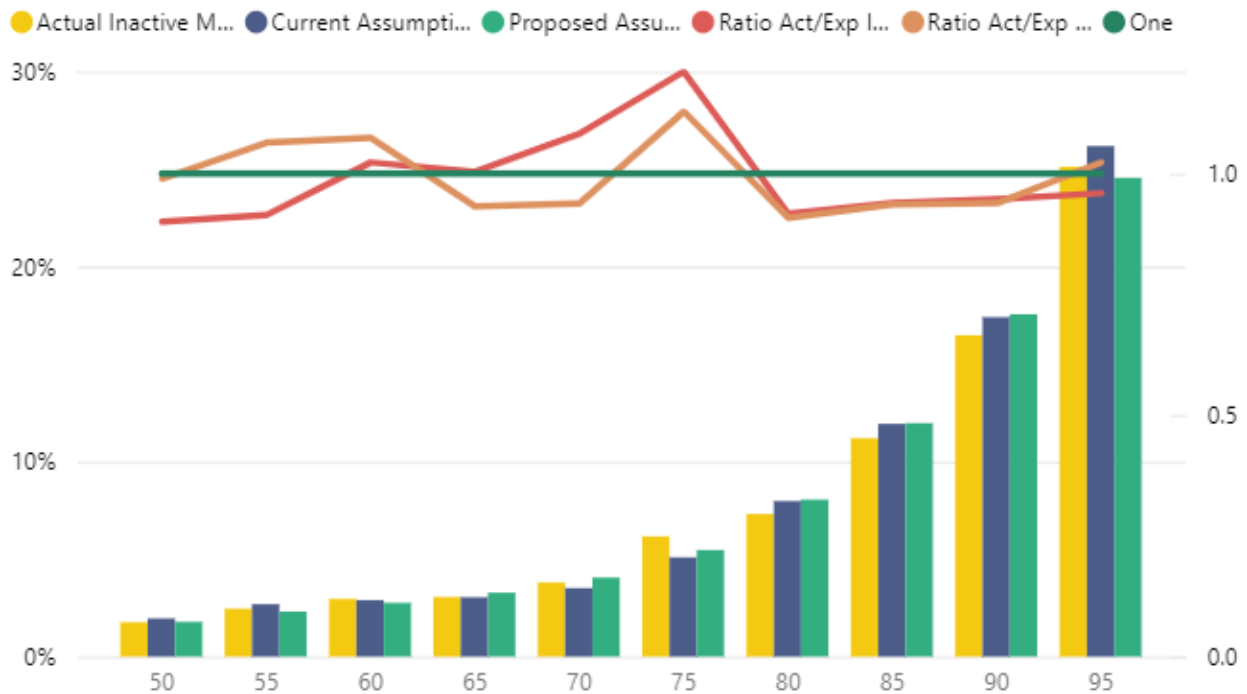
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
50	\$1.9M	\$2.1M	\$105.3M	1.7623%	1.9566%	0.90
55	\$3.8M	\$4.2M	\$155.5M	2.4536%	2.6839%	0.91
60	\$5.5M	\$5.4M	\$186.8M	2.9593%	2.8932%	1.02
65	\$6.0M	\$6.0M	\$195.7M	3.0536%	3.0422%	1.00
70	\$5.9M	\$5.4M	\$154.7M	3.7998%	3.5101%	1.08
75	\$4.8M	\$3.9M	\$77.6M	6.1619%	5.0870%	1.21
80	\$2.9M	\$3.1M	\$39.3M	7.3109%	7.9752%	0.92
85	\$2.9M	\$3.1M	\$26.3M	11.1982%	11.9311%	0.94
90	\$1.6M	\$1.7M	\$9.8M	16.4765%	17.4047%	0.95
95	\$0.5M	\$0.5M	\$1.9M	25.1120%	26.1766%	0.96
Total	\$35.7M	\$35.4M	\$952.7M	3.7513%	3.7198%	1.01

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
50	\$1.9M	\$1.9M	\$105.3M	1.7623%	1.7812%	0.99
55	\$3.8M	\$3.6M	\$155.5M	2.4536%	2.3066%	1.06
60	\$5.5M	\$5.1M	\$186.8M	2.9593%	2.7549%	1.07
65	\$6.0M	\$6.4M	\$195.7M	3.0536%	3.2756%	0.93
70	\$5.9M	\$6.3M	\$154.7M	3.7998%	4.0505%	0.94
75	\$4.8M	\$4.2M	\$77.6M	6.1619%	5.4621%	1.13
80	\$2.9M	\$3.2M	\$39.3M	7.3109%	8.0491%	0.91
85	\$2.9M	\$3.1M	\$26.3M	11.1982%	11.9678%	0.94
90	\$1.6M	\$1.7M	\$9.8M	16.4765%	17.5516%	0.94
95	\$0.5M	\$0.5M	\$1.9M	25.1120%	24.5481%	1.02
Total	\$35.7M	\$36.0M	\$952.7M	3.7513%	3.7803%	0.99

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



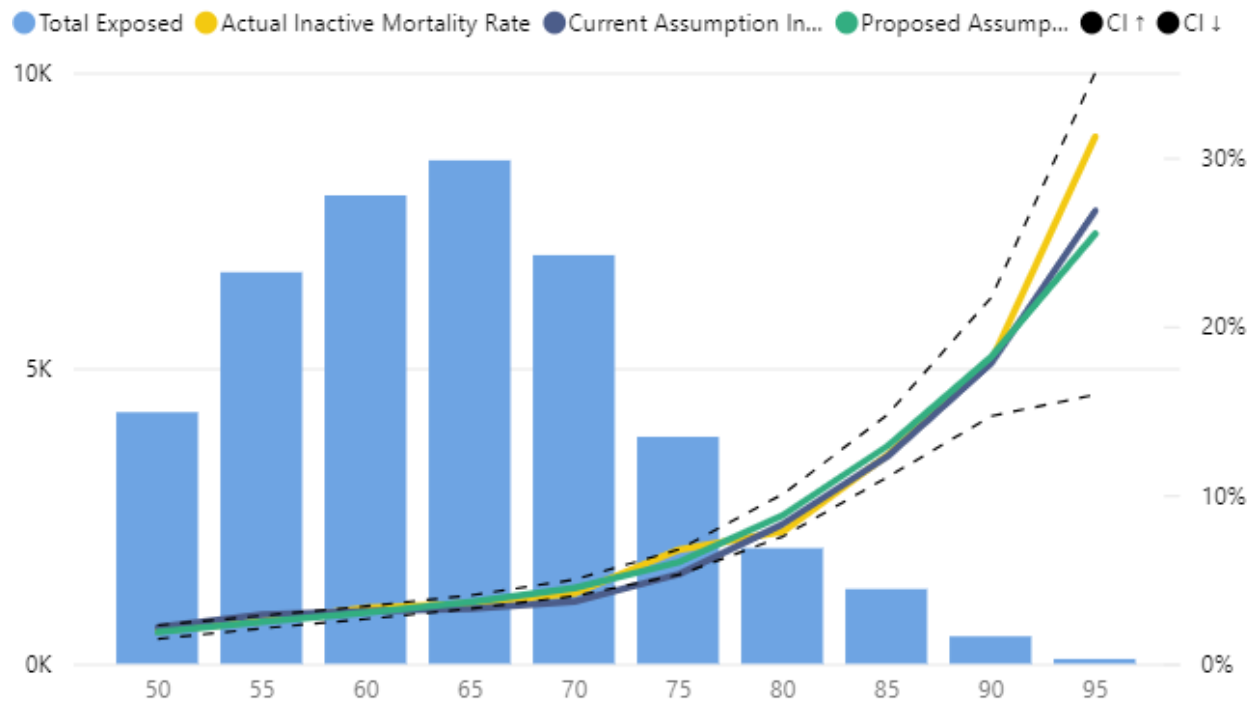
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for males on the current and proposed assumptions for all non-public safety members of NYCERS. The A/E decreased from 1.06 to 1.00 and decreased from 1.33 to 1.04 for only BERS.

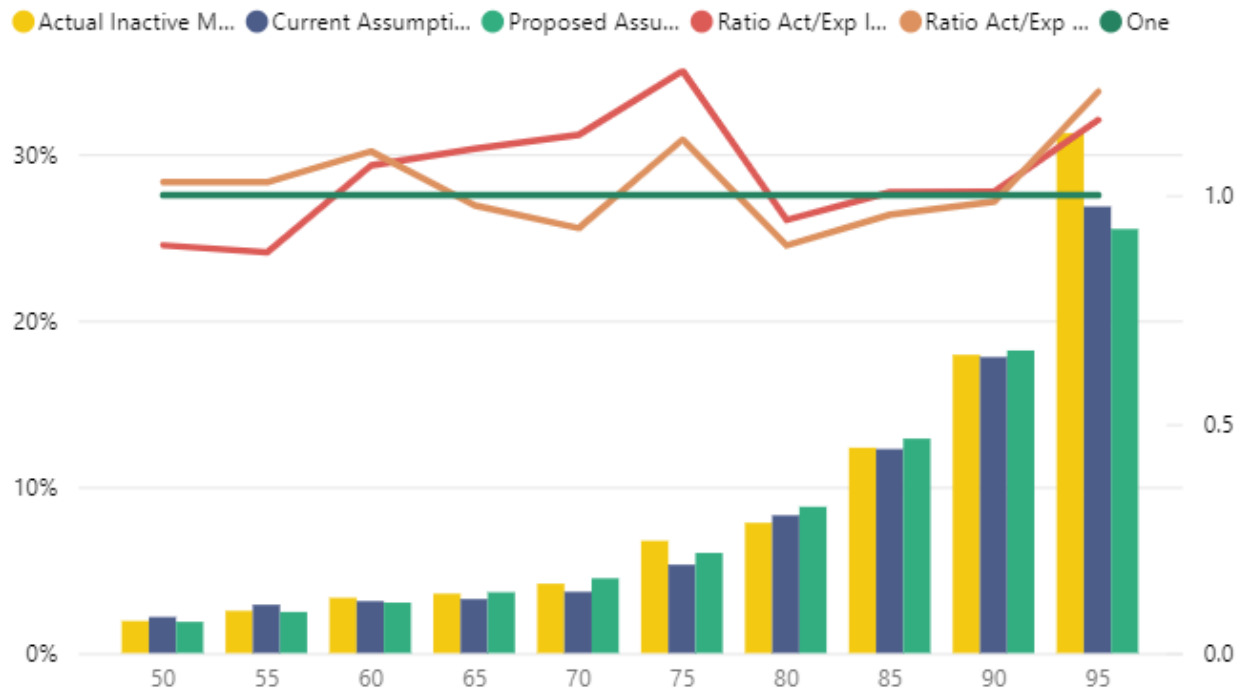
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
50	82	92.1	4,254	1.9276%	2.1651%	0.89
55	168	192.0	6,622	2.5370%	2.8998%	0.87
60	263	247.0	7,922	3.3199%	3.1175%	1.06
65	304	276.1	8,515	3.5702%	3.2420%	1.10
70	288	254.4	6,911	4.1673%	3.6815%	1.13
75	259	203.7	3,838	6.7483%	5.3070%	1.27
80	153	161.8	1,955	7.8261%	8.2751%	0.95
85	156	155.0	1,264	12.3418%	12.2615%	1.01
90	83	82.4	463	17.9266%	17.7917%	1.01
95	25	21.5	80	31.2500%	26.8389%	1.16
Total	1,781	1,685.9	41,824	4.2583%	4.0309%	1.06

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
50	82	79.7	4,254	1.9276%	1.8739%	1.03
55	168	163.4	6,622	2.5370%	2.4678%	1.03
60	263	240.0	7,922	3.3199%	3.0298%	1.10
65	304	311.1	8,515	3.5702%	3.6533%	0.98
70	288	310.4	6,911	4.1673%	4.4916%	0.93
75	259	231.0	3,838	6.7483%	6.0185%	1.12
80	153	171.9	1,955	7.8261%	8.7929%	0.89
85	156	162.9	1,264	12.3418%	12.8885%	0.96
90	83	84.2	463	17.9266%	18.1868%	0.99
95	25	20.4	80	31.2500%	25.4901%	1.23
Total	1,781	1,775.1	41,824	4.2583%	4.2441%	1.00

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Disabled Retirees - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for females on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.07 to 1.03 and decreased from 1.32 to 1.18 for only BERS.

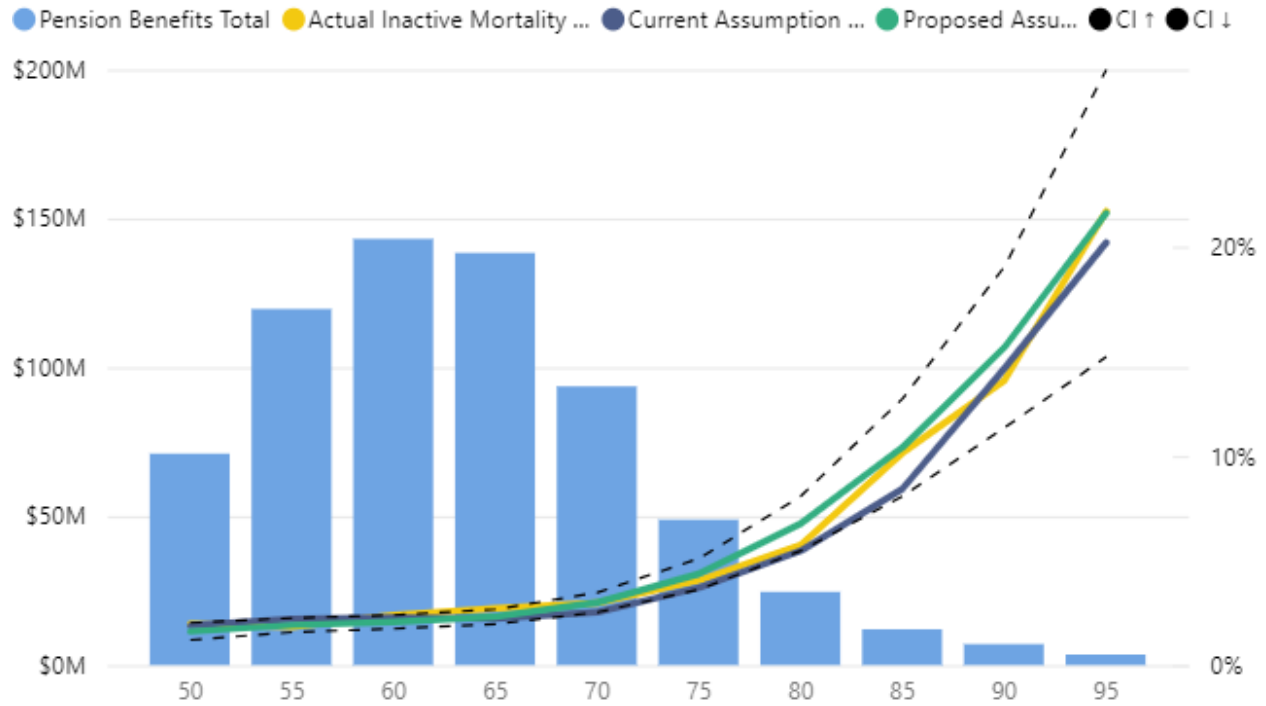
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

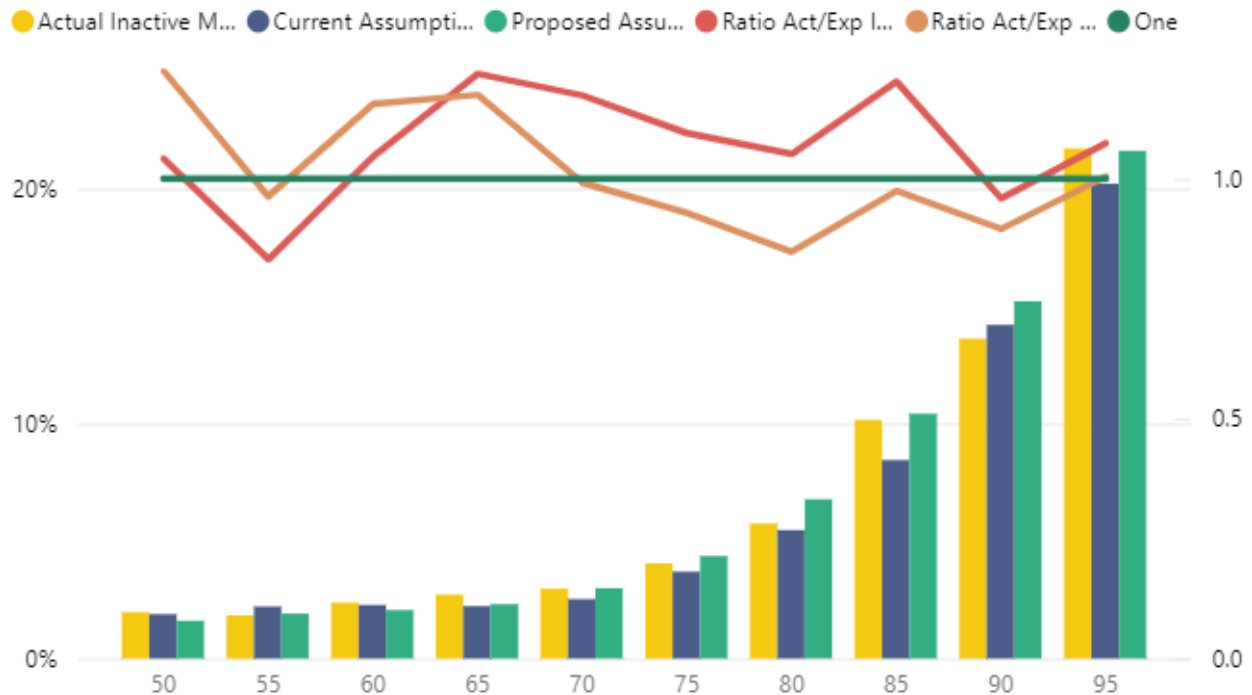
Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
50	\$1.4M	\$1.3M	\$71.0M	1.9696%	1.8904%	● 1.04
55	\$2.2M	\$2.6M	\$119.6M	1.8399%	2.2107%	▲ 0.83
60	\$3.4M	\$3.3M	\$143.1M	2.3825%	2.2775%	● 1.05
65	\$3.8M	\$3.1M	\$138.4M	2.7175%	2.2298%	▲ 1.22
70	\$2.8M	\$2.4M	\$93.6M	2.9685%	2.5294%	▲ 1.17
75	\$2.0M	\$1.8M	\$48.8M	4.0481%	3.6977%	● 1.09
80	\$1.4M	\$1.3M	\$24.6M	5.7461%	5.4637%	● 1.05
85	\$1.2M	\$1.0M	\$12.0M	10.1535%	8.4456%	▲ 1.20
90	\$1.0M	\$1.0M	\$7.0M	13.6074%	14.1951%	● 0.96
95	\$0.8M	\$0.7M	\$3.5M	21.7020%	20.2025%	● 1.07
Total	\$19.9M	\$18.6M	\$661.8M	3.0051%	2.8076%	● 1.07

Age (bins)	Actual Inactive Benefits Released	Expected Inactive Benefits Released Proposed	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Proposed Assumption Inactive Mortality BftWght	Act/Exp Proposed Inactive Mortality BftWght
50	\$1.4M	\$1.1M	\$71.0M	1.9696%	1.6085%	▲ 1.22
55	\$2.2M	\$2.3M	\$119.6M	1.8399%	1.9113%	● 0.96
60	\$3.4M	\$3.0M	\$143.1M	2.3825%	2.0617%	▲ 1.16
65	\$3.8M	\$3.2M	\$138.4M	2.7175%	2.3137%	▲ 1.17
70	\$2.8M	\$2.8M	\$93.6M	2.9685%	2.9944%	● 0.99
75	\$2.0M	\$2.1M	\$48.8M	4.0481%	4.3597%	● 0.93
80	\$1.4M	\$1.7M	\$24.6M	5.7461%	6.7782%	▲ 0.85
85	\$1.2M	\$1.3M	\$12.0M	10.1535%	10.4182%	● 0.97
90	\$1.0M	\$1.1M	\$7.0M	13.6074%	15.2018%	▲ 0.90
95	\$0.8M	\$0.8M	\$3.5M	21.7020%	21.6034%	● 1.00
Total	\$19.9M	\$19.3M	\$661.8M	3.0051%	2.9116%	● 1.03

Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



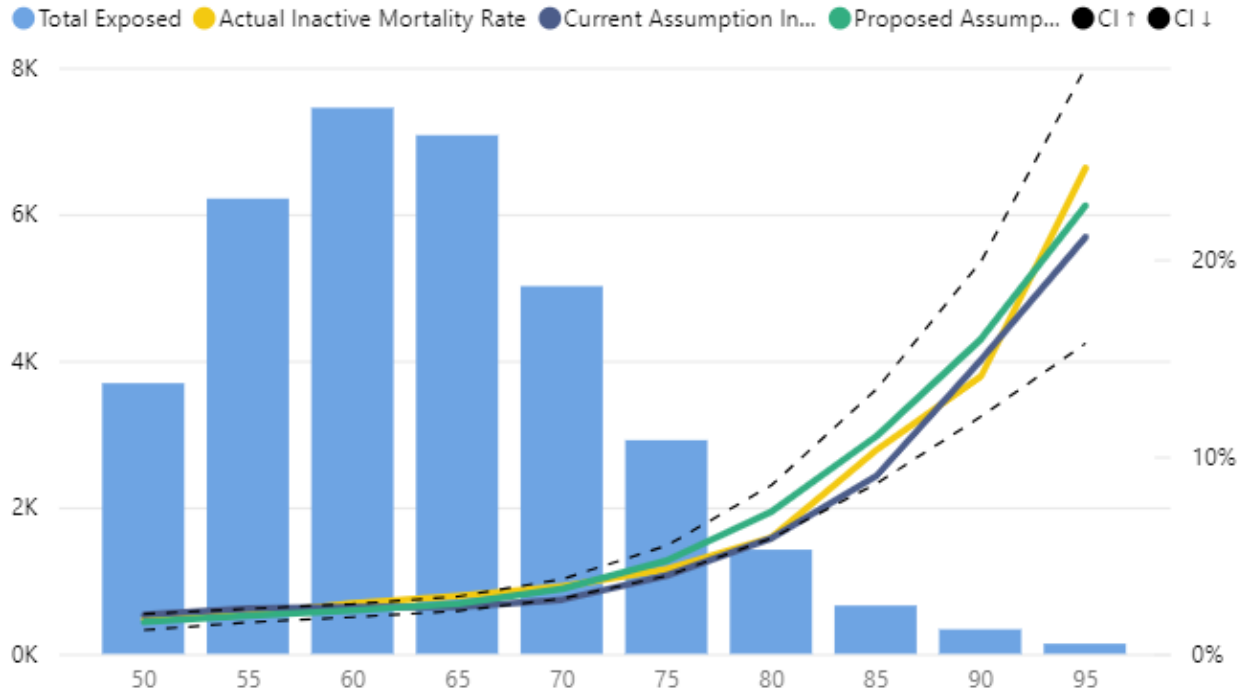
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (50 to 99) during the period 2015 – 2019 for females on the current and proposed assumptions for all non-public safety members of NYCRS. The A/E decreased from 1.08 to 1.03 and decreased from 1.03 to 0.88 for only BERS.

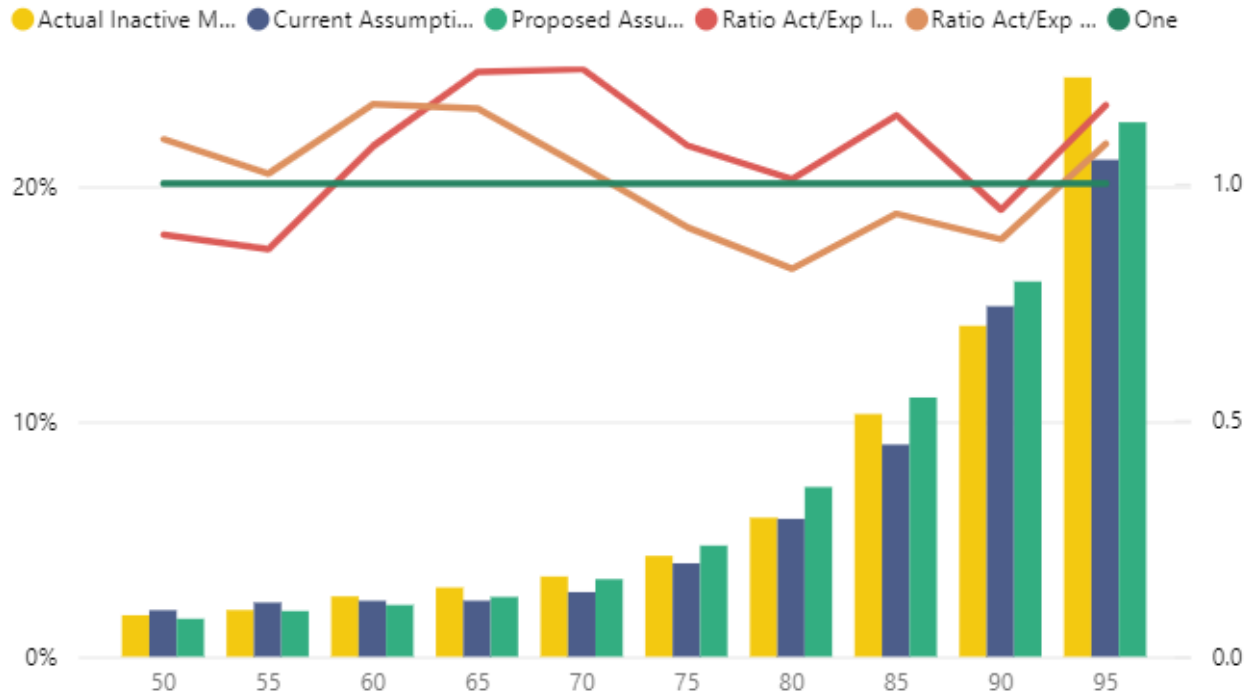
Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
50	65	72.9	3,693	1.7601%	1.9735%	▲ 0.89
55	123	142.8	6,212	1.9800%	2.2983%	▲ 0.86
60	191	177.0	7,452	2.5631%	2.3753%	● 1.08
65	208	168.3	7,077	2.9391%	2.3778%	▲ 1.24
70	171	137.7	5,017	3.4084%	2.7437%	▲ 1.24
75	125	115.7	2,916	4.2867%	3.9679%	● 1.08
80	84	83.2	1,421	5.9113%	5.8585%	● 1.01
85	68	59.4	659	10.3187%	9.0192%	▲ 1.14
90	47	49.8	334	14.0719%	14.9037%	● 0.94
95	34	29.2	138	24.6377%	21.1339%	▲ 1.17
Total	1,116	1,035.9	34,919	3.1960%	2.9666%	● 1.08

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths Proposed	Total Exposed	Actual Inactive Mortality Rate	Proposed Assumption Inactive Mortality	Act/Exp Proposed Inactive Mortality
50	65	59.4	3,693	1.7601%	1.6096%	● 1.09
55	123	120.5	6,212	1.9800%	1.9399%	● 1.02
60	191	163.5	7,452	2.5631%	2.1947%	▲ 1.17
65	208	179.6	7,077	2.9391%	2.5380%	▲ 1.16
70	171	165.3	5,017	3.4084%	3.2938%	● 1.03
75	125	137.7	2,916	4.2867%	4.7229%	● 0.91
80	84	102.5	1,421	5.9113%	7.2135%	▲ 0.82
85	68	72.6	659	10.3187%	11.0220%	● 0.94
90	47	53.3	334	14.0719%	15.9562%	▲ 0.88
95	34	31.4	138	24.6377%	22.7291%	● 1.08
Total	1,116	1,085.9	34,919	3.1960%	3.1097%	● 1.03

Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

We have proposed new assumptions consistent with industry standards. In total, the proposed mortality tables are anticipated to decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.3309%	0.3302%	68	2.8866%	2.3870%
16	0.4477%	0.4467%	69	2.9926%	2.4723%
17	0.6034%	0.6020%	70	3.1133%	2.5721%
18	0.7007%	0.6521%	71	3.2494%	2.6887%
19	0.7591%	0.7023%	72	3.4007%	2.8231%
20	0.7745%	0.7242%	73	3.5688%	2.9757%
21	0.8177%	0.7766%	74	3.7535%	3.1493%
22	0.8636%	0.8321%	75	3.9565%	3.3428%
23	0.9115%	0.8806%	76	4.1960%	3.5573%
24	0.9623%	0.9414%	77	4.4576%	3.7722%
25	1.0128%	0.9950%	78	4.7400%	4.0056%
26	1.0629%	1.0450%	79	5.0460%	4.2512%
27	1.1121%	1.1039%	80	5.3741%	4.5399%
28	1.1590%	1.1437%	81	5.7241%	4.8505%
29	1.2025%	1.1849%	82	6.0991%	5.1822%
30	1.2403%	1.2276%	83	6.5012%	5.5379%
31	1.2721%	1.2719%	84	6.9293%	5.9081%
32	1.2964%	1.2906%	85	7.5490%	6.6447%
33	1.3125%	1.3095%	86	8.3752%	7.3415%
34	1.3230%	1.3220%	87	9.2076%	8.0805%
35	1.3497%	1.3314%	88	10.0528%	8.8285%
36	1.3769%	1.3388%	89	10.9057%	10.1243%
37	1.4047%	1.3459%	90	11.7730%	11.4944%
38	1.4330%	1.3555%	91	13.5023%	12.9995%
39	1.4619%	1.3700%	92	15.2987%	14.4425%
40	1.4914%	1.3831%	93	17.1548%	15.8488%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE TABLE					
Age	Males	Females	Age	Males	Females
41	1.5215%	1.3968%	94	19.1157%	17.6512%
42	1.5522%	1.4199%	95	21.2311%	19.4304%
43	1.5835%	1.4535%	96	23.3168%	20.7560%
44	1.6154%	1.4910%	97	25.4537%	21.5692%
45	1.6480%	1.5473%	98	27.7263%	22.0007%
46	1.6812%	1.6100%	99	29.9589%	23.0087%
47	1.7151%	1.6774%	100	32.1584%	23.1230%
48	1.7497%	1.7359%	101	33.7521%	23.6022%
49	1.7850%	1.7789%	102	35.1259%	24.0803%
50	1.8210%	1.8069%	103	36.3671%	25.2770%
51	1.8577%	1.8265%	104	37.3834%	26.6309%
52	1.8952%	1.8400%	105	38.1051%	28.0912%
53	1.9838%	1.8414%	106	38.4698%	29.6244%
54	2.0700%	1.8419%	107	38.6325%	31.1943%
55	2.1499%	1.8425%	108	38.8076%	32.7579%
56	2.2301%	1.8428%	109	38.9794%	34.2712%
57	2.2996%	1.8478%	110	50.0000%	50.0000%
58	2.3571%	1.8725%	111	50.0000%	50.0000%
59	2.4033%	1.9054%	112	50.0000%	50.0000%
60	2.4415%	1.9416%	113	50.0000%	50.0000%
61	2.4758%	1.9833%	114	50.0000%	50.0000%
62	2.5090%	2.0209%	115	50.0000%	50.0000%
63	2.5475%	2.0671%	116	50.0000%	50.0000%
64	2.5926%	2.1353%	117	50.0000%	50.0000%
65	2.6476%	2.2013%	118	50.0000%	50.0000%
66	2.7148%	2.2603%	119	50.0000%	50.0000%
67	2.7940%	2.3165%	120	100.0000%	100.0000%

¹ An adjustment factor of 0.98 is applied to the probabilities above to develop benefit weighted probabilities of mortality

² An adjustment factor of 0.98 is applied to the probabilities above to develop benefit weighted probabilities of mortality

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	3.3842%	2.3432%
16	0.0230%	0.0110%	69	3.5082%	2.4466%
17	0.0310%	0.0120%	70	3.6470%	2.5754%
18	0.4030%	0.2460%	71	3.8075%	2.7300%
19	0.4210%	0.2450%	72	3.9915%	2.9132%
20	0.4163%	0.2464%	73	4.2050%	3.1253%
21	0.3966%	0.2320%	74	4.4502%	3.3701%
22	0.3692%	0.2139%	75	4.7304%	3.6498%
23	0.3399%	0.1985%	76	5.0478%	3.9650%
24	0.3200%	0.1892%	77	5.4066%	4.3189%
25	0.3174%	0.1935%	78	5.8091%	4.7163%
26	0.3442%	0.2159%	79	6.2603%	5.1576%
27	0.3720%	0.2415%	80	6.7634%	5.6480%
28	0.4017%	0.2702%	81	7.3225%	6.1903%
29	0.4330%	0.3005%	82	7.9386%	6.7873%
30	0.4652%	0.3334%	83	8.6105%	7.4432%
31	0.4979%	0.3681%	84	9.3418%	8.1602%
32	0.5305%	0.4042%	85	10.1307%	8.9444%
33	0.5623%	0.4421%	86	10.9766%	9.7615%
34	0.5953%	0.4794%	87	11.8838%	10.5959%
35	0.6258%	0.5169%	88	12.8609%	11.4431%
36	0.6571%	0.5536%	89	14.0871%	12.2998%
37	0.6883%	0.5904%	90	15.4361%	13.1766%
38	0.7202%	0.6269%	91	16.8194%	14.0960%
39	0.7524%	0.6646%	92	18.2069%	15.0702%
40	0.7857%	0.7031%	93	19.6007%	16.1223%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.8220%	0.7434%	94	21.0087%	17.2666%
42	0.8627%	0.7863%	95	22.4349%	18.5246%
43	0.9083%	0.8336%	96	24.0164%	19.9812%
44	0.9628%	0.8866%	97	25.6872%	21.6140%
45	1.0252%	0.9470%	98	27.4698%	23.3793%
46	1.0990%	1.0145%	99	29.3703%	25.2723%
47	1.1836%	1.0920%	100	31.3559%	27.2907%
48	1.2797%	1.1808%	101	33.3920%	29.3896%
49	1.3871%	1.2823%	102	35.4093%	31.5085%
50	1.5068%	1.3956%	103	37.4123%	33.6377%
51	1.6080%	1.4626%	104	39.3600%	35.7445%
52	1.7161%	1.5364%	105	41.2510%	37.8251%
53	1.8294%	1.6172%	106	43.0828%	39.8479%
54	1.9470%	1.7002%	107	44.8334%	41.8058%
55	2.0663%	1.7817%	108	46.4949%	43.6934%
56	2.1843%	1.8568%	109	48.0767%	45.4898%
57	2.2969%	1.9225%	110	49.3439%	47.1868%
58	2.4053%	1.9756%	111	49.4725%	48.7883%
59	2.5068%	2.0164%	112	49.5965%	49.6759%
60	2.6030%	2.0471%	113	49.7207%	49.7804%
61	2.6945%	2.0683%	114	49.8602%	49.8851%
62	2.7854%	2.0863%	115	49.9850%	49.9900%
63	2.8779%	2.1053%	116	49.9950%	49.9950%
64	2.9721%	2.1278%	117	50.0000%	50.0000%
65	3.0682%	2.1591%	118	50.0000%	50.0000%
66	3.1673%	2.2023%	119	50.0000%	50.0000%
67	3.2721%	2.2632%	120	100.0000%	100.0000%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0170%	0.0090%	68	3.7760%	2.5785%
16	0.0230%	0.0110%	69	3.9086%	2.6943%
17	0.0310%	0.0120%	70	4.0556%	2.8354%
18	0.4030%	0.2460%	71	4.2241%	3.0021%
19	0.4210%	0.2450%	72	4.4187%	3.1983%
20	0.4163%	0.2464%	73	4.6447%	3.4221%
21	0.3966%	0.2320%	74	4.9089%	3.6783%
22	0.3755%	0.2139%	75	5.2124%	3.9698%
23	0.3625%	0.2007%	76	5.5593%	4.2971%
24	0.3565%	0.1995%	77	5.9509%	4.6633%
25	0.3631%	0.2088%	78	6.3903%	5.0750%
26	0.3937%	0.2316%	79	6.8806%	5.5325%
27	0.4255%	0.2575%	80	7.4270%	6.0439%
28	0.4593%	0.2865%	81	8.0308%	6.6090%
29	0.4960%	0.3172%	82	8.6949%	7.2335%
30	0.5323%	0.3502%	83	9.4149%	7.9215%
31	0.5689%	0.3839%	84	10.1938%	8.6755%
32	0.6051%	0.4187%	85	11.0300%	9.5023%
33	0.6416%	0.4539%	86	11.9194%	10.3647%
34	0.6776%	0.4899%	87	12.8652%	11.2472%
35	0.7133%	0.5246%	88	13.8754%	12.1426%
36	0.7463%	0.5599%	89	14.9554%	13.0490%
37	0.7800%	0.5929%	90	16.1047%	13.9740%
38	0.8136%	0.6269%	91	17.3340%	14.9427%
39	0.8469%	0.6646%	92	18.7571%	15.9646%
40	0.8808%	0.7031%	93	20.2661%	17.0643%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF MORTALITY FOR DISABLED RETIREES BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.9172%	0.7434%	94	21.7776%	18.2532%
42	0.9565%	0.7863%	95	23.2870%	19.5565%
43	1.0009%	0.8336%	96	24.9333%	21.0589%
44	1.0532%	0.8866%	97	26.6451%	22.7137%
45	1.1137%	0.9470%	98	28.4453%	24.5248%
46	1.1852%	1.0145%	99	30.3399%	26.4685%
47	1.2679%	1.0920%	100	32.3001%	28.5273%
48	1.3636%	1.1808%	101	34.2993%	30.6491%
49	1.4729%	1.2823%	102	36.2704%	32.7813%
50	1.5960%	1.3965%	103	38.2225%	34.9113%
51	1.6935%	1.4626%	104	40.1159%	37.0070%
52	1.8010%	1.5364%	105	41.9494%	39.0659%
53	1.9190%	1.6172%	106	43.7225%	41.0568%
54	2.0454%	1.7002%	107	45.4141%	42.9728%
55	2.1777%	1.7817%	108	47.0172%	44.8128%
56	2.3143%	1.8641%	109	48.5432%	46.5543%
57	2.4490%	1.9445%	110	49.3439%	48.1911%
58	2.5810%	2.0167%	111	49.4725%	49.5766%
59	2.7081%	2.0806%	112	49.5965%	49.6759%
60	2.8308%	2.1350%	113	49.7207%	49.7804%
61	2.9500%	2.1820%	114	49.8602%	49.8851%
62	3.0673%	2.2227%	115	49.9850%	49.9900%
63	3.1837%	2.2630%	116	49.9950%	49.9950%
64	3.3002%	2.3036%	117	50.0000%	50.0000%
65	3.4170%	2.3515%	118	50.0000%	50.0000%
66	3.5333%	2.4098%	119	50.0000%	50.0000%
67	3.6527%	2.4849%	120	100.0000%	100.0000%

Postretirement Mortality – Contingent Beneficiaries

The SOA combined the experience of all contingent beneficiaries of teachers, general employees and public safety members in developing contingent survivor annuity mortality tables. We combined the experience of all NYCRS systems (TRS, BERS, NYCERS, POLICE and FIRE) in proposing a recommended assumption. We propose to use the PUB contingent survivor annuitant mortality tables, multiplied by adjustment factors. Separate tables exist on a headcount-weighted and amount-weighted basis in addition to gender.

For males, the proposed adjustment factors are 125% for amount-weighted and 120% for headcount-weighted. For females, the proposed adjustment factors are 120% for amount-weighted and 108% for headcount-weighted.

The contingent survivor assumption would apply upon the death of the member. While both the member and contingent survivor are both alive, we propose the healthy annuitant mortality table apply.

The following charts show postretirement mortality experience on a headcount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all members of NYCRS. The A/E decreased from 1.12 to 1.00 and decreased from 0.96 to 0.86 for only BERS.

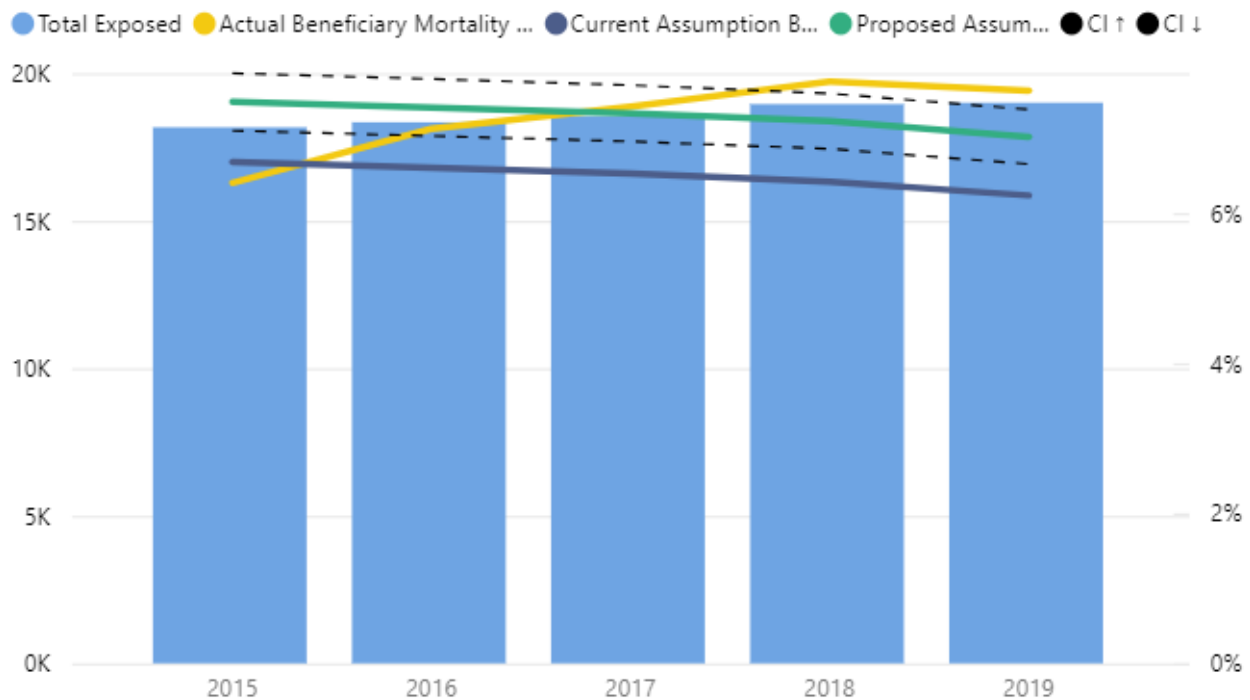
Current Assumption – Headcount-weighted

Plan Year	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
2015	1,163	1,213.4	18,168	6.4014%	6.6789%	0.96
2016	1,307	1,210.9	18,340	7.1265%	6.6027%	1.08
2017	1,376	1,210.4	18,541	7.4214%	6.5285%	1.14
2018	1,470	1,216.8	18,955	7.7552%	6.4197%	1.21
2019	1,450	1,184.7	19,001	7.6312%	6.2351%	1.22
Total	6,766	6,036.4	93,005	7.2749%	6.4904%	1.12

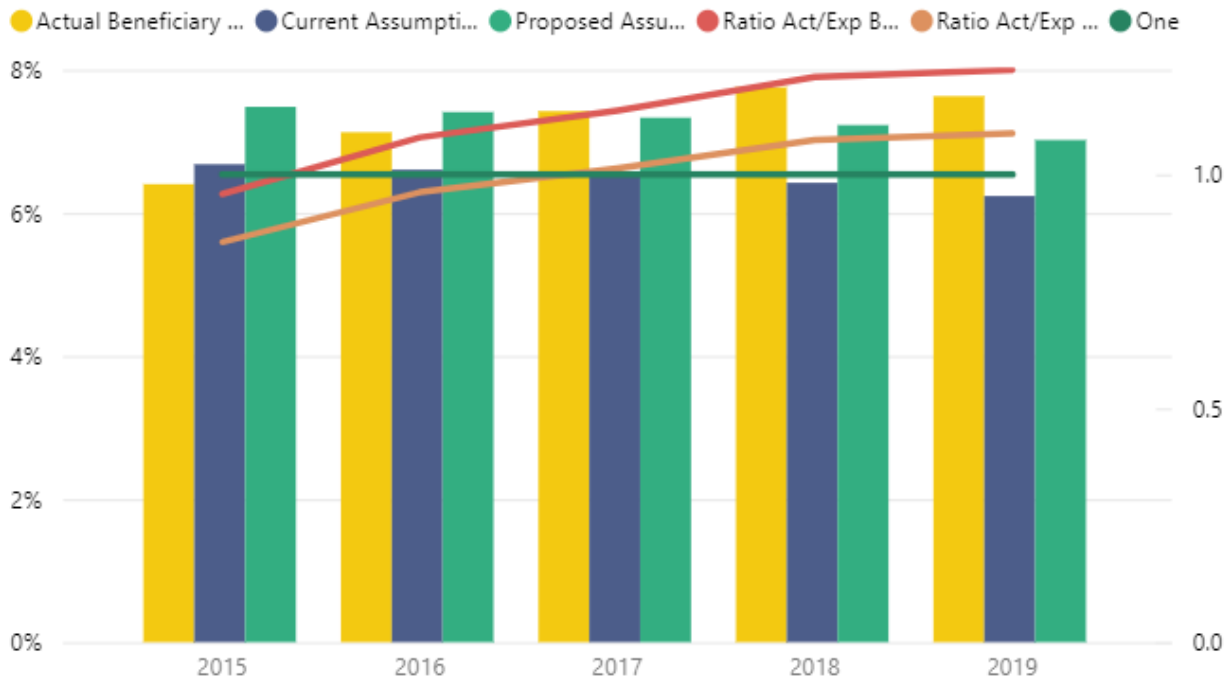
Proposed Assumption – Headcount-weighted

Plan Year	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
2015	1,163	1,359.3	18,168	6.4014%	7.4816%	▲ 0.86
2016	1,307	1,358.7	18,340	7.1265%	7.4084%	● 0.96
2017	1,376	1,359.0	18,541	7.4214%	7.3296%	● 1.01
2018	1,470	1,369.6	18,955	7.7552%	7.2257%	● 1.07
2019	1,450	1,333.4	19,001	7.6312%	7.0175%	● 1.09
Total	6,766	6,780.0	93,005	7.2749%	7.2899%	● 1.00

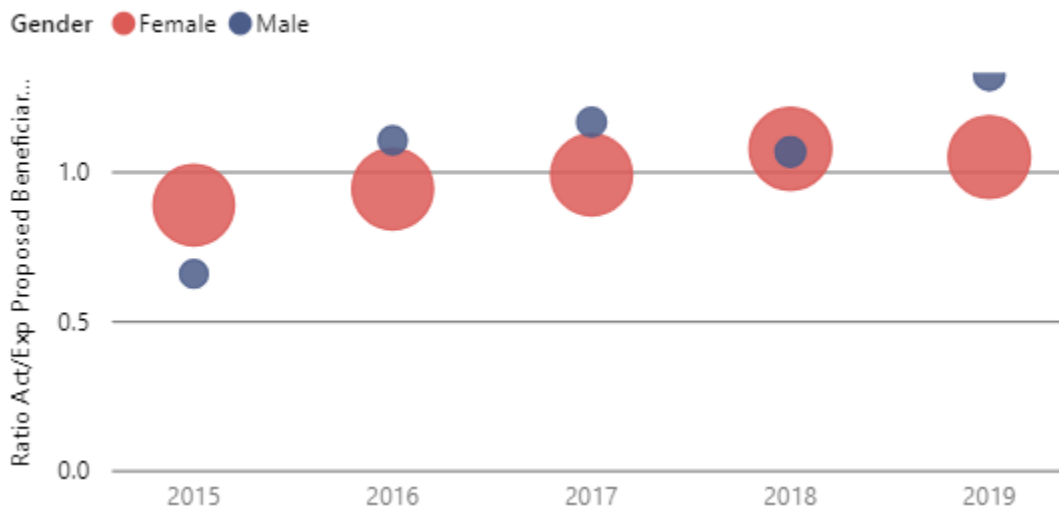
Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Year



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Year



Actual vs. Expected - Beneficiary Mortality Proposed w/ Exposure Bubbles; by ...



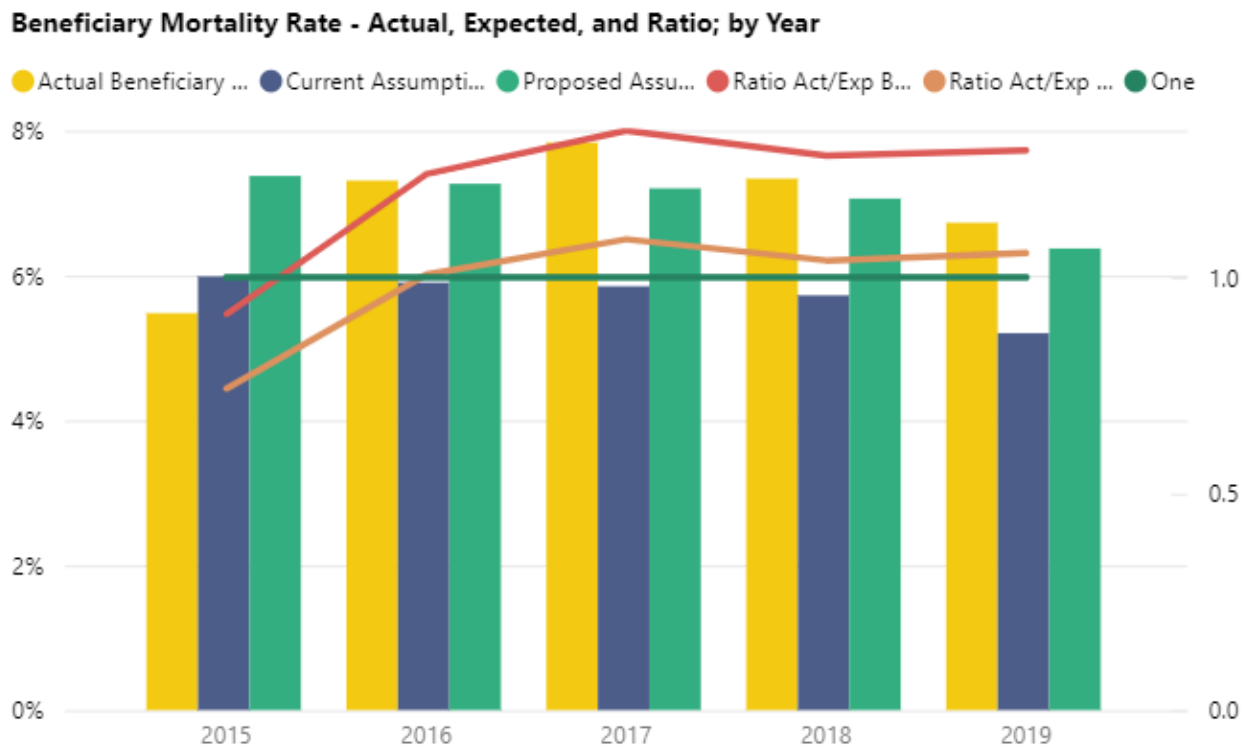
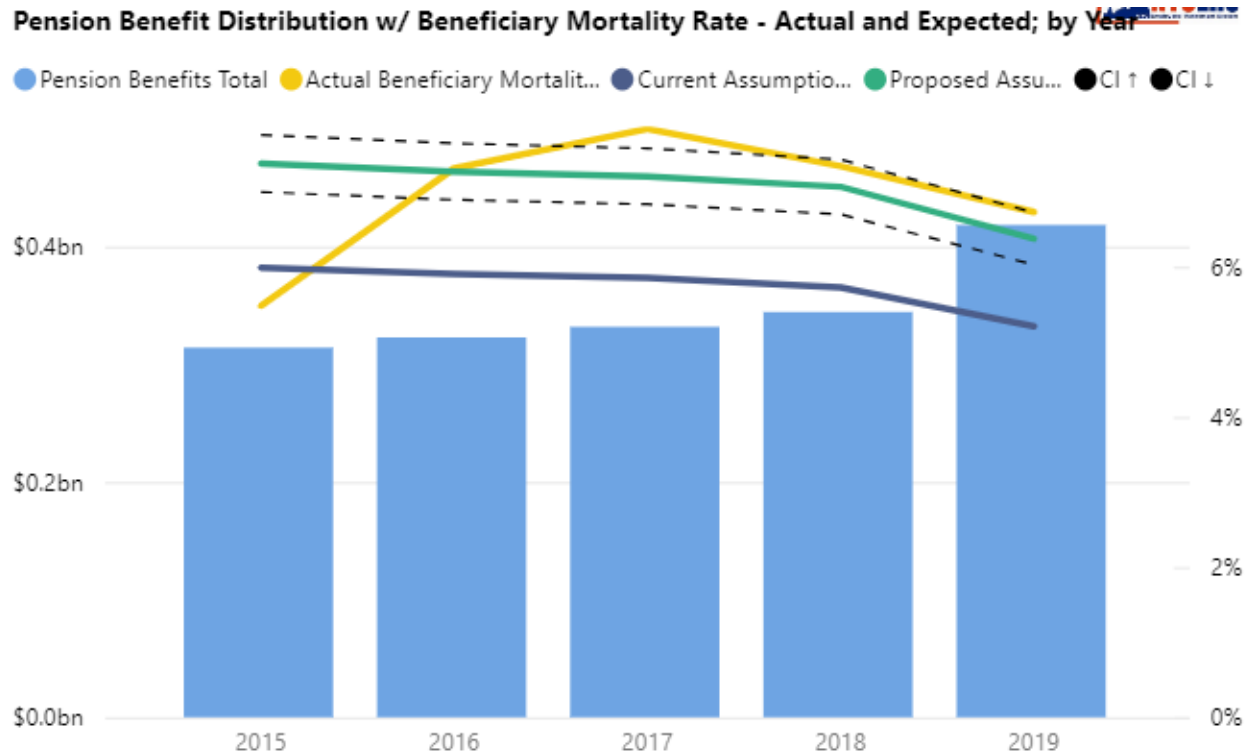
The following charts show postretirement mortality experience on an amount-weighted basis by year for the age range (60 to 104) during the period 2015 – 2019 for both males and females combined on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.22 to 0.99 and decreased from 1.10 to 0.90 for only BERS.

Current Assumption – Amount-weighted

Plan Year	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
2015	\$17.2M	\$18.8M	\$314.1M	5.4787%	5.9868%	0.92
2016	\$23.6M	\$19.0M	\$322.7M	7.3093%	5.9014%	1.24
2017	\$26.0M	\$19.4M	\$331.8M	7.8345%	5.8502%	1.34
2018	\$25.3M	\$19.7M	\$344.3M	7.3366%	5.7247%	1.28
2019	\$28.1M	\$21.8M	\$418.3M	6.7269%	5.2026%	1.29
Total	\$120.2M	\$98.7M	\$1,731.3M	6.9425%	5.7031%	1.22

Proposed Assumption – Amount-weighted

Plan Year	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
2015	\$17.2M	\$23.2M	\$314.1M	5.4787%	7.3734%	0.74
2016	\$23.6M	\$23.4M	\$322.7M	7.3093%	7.2656%	1.01
2017	\$26.0M	\$23.9M	\$331.8M	7.8345%	7.2019%	1.09
2018	\$25.3M	\$24.3M	\$344.3M	7.3366%	7.0609%	1.04
2019	\$28.1M	\$26.7M	\$418.3M	6.7269%	6.3717%	1.06
Total	\$120.2M	\$121.5M	\$1,731.3M	6.9425%	7.0162%	0.99



The following section displays results by gender.

Contingent Beneficiaries - Males

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.52 to 1.11 and decreased from 0.98 to 0.72 for only BERS.

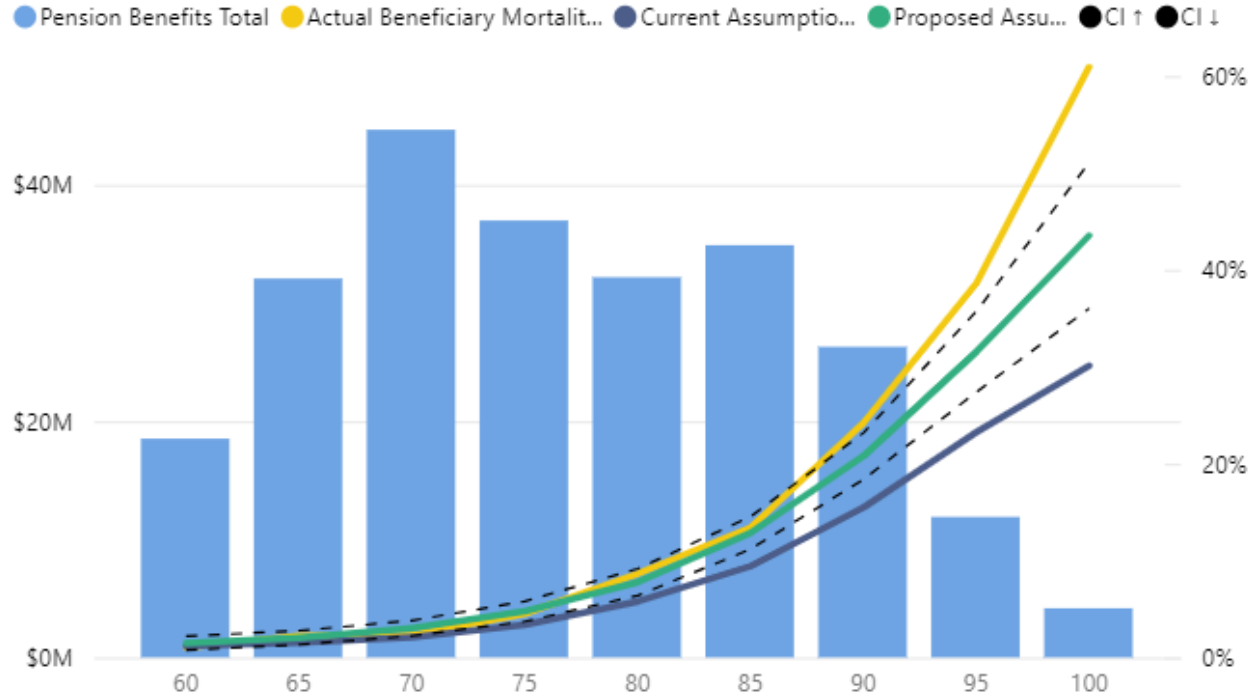
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

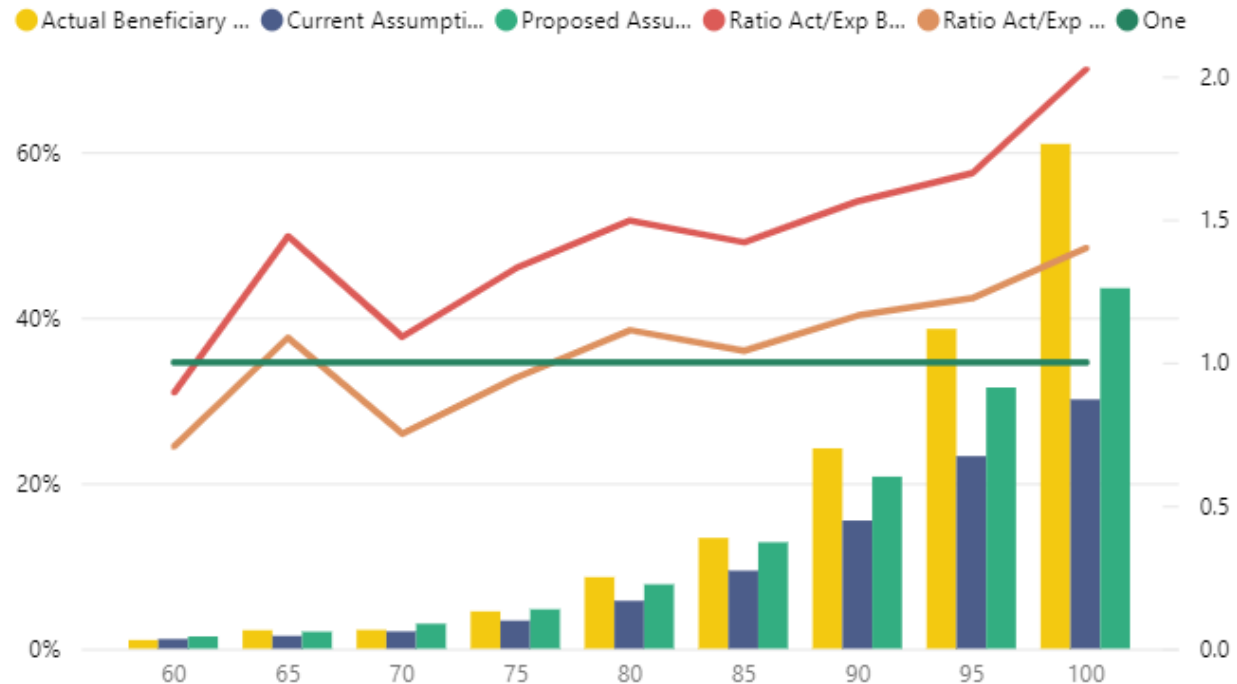
Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
60	\$0.2M	\$0.2M	\$18.5M	1.0416%	1.1637%	▲ 0.90
65	\$0.7M	\$0.5M	\$32.1M	2.2223%	1.5421%	▲ 1.44
70	\$1.0M	\$0.9M	\$44.7M	2.2615%	2.0760%	● 1.09
75	\$1.7M	\$1.3M	\$37.0M	4.4993%	3.3836%	▲ 1.33
80	\$2.8M	\$1.9M	\$32.2M	8.6385%	5.7759%	▲ 1.50
85	\$4.7M	\$3.3M	\$34.9M	13.3692%	9.4174%	▲ 1.42
90	\$6.4M	\$4.1M	\$26.3M	24.1876%	15.4684%	◆ 1.56
95	\$4.6M	\$2.8M	\$11.9M	38.6136%	23.2507%	◆ 1.66
100	\$2.5M	\$1.3M	\$4.2M	60.9581%	30.0988%	◆ 2.03
Total	\$24.5M	\$16.1M	\$241.6M	10.1452%	6.6706%	◆ 1.52

Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
60	\$0.2M	\$0.3M	\$18.5M	1.0416%	1.4728%	▲ 0.71
65	\$0.7M	\$0.7M	\$32.1M	2.2223%	2.0459%	● 1.09
70	\$1.0M	\$1.3M	\$44.7M	2.2615%	3.0124%	▲ 0.75
75	\$1.7M	\$1.8M	\$37.0M	4.4993%	4.7523%	● 0.95
80	\$2.8M	\$2.5M	\$32.2M	8.6385%	7.7645%	▲ 1.11
85	\$4.7M	\$4.5M	\$34.9M	13.3692%	12.8490%	● 1.04
90	\$6.4M	\$5.5M	\$26.3M	24.1876%	20.7707%	▲ 1.16
95	\$4.6M	\$3.8M	\$11.9M	38.6136%	31.5366%	▲ 1.22
100	\$2.5M	\$1.8M	\$4.2M	60.9581%	43.5346%	▲ 1.40
Total	\$24.5M	\$22.0M	\$241.6M	10.1452%	9.1203%	▲ 1.11

Pension Benefit Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Headcount-weighted

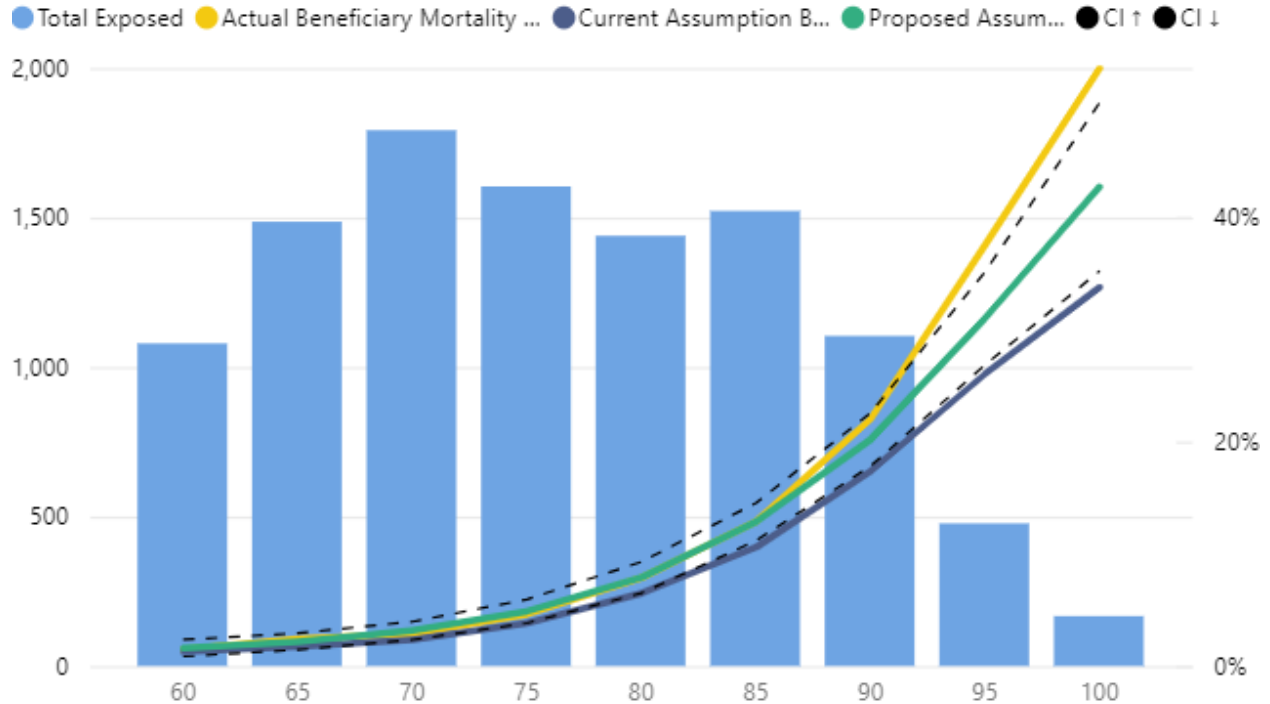
Part II Experience Study Report – TRS and BERS
New York City Retirement Systems

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for males on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.30 to 1.07 and decreased from 0.89 to 0.73 for only BERS.

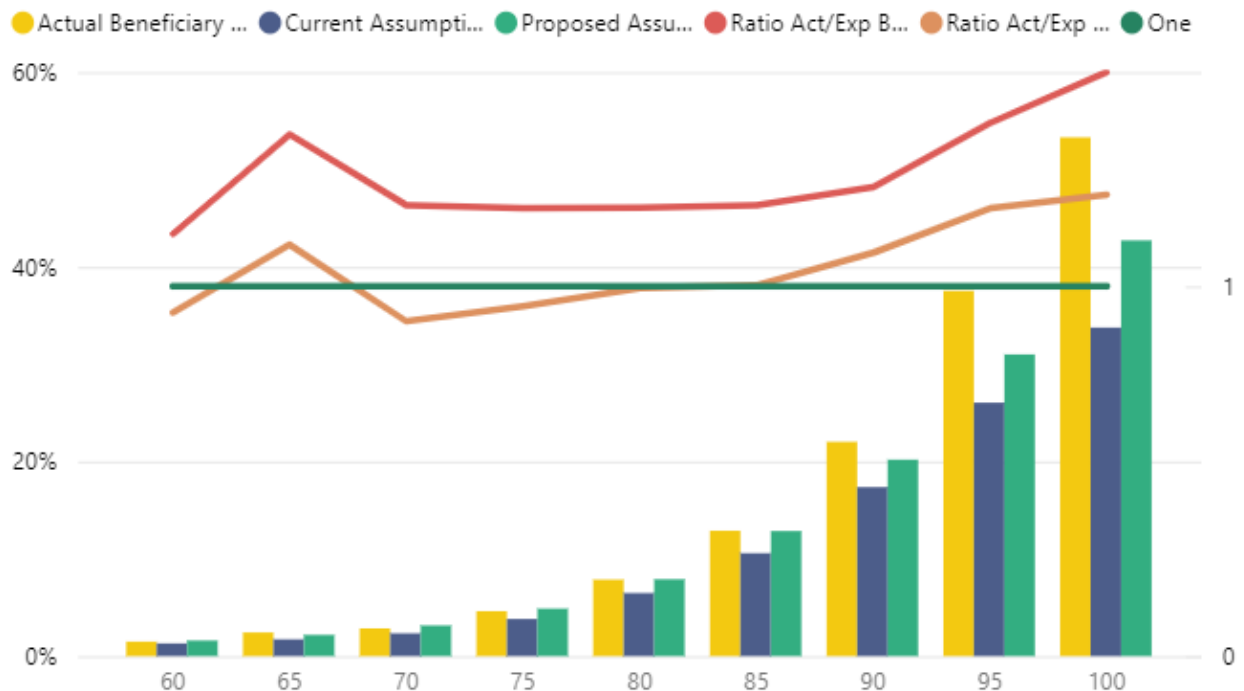
Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
60	16	14.0	1,079	1.4829%	1.2992%	▲ 1.14
65	36	25.5	1,486	2.4226%	1.7181%	▲ 1.41
70	51	41.8	1,792	2.8460%	2.3340%	▲ 1.22
75	74	61.1	1,604	4.6135%	3.8106%	▲ 1.21
80	113	93.2	1,439	7.8527%	6.4733%	▲ 1.21
85	196	160.8	1,522	12.8778%	10.5664%	▲ 1.22
90	243	191.6	1,104	22.0109%	17.3553%	▲ 1.27
95	179	124.2	477	37.5262%	26.0300%	▲ 1.44
100	89	56.4	167	53.2934%	33.7478%	◆ 1.58
Total	997	768.6	10,670	9.3440%	7.2033%	▲ 1.30

Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
60	16	17.2	1,079	1.4829%	1.5966%	● 0.93
65	36	32.3	1,486	2.4226%	2.1770%	▲ 1.11
70	51	56.3	1,792	2.8460%	3.1441%	● 0.91
75	74	78.2	1,604	4.6135%	4.8756%	● 0.95
80	113	113.6	1,439	7.8527%	7.8916%	● 1.00
85	196	195.5	1,522	12.8778%	12.8459%	● 1.00
90	243	222.8	1,104	22.0109%	20.1786%	● 1.09
95	179	147.8	477	37.5262%	30.9910%	▲ 1.21
100	89	71.3	167	53.2934%	42.7034%	▲ 1.25
Total	997	935.1	10,670	9.3440%	8.7639%	● 1.07

Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Contingent Beneficiaries - Females

The following charts show postretirement mortality experience on an amount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.16 to 0.96 and decreased from 1.13 to 0.95 for only BERS.

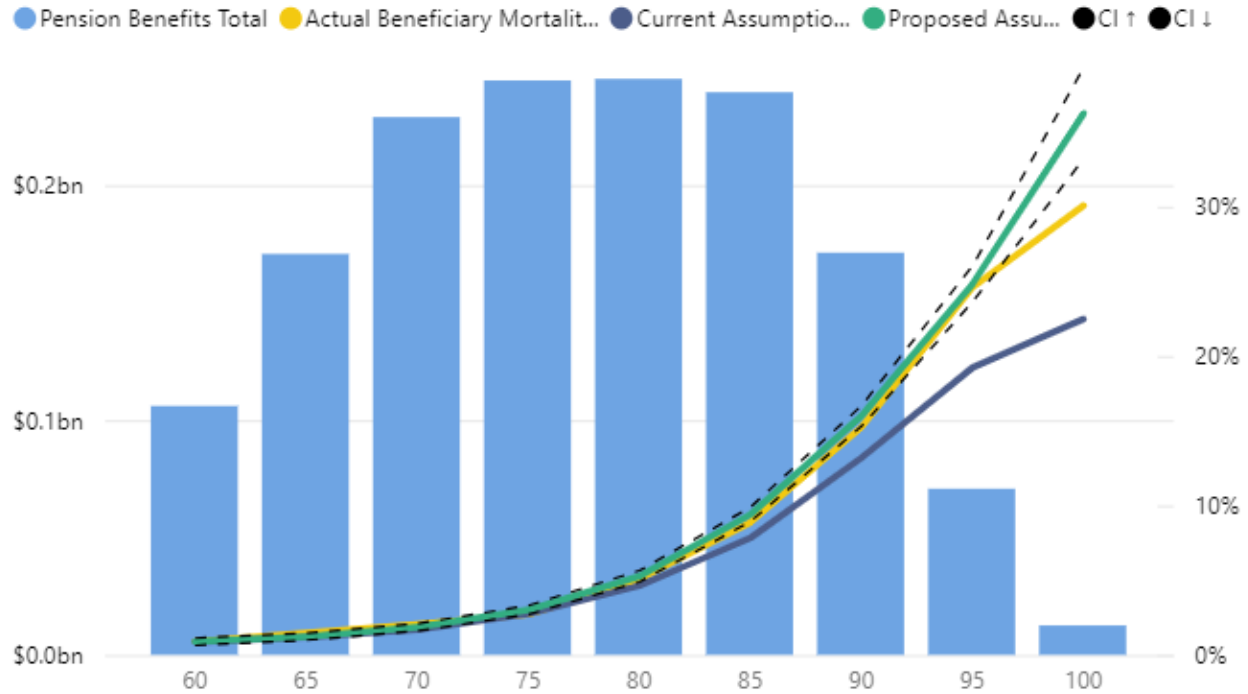
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 75 should be interpreted as the interval 75 – 79.

Amount-weighted

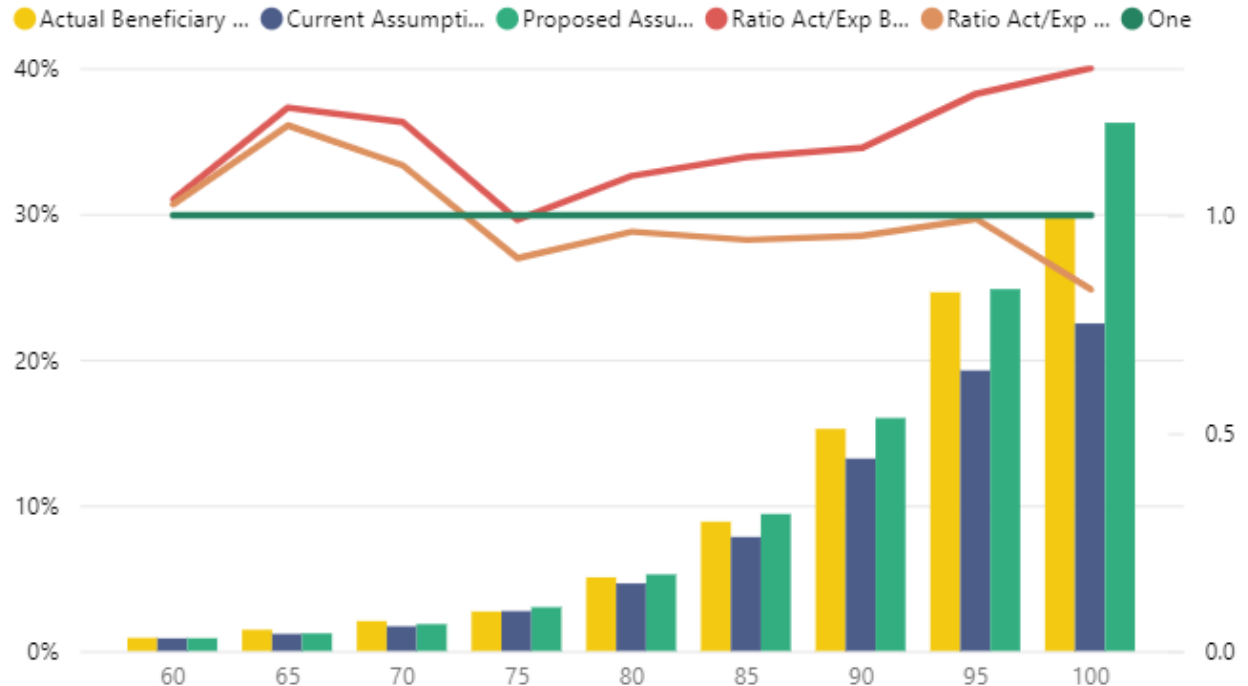
Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Current Assumption Beneficiary Mortality BftWght	Ratio Act/Exp Beneficiary Mortality BftWght
60	\$1.0M	\$0.9M	\$106.0M	0.8984%	0.8666%	1.04
65	\$2.5M	\$2.0M	\$170.7M	1.4586%	1.1698%	1.25
70	\$4.7M	\$3.9M	\$229.0M	2.0543%	1.6923%	1.21
75	\$6.6M	\$6.7M	\$244.6M	2.7071%	2.7350%	0.99
80	\$12.4M	\$11.4M	\$245.3M	5.0535%	4.6336%	1.09
85	\$21.2M	\$18.7M	\$239.6M	8.8691%	7.8227%	1.13
90	\$26.1M	\$22.6M	\$171.3M	15.2405%	13.2015%	1.15
95	\$17.4M	\$13.6M	\$70.7M	24.6092%	19.2429%	1.28
100	\$3.8M	\$2.8M	\$12.5M	30.0705%	22.4709%	1.34
Total	\$95.7M	\$82.6M	\$1,489.6M	6.4231%	5.5462%	1.16

Age Bene (bins)	Actual Beneficiary Benefits Released	Expected Beneficiary Benefits Released Proposed	Pension Benefits Total	Actual Beneficiary Mortality Rate BftWght	Proposed Assumption Beneficiary Mortality BftWght	Act/Exp Proposed Beneficiary Mortality BftWght
60	\$1.0M	\$0.9M	\$106.0M	0.8984%	0.8763%	1.03
65	\$2.5M	\$2.1M	\$170.7M	1.4586%	1.2092%	1.21
70	\$4.7M	\$4.2M	\$229.0M	2.0543%	1.8436%	1.11
75	\$6.6M	\$7.3M	\$244.6M	2.7071%	3.0029%	0.90
80	\$12.4M	\$12.9M	\$245.3M	5.0535%	5.2520%	0.96
85	\$21.2M	\$22.5M	\$239.6M	8.8691%	9.3996%	0.94
90	\$26.1M	\$27.4M	\$171.3M	15.2405%	15.9868%	0.95
95	\$17.4M	\$17.6M	\$70.7M	24.6092%	24.8248%	0.99
100	\$3.8M	\$4.5M	\$12.5M	30.0705%	36.2393%	0.83
Total	\$95.7M	\$99.4M	\$1,489.6M	6.4231%	6.6750%	0.96

Pension Benefit Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



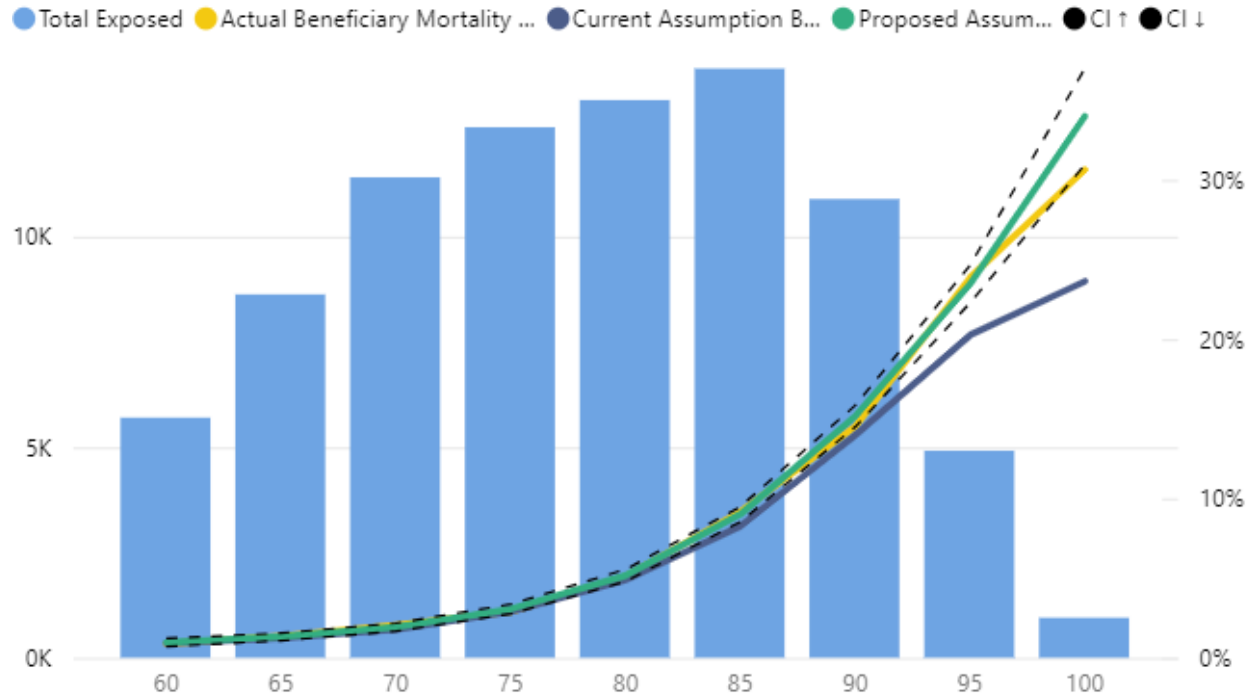
Headcount-weighted

The following charts show postretirement mortality experience on a headcount-weighted basis by age band for the age range (60 to 104) during the period 2015 – 2019 for females on the current and proposed assumptions for all members of NYCERS. The A/E decreased from 1.10 to 0.99 and decreased from 0.99 to 0.90 for only BERS.

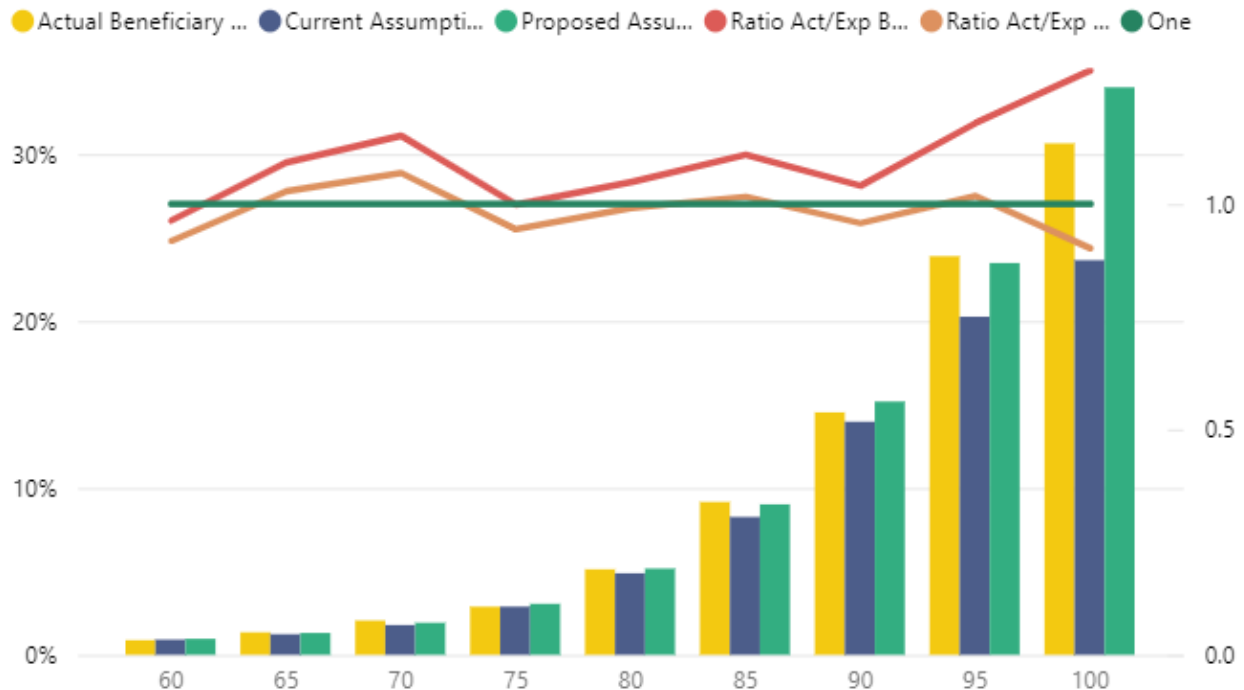
Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
60	50	51.9	5,702	0.8769%	0.9101%	0.96
65	116	106.2	8,629	1.3443%	1.2311%	1.09
70	234	203.2	11,408	2.0512%	1.7814%	1.15
75	363	363.5	12,598	2.8814%	2.8857%	1.00
80	678	646.9	13,244	5.1193%	4.8841%	1.05
85	1,281	1,155.2	13,993	9.1546%	8.2556%	1.11
90	1,582	1,520.7	10,894	14.5218%	13.9588%	1.04
95	1,174	995.6	4,917	23.8763%	20.2491%	1.18
100	291	224.5	950	30.6316%	23.6325%	1.30
Total	5,769	5,267.8	82,335	7.0067%	6.3980%	1.10

Age Bene (bins)	Actual Beneficiary Deaths	Expected Beneficiary Deaths Proposed	Total Exposed	Actual Beneficiary Mortality Rate	Proposed Assumption Beneficiary Mortality	Act/Exp Proposed Beneficiary Mortality
60	50	54.5	5,702	0.8769%	0.9555%	0.92
65	116	112.8	8,629	1.3443%	1.3075%	1.03
70	234	219.0	11,408	2.0512%	1.9194%	1.07
75	363	384.6	12,598	2.8814%	3.0528%	0.94
80	678	684.0	13,244	5.1193%	5.1648%	0.99
85	1,281	1,260.9	13,993	9.1546%	9.0109%	1.02
90	1,582	1,652.4	10,894	14.5218%	15.1684%	0.96
95	1,174	1,153.7	4,917	23.8763%	23.4644%	1.02
100	291	322.9	950	30.6316%	33.9867%	0.90
Total	5,769	5,844.9	82,335	7.0067%	7.0989%	0.99

Exposure Distribution w/ Beneficiary Mortality Rate - Actual and Expected; by Age



Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



Summary

We have proposed new assumptions consistent with industry standards. In total, the proposed mortality tables are anticipated to decrease plan liabilities.

Assumption Tables

The following table shows the current assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT PROBABILITIES OF BENEFICIARY MORTALITY BASE TABLE					
Age	Males	Females	Age	Males	Females
15	0.0105%	0.0092%	68	1.8256%	1.3605%
16	0.0142%	0.0112%	69	1.9386%	1.4332%
17	0.0191%	0.0122%	70	2.0542%	1.5007%
18	0.0222%	0.0133%	71	2.2359%	1.6745%
19	0.0240%	0.0143%	72	2.4230%	1.8463%
20	0.0251%	0.0145%	73	2.6165%	2.0157%
21	0.0268%	0.0153%	74	2.8157%	2.1838%
22	0.0284%	0.0161%	75	3.0220%	2.3492%
23	0.0301%	0.0171%	76	3.4928%	2.6652%
24	0.0315%	0.0183%	77	3.9787%	2.9831%
25	0.0327%	0.0195%	78	4.4792%	3.3011%
26	0.0342%	0.0208%	79	4.9963%	3.6207%
27	0.0354%	0.0221%	80	5.5282%	3.9391%
28	0.0371%	0.0236%	81	6.1051%	4.4386%
29	0.0394%	0.0252%	82	6.6894%	4.9473%
30	0.0427%	0.0270%	83	7.2805%	5.4665%
31	0.0495%	0.0330%	84	7.8749%	5.9942%
32	0.0562%	0.0384%	85	8.4753%	6.5354%
33	0.0625%	0.0431%	86	9.6136%	7.4659%
34	0.0682%	0.0471%	87	10.8005%	8.3995%
35	0.0743%	0.0511%	88	12.0443%	9.3428%
36	0.0780%	0.0542%	89	13.3397%	10.2918%
37	0.0818%	0.0579%	90	14.6958%	11.2477%
38	0.0861%	0.0618%	91	16.4185%	12.8868%
39	0.0917%	0.0666%	92	18.1416%	14.4887%
40	0.0997%	0.0719%	93	19.8574%	16.0801%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM CURRENT (continued) PROBABILITIES OF BENEFICIARY MORTALITY BASE TABLE					
Age	Males	Females	Age	Males	Females
41	0.1394%	0.0775%	94	21.6187%	17.5854%
42	0.1774%	0.0859%	95	23.5884%	19.0626%
43	0.2143%	0.0968%	96	25.4266%	20.2474%
44	0.2507%	0.1111%	97	27.2119%	21.2937%
45	0.2875%	0.1287%	98	29.0202%	22.0663%
46	0.3207%	0.1501%	99	30.6654%	22.5443%
47	0.3534%	0.1748%	100	32.1584%	22.6473%
48	0.3849%	0.2022%	101	33.7521%	23.5294%
49	0.4150%	0.2319%	102	35.1259%	24.5619%
50	0.4431%	0.2633%	103	36.3671%	25.7825%
51	0.5156%	0.2999%	104	37.3834%	27.1635%
52	0.5928%	0.3376%	105	38.1051%	28.6530%
53	0.6740%	0.3762%	106	38.4698%	30.2169%
54	0.7583%	0.4151%	107	38.6325%	31.8182%
55	0.8440%	0.4540%	108	38.8076%	33.4131%
56	0.9048%	0.5132%	109	38.9794%	34.9566%
57	0.9604%	0.5735%	110	50.0000%	50.0000%
58	1.0101%	0.6353%	111	50.0000%	50.0000%
59	1.0536%	0.6981%	112	50.0000%	50.0000%
60	1.0919%	0.7631%	113	50.0000%	50.0000%
61	1.1835%	0.8329%	114	50.0000%	50.0000%
62	1.2676%	0.8908%	115	50.0000%	50.0000%
63	1.3473%	0.9493%	116	50.0000%	50.0000%
64	1.4238%	1.0146%	117	50.0000%	50.0000%
65	1.4985%	1.0876%	118	50.0000%	50.0000%
66	1.6059%	1.1681%	119	50.0000%	50.0000%
67	1.7146%	1.2609%	120	100.0000%	100.0000%

The following table shows the proposed assumptions.

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF BENEFICIARY MORTALITY* BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0213%	0.0108%	68	2.1319%	1.2510%
16	0.0288%	0.0132%	69	2.2991%	1.3475%
17	0.0388%	0.0144%	70	2.4880%	1.4610%
18	0.0450%	0.0156%	71	2.7020%	1.5932%
19	0.0475%	0.0156%	72	2.9426%	1.7474%
20	0.0467%	0.0165%	73	3.2127%	1.9239%
21	0.0462%	0.0155%	74	3.5155%	2.1243%
22	0.0433%	0.0146%	75	3.8517%	2.3534%
23	0.0417%	0.0135%	76	4.2232%	2.6102%
24	0.0401%	0.0125%	77	4.6341%	2.9016%
25	0.0400%	0.0127%	78	5.0911%	3.2318%
26	0.0442%	0.0145%	79	5.5977%	3.6056%
27	0.0471%	0.0163%	80	6.1669%	4.0314%
28	0.0516%	0.0181%	81	6.8074%	4.5194%
29	0.0546%	0.0199%	82	7.5285%	5.0748%
30	0.0591%	0.0233%	83	8.3336%	5.7106%
31	0.0636%	0.0252%	84	9.2333%	6.4368%
32	0.0678%	0.0284%	85	10.2373%	7.2652%
33	0.0718%	0.0300%	86	11.3474%	8.2088%
34	0.0754%	0.0329%	87	12.5685%	9.2702%
35	0.0803%	0.0356%	88	13.9075%	10.4520%
36	0.0845%	0.0379%	89	15.3777%	11.7389%
37	0.0880%	0.0414%	90	17.1167%	13.1089%
38	0.0925%	0.0431%	91	18.9624%	14.5764%
39	0.0961%	0.0458%	92	20.8892%	16.1376%
40	0.1005%	0.0483%	93	22.8919%	17.7993%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF BENEFICIARY MORTALITY* BASE YEAR 2019 BENEFIT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.1042%	0.0518%	94	24.9620%	19.5555%
42	0.1088%	0.0538%	95	27.0734%	21.4140%
43	0.1130%	0.0570%	96	29.3636%	23.4560%
44	0.1183%	0.0602%	97	31.7238%	25.6189%
45	0.6986%	0.3023%	98	34.1591%	27.9023%
46	0.7085%	0.3098%	99	36.6614%	30.2827%
47	0.7222%	0.3189%	100	39.1948%	32.7488%
48	0.7402%	0.3310%	101	41.7401%	35.2675%
49	0.7619%	0.3452%	102	44.2616%	37.8102%
50	0.8227%	0.3614%	103	46.7654%	40.3653%
51	0.8500%	0.3910%	104	49.2000%	42.8934%
52	0.8814%	0.4252%	105	51.5638%	45.3902%
53	0.9178%	0.4627%	106	53.8534%	47.8174%
54	0.9603%	0.5028%	107	56.0417%	50.1669%
55	1.0067%	0.5474%	108	58.1186%	52.4321%
56	1.0594%	0.5928%	109	60.0958%	54.5877%
57	1.1170%	0.6394%	110	61.6798%	56.6242%
58	1.1797%	0.6869%	111	61.8406%	58.5460%
59	1.2454%	0.7345%	112	61.9956%	59.6111%
60	1.3156%	0.7812%	113	62.1509%	59.7365%
61	1.3908%	0.8277%	114	62.3252%	59.8621%
62	1.4697%	0.8752%	115	62.4813%	59.9880%
63	1.5526%	0.9244%	116	62.4938%	59.9940%
64	1.6430%	0.9765%	117	62.5000%	60.0000%
65	1.7438%	1.0325%	118	62.5000%	60.0000%
66	1.8562%	1.0961%	119	62.5000%	60.0000%
67	1.9859%	1.1673%	120	100.0000%	100.0000%

* This table is to be utilized for beneficiary mortality after the retiree's death. Service retirement mortality is used for the beneficiary while the retiree is alive

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED PROBABILITIES OF BENEFICIARY MORTALITY BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
15	0.0204%	0.0097%	68	2.2864%	1.3446%
16	0.0276%	0.0119%	69	2.4491%	1.4354%
17	0.0372%	0.0130%	70	2.6331%	1.5423%
18	0.0432%	0.0140%	71	2.8383%	1.6697%
19	0.0468%	0.0151%	72	3.0697%	1.8184%
20	0.0473%	0.0160%	73	3.3299%	1.9907%
21	0.0481%	0.0151%	74	3.6244%	2.1879%
22	0.0466%	0.0155%	75	3.9545%	2.4115%
23	0.0465%	0.0146%	76	4.3256%	2.6622%
24	0.0465%	0.0149%	77	4.7424%	2.9435%
25	0.0480%	0.0166%	78	5.2081%	3.2609%
26	0.0523%	0.0182%	79	5.7273%	3.6176%
27	0.0569%	0.0200%	80	6.3080%	4.0192%
28	0.0616%	0.0217%	81	6.9573%	4.4737%
29	0.0663%	0.0235%	82	7.6811%	4.9877%
30	0.0710%	0.0266%	83	8.4812%	5.5718%
31	0.0771%	0.0283%	84	9.3690%	6.2370%
32	0.0814%	0.0313%	85	10.3482%	6.9994%
33	0.0870%	0.0341%	86	11.4214%	7.8703%
34	0.0922%	0.0367%	87	12.5930%	8.8554%
35	0.0967%	0.0390%	88	13.8708%	9.9520%
36	0.1022%	0.0423%	89	15.2597%	11.1439%
37	0.1068%	0.0439%	90	16.7591%	12.4051%
38	0.1106%	0.0465%	91	18.4162%	13.7635%
39	0.1149%	0.0488%	92	20.2341%	15.2202%
40	0.1184%	0.0519%	93	22.2115%	16.7860%

NEW YORK CITY BOARD OF EDUCATION RETIREMENT SYSTEM PROPOSED (continued) PROBABILITIES OF BENEFICIARY MORTALITY BASE YEAR 2019 COUNT WEIGHTED					
Age	Males	Females	Age	Males	Females
41	0.1226%	0.0536%	94	24.3289%	18.4516%
42	0.1262%	0.0563%	95	26.5331%	20.2181%
43	0.1320%	0.0600%	96	28.9271%	22.1559%
44	0.1375%	0.0637%	97	31.3742%	24.1980%
45	0.7758%	0.3208%	98	33.8485%	26.3367%
46	0.7682%	0.3452%	99	36.3239%	28.5431%
47	0.7677%	0.3719%	100	38.7602%	30.8094%
48	0.7747%	0.4016%	101	41.1591%	33.1010%
49	0.7926%	0.4297%	102	43.5244%	35.4038%
50	0.8224%	0.4563%	103	45.8670%	37.7042%
51	0.8577%	0.4816%	104	48.1391%	39.9675%
52	0.8994%	0.5102%	105	50.3393%	42.1912%
53	0.9462%	0.5421%	106	52.4670%	44.3413%
54	0.9994%	0.5784%	107	54.4969%	46.4107%
55	1.0591%	0.6175%	108	56.4206%	48.3978%
56	1.1230%	0.6591%	109	58.2519%	50.2786%
57	1.1932%	0.7034%	110	59.2126%	52.0464%
58	1.2685%	0.7492%	111	59.3670%	53.5427%
59	1.3479%	0.7976%	112	59.5157%	53.6500%
60	1.4302%	0.8477%	113	59.6648%	53.7629%
61	1.5154%	0.9002%	114	59.8322%	53.8759%
62	1.6044%	0.9547%	115	59.9820%	53.9892%
63	1.6963%	1.0119%	116	59.9940%	53.9946%
64	1.7931%	1.0709%	117	60.0000%	54.0000%
65	1.8978%	1.1318%	118	60.0000%	54.0000%
66	2.0128%	1.1964%	119	60.0000%	54.0000%
67	2.1418%	1.2660%	120	100.0000%	100.0000%

* This table is to be utilized for beneficiary mortality after the retiree's death. Service retirement mortality is used for the beneficiary while the retiree is alive