



New York City Retirement Systems Part I Experience Study Report - NYCERS

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

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

Re: Part I Experience Study Report – NYCERS

Dear Ms. Olson:

We are pleased to present the enclosed report, along with the Milliman Experience Study Tool, of our observations of the Part I Experience Study for the five New York City Retirement Systems (“NYCRS”):

- **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 Section I for NYCERS and is separated into five different subsections:

- General Employees
- Correction Officers
- Sanitation Employees
- Bridges and Tunnels and Transit Employees
- Postretirement Mortality

The purpose of the Part I Experience Study report is to provide high-level observations of the demographic assumptions used in the actuarial valuations performed by the Office of the Actuary (OA) for these systems compared to the experience. The experience includes data from 2012 – 2017 used in prior experience studies, along with updates for the 4-year period ending June 30, 2021.

Part I Experience Study Report – NYCERS
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.

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Part II Experience Study report will incorporate recommendations for changes to the actuarial assumptions reviewed.

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 observations included in this report are based on the charts produced by the MEST.

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 NYCERS' operations, and is based on NYCERS' 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 NYCERS. We are not aware of any relationship that would impair the objectivity of our work.

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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,



Glenn D. Bowen, FSA, EA, MAAA



Scott Porter, FSA, EA, MAAA

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Executive Summary

This report summarizes the Part I 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 Section I for NYCERS and is separated into five different subsections:

- General Employees
- Correction Officers
- Sanitation Employees
- Bridges and Tunnels (TBTA) and Transit Employees
- Postretirement Mortality

For General employees, withdrawal and retirement experience is reviewed separately for Basic Plan group members and Specialty Plan group members. These groupings are explained in the [General Plan Code Groupings](#).

The postretirement mortality experience is combined for all NYCERS’ groups.

The primary purposes of the Part I Experience Study Report are to provide high-level observations of the experience for the indicated systems:

- This report provides information on key preretirement demographic assumptions - withdrawal, retirement, and disability – used in the actuarial valuations performed by the OA.
- This report provides information on the pre-retirement and postretirement mortality assumptions used in the actuarial valuations performed by the OA.

Part II Experience Study report will incorporate recommendations for changes to the actuarial assumptions reviewed.

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.

General

The following is a summary of our observations regarding the experience of General employees.

Summary of General Observations		
Decrement	Observation	Potential Impact
Withdrawal Basic Plan Group	Fewer withdrawals than expected at service between 6 and 29 years. Older members exhibited lower rates than younger members for same service periods. Male members exhibited lower rates than female members.	Decreasing withdrawal rates generally results in higher liabilities.
Withdrawal Specialty Plan Group	Specialty Plan group members exhibited greater rates than Basic Plan group members, but experience was less than expected at service between 6 and 24 years.	Decreasing withdrawal rates generally results in higher liabilities.
Retirement Basic Plan Group	Change in benefit formula at 20 years of service has a significant impact on rates of retirement. Fewer than expected if less than 20 years and greater than expected at 20 more years of service.	While increasing the number of members anticipated to receive the 2% formula benefit generally results in higher liabilities, the impact on accrued liabilities and normal cost may vary.
Retirement Specialty Plan Group	Fewer retirements occurred than expected at first eligibility. More retirements occurred if eligible for early retirement from the Basic Plan where OA applies the withdrawal assumption. Fewer retirements occurred than expected at ages 62 and older and fewer than 25 years of service.	Decreasing rates of retirement generally result in lower liabilities. Applying early retirement rates rather than termination rates may not have a significant impact on liabilities, but impact on accrued liabilities and normal cost may vary.
Ordinary Disability	Eligibility for retirement and change in benefit formula at 20 years of service has a significant impact on rates of disability; nearly none occurred for members with at least 20 years of service and 62 and older, but greater than expected for those with less than 20 years.	Modifying rates of disability based on eligibility for retirement and benefit formula generally results in higher liabilities.
Accidental Disability	Rates of actual accidental disability retirements vary by age and were greater for Specialty Plan group members than Basic Plan group members.	Increasing accidental disability rates generally results in higher liabilities but reducing rates at younger ages would offset the impact.
Ordinary Death	Slightly greater number of deaths than expected, but there were significant variations in the experience over time.	Increases in rates of mortality generally result in lower liabilities but we don't know what generated these anomalous results and if the data is reliable.

Corrections

The following is a summary of our observations regarding the experience of Correction officers.

Summary of Corrections Observations		
Decrement	Observation	Potential Impact
Withdrawal	More withdrawals than expected.	Increasing withdrawal rates generally results in lower liabilities.
Retirement	Greater number of retirements than expected, except at first eligibility.	Increasing rates of retirement, generally results in higher liabilities.
Ordinary Disability	Eligibility for retirement impacts rates of disability; very few occurred for members with at least 20 years of service. But still less than expected for those with less than 20 years.	Decreasing rates of disability generally results in lower liabilities.
Accidental Disability	More accidental disability retirements than expected.	Increasing accidental disability rates generally results in higher liabilities.
Ordinary Death	Less deaths than expected but not enough data for experience to be considered fully credible.	Decrease in rates of mortality generally results in higher liabilities.
Accidental Death	Excluding 2020 – 2021, there were no accidental deaths during the study period.	Reductions in rates of accidental death would generally result in lower liabilities.

Sanitation

The following is a summary of our observations regarding the experience of Sanitation employees.

Summary of Sanitation Observations		
Decrement	Observation	Potential Impact
Withdrawal	Experience was fairly consistent with the assumption.	Little impact anticipated.
Retirement	Greater number of retirements than expected, especially at older ages but less than expected at younger ages.	Impact will depend on relative change of increasing retirements but delaying retirement to older ages. Increasing rates of retirement, generally results in higher liabilities
Ordinary Disability	Eligibility for retirement impacts rates of disability; very few occurred for members with at least 20 years of service. But still less than expected for those with less than 20 years.	Decreasing rates of disability generally results in lower liabilities.

Summary of Sanitation Observations		
Decrement	Observation	Potential Impact
Accidental Disability	More accidental disability retirements than expected.	Increasing accidental disability rates generally results in higher liabilities.
Ordinary Death	Less deaths than expected but not enough data for experience to be considered fully credible.	Decrease in rates of mortality generally results in higher liabilities.
Accidental Death	Excluding 2020 – 2021, there was only one accidental death during the study period.	Reductions in rates of accidental death would generally result in lower liabilities.

TBTA / Transit

The following is a summary of our observations regarding the experience of TBTA and Transit members.

Summary of TBTA/Transit Observations		
Decrement	Observation	Potential Impact
Withdrawal TBTA	More withdrawals than expected.	Increasing withdrawal rates generally results in lower liabilities.
Withdrawal Transit	Up to 25 years of service, actual experience for males was relatively similar to the assumption, but more withdrawals occurred than expected for females. Beginning at 25 years of service, more withdrawals occurred than expected.	Increasing withdrawal rates generally results in lower liabilities.
Retirement	Overall, actual experience was relatively similar to the expected for TBTA and Transit but experience for certain age / service / plan combinations may be more or less than expected. For instance, less retirements occurred at age 62 to 69 for members with less than 20 years of service.	Without additional analysis, it is difficult to determine the impact at this time.
Ordinary Disability	Eligibility for retirement and change in benefit formula at 20 years of service has a significant impact on rates of disability; much fewer than expected for members with at least 20 years of service and 62 and older, but greater than expected for those with less than 20 years. Also, higher rates among females versus males.	Modifying rates of disability based on eligibility for retirement and benefit formula generally results in higher liabilities.
Accidental Disability	Fewer accidental disability retirements than expected and experience varies by age.	Decreasing accidental disability rates generally results in lower liabilities.

Summary of TBTA/Transit Observations		
Decrement	Observation	Potential Impact
Ordinary Death	Slightly less deaths than expected but not enough data for experience to be considered fully credible.	Decrease in rates of mortality generally results in higher liabilities.
Accidental Death	Excluding 2020 – 2021, there were only four accidental deaths during the study period.	Reductions in rates of accidental death would generally result in lower liabilities.

Postretirement Mortality

The following is a summary of our observations regarding the postretirement mortality experience of all groups combined.

Summary of Postretirement Mortality Observations		
Decrement	Observation	Potential Impact
Service Retirees	Overall, actual number of deaths was generally within 3% of expectations excluding 2020 – 2021, but greater differences exist by group.	Further review required to compare experience to the most recent published mortality tables but increases in rates of mortality generally results in lower liabilities.
Disabled Retirees	Actual number of deaths was similar to expected but differences exist by gender and group.	
Contingent Beneficiaries	Actual number of deaths was greater than expected, especially for male beneficiaries.	

Introduction

Part I Experience Study Introduction

Milliman’s focus for Part I of the experience study is to provide high-level observations of the experience during the 10-year study period July 1, 2011 – June 30, 2021. Our review splits this study period into three subperiods:

- 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.

Our observations are based on analysis performed with 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 preretirement decrements – withdrawal, retirement and disability – and the mortality assumptions – pre-retirement and postretirement.

An Appendix (to be provided subsequently) describes the data processing in detail. The following sections briefly describe this process.

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 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.

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 note that the vast majority of records with a LOA status code do terminate employment (withdrawal, retire, become disabled, etc.).

Other NYCERS Adjustments

For NYCERS, a few other adjustments were made to the historical database:

- **Plan Code for Corrections:** In the historical database, there were records with Group Codes indicating they were Corrections records, but the indicated Plan Code did not align with a Correction’s Plan Code. This primarily impacted records from 2012 – 2014. As discussed with OA, these records were re-mapped to Plan X – Correction – 20 Year Plan.
- **Year 2017:** There were 2,782 active member records in 2017 that were active in prior years, but the status codes and applicable information were not included on the record. For prior years back until date of hire, the status code, plan code, tier, service and other information were updated based on the information contained on the 2017 record.
- **Rehired Vested Records:** For the fiscal year endings 2019 – 2021, the number of vested records with an active status code the following year was significantly higher than in prior years. In discussion with OA, records with a vested code (“V”) that were preceded by an active code (A”) and followed by an active code were not assumed to terminate and the “V” code was changed to a rehire code (“B”). The following chart provides the counts of these adjustments:

Vested Records Changed to Rehired Records		
Year End	Counts of “V” to “A”	Counts of “V” Change to “B”
2021	1,248	999
2020	903	585
2019	901	577

- **Death Records:** In 2018 and 2019, OA indicated that 741 records (344 in 2018 and 397 in 2019) originally coded as terminations were deaths. We updated the historical database code accordingly.
- **Death to Retiree or Vested Records:** Based on a review of the historical database codes, we replaced the death code for those records where the death code in one year was followed by a retiree or a vested code in the next year. The following table shows the adjustments by year:

Death Records Changed to Retired or Vested Records	
Year End	Counts of “D” to “R” or “V”
2019	109
2018	49
2017	63
2016	24
2015	5
2014	5
2013	189
2012	186

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 preretirement 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. In subsequent analyses, we will review to determine if any adjustments should be considered.

Milliman Experience Study Tool (MEST)

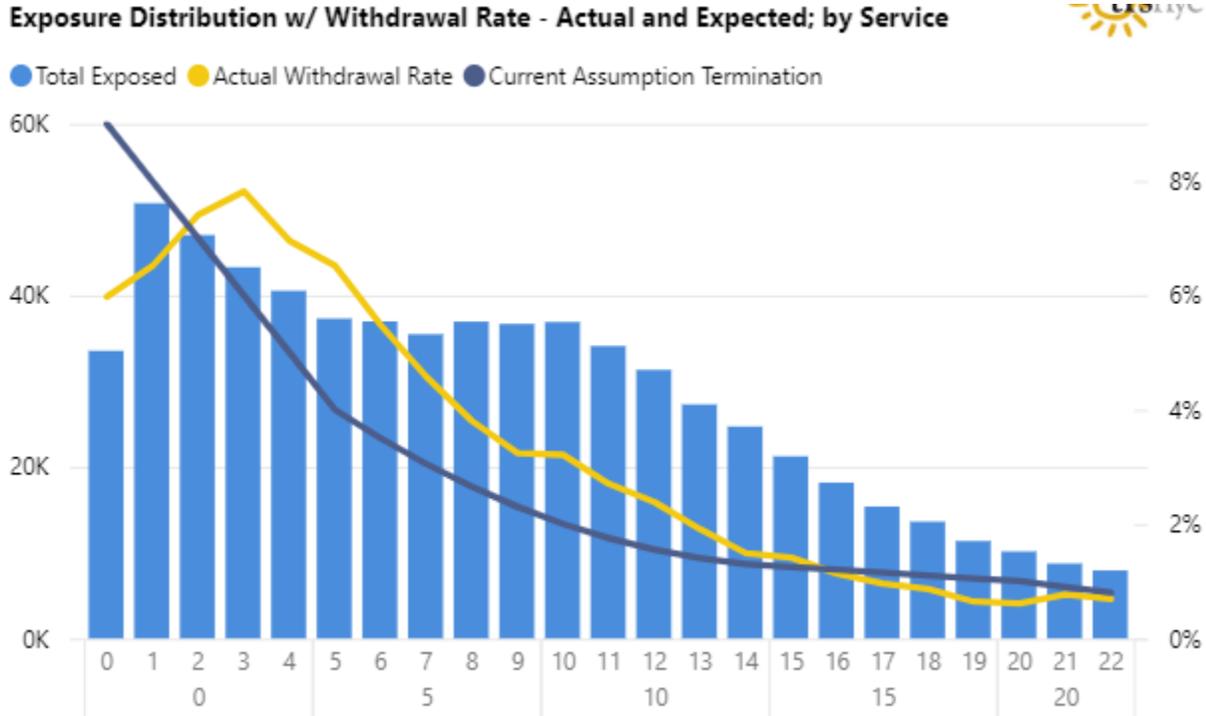
The purpose of the MEST is to analyze the experience by System using the status codes in the historical database. The MEST allows easy review of the experience by plan or other parameters for each System.

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. A tool bar at the top of page allows the user to select how the information is displayed. A walkthrough of these charts in MEST has been described below using the withdrawal decrement tab as an example.

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

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.



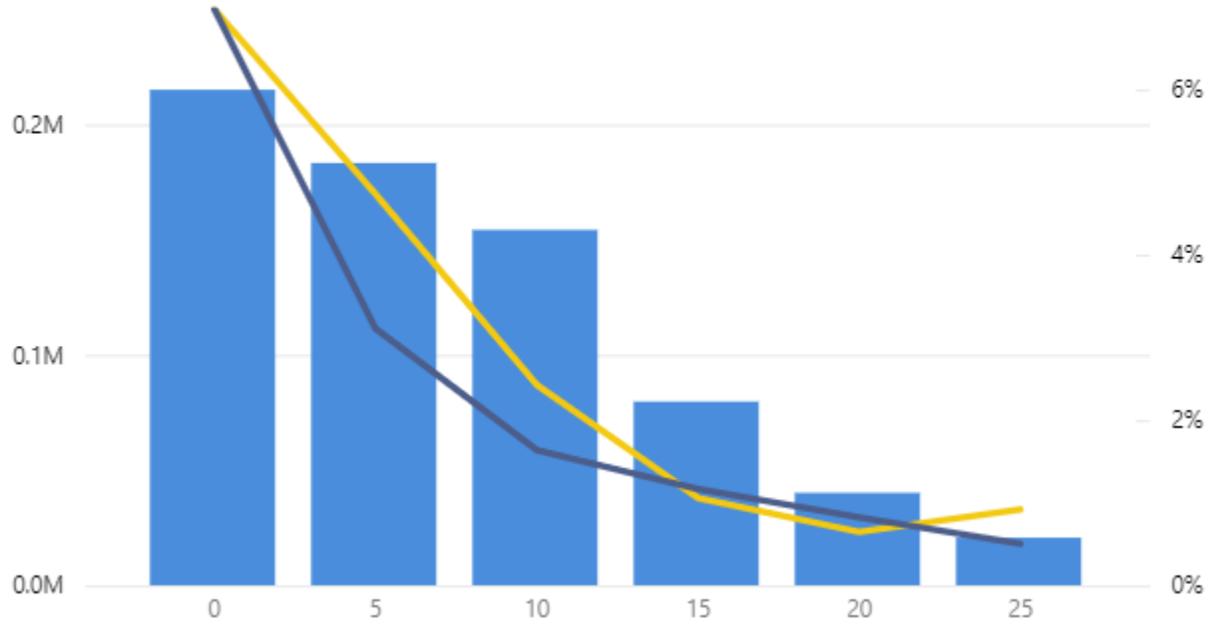
Also, this chart can be used to review the experience in 5-year service or age bins. In the chart above, the second row in the x-axis shows 0, 5, 10, etc. indicating the service bin from 0-4 years, 5-9 years, 10-14 years, etc.

The following chart shows the results based on service bins.

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

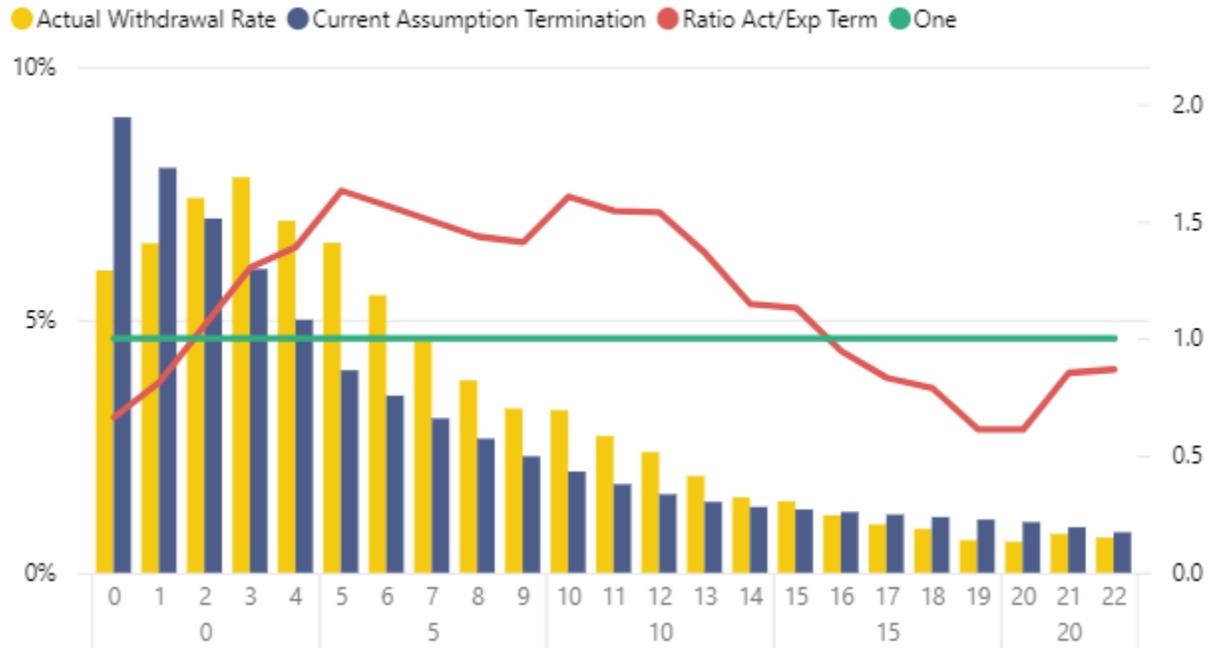


● Total Exposed ● Actual Withdrawal Rate ● Current Assumption Termination



In the next chart, the A/E ratio is graphed as the red line 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 and the current assumption are shown on the graph in the yellow and blue bars, respectively.

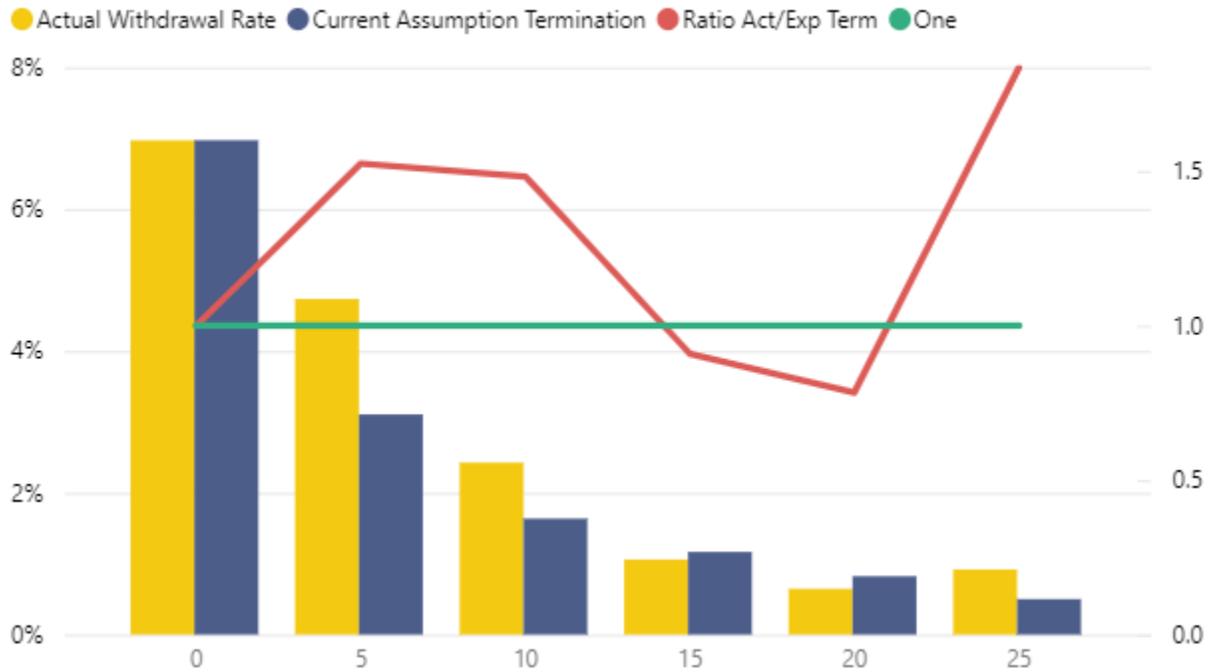
Withdrawal Rate - Actual, Expected, and Ratio; by Service



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.

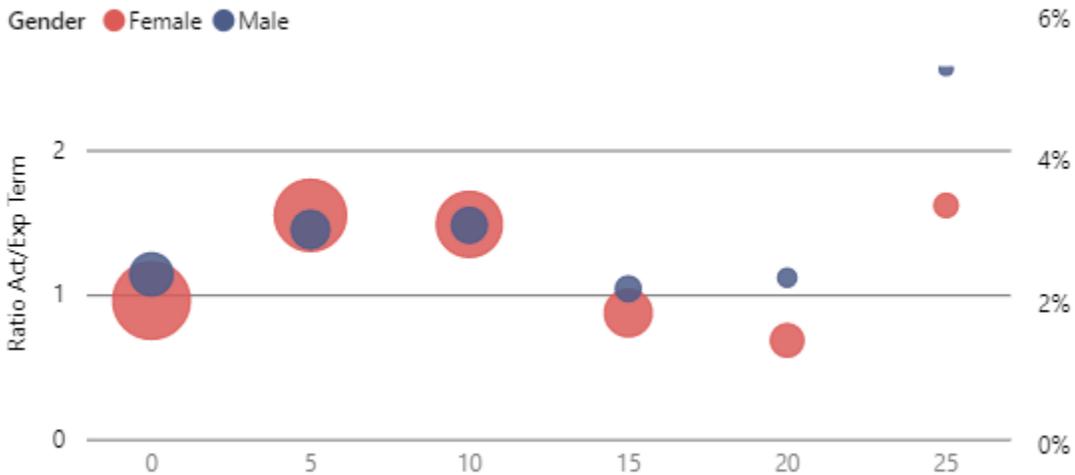
The following chart shows the results based on service bins.

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



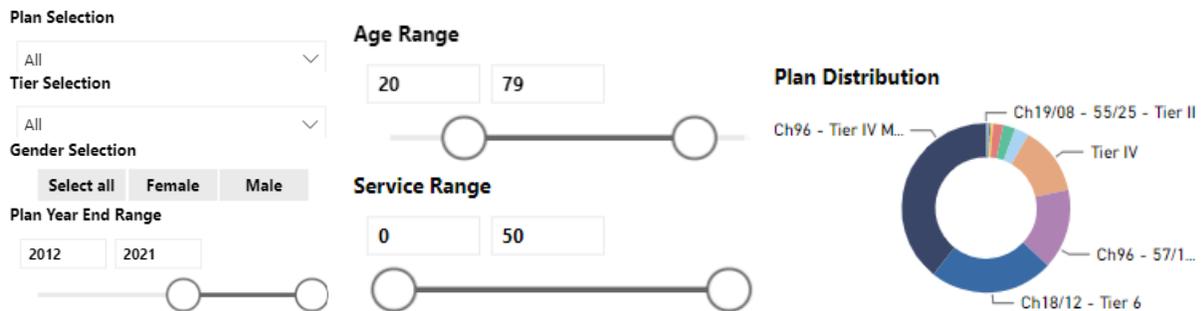
Finally, a bubble chart displaying the A/E ratios by gender is shown. The size of the bubble reflects the number of exposures.

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.



Section I(A) – General Employees of New York City Employees’ Retirement System (NYCERS)

Exposures and Decrements

To set the exposures and actual decrements for NYCERS General employees, 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.

NYCERS Retirement Eligibility Chart - General

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
F	Basic 62/5	TRUE	TRUE	62	5			55	5
G	Fire Alarm Dispatchers - Tier 4	BOTH	Under Basic Tier 4	0	25	62	5		
G	Fire Alarm Dispatchers - Tier 6	TRUE	Under Basic Tier 6	0	25	63	10		
I	57/5 Plan	TRUE	TRUE	57	5				
I	57/5 Plan - Physically Taxing	TRUE	TRUE	50	25	57	5		
J	Emergency Medical Technicians - Tier 4	BOTH	Under Basic Tier 4	0	25	62	5		
J	Emergency Medical Technicians - Tier 6	BOTH	Under Basic Tier 6	0	25	63	10		
L	Special Officers - Tier 4	BOTH	Under Basic Tier 4	0	25	62	5		
L	Special Officers - Tier 6	TRUE	Under Basic Tier 6	0	25	63	10		
N	55/25 Plan - Tier 4	FALSE	TRUE	55	25	62	5		
N	55/25 Plan - Tier 4 - Physically Taxing	FALSE	TRUE	50	25	62	5		
S	Deputy Sheriffs - Tier 4	FALSE	Under Basic Tier 4	0	25	62	5		
S	Deputy Sheriffs - Tier 6	TRUE	Under Basic Tier 6	0	25	63	10		
T	Auto Workers - Tier 4	BOTH	FALSE	50	25	62	5		
T	Auto Workers - Tier 6	TRUE	FALSE	50	25	63	10		
U	Transit - Improved Plan - Tier 4	BOTH	Under Basic Tier 4	55	25	62	5		
U	Transit - Improved Plan - Tier 6	TRUE	Under Basic Tier 6	55	25	63	10		
V	Police Communications Techs - Tier 4	BOTH	Under Basic Tier 4	0	25	62	5		
V	Police Communications Techs - Tier 6	TRUE	Under Basic Tier 6	0	25	63	10		
W	DA Investigators - 20 Year Plan - Tier 4	FALSE	FALSE	0	20	70	0		
W	DA Investigators - 20 Year Plan - Tier 6	TRUE	FALSE	0	25			0	20
X	Correction - 20 Year Plan - Tier 6	TRUE	FALSE	0	25			0	20
Y	63/5 Plan	TRUE	TRUE	63	10			55	10

For General employees in the Transit – Improved Plan and Correction – 20 Year Plan, OA applies the Transit or Corrections actuarial assumptions. Therefore, these members are included in the Transit or Corrections experience. See the Group Codes discussion below.

For the various Tier 6 plans, 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 plans, such as those that have unreduced retirement at attainment of 20 or 25 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 5 years of service). In these situations, OA applies the rates of termination at these age/service conditions and not reduced rates of retirement. We have coded these members as retirement exposures but apply the rates of termination. Please see the discussion under the [Specialty Plan Grouping](#).

Due to the rounding of ages, there can be members with a recorded age at retirement of 54 but who actually retired when first attained age 55 (or age 56 when first attained age 57 in the age 57 plan). In this analysis their experience is reflected at the provided age and service bin without adjustment, slightly understating experience at first eligibility.

Excluded Plans

The following table notes the Plan Codes where exposures were excluded from the tool, except for mortality purposes, because there are very few of them.

NYCERS Excluded Plan Codes	
Plan Code	Plan Description
1	1/100
6	Transit - 20 Year Plan
7	Sanitation - 20 Year Plan
A	CPP (Plan "A")
B	ISF (Plan "B")
C	Modified (Plan "C")
D	Modified ISF (Plan "D")
E	Original Tier 3 Plan
K	Tier 2 DA Investigators – 25 Year Plan
Z	Assumed 62/5 or 57/5 Plan for Deferred Vested Members

In addition, there may be records that were excluded in a Group Code that does not match up with the applicable Plan Code for that Group. The number of these records was insignificant.

Group Codes

To determine which records are considered General employees, we used the Group Code contained on the member’s record. However, there are situations where the OA applies an assumption set that does not match this Group Code. In these instances, we have adjusted the group code used (the original group code remains in the historical data) to be consistent with the assumptions used by OA in the valuation program.

The following table indicates the records with certain plan codes that have a General employee Group Code but not included as General employees in this analysis as well as those records who have another Group Code but are included as General employees. Other code combinations were revised but impacted an insignificant number of records and thus, we did not note them below.

Adjusted Group Codes			
Plan Code	Plan Description	Original Group Code	Revised Group Code
U	Transit - Improved Plan	General	Transit
R	TBTA – 50/20 Plan	General	TBTA
X	Correction - 20 Year Plan	General	Correction

Adjusted Group Codes			
Plan Code	Plan Description	Original Group Code	Revised Group Code
H	Corrections Capt. – Imp Plan	General	Correction
P	Corrections Off. – 25 Year Plan	General	Correction
Q	Corrections Off. – Imp Plan	General	Correction
M	Sanitation – Improved Plan	General	Sanitation
F	Basic 62/5	Sanitation, TBTA, Transit	General
Y	Basic 63/5	TBTA, Transit	General
I	57/5 Plan	Transit	General
L	Special Officers	Transit	General
N	55/25 Plan	Transit	General
T	Auto Workers	Transit	General

General Plan Code Groupings

In our analysis, we have further segmented the General employee population into basic plans and specialty plans. The following table shows the plans in these two categories.

Plan Code	Plan Description	Grouping
F	Basic Plan 62/5	Basic
I	57/5 Plan	Basic
Y	63/10 Plan	Basic
G	Fire Alarm Dispatchers	Specialty
J	Emergency Medical Technicians	Specialty
L	Special Officer	Specialty
N	55/25 Plan	Specialty
S	Deputy Sheriffs	Specialty
T	Auto Workers	Specialty
V	Police Communication Techs	Specialty
W	DA Investigators – 20 Year Plan	Specialty

The specialty plans include those members eligible for unreduced retirement at completion of 20 or 25 years. Only the Auto Workers and 55/25 Plan require attainment of age 50 or 55; the other specialty plans have no age requirement.

Withdrawal

The current withdrawal assumption varies by service.

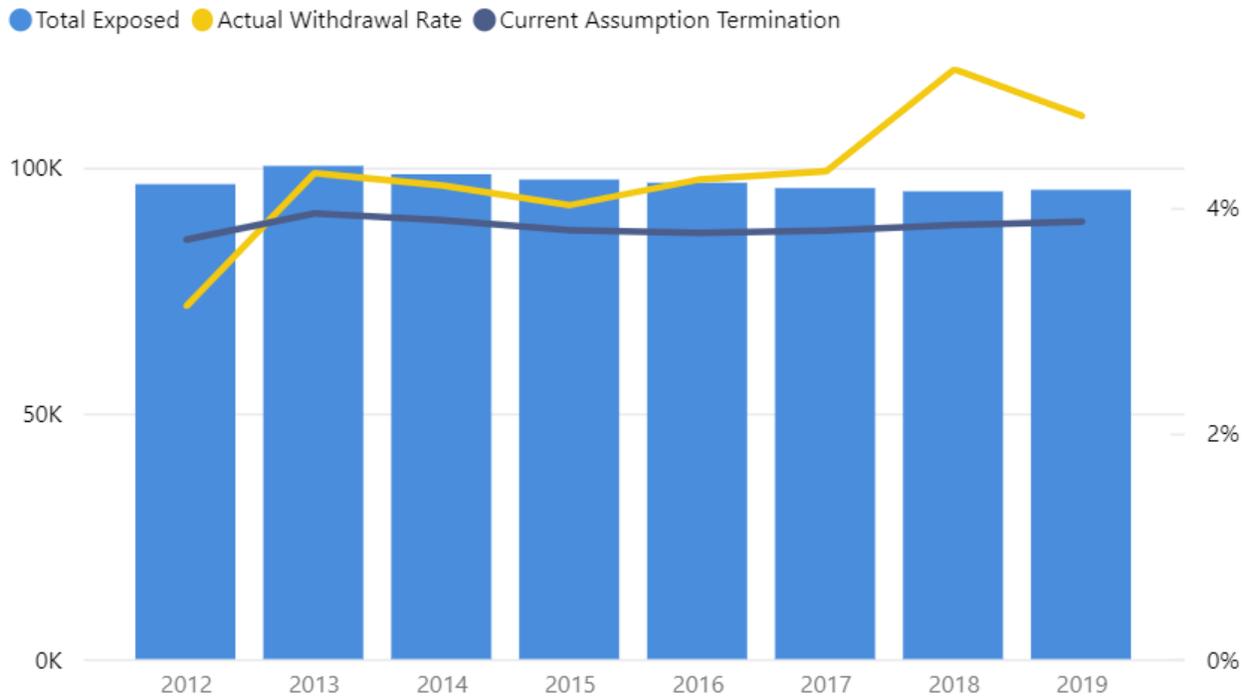
The following table shows the experience for withdrawal by year, for the age range (20 to 79) and service range (0 to 38). Based on the current assumptions, the overall expected rate of withdrawal averaged 3.87%, whereas the actual rate was 3.88%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	3,026	3,593.7	96,630	3.13%	3.72%	▲ 0.84
2013	4,322	3,963.8	100,344	4.31%	3.95%	● 1.09
2014	4,142	3,838.5	98,645	4.20%	3.89%	● 1.08
2015	3,927	3,710.0	97,570	4.02%	3.80%	● 1.06
2016	4,120	3,661.3	96,921	4.25%	3.78%	▲ 1.13
2017	4,145	3,640.5	95,835	4.33%	3.80%	▲ 1.14
2018	4,976	3,661.8	95,163	5.23%	3.85%	▲ 1.36
2019	4,598	3,702.0	95,482	4.82%	3.88%	▲ 1.24
2020	2,482	3,904.3	98,533	2.52%	3.96%	▲ 0.64
2021	2,197	4,099.2	101,685	2.16%	4.03%	▲ 0.54
Total	37,935	37,775.1	976,808	3.88%	3.87%	● 1.00

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. Note that from 2016 to 2020, between 5% and 11% of all NYCERS records with a status code of LOA were changed to rehire. Hence, between 89% and 95% of the LOA records are eventually coded as withdrawal, retired, disabled or death. Excluding these two years, the actual rate of termination of 4.28% exceeded the assumed rate of 3.83% for an A/E ratio of 1.12 as shown in the following tables.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	3,026	3,593.7	96,630	3.13%	3.72%	▲ 0.84
2013	4,322	3,963.8	100,344	4.31%	3.95%	● 1.09
2014	4,142	3,838.5	98,645	4.20%	3.89%	● 1.08
2015	3,927	3,710.0	97,570	4.02%	3.80%	● 1.06
2016	4,120	3,661.3	96,921	4.25%	3.78%	▲ 1.13
2017	4,145	3,640.5	95,835	4.33%	3.80%	▲ 1.14
2018	4,976	3,661.8	95,163	5.23%	3.85%	▲ 1.36
2019	4,598	3,702.0	95,482	4.82%	3.88%	▲ 1.24
Total	33,256	29,771.6	776,590	4.28%	3.83%	▲ 1.12

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



Specific observations on results through 2019:

- The actual rate of withdrawal exceeded the assumption from 2013 – 2019.
- The number of withdrawals and rates of withdrawals were highest during 2018 - 2019, but this was essentially due to high number of withdrawals in a member’s first few years of service.
- The experience of female members (A/E ratio of 1.15) and male members (A/E ratio of 1.07) were similar.
- Rates of withdrawal for members with 0 to 5 years of service was greater than expected (A/E ratio of 1.30).
- Rates of withdrawal for members with at least 6 years of service was smaller than expected (A/E ratio of 0.86).

We noticed different patterns of withdrawal between basic plan and specialty plan members. We will discuss each of these groups separately.

Basic Plan Grouping

The following table shows the experience for withdrawal by year for the age range (20 to 69) and service range (0 to 29) during 2012 - 2019. Based on the current assumptions, the overall expected rate of withdrawal averaged 3.84%, whereas the actual rate was 4.14%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	2,678	3,164.8	84,387	3.17%	3.75%	▲ 0.85
2013	3,608	3,520.1	88,120	4.09%	3.99%	● 1.02
2014	3,571	3,400.3	86,883	4.11%	3.91%	● 1.05
2015	3,479	3,264.9	85,841	4.05%	3.80%	● 1.07
2016	3,567	3,197.6	84,964	4.20%	3.76%	▲ 1.12
2017	3,685	3,195.1	84,194	4.38%	3.79%	▲ 1.15
2018	3,840	3,179.1	83,012	4.63%	3.83%	▲ 1.21
2019	3,757	3,210.7	83,362	4.51%	3.85%	▲ 1.17
Total	28,185	26,132.7	680,763	4.14%	3.84%	● 1.08

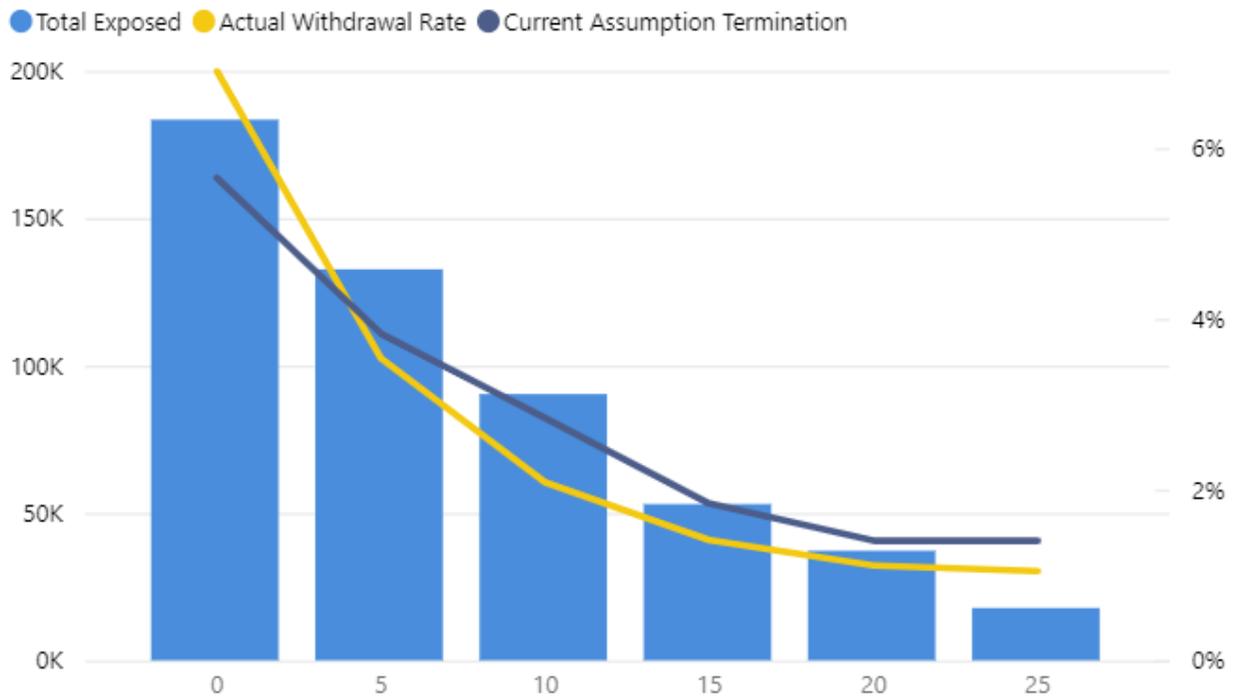
Specific observations:

- The actual rate of withdrawal exceeded the assumption every year beginning with 2013.
- The number of withdrawals and rates of withdrawals were highest in 2018 and 2019. Upon review, this was essentially due to high number of withdrawals in a member’s first few years of service.

The following charts show the experience for withdrawal by service for the age range 20 to 69, and the service range 0 to 29, during 2012 - 2017, prior to the addition of new data.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	1,892	1,782.2	21,217	8.92%	8.40%	1.06
1	3,522	2,979.1	42,558	8.28%	7.00%	1.18
2	2,966	2,298.6	41,047	7.23%	5.60%	1.29
3	2,373	1,644.1	39,145	6.06%	4.20%	1.44
4	1,912	1,657.4	39,463	4.85%	4.20%	1.15
5	1,407	1,215.9	28,951	4.86%	4.20%	1.16
6	1,086	1,177.2	29,431	3.69%	4.00%	0.92
7	894	1,033.5	27,197	3.29%	3.80%	0.87
8	689	877.9	24,385	2.83%	3.60%	0.78
9	617	771.6	22,693	2.72%	3.40%	0.80
10	536	676.6	21,145	2.53%	3.20%	0.79
11	431	607.6	20,254	2.13%	3.00%	0.71
12	350	499.1	17,825	1.96%	2.80%	0.70
13	280	421.4	16,207	1.73%	2.60%	0.66
14	287	357.6	14,900	1.93%	2.40%	0.80
15	208	284.2	12,918	1.61%	2.20%	0.73
16	166	227.7	11,387	1.46%	2.00%	0.73
17	122	183.1	10,171	1.20%	1.80%	0.67
18	117	151.6	9,478	1.23%	1.60%	0.77
19	134	126.8	9,060	1.48%	1.40%	1.06
20	110	117.2	8,373	1.31%	1.40%	0.94
21	95	114.0	8,146	1.17%	1.40%	0.83
22	85	107.0	7,646	1.11%	1.40%	0.79
23	71	97.5	6,961	1.02%	1.40%	0.73
24	52	84.7	6,050	0.86%	1.40%	0.61
25	57	74.0	5,289	1.08%	1.40%	0.77
26	55	62.9	4,496	1.22%	1.40%	0.87
27	32	48.9	3,492	0.92%	1.40%	0.65
28	25	36.1	2,576	0.97%	1.40%	0.69
29	17	27.0	1,928	0.88%	1.40%	0.63
Total	20,588	19,742.8	514,389	4.00%	3.84%	1.04

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



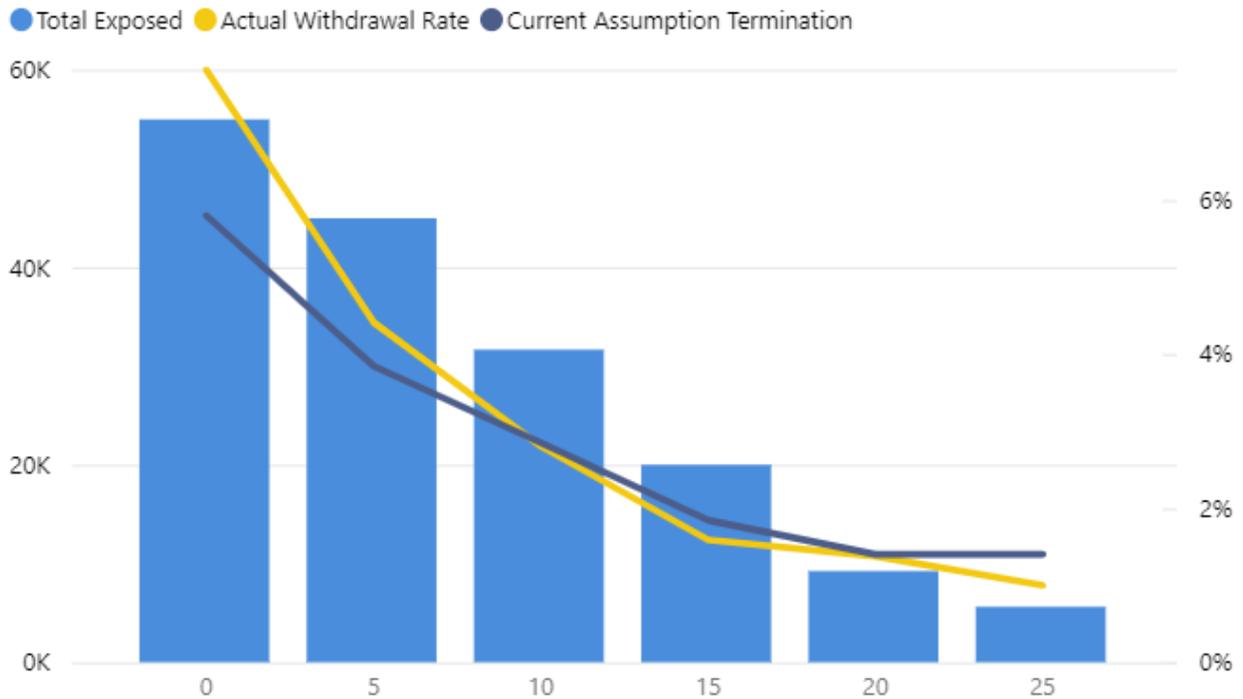
Specific observations:

- For service periods from 0 to 5 years, actual withdrawal rates were greater than the assumed rates (A/E ratio of 1.22).
- For those with between 6 and 29 years of service, the actual experience was lower than the assumed rates (A/E ratio of 0.80).

The following chart shows the experience for the two-year period July 1, 2017 – June 30, 2019 (2018 and 2019) by service (0 to 29 years). As noted earlier, the actual rates of withdrawal were higher than expected for these two years.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	678	553.6	6,590	10.29%	8.40%	▲ 1.22
1	1,237	1,049.7	14,996	8.25%	7.00%	▲ 1.18
2	980	725.4	12,954	7.57%	5.60%	▲ 1.35
3	766	468.8	11,162	6.86%	4.20%	◆ 1.63
4	566	388.5	9,250	6.12%	4.20%	▲ 1.46
5	650	488.3	11,627	5.59%	4.20%	▲ 1.33
6	493	413.8	10,344	4.77%	4.00%	▲ 1.19
7	294	264.3	6,956	4.23%	3.80%	▲ 1.11
8	294	287.0	7,973	3.69%	3.60%	● 1.02
9	252	273.4	8,042	3.13%	3.40%	● 0.92
10	282	252.6	7,895	3.57%	3.20%	▲ 1.12
11	203	200.9	6,695	3.03%	3.00%	● 1.01
12	173	182.1	6,503	2.66%	2.80%	● 0.95
13	138	157.8	6,068	2.27%	2.60%	▲ 0.87
14	91	107.7	4,486	2.03%	2.40%	▲ 0.85
15	78	95.9	4,359	1.79%	2.20%	▲ 0.81
16	92	95.0	4,750	1.94%	2.00%	● 0.97
17	53	79.7	4,428	1.20%	1.80%	▲ 0.66
18	57	58.0	3,622	1.57%	1.60%	● 0.98
19	37	39.6	2,827	1.31%	1.40%	● 0.93
20	41	32.2	2,299	1.78%	1.40%	▲ 1.27
21	28	26.3	1,877	1.49%	1.40%	● 1.07
22	20	24.8	1,770	1.13%	1.40%	▲ 0.81
23	19	23.6	1,688	1.13%	1.40%	▲ 0.80
24	19	22.3	1,595	1.19%	1.40%	▲ 0.85
25	16	21.2	1,516	1.06%	1.40%	▲ 0.75
26	15	17.7	1,265	1.19%	1.40%	▲ 0.85
27	9	16.1	1,147	0.78%	1.40%	▲ 0.56
28	8	13.7	981	0.82%	1.40%	▲ 0.58
29	8	9.9	709	1.13%	1.40%	▲ 0.81
Total	7,597	6,389.9	166,374	4.57%	3.84%	▲ 1.19

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



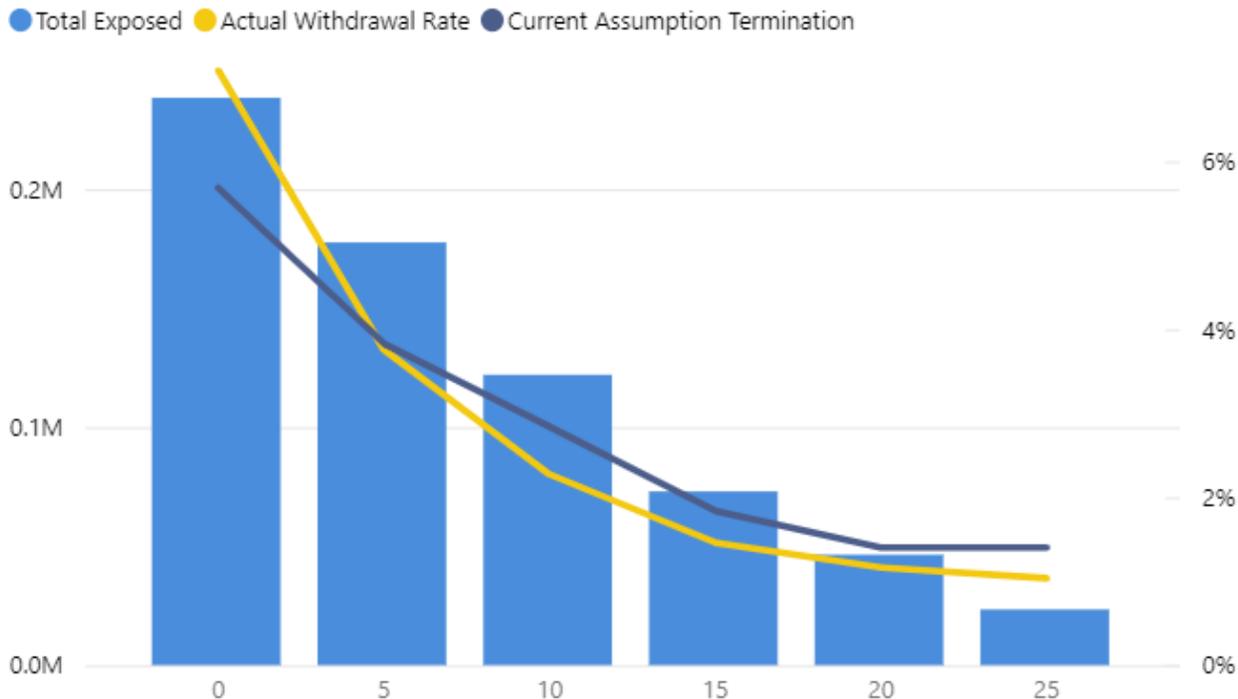
Specific observations for the 2-year period 2018-2019:

- The experience during 2018 – 2019 exhibited similar patterns to the experience from 2012 – 2017, although the overall level of withdrawal was higher.
 - For service periods between 0 and 5 years, the A/E ratio was 1.33, which is higher than the 1.22 A/E ratio of the period 2012 to 2017.
 - For service periods between 6 and 29 years, the A/E ratio was 1.00 vs 0.80.

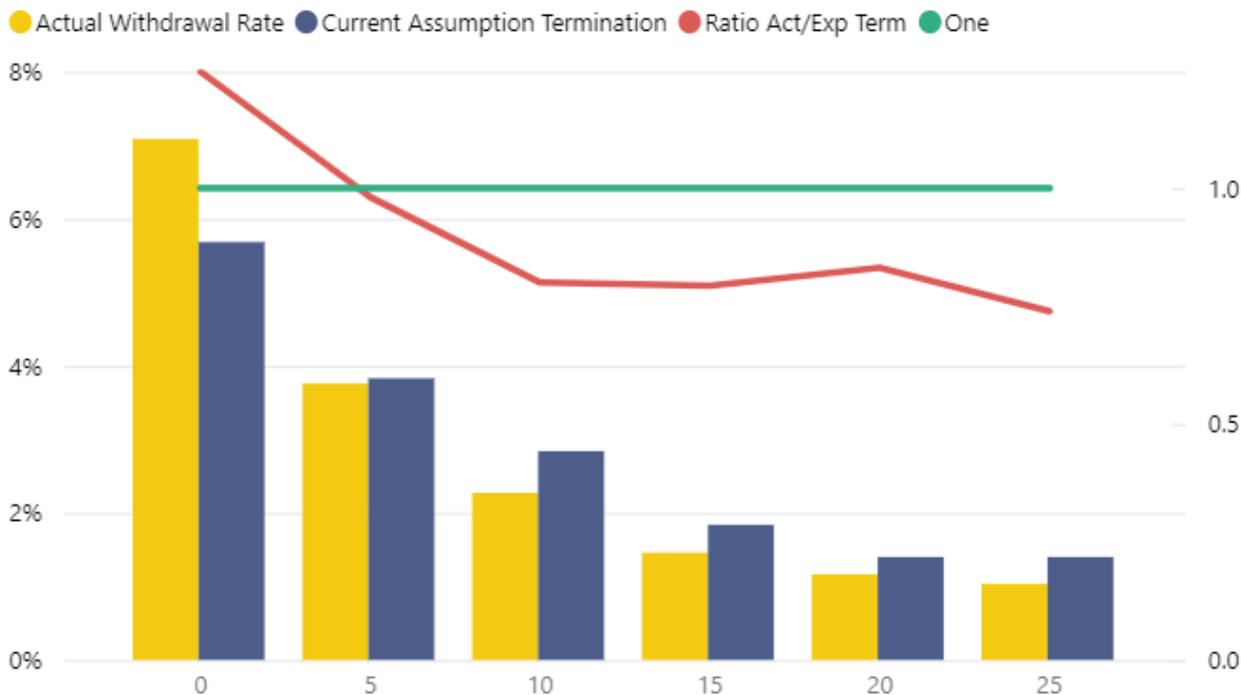
The following charts show the combined experience for 2012 - 2019 by service (0 to 29 years) for ages 20 to 69.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	2,570	2,335.8	27,807	9.24%	8.40%	▲ 1.10
1	4,759	4,028.8	57,554	8.27%	7.00%	▲ 1.18
2	3,946	3,024.1	54,001	7.31%	5.60%	▲ 1.30
3	3,139	2,112.9	50,307	6.24%	4.20%	▲ 1.49
4	2,478	2,045.9	48,713	5.09%	4.20%	▲ 1.21
5	2,057	1,704.3	40,578	5.07%	4.20%	▲ 1.21
6	1,579	1,591.0	39,775	3.97%	4.00%	● 0.99
7	1,188	1,297.8	34,153	3.48%	3.80%	● 0.92
8	983	1,164.9	32,358	3.04%	3.60%	▲ 0.84
9	869	1,045.0	30,735	2.83%	3.40%	▲ 0.83
10	818	929.3	29,040	2.82%	3.20%	▲ 0.88
11	634	808.5	26,949	2.35%	3.00%	▲ 0.78
12	523	681.2	24,328	2.15%	2.80%	▲ 0.77
13	418	579.1	22,275	1.88%	2.60%	▲ 0.72
14	378	465.3	19,386	1.95%	2.40%	▲ 0.81
15	286	380.1	17,277	1.66%	2.20%	▲ 0.75
16	258	322.7	16,137	1.60%	2.00%	▲ 0.80
17	175	262.8	14,599	1.20%	1.80%	▲ 0.67
18	174	209.6	13,100	1.33%	1.60%	▲ 0.83
19	171	166.4	11,887	1.44%	1.40%	● 1.03
20	151	149.4	10,672	1.41%	1.40%	● 1.01
21	123	140.3	10,023	1.23%	1.40%	▲ 0.88
22	105	131.8	9,416	1.12%	1.40%	▲ 0.80
23	90	121.1	8,649	1.04%	1.40%	▲ 0.74
24	71	107.0	7,645	0.93%	1.40%	▲ 0.66
25	73	95.3	6,805	1.07%	1.40%	▲ 0.77
26	70	80.7	5,761	1.22%	1.40%	▲ 0.87
27	41	64.9	4,639	0.88%	1.40%	▲ 0.63
28	33	49.8	3,557	0.93%	1.40%	▲ 0.66
29	25	36.9	2,637	0.95%	1.40%	▲ 0.68
Total	28,185	26,132.7	680,763	4.14%	3.84%	● 1.08

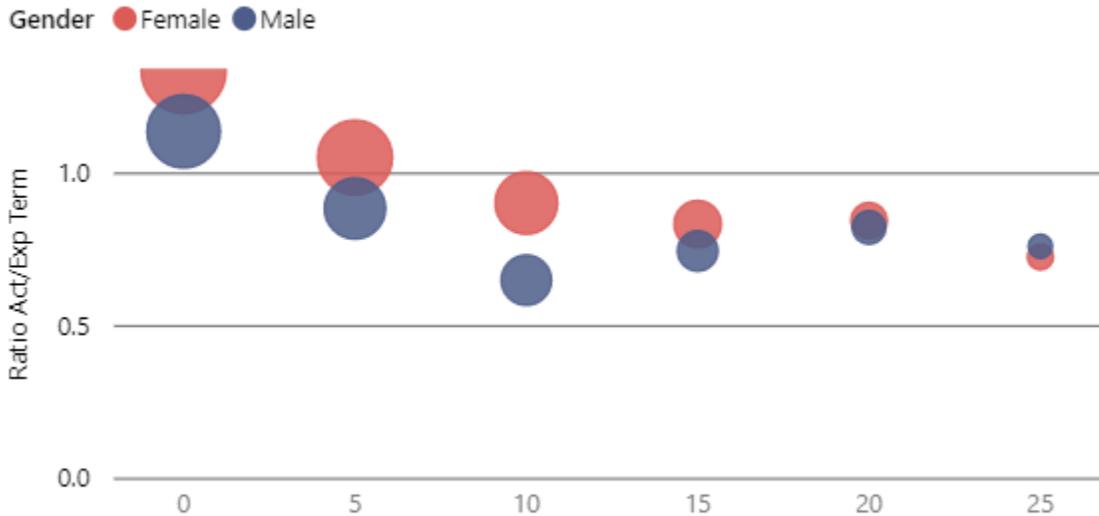
Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



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



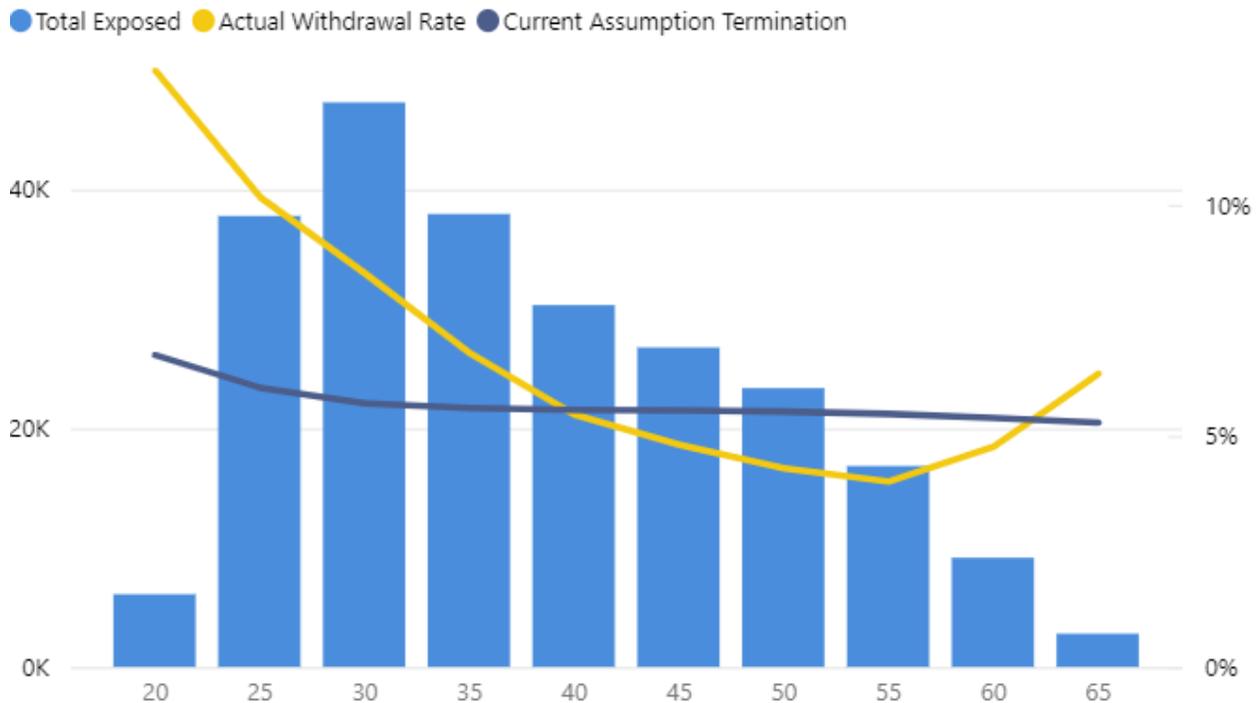
Actual vs. Expected - Withdrawal Rate w/ Exposure Bubbles; by Service



As age seems to be a distinguishing characteristic in the rates of withdrawal, in addition to service, the following charts show results by age for service periods every 5 years from 2012 - 2019.

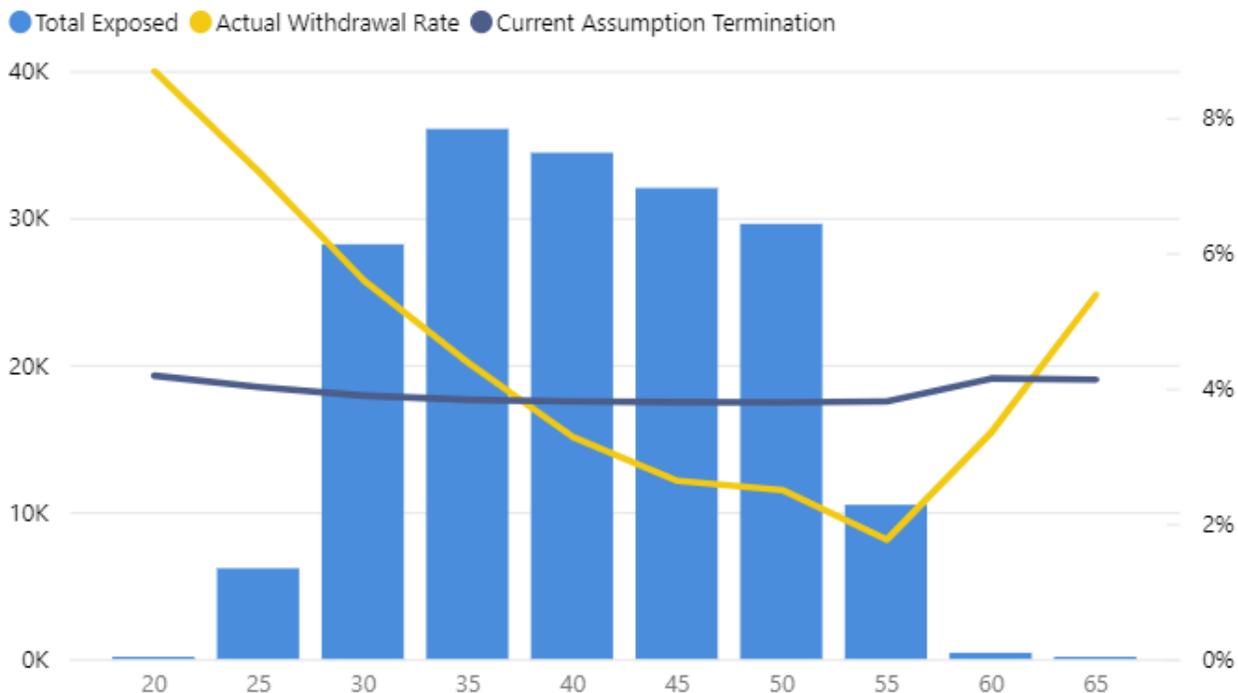
The following chart is for the service period 0 to 4 years.

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



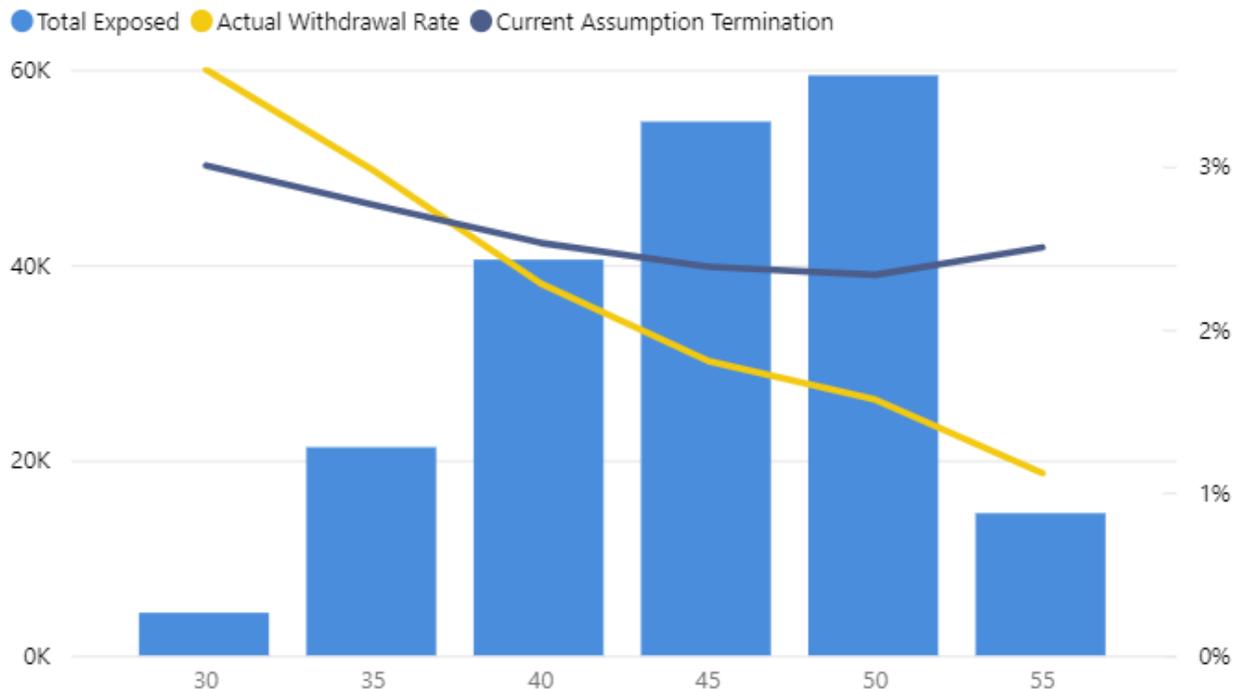
The following chart is for the service period 5 to 9 years.

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



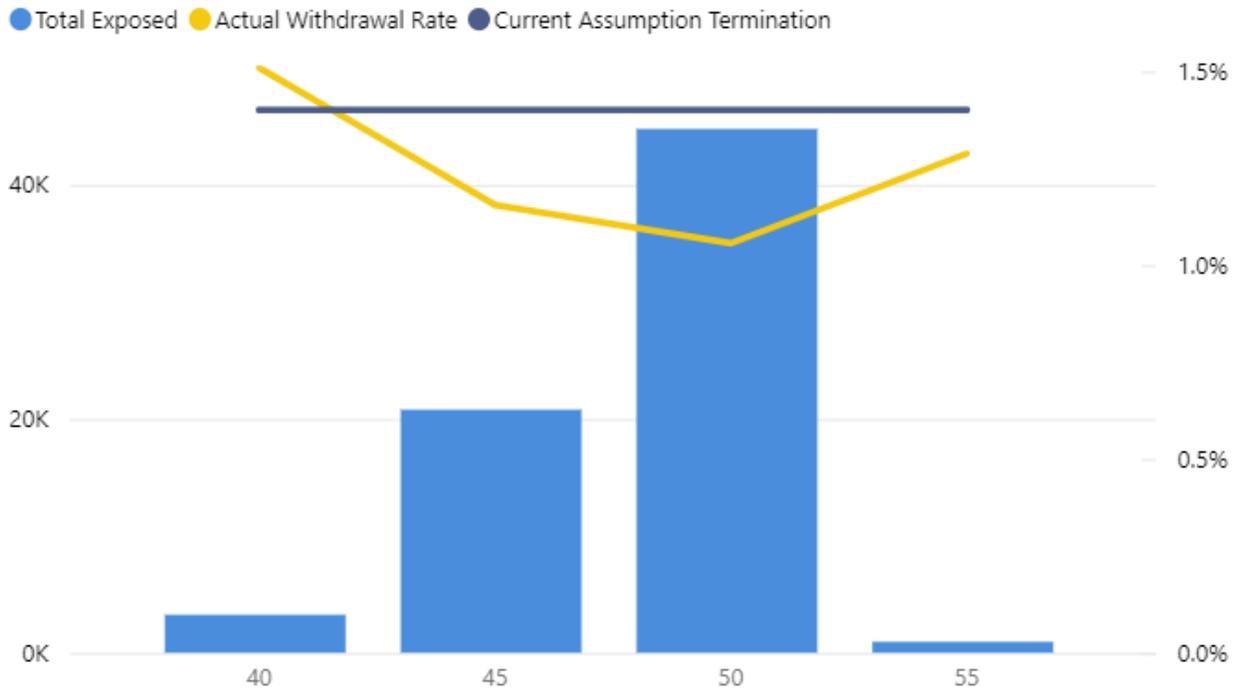
The following chart is for the service period 10 to 19 years.

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



The following chart is for the service period 20 to 29 years.

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



Specific observations:

- Rates of withdrawal are correlated with both service and age. As service increases, the rates of withdrawal decrease. Within the 5-year service groupings, as age increases, the rates of withdrawal decrease. Although at older ages 55+, the rates of withdrawal begin to increase albeit the volume of data is small at these ages.
- For service periods from 0 to 5 years, actual withdrawal rates were greater than the assumed rates, partially driven by above average withdrawals occurring during 2018 - 2019 (A/E ratio of 1.24 from 2012 - 2019).
- For those with between 6 and 29 years of service, the actual experience was lower than the assumed rates (A/E ratio of 0.85).
- Females exhibited higher rates of termination than males.
- Younger members exhibited higher rates of termination than older members for the same service periods.

Specialty Plan Grouping

Please note that Specialty Plan group members may elect to retire under the Basic Plan rather than their specific Specialty Plan. When a member is eligible for reduced retirement under the Basic Plan and not eligible for unreduced retirement under their specific plan, OA utilizes the rates of withdrawal during this period, but values an immediate reduced early retirement benefit. The experience of these members during this period is included in the retirement analysis.

Age	Actual Retirements	Service	Actual Retirements	Plan Year	Actual Retirements
44	3	10	1	2012	20
45	6	12	4	2013	26
46	9	13	2	2014	29
47	9	14	3	2015	14
48	14	15	2	2016	25
49	27	16	5	2017	31
50	42	17	5	2018	23
51	25	18	15	2019	17
52	29	19	9	2020	2
53	25	20	19	2021	2
Total	189	21	29	Total	189
		22	36		
		23	59		
		Total	189		

On the other hand, Specialty Plan group members who were given a retirement code but did not meet the criteria for retirement under the Basic Plan or their specific Specialty Plan are excluded from both the retirement and the withdrawal analysis. The following tables display these members by age, by service and by plan year. We are unsure why these members were coded as retirement if seemingly they were not eligible. We excluded members within 1 year of retirement eligibility due to the rounding of age and service. We will continue to review these members below to determine if further adjustments to the data are required. This may be due to assignment of a retirement status code for members originally coded as LOA.

If these members were included in the following withdrawal analysis, the actual rates of withdrawal would increase.

The following table shows the experience for withdrawal by year for the age range (20 to 54), and for the service range (0 to 24) during 2012 - 2019. Based on the current assumptions, the overall expected rate of withdrawal averaged 3.99%, whereas the actual rate was 5.70%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	326	399.0	10,774	3.03%	3.70%	▲ 0.82
2013	686	413.1	10,772	6.37%	3.83%	◆ 1.66
2014	549	411.2	10,506	5.23%	3.91%	▲ 1.34
2015	428	419.1	10,512	4.07%	3.99%	● 1.02
2016	531	437.7	10,745	4.94%	4.07%	▲ 1.21
2017	439	420.7	10,477	4.19%	4.02%	● 1.04
2018	1,117	460.9	11,109	10.05%	4.15%	◆ 2.42
2019	822	468.3	11,078	7.42%	4.23%	◆ 1.76
Total	4,898	3,429.9	85,973	5.70%	3.99%	▲ 1.43

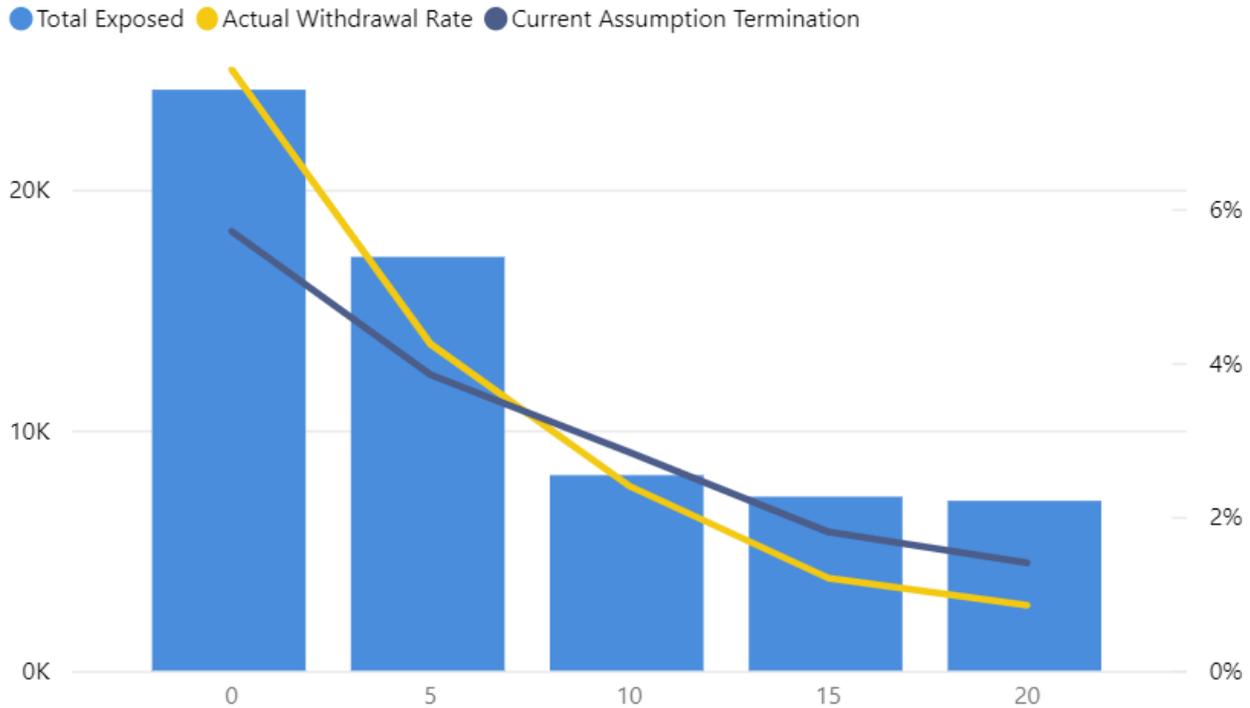
Specific observations:

- The rates of withdrawal for Specialty Plan members are greater than the rates for Basic Plan members.
- The actual rate of withdrawal exceeded the assumption from 2013 – 2019.
- The number of withdrawals and rates of withdrawals were significantly higher during 2018 and 2019. This was essentially due to a high number of withdrawals in members’ first few years of service.

The following charts show the experience for withdrawal by service for the age range 20 to 54, and the service range 0 to 24, during 2012 - 2017, prior to the addition of new data.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	200	247.7	2,949	6.78%	8.40%	▲ 0.81
1	500	413.6	5,908	8.46%	7.00%	▲ 1.21
2	506	300.7	5,370	9.42%	5.60%	◆ 1.68
3	377	219.9	5,235	7.20%	4.20%	◆ 1.71
4	304	196.9	4,689	6.48%	4.20%	◆ 1.54
5	209	170.0	4,048	5.16%	4.20%	▲ 1.23
6	173	156.7	3,917	4.42%	4.00%	▲ 1.10
7	158	137.9	3,630	4.35%	3.80%	▲ 1.15
8	109	114.9	3,192	3.41%	3.60%	● 0.95
9	81	82.1	2,416	3.35%	3.40%	● 0.99
10	46	66.2	2,068	2.22%	3.20%	▲ 0.70
11	41	52.7	1,757	2.33%	3.00%	▲ 0.78
12	35	40.4	1,444	2.42%	2.80%	▲ 0.87
13	56	37.8	1,453	3.85%	2.60%	▲ 1.48
14	17	33.8	1,408	1.21%	2.40%	▲ 0.50
15	17	30.5	1,385	1.23%	2.20%	▲ 0.56
16	18	30.4	1,522	1.18%	2.00%	▲ 0.59
17	19	26.9	1,493	1.27%	1.80%	▲ 0.71
18	18	23.6	1,475	1.22%	1.60%	▲ 0.76
19	15	19.1	1,362	1.10%	1.40%	▲ 0.79
20	9	18.8	1,341	0.67%	1.40%	◆ 0.48
21	11	20.5	1,466	0.75%	1.40%	▲ 0.54
22	14	20.2	1,441	0.97%	1.40%	▲ 0.69
23	11	19.9	1,425	0.77%	1.40%	▲ 0.55
24	15	19.5	1,392	1.08%	1.40%	▲ 0.77
Total	2,959	2,500.7	63,786	4.64%	3.92%	▲ 1.18

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



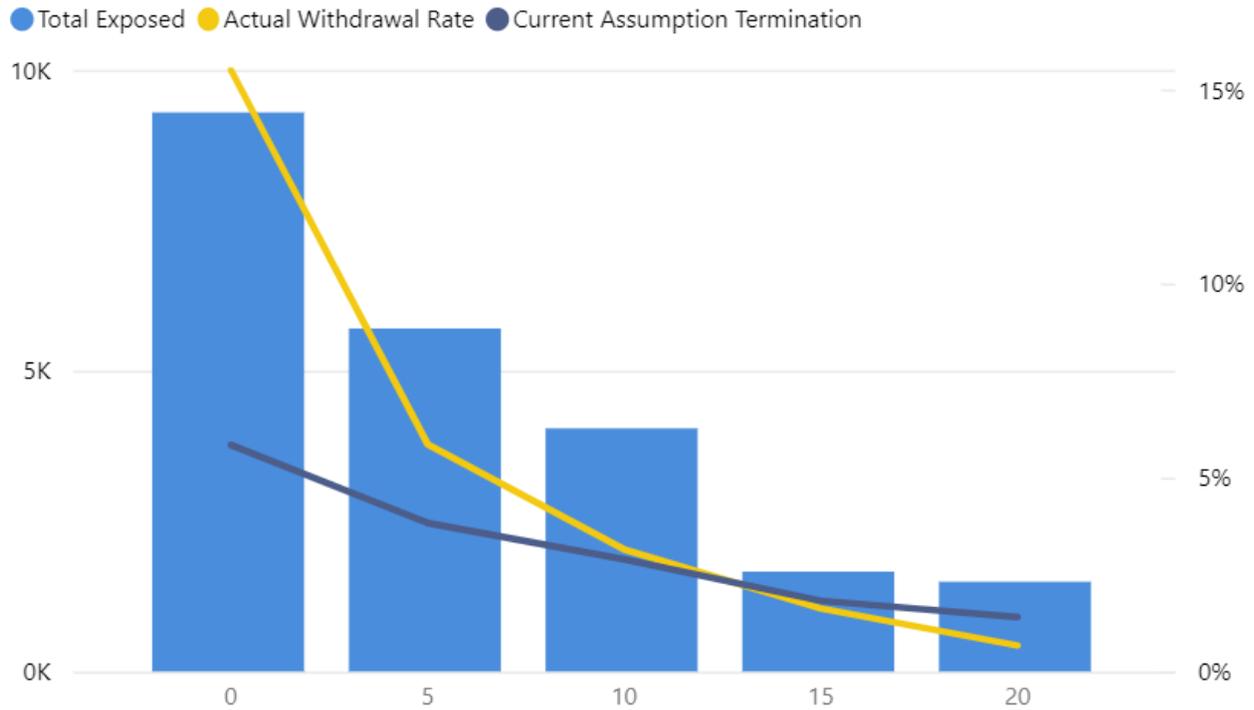
Specific observations:

- For service periods from 0 to 5 years, actual withdrawal rates were greater than the assumed rates (A/E ratio of 1.35).
- For those with between 6 and 24 years of service, the actual experience was less than the assumed rates (A/E ratio of 0.91).

The following chart shows the experience for the two-year period July 1, 2017 – June 30, 2019 (2018 and 2019) by service (0 to 24 years). As noted earlier, the actual rates of withdrawal were significantly higher than expected for these two years.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	113	90.0	1,071	10.55%	8.40%	▲ 1.26
1	369	195.2	2,788	13.24%	7.00%	◆ 1.89
2	524	118.8	2,121	24.71%	5.60%	◆ 4.41
3	216	69.5	1,654	13.06%	4.20%	◆ 3.11
4	219	69.6	1,658	13.21%	4.20%	◆ 3.14
5	149	63.1	1,502	9.92%	4.20%	◆ 2.36
6	48	48.8	1,221	3.93%	4.00%	● 0.98
7	46	33.1	872	5.28%	3.80%	▲ 1.39
8	39	29.6	823	4.74%	3.60%	▲ 1.32
9	52	43.6	1,283	4.05%	3.40%	▲ 1.19
10	57	39.6	1,238	4.60%	3.20%	▲ 1.44
11	20	25.5	851	2.35%	3.00%	▲ 0.78
12	22	23.7	848	2.59%	2.80%	● 0.93
13	24	17.6	678	3.54%	2.60%	▲ 1.36
14	4	10.2	426	0.94%	2.40%	◆ 0.39
15	9	8.1	370	2.43%	2.20%	▲ 1.11
16	10	7.5	375	2.67%	2.00%	▲ 1.33
17	3	5.7	315	0.95%	1.80%	▲ 0.53
18	3	4.2	264	1.14%	1.60%	▲ 0.71
19	2	4.7	337	0.59%	1.40%	◆ 0.42
20	3	4.8	346	0.87%	1.40%	▲ 0.62
21	4	3.7	266	1.50%	1.40%	● 1.07
22	2	4.7	335	0.60%	1.40%	◆ 0.43
23	1	4.6	325	0.31%	1.40%	◆ 0.22
24	0	3.1	220	0.00%	1.40%	◆ 0.00
Total	1,939	929.2	22,187	8.74%	4.19%	◆ 2.09

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



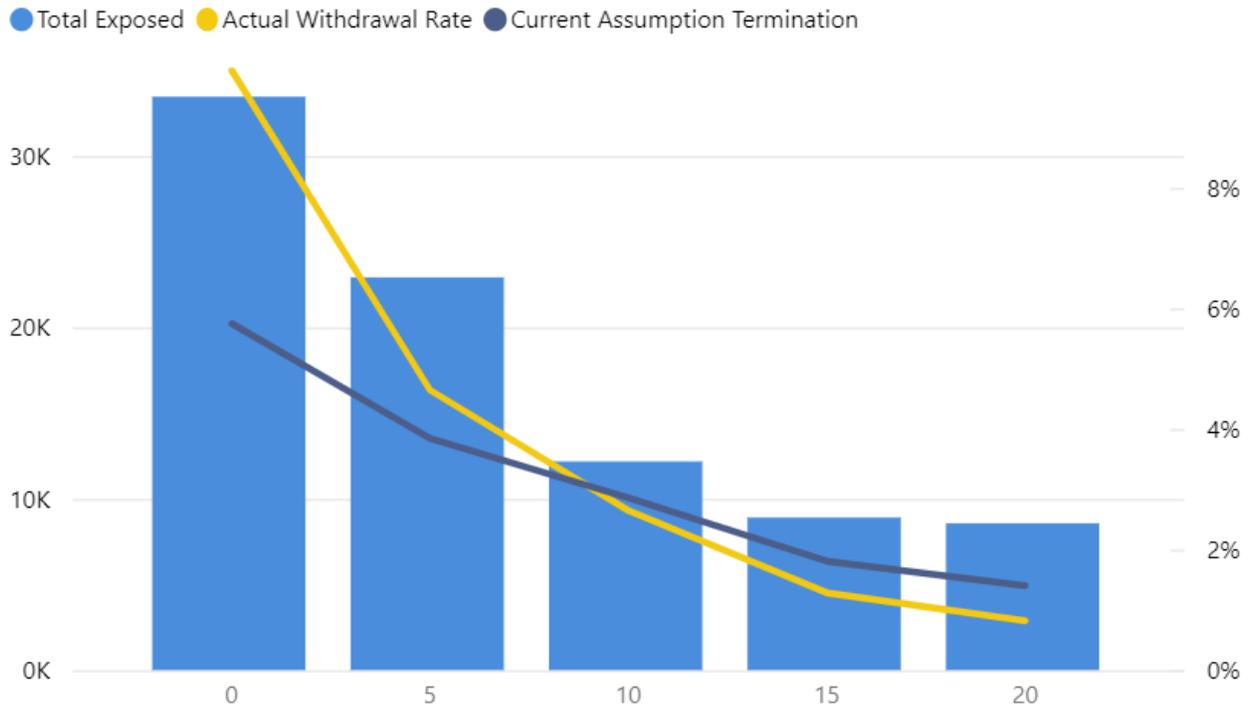
Specific observations for the 2-year period 2018-2019:

- The overall level of withdrawal was significantly greater during 2018 – 2019 than the prior period 2012 – 2017.
 - For service periods between 0 and 5 years, the A/E ratio was 2.62, which is higher than the 1.35 A/E ratio of the period 2012 to 2017.
 - For service periods between 6 and 24 years, the A/E ratio was 1.08 vs 0.91.

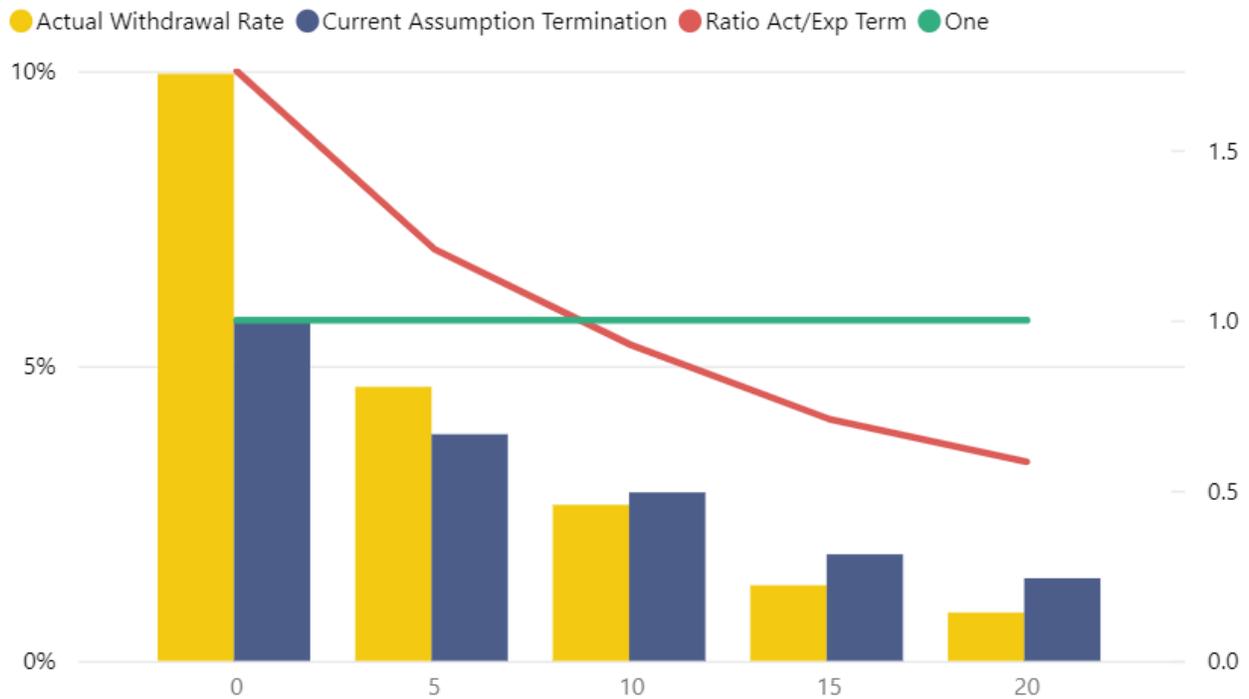
The following charts show the combined experience for 2012 - 2019 by service (0 to 24 years) for ages 20 to 54.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	313	337.7	4,020	7.79%	8.40%	0.93
1	869	608.7	8,696	9.99%	7.00%	1.43
2	1,030	419.5	7,491	13.75%	5.60%	2.46
3	593	289.3	6,889	8.61%	4.20%	2.05
4	523	266.6	6,347	8.24%	4.20%	1.96
5	358	233.1	5,550	6.45%	4.20%	1.54
6	221	205.5	5,138	4.30%	4.00%	1.08
7	204	171.1	4,502	4.53%	3.80%	1.19
8	148	144.5	4,015	3.69%	3.60%	1.02
9	133	125.8	3,699	3.60%	3.40%	1.06
10	103	105.8	3,306	3.12%	3.20%	0.97
11	61	78.2	2,608	2.34%	3.00%	0.78
12	57	64.2	2,292	2.49%	2.80%	0.89
13	80	55.4	2,131	3.75%	2.60%	1.44
14	21	44.0	1,834	1.15%	2.40%	0.48
15	26	38.6	1,755	1.48%	2.20%	0.67
16	28	37.9	1,897	1.48%	2.00%	0.74
17	22	32.5	1,808	1.22%	1.80%	0.68
18	21	27.8	1,739	1.21%	1.60%	0.75
19	17	23.8	1,699	1.00%	1.40%	0.71
20	12	23.6	1,687	0.71%	1.40%	0.51
21	15	24.2	1,732	0.87%	1.40%	0.62
22	16	24.9	1,776	0.90%	1.40%	0.64
23	12	24.5	1,750	0.69%	1.40%	0.49
24	15	22.6	1,612	0.93%	1.40%	0.66
Total	4,898	3,429.9	85,973	5.70%	3.99%	1.43

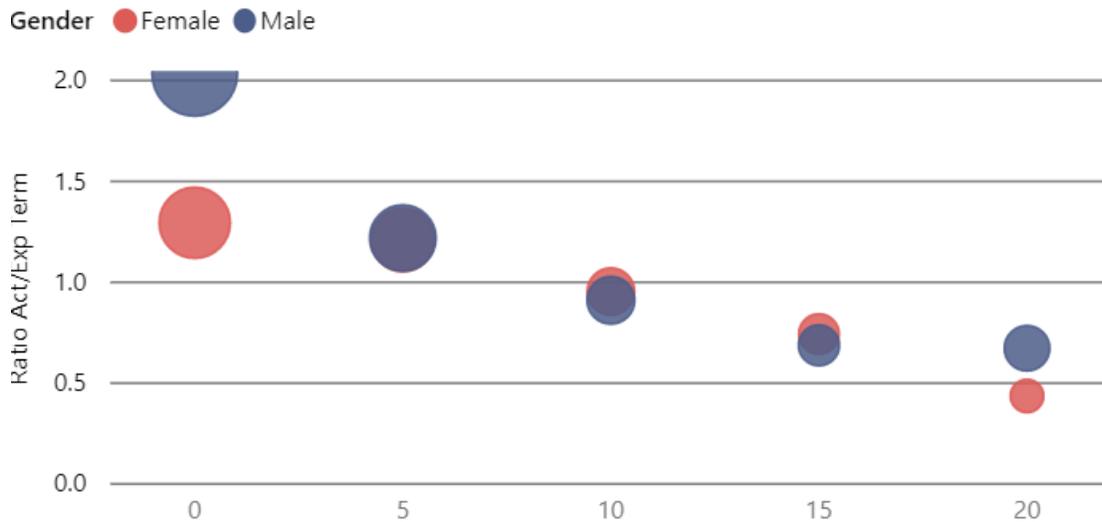
Exposure Distribution w/ Withdrawal Rate - Actual and Expected; by Service



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



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



Specific observations:

- For service periods from 0 to 5 years, actual withdrawal rates were greater than the assumed rates, partially driven by more withdrawals occurring in 2018 and 2019 (A/E ratio of 1.71 from 2012 - 2019).
- For those with between 6 and 24 years of service, the actual experience was lower than the assumed rates (A/E ratio of 0.95).

Summary

We find that rates of withdrawal are greater among Specialty Plan members than Basic Plan members. Actual withdrawal experience is higher than expected by the current assumption for service periods 0 to 5 years, and lower than expected for service periods of more than 6 years of service for all General members. For Basic Plan members, age may influence the withdrawal rates as withdrawal rates decreased as age increased.

In subsequent analyses, we will develop the experience on a salary-weighted basis as lower paid members may exhibit higher rates of termination but would have less impact on the liability.

Retirement

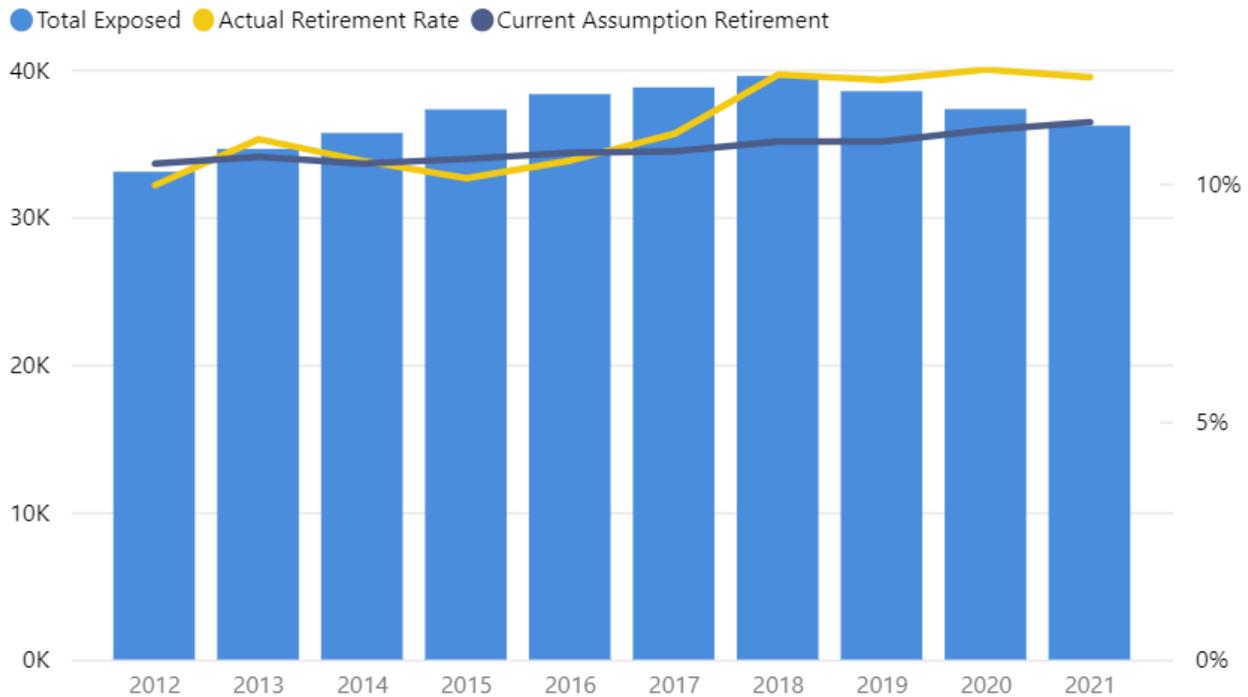
The current retirement assumption varies by age and eligibility for unreduced retirement with higher rates occurring at first eligibility. Furthermore, higher rates of retirement are assumed for members who had the option to elect an improved program.

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. 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 retirement experience of all the plans by year based on the age range (45 – 79) and service range (5 – 44). Based on the current assumptions, the overall expected rate of retirement averaged 10.74% during this period whereas the actual rate was 11.23%, for an A/E ratio of 1.05.

Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	3,294	3,443.4	33,065	9.96%	10.41%	0.96
2013	3,783	3,654.4	34,617	10.93%	10.56%	1.04
2014	3,738	3,718.2	35,689	10.47%	10.42%	1.01
2015	3,769	3,920.2	37,288	10.11%	10.51%	0.96
2016	4,016	4,078.3	38,322	10.48%	10.64%	0.98
2017	4,282	4,140.3	38,781	11.04%	10.68%	1.03
2018	4,857	4,303.0	39,552	12.28%	10.88%	1.13
2019	4,689	4,189.7	38,524	12.17%	10.88%	1.12
2020	4,624	4,148.3	37,311	12.39%	11.12%	1.11
2021	4,426	4,084.8	36,190	12.23%	11.29%	1.08
Total	41,478	39,680.5	369,339	11.23%	10.74%	1.05

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

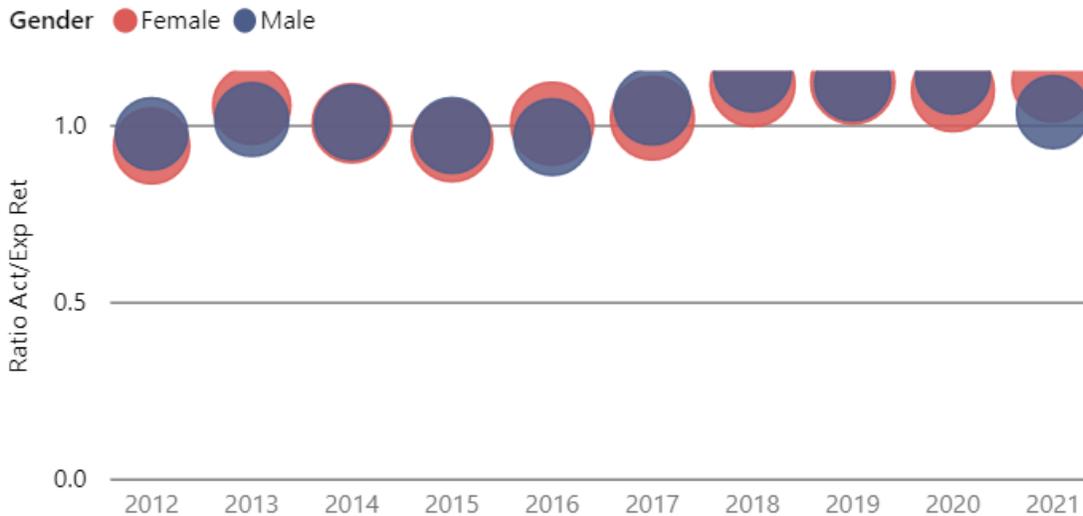


The rate of retirement during 2020 and 2021 may be slightly lower than shown in this report due to the treatment of members with a LOA status code. While the percentage of members with a LOA code who have a retired status code in the following two years is approximately 2%, the number of retirements not captured in each of these two years could be roughly 700 for all NYCERS members. We have not tabulated the specific breakdown for this group. We do note that there were more retirements in 2020 – 2021 than expected.

Specific observations:

- From 2018 – 2021, the actual number of retirements was greater than expected by 11% (A/E ratio of 1.11).
- From 2012 – 2017, the actual number of retirements was very similar to that expected (A/E ratio of 1.00).
- A higher retirement assumption applies to members who elected an improved plan versus other members and actual experience was consistent with that assertion. Average rate of retirement for those who elected an improved plan was 18.27% for the age range 45 to 79 versus 10.68% for mandated plan members for the age range 55 to 79.
- Actual retirement rates were greater among specialty plan members versus basic plan members.
- Experience for males and females is similar as shown in the following graph.

Actual vs. Expected - Retirement Rate w/ Exposure Bubbles; by Year



Analysis

We will review the retirement experience split by basic plan group versus the specialty plan group and by other characteristics within each group code as follows:

A. Basic Plan Grouping

1. Basic 62/5 (plan code F) – normal retirement at age 62 with reduced retirement benefits at age 55 and mandated plan retirement rates.
2. Age 57/5 (plan code I) – normal retirement at age 57 and mandated plan retirement rates. Physically Taxing members are eligible for unreduced retirement at age 50 with 25 years of service.

B. Specialty Plan Grouping

3. Improved Plan Members – retirement age 50 with 25 years of service. Due to physically taxing retirement eligibility (age 50 and 25) and very few exposures of specialty plan group members less than age 50 who have accrued 25 years of service, we have combined all specialty plan group members who meet this condition.
 - a. There are very few mandated plan members with 25 years of service so no specific analysis is included in this report.
4. Basic Plan Early Retirement Ages (55 to 61) - reduced retirement at age 55 with 5 years of service. We have separated out the experience for the age range 55 to 61. Members are coded as both mandated and elected.
5. Retirement Ages 62 to 69 – For members with less than 25 years of service, we have separated out the experience for the age range 62 to 69. Members are coded as both mandated and elected.

Basic Plan Grouping

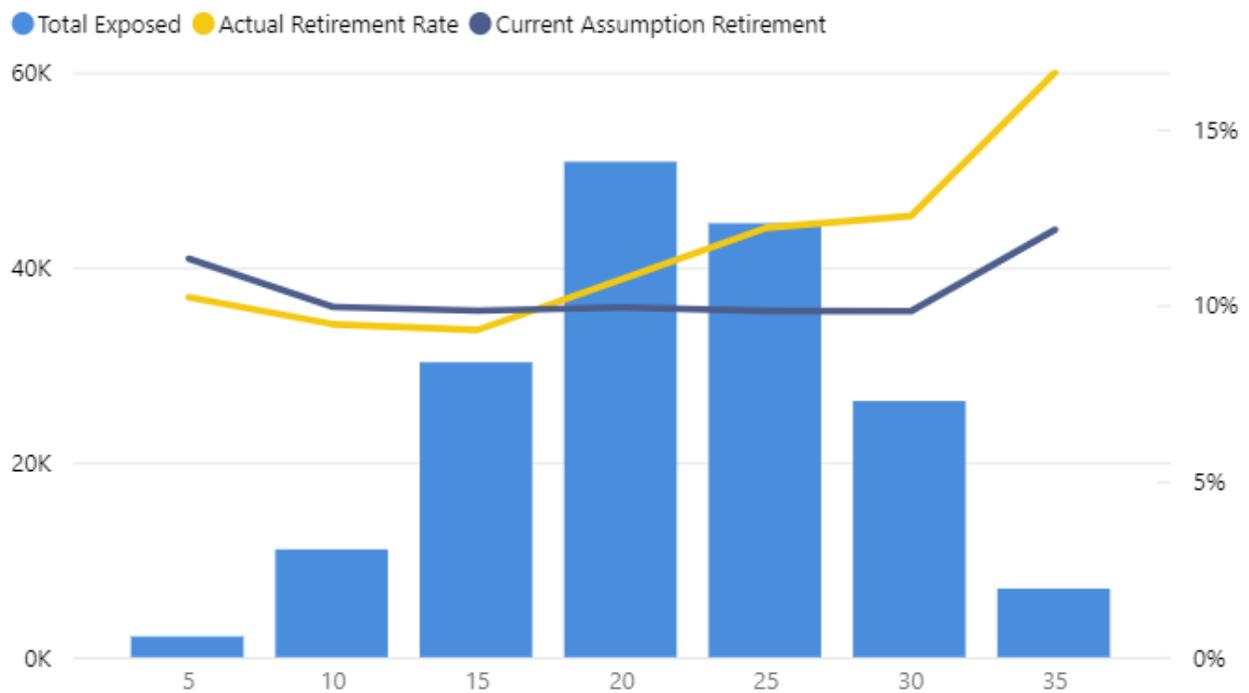
Basic 62/5 Plan

The following charts display the experience of Basic 62/5 Plan by service based on the age range (55 to 79) and service range (5 to 39), during the period 2012 – 2019.

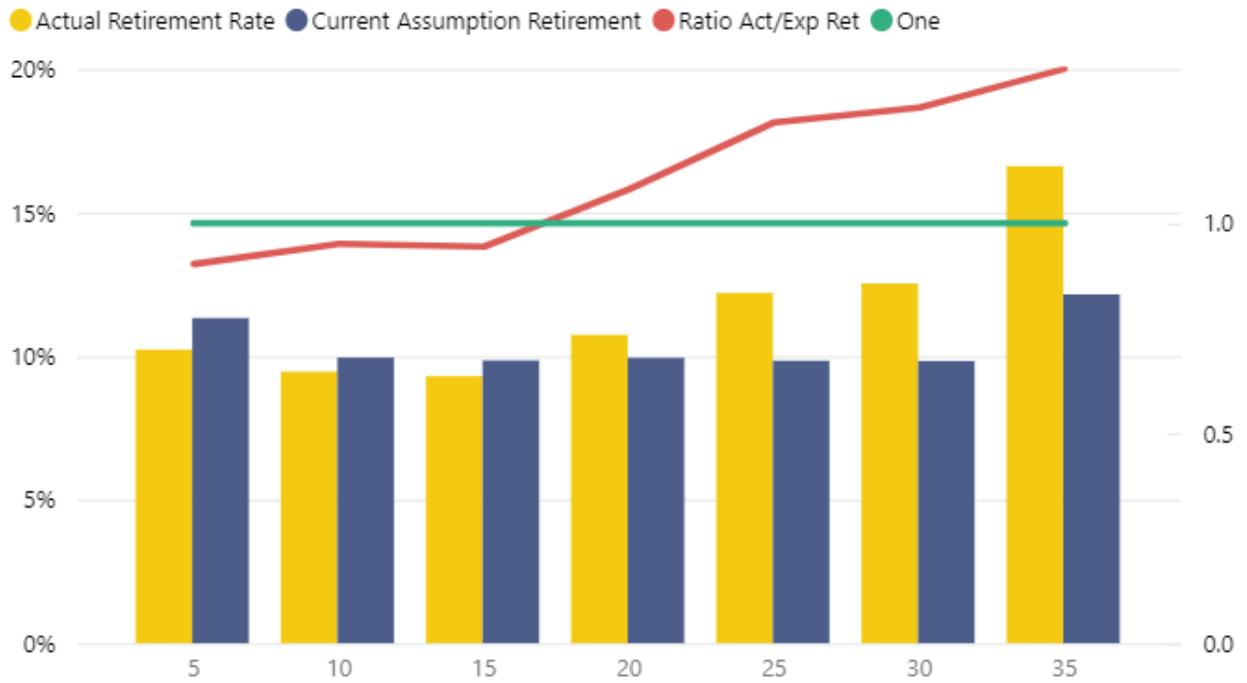
Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	10	14.3	84	11.90%	17.03%	▲ 0.70
6	33	33.3	251	13.15%	13.27%	● 0.99
7	40	47.5	400	10.00%	11.88%	▲ 0.84
8	48	56.7	538	8.92%	10.54%	▲ 0.85
9	86	88.5	850	10.12%	10.41%	● 0.97
10	127	123.0	1,199	10.59%	10.26%	● 1.03
11	130	162.2	1,614	8.05%	10.05%	▲ 0.80
12	174	219.5	2,202	7.90%	9.97%	▲ 0.79
13	315	273.3	2,758	11.42%	9.91%	▲ 1.15
14	300	322.4	3,290	9.12%	9.80%	● 0.93
15	369	373.5	3,838	9.61%	9.73%	● 0.99
16	463	486.9	4,944	9.36%	9.85%	● 0.95
17	531	581.3	5,956	8.92%	9.76%	● 0.91
18	667	718.7	7,224	9.23%	9.95%	● 0.93
19	783	819.2	8,302	9.43%	9.87%	● 0.96
20	1,028	905.2	9,169	11.21%	9.87%	▲ 1.14
21	986	963.4	9,721	10.14%	9.91%	● 1.02
22	1,049	1,018.7	10,318	10.17%	9.87%	● 1.03
23	1,129	1,096.5	10,900	10.36%	10.06%	● 1.03
24	1,270	1,067.8	10,735	11.83%	9.95%	▲ 1.19
25	1,313	1,036.8	10,405	12.62%	9.96%	▲ 1.27
26	1,136	938.6	9,531	11.92%	9.85%	▲ 1.21
27	1,043	862.5	8,835	11.81%	9.76%	▲ 1.21
28	964	799.1	8,171	11.80%	9.78%	▲ 1.21
29	977	742.1	7,580	12.89%	9.79%	▲ 1.32

30	853	660.0	6,778	12.58%	9.74%	▲	1.29
31	746	601.1	6,202	12.03%	9.69%	▲	1.24
32	657	515.6	5,378	12.22%	9.59%	▲	1.27
33	564	438.0	4,380	12.88%	10.00%	▲	1.29
34	474	367.8	3,544	13.37%	10.38%	▲	1.29
35	367	293.1	2,681	13.69%	10.93%	▲	1.25
36	339	240.3	2,020	16.78%	11.90%	▲	1.41
37	252	174.1	1,322	19.06%	13.17%	▲	1.45
38	141	101.4	723	19.50%	14.02%	▲	1.39
39	70	46.0	292	23.97%	15.76%	◆	1.52
Total	19,434	17,188.2	172,135	11.29%	9.99%	▲	1.13

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



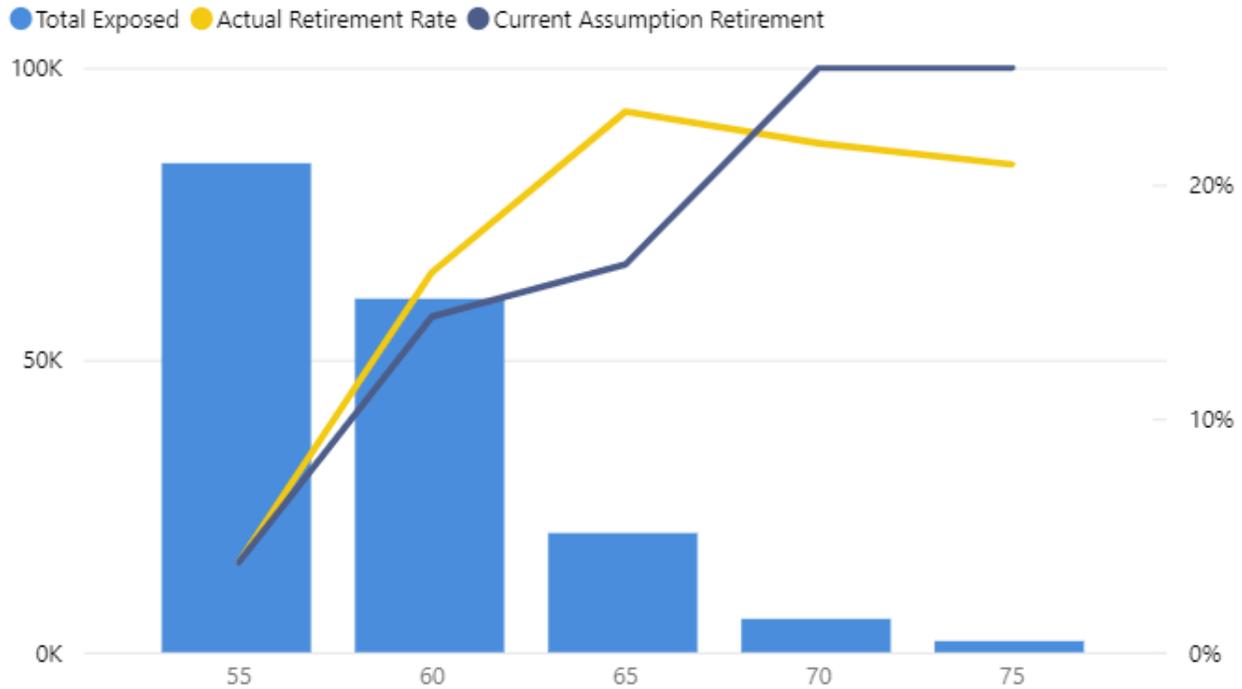
Retirement Rate - Actual, Expected, and Ratio; by Service



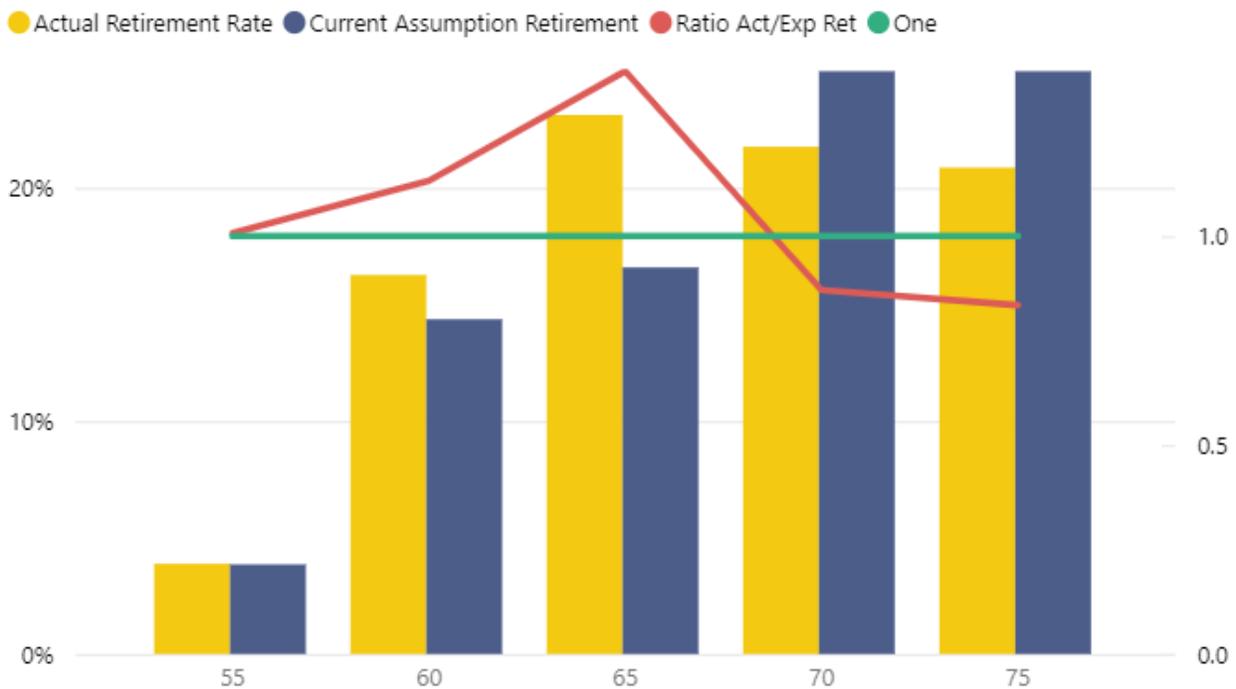
The following charts display the experience of Basic 62/5 Plan by age based on the age range (55 to 79) and service range (5 to 39), during the period 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	675	586.2	16,748	4.03%	3.50%	▲ 1.15
56	560	589.4	16,839	3.33%	3.50%	● 0.95
57	606	590.1	16,861	3.59%	3.50%	● 1.03
58	647	587.4	16,784	3.85%	3.50%	▲ 1.10
59	754	861.2	16,404	4.60%	5.25%	▲ 0.88
60	882	1,106.0	15,800	5.58%	7.00%	▲ 0.80
61	2,260	1,194.0	14,925	15.14%	8.00%	◆ 1.89
62	3,661	3,839.4	12,798	28.61%	30.00%	● 0.95
63	1,693	1,385.1	9,230	18.34%	15.01%	▲ 1.22
64	1,336	1,158.2	7,717	17.31%	15.01%	▲ 1.15
65	1,450	1,288.3	6,440	22.52%	20.00%	▲ 1.13
66	1,324	752.7	5,016	26.40%	15.01%	◆ 1.76
67	789	554.4	3,695	21.35%	15.00%	▲ 1.42
68	647	443.7	2,957	21.88%	15.01%	▲ 1.46
69	505	342.6	2,283	22.12%	15.01%	▲ 1.47
70	419	438.3	1,753	23.90%	25.00%	● 0.96
71	299	335.0	1,340	22.31%	25.00%	▲ 0.89
72	229	263.0	1,052	21.77%	25.00%	▲ 0.87
73	152	213.0	852	17.84%	25.00%	▲ 0.71
74	145	179.8	719	20.17%	25.00%	▲ 0.81
75	118	145.5	582	20.27%	25.00%	▲ 0.81
76	93	113.5	454	20.48%	25.00%	▲ 0.82
77	67	90.0	360	18.61%	25.00%	▲ 0.74
78	79	76.0	304	25.99%	25.00%	● 1.04
79	44	55.5	222	19.82%	25.00%	▲ 0.79
Total	19,434	17,188.2	172,135	11.29%	9.99%	▲ 1.13

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



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



Specific observations:

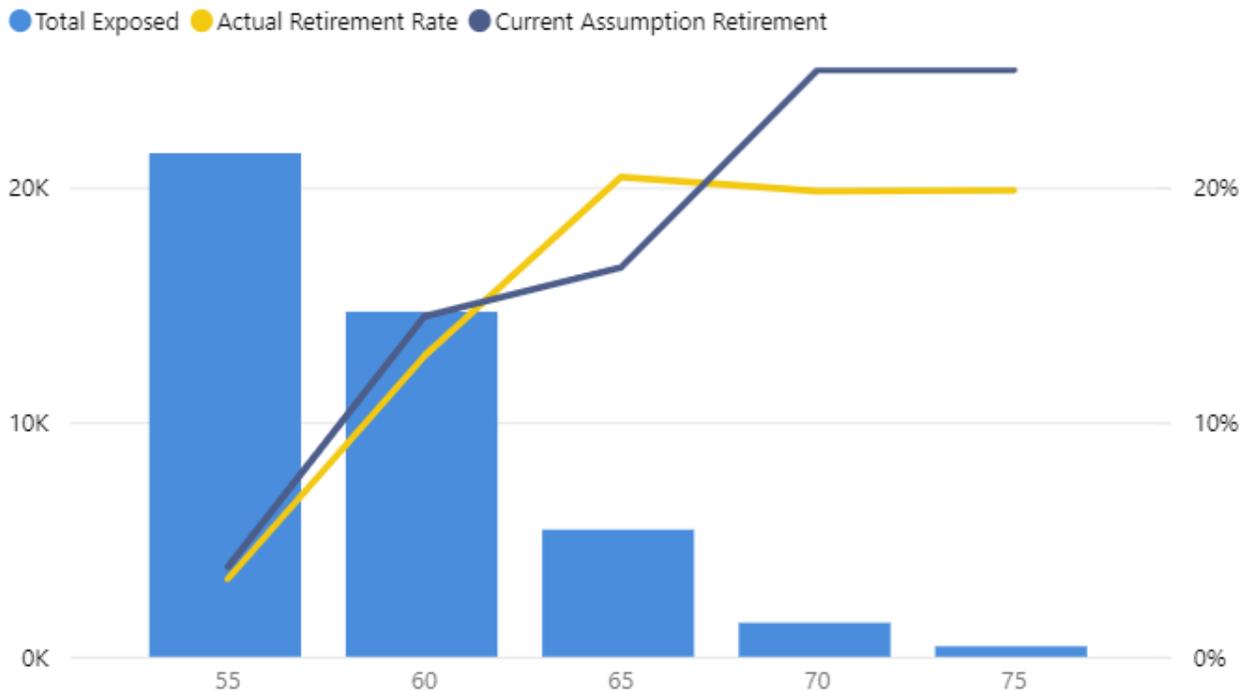
- In total, actual retirements were greater than assumed by 13% (A/E ratio of 1.13).
- Actual rates were lower than expected for up to 19 years of service (A/E ratio of 0.94).
- For 20 or more years of service, the relationship is reversed, and actual rates of retirement exceeded the assumption (A/E ratio of 1.19).
 - This is probably due to the benefit formula that applies a 2% multiplier to all years of service once 20 years are accrued and unreduced retirement occurs at 30 years of service.
- During reduced retirement periods (ages 55 to 61), actual rates of retirement were smaller for members with less than 20 years of service (4.23% for an A/E ratio of 0.89) than for members with at least 20 years of service (6.03% for an A/E ratio of 1.24).
- Relatively higher rates of retirement occur at ages 62 and 66 for those with at least 20 years of service.

The following charts show the retirement experience split by members with less than 20 years of service, and members with at least 20 years of service. Members under age 62 are not eligible for unreduced retirement benefits. Please note that due to rounding there may be some members with an assigned retirement age of 61 who actually retired when they first attained age 62. We will review potential adjustments in subsequent analyses.

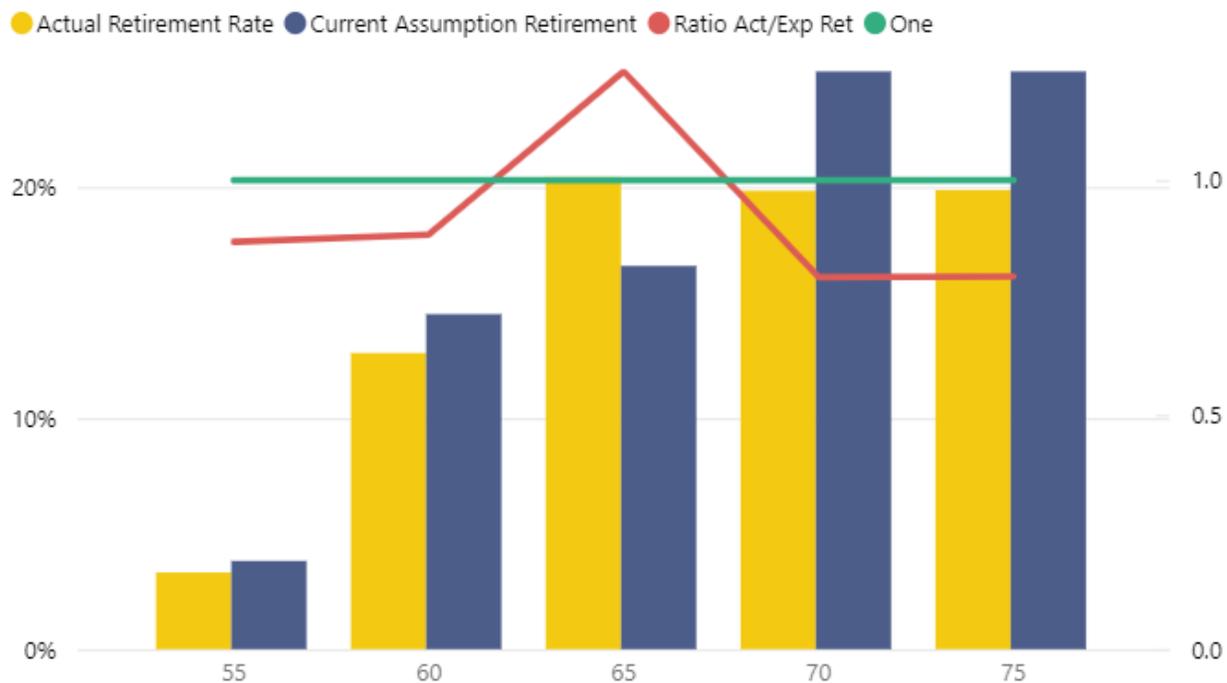
The following charts show the retirement experience by age of members with less than 20 years of service.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	148	159.9	4,568	3.24%	3.50%	0.93
56	136	156.8	4,479	3.04%	3.50%	0.87
57	141	151.3	4,322	3.26%	3.50%	0.93
58	131	145.3	4,150	3.16%	3.50%	0.90
59	156	206.4	3,931	3.97%	5.25%	0.76
60	173	260.8	3,726	4.64%	7.00%	0.66
61	325	274.2	3,428	9.48%	8.00%	1.19
62	693	925.5	3,085	22.46%	30.00%	0.75
63	371	360.4	2,399	15.46%	15.03%	1.03
64	321	309.5	2,059	15.59%	15.03%	1.04
65	320	339.5	1,696	18.87%	20.02%	0.94
66	316	200.1	1,332	23.72%	15.02%	1.58
67	190	149.2	994	19.11%	15.01%	1.27
68	155	118.9	792	19.57%	15.02%	1.30
69	125	90.0	599	20.87%	15.03%	1.39
70	98	110.0	440	22.27%	25.00%	0.89
71	70	82.8	331	21.15%	25.00%	0.85
72	49	66.8	267	18.35%	25.00%	0.73
73	33	55.0	220	15.00%	25.00%	0.60
74	37	47.3	189	19.58%	25.00%	0.78
75	28	36.5	146	19.18%	25.00%	0.77
76	28	27.3	109	25.69%	25.00%	1.03
77	11	20.0	80	13.75%	25.00%	0.55
78	12	15.8	63	19.05%	25.00%	0.76
79	9	11.3	45	20.00%	25.00%	0.80
Total	4,076	4,320.3	43,450	9.38%	9.94%	0.94

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



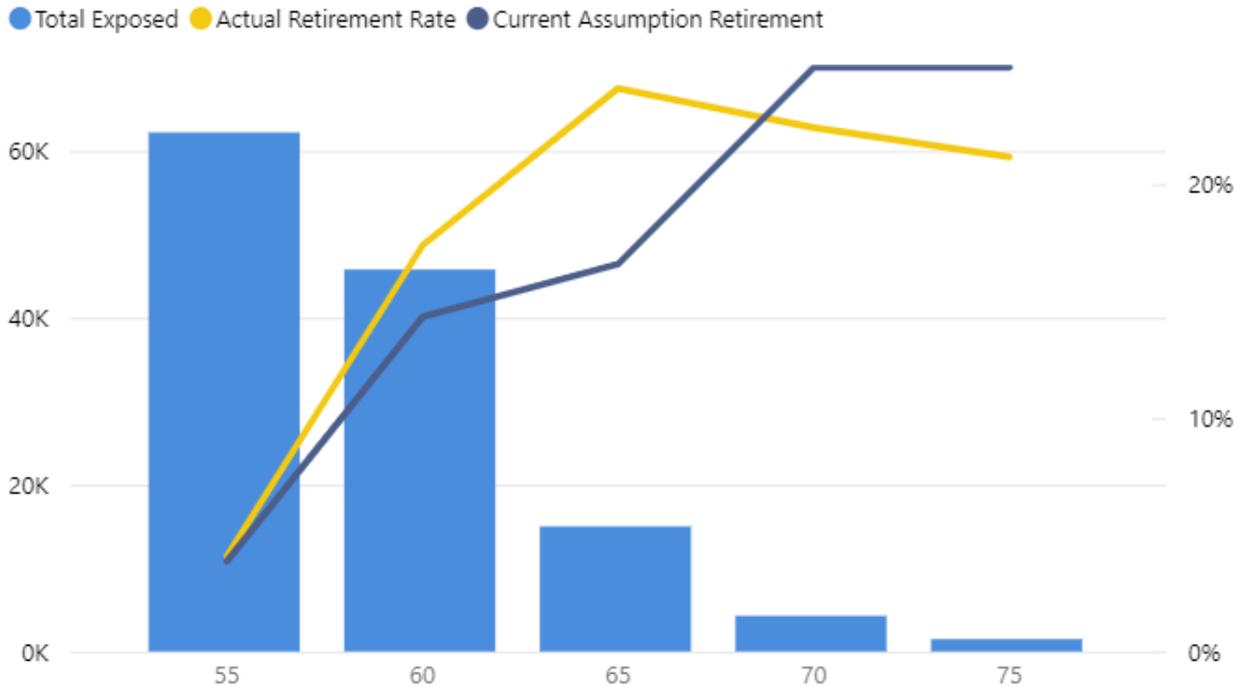
Retirement Rate - Actual, Expected, and Ratio; by Age



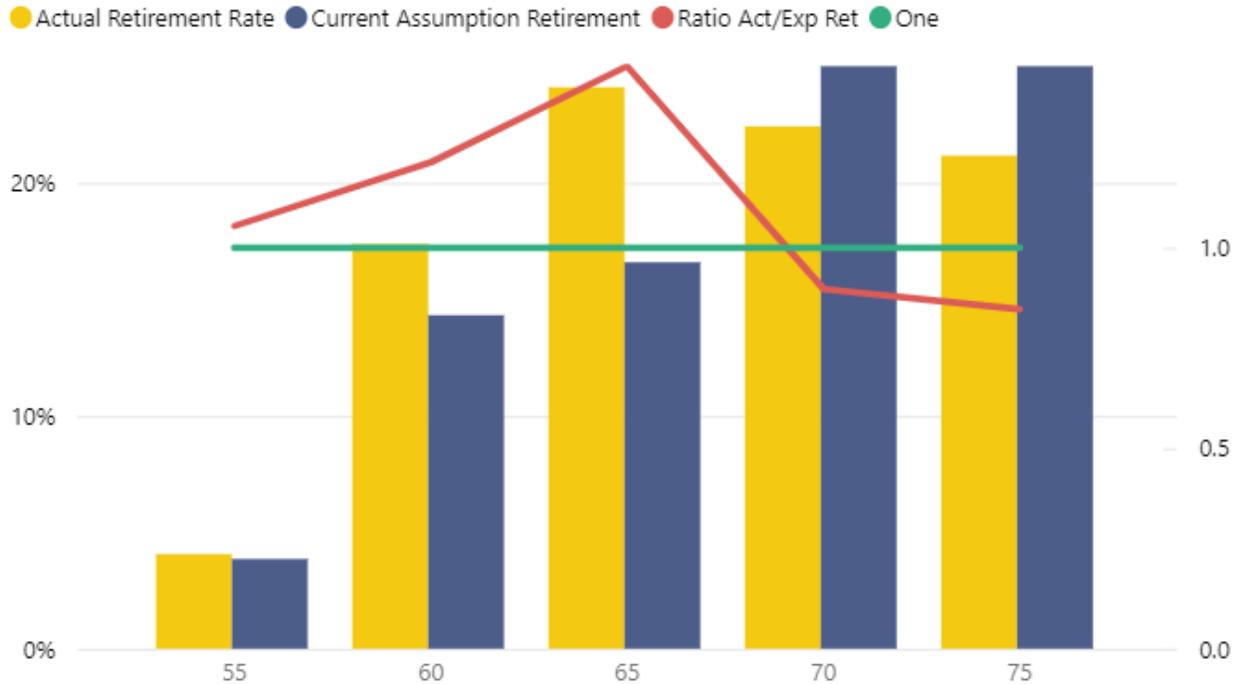
The following charts show the retirement experience of members with at least 20 years of service.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	527	426.3	12,180	4.33%	3.50%	▲ 1.24
56	424	432.6	12,360	3.43%	3.50%	● 0.98
57	465	438.9	12,539	3.71%	3.50%	● 1.06
58	516	442.2	12,634	4.08%	3.50%	▲ 1.17
59	598	654.8	12,473	4.79%	5.25%	● 0.91
60	709	845.2	12,074	5.87%	7.00%	▲ 0.84
61	1,935	919.8	11,497	16.83%	8.00%	◆ 2.10
62	2,968	2,913.9	9,713	30.56%	30.00%	● 1.02
63	1,322	1,024.7	6,831	19.35%	15.00%	▲ 1.29
64	1,015	848.7	5,658	17.94%	15.00%	▲ 1.20
65	1,130	948.8	4,744	23.82%	20.00%	▲ 1.19
66	1,008	552.6	3,684	27.36%	15.00%	◆ 1.82
67	599	405.1	2,701	22.18%	15.00%	▲ 1.48
68	492	324.7	2,165	22.73%	15.00%	◆ 1.52
69	380	252.6	1,684	22.57%	15.00%	◆ 1.50
70	321	328.3	1,313	24.45%	25.00%	● 0.98
71	229	252.3	1,009	22.70%	25.00%	● 0.91
72	180	196.3	785	22.93%	25.00%	● 0.92
73	119	158.0	632	18.83%	25.00%	▲ 0.75
74	108	132.5	530	20.38%	25.00%	▲ 0.82
75	90	109.0	436	20.64%	25.00%	▲ 0.83
76	65	86.3	345	18.84%	25.00%	▲ 0.75
77	56	70.0	280	20.00%	25.00%	▲ 0.80
78	67	60.3	241	27.80%	25.00%	▲ 1.11
79	35	44.3	177	19.77%	25.00%	▲ 0.79
Total	15,358	12,867.9	128,685	11.93%	10.00%	▲ 1.19

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



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

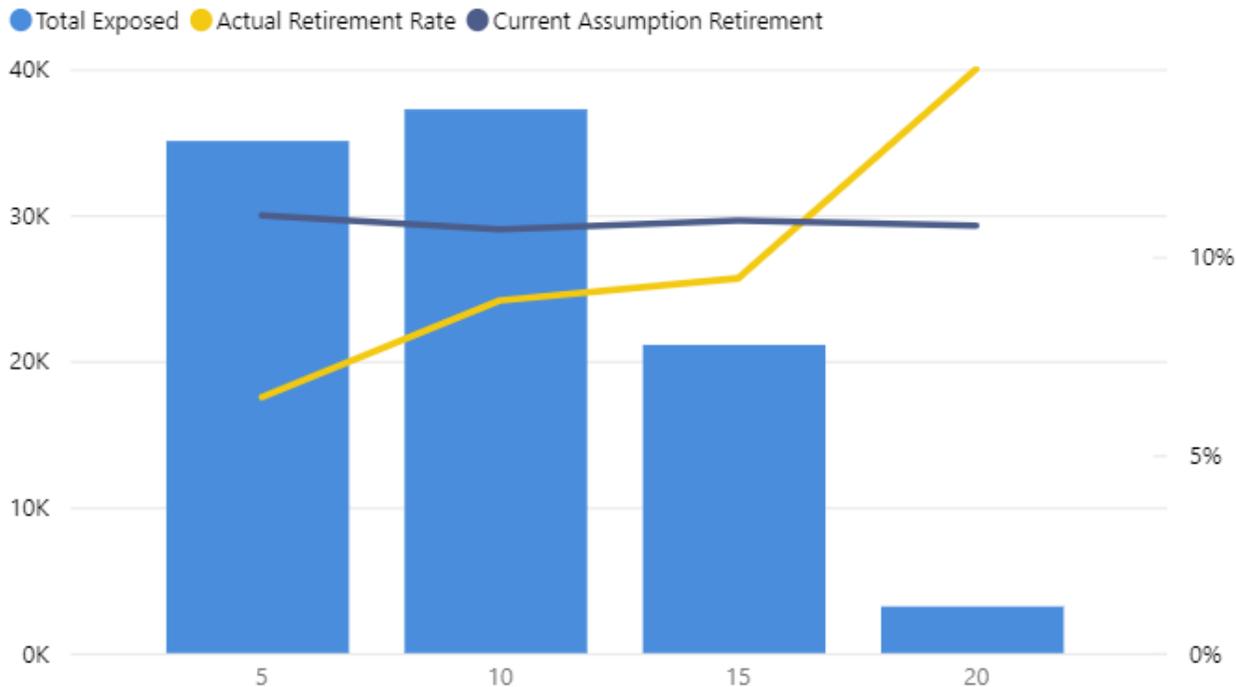


Age 57/5 Plan

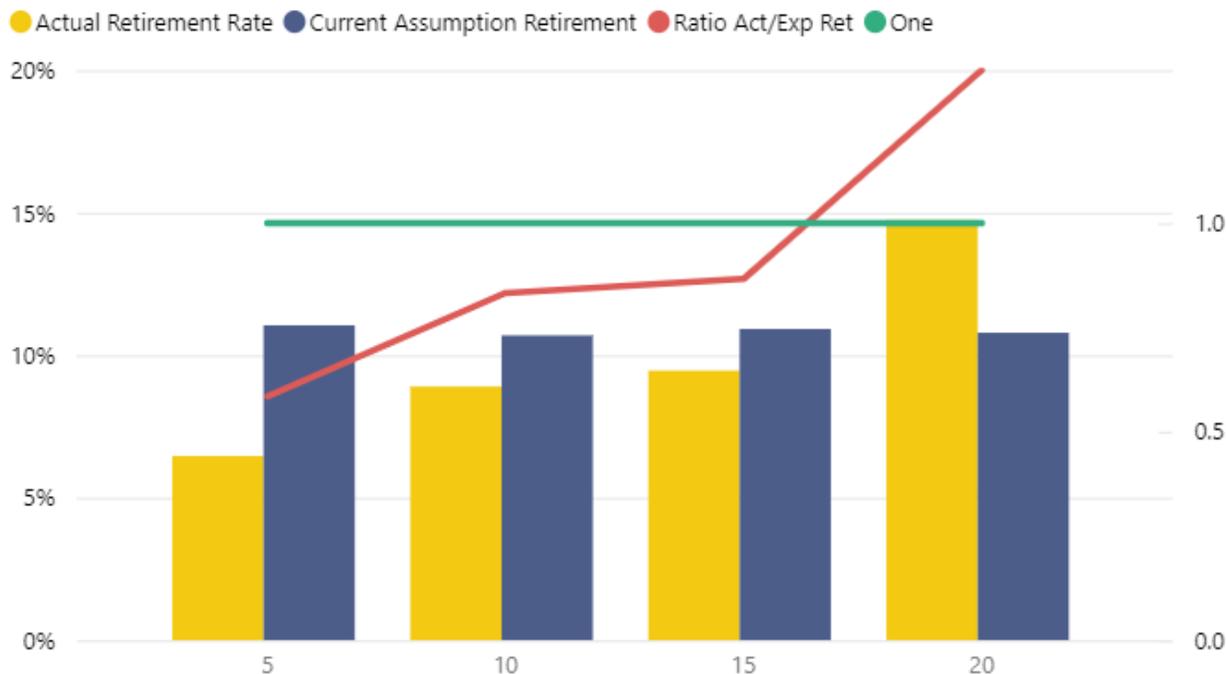
The following charts display the experience of the Age 57/5 Plan, by service (5 - 24 years), for the age range (57 – 79), during the period 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	382	848.3	5,737	6.66%	14.79%	0.45
6	493	724.5	7,094	6.95%	10.21%	0.68
7	443	712.5	6,978	6.35%	10.21%	0.62
8	427	765.8	7,415	5.76%	10.33%	0.56
9	526	823.1	7,846	6.70%	10.49%	0.64
10	828	860.9	8,129	10.19%	10.59%	0.96
11	689	842.1	7,941	8.68%	10.60%	0.82
12	601	792.4	7,410	8.11%	10.69%	0.76
13	628	780.2	7,241	8.67%	10.78%	0.80
14	570	706.0	6,515	8.75%	10.84%	0.81
15	555	644.4	5,964	9.31%	10.80%	0.86
16	450	571.8	5,267	8.54%	10.86%	0.79
17	416	473.0	4,319	9.63%	10.95%	0.88
18	293	354.0	3,221	9.10%	10.99%	0.83
19	283	261.0	2,333	12.13%	11.19%	1.08
20	275	173.8	1,560	17.63%	11.14%	1.58
21	122	99.7	924	13.20%	10.79%	1.22
22	49	46.3	452	10.84%	10.25%	1.06
23	18	16.3	169	10.65%	9.65%	1.10
24	7	8.5	90	7.78%	9.43%	0.82
Total	8,055	10,504.5	96,605	8.34%	10.87%	0.77

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



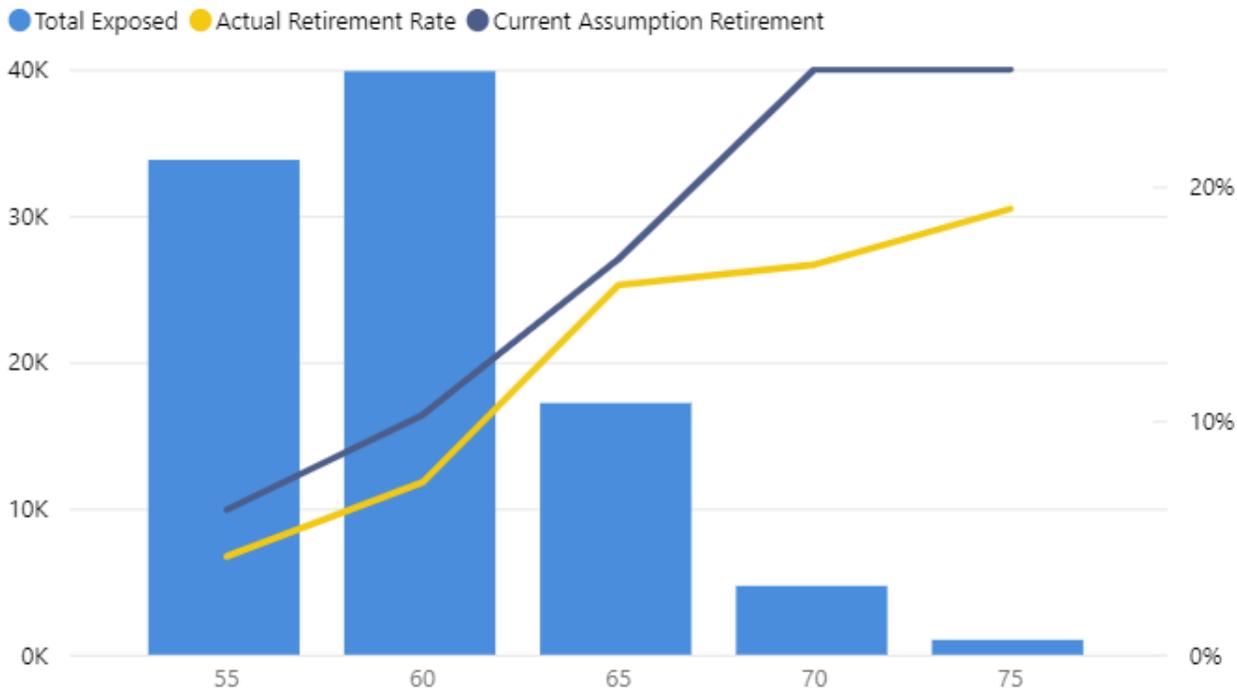
Retirement Rate - Actual, Expected, and Ratio; by Service



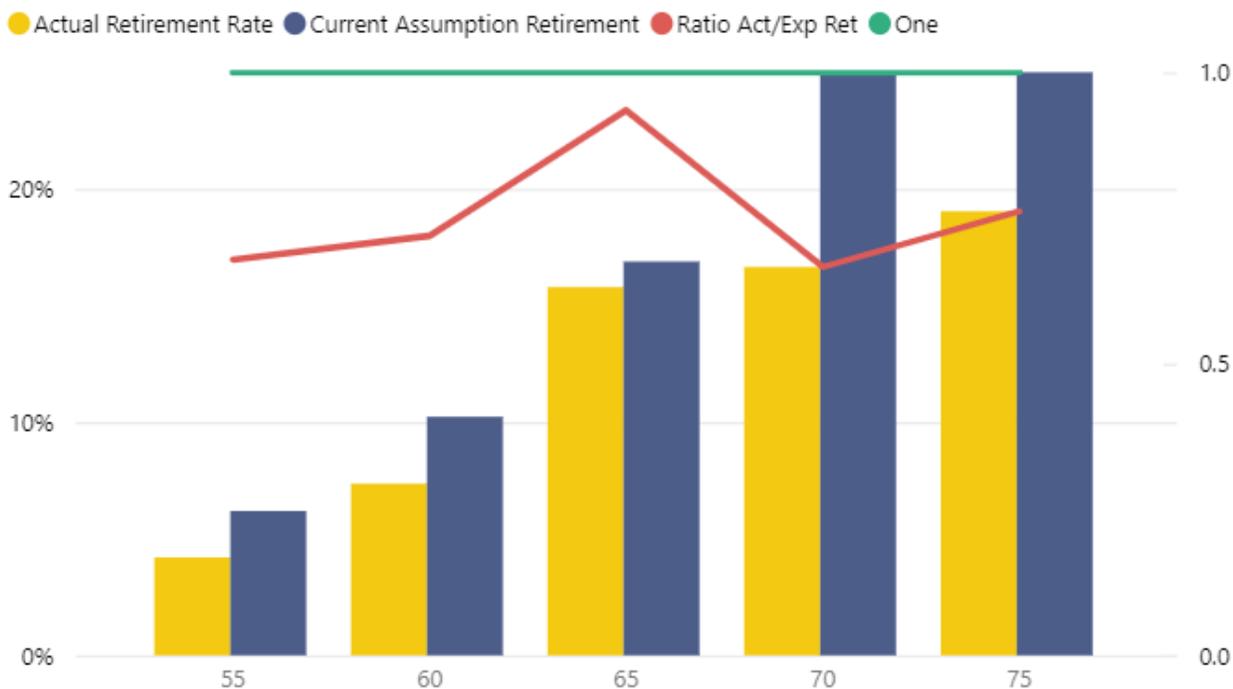
The following charts display the experience of the Age 57/5 Plan, by age, for the age range 57 to 79 and the service range 5 – 24 years, during the period 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
57	583	959.4	11,992	4.86%	8.00%	▲ 0.61
58	406	585.5	11,267	3.60%	5.20%	▲ 0.69
59	437	547.4	10,555	4.14%	5.19%	▲ 0.80
60	376	505.1	9,752	3.86%	5.18%	▲ 0.74
61	510	678.4	9,009	5.66%	7.53%	▲ 0.75
62	848	912.3	8,139	10.42%	11.21%	● 0.93
63	611	1,058.7	6,926	8.82%	15.29%	▲ 0.58
64	590	924.0	6,047	9.76%	15.28%	▲ 0.64
65	710	1,070.7	5,188	13.69%	20.64%	▲ 0.66
66	768	646.7	4,233	18.14%	15.28%	▲ 1.19
67	537	497.0	3,251	16.52%	15.29%	● 1.08
68	378	386.5	2,533	14.92%	15.26%	● 0.98
69	324	302.9	1,992	16.27%	15.21%	● 1.07
70	271	380.5	1,522	17.81%	25.00%	▲ 0.71
71	176	288.0	1,152	15.28%	25.00%	▲ 0.61
72	145	218.5	874	16.59%	25.00%	▲ 0.66
73	97	162.0	648	14.97%	25.00%	▲ 0.60
74	94	126.5	506	18.58%	25.00%	▲ 0.74
75	72	90.8	363	19.83%	25.00%	▲ 0.79
76	58	67.3	269	21.56%	25.00%	▲ 0.86
77	24	42.3	169	14.20%	25.00%	▲ 0.57
78	19	31.3	125	15.20%	25.00%	▲ 0.61
79	21	23.3	93	22.58%	25.00%	● 0.90
Total	8,055	10,504.5	96,605	8.34%	10.87%	▲ 0.77

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



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



Specific observations:

- Overall, the number of retirements was less than expected (A/E ratio of 0.77)
- Due to when these plans were adopted, the retirement experience for members with 20 or more years of service was limited.
 - Based on the limited data available, the rates of retirement of members with at least 20 years of service were higher than the rates of retirement of members with shorter service periods (A/E ratio of 1.33 when all service periods are selected).
- Under the current assumptions, higher first eligibility rates apply when members are first eligible for retirement, which includes members in their fifth year of service after attaining age 57. However, the actual rate of retirement of these members was smaller than expected (A/E ratio of 0.61 for members attaining age 57 and 0.45 for members in their fifth year of service).
 - Please note that due to rounding there were members with an assigned retirement age of 56 who retired when they first attained age 57. We will review potential adjustments in subsequent analyses. However, even with adjustments, the actual number of retirements is expected to be much smaller than expected.
- Physically Taxing members had a larger rate of retirement at 9.32% than non-Physically Taxing members at 8.21% for an overall A/E of 0.94 vs. 0.75.
 - For members with at least 20 years of service, the difference is even greater (A/E ratio of 2.27 vs 1.18 when all service periods are selected).

Specialty Plan Grouping

Improved Plan Members (25+ Years of Service)

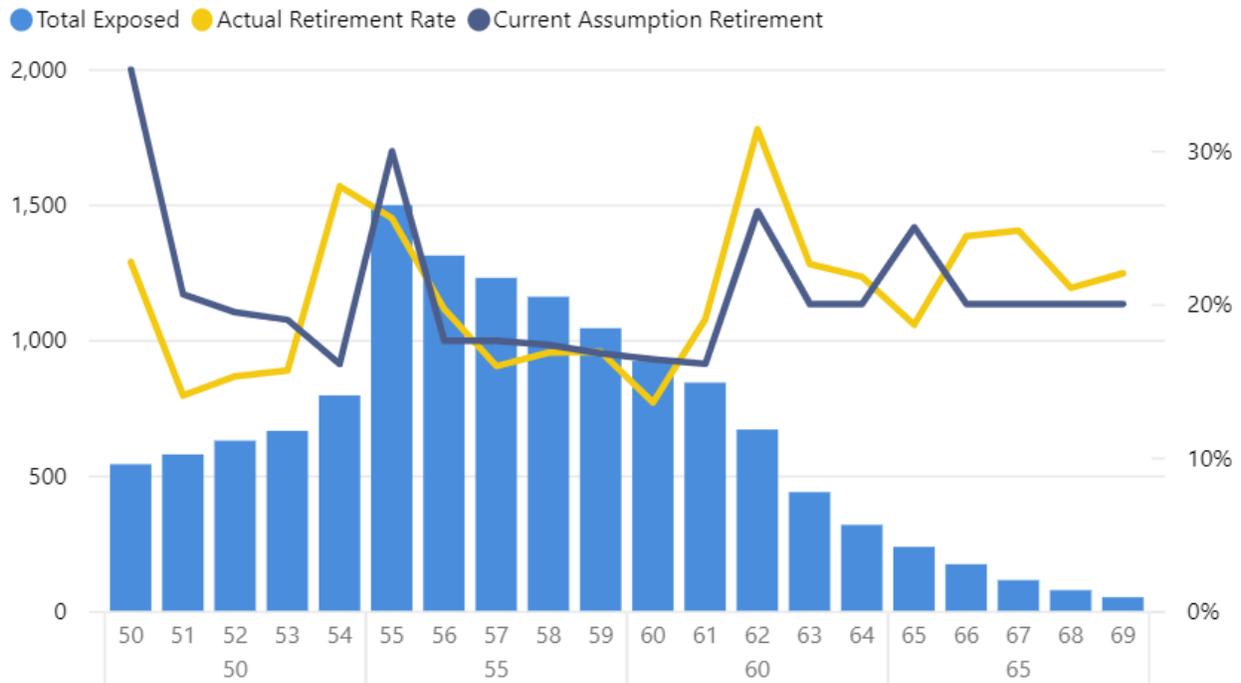
The following chart displays the experience of improved plan members by service, for the age range 50 to 69 and service range 25 to 39, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
25	277	553.9	1,403	19.74%	39.48%	▲ 0.50
26	250	263.4	1,443	17.33%	18.25%	● 0.95
27	251	264.5	1,470	17.07%	18.00%	● 0.95
28	281	257.5	1,429	19.66%	18.02%	● 1.09
29	274	245.3	1,326	20.66%	18.50%	▲ 1.12
30	278	230.9	1,265	21.98%	18.25%	▲ 1.20
31	265	208.1	1,166	22.73%	17.85%	▲ 1.27
32	216	185.8	1,017	21.24%	18.27%	▲ 1.16
33	166	146.7	816	20.34%	17.98%	▲ 1.13
34	129	115.3	648	19.91%	17.79%	▲ 1.12
35	86	85.6	476	18.07%	17.97%	● 1.01
36	69	63.8	355	19.44%	17.96%	● 1.08
37	47	46.3	246	19.11%	18.80%	● 1.02
38	29	28.0	144	20.14%	19.44%	● 1.04
39	18	15.2	74	24.32%	20.54%	▲ 1.18
Total	2,636	2,710.3	13,278	19.85%	20.41%	● 0.97

The following chart displays the experience of improved plan members by age, for the age range 50 to 69 and service range 25 to 39, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
50	123	191.1	541	22.74%	35.32%	▲ 0.64
51	81	119.0	577	14.04%	20.63%	▲ 0.68
52	96	122.2	628	15.29%	19.46%	▲ 0.79
53	104	125.9	664	15.66%	18.97%	▲ 0.83
54	220	127.8	795	27.67%	16.08%	◆ 1.72
55	383	448.6	1,497	25.58%	29.96%	▲ 0.85
56	258	230.6	1,311	19.68%	17.59%	▲ 1.12
57	196	216.3	1,229	15.95%	17.60%	● 0.91
58	195	200.8	1,159	16.82%	17.33%	● 0.97
59	176	174.9	1,043	16.87%	16.77%	● 1.01
60	125	150.9	921	13.57%	16.38%	▲ 0.83
61	160	135.5	842	19.00%	16.10%	▲ 1.18
62	210	174.3	669	31.39%	26.05%	▲ 1.21
63	99	87.6	438	22.60%	20.00%	▲ 1.13
64	69	63.4	317	21.77%	20.00%	● 1.09
65	44	59.0	236	18.64%	25.00%	▲ 0.75
66	42	34.4	172	24.42%	20.00%	▲ 1.22
67	28	22.6	113	24.78%	20.00%	▲ 1.24
68	16	15.2	76	21.05%	20.00%	● 1.05
69	11	10.0	50	22.00%	20.00%	● 1.10
Total	2,636	2,710.3	13,278	19.85%	20.41%	● 0.97

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



Specific observations:

- Retirements in the 25th year of service were much less than expected (A/E ratio of 0.50). Retirements recorded in the 24th year of service may have actually occurred upon completion of 25 years. If we include all retirements in the 24th year, the A/E ratio increases to approximately 0.79.
- For members after first eligibility (age range 51 to 69 and service range 26 to 39), actual retirements were greater than assumed by 12% (A/E ratio of 1.12).

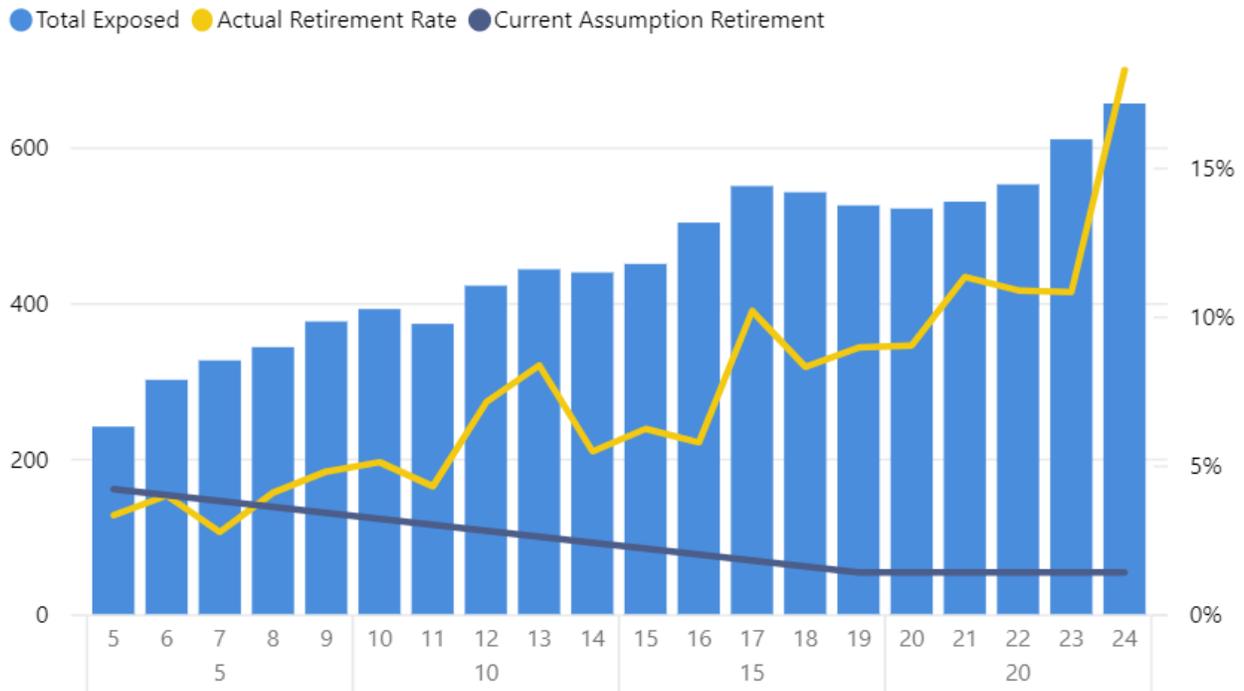
Basic Plan Early Retirement Ages (55 to 61)

In this section, we review the experience of specialty plan group members with less than 25 years of service but eligible for reduced retirement under the Basic Plan. OA applies rates of termination which vary by service during this period. While there are mandated and improved plan members, the rate of termination does not vary by this characteristic.

The following chart displays the early retirement experience of specialty group plan members by service, for the age range 55 to 61 and service range 5 to 24, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	8	10.1	241	3.32%	4.20%	▲ 0.79
6	12	12.0	301	3.99%	4.00%	● 1.00
7	9	12.4	326	2.76%	3.80%	▲ 0.73
8	14	12.3	343	4.08%	3.60%	▲ 1.13
9	18	12.8	376	4.79%	3.40%	▲ 1.41
10	20	12.5	391	5.12%	3.20%	◆ 1.60
11	16	11.2	372	4.30%	3.00%	▲ 1.43
12	30	11.8	422	7.11%	2.80%	◆ 2.54
13	37	11.5	442	8.37%	2.60%	◆ 3.22
14	24	10.5	439	5.47%	2.40%	◆ 2.28
15	28	9.9	450	6.22%	2.20%	◆ 2.83
16	29	10.1	503	5.77%	2.00%	◆ 2.88
17	56	9.9	549	10.20%	1.80%	◆ 5.67
18	45	8.7	542	8.30%	1.60%	◆ 5.19
19	47	7.4	525	8.95%	1.40%	◆ 6.39
20	47	7.3	521	9.02%	1.40%	◆ 6.44
21	60	7.4	529	11.34%	1.40%	◆ 8.10
22	60	7.7	551	10.89%	1.40%	◆ 7.78
23	66	8.5	610	10.82%	1.40%	◆ 7.73
24	120	9.2	656	18.29%	1.40%	◆ 13.07
Total	746	203.2	9,089	8.21%	2.24%	◆ 3.67

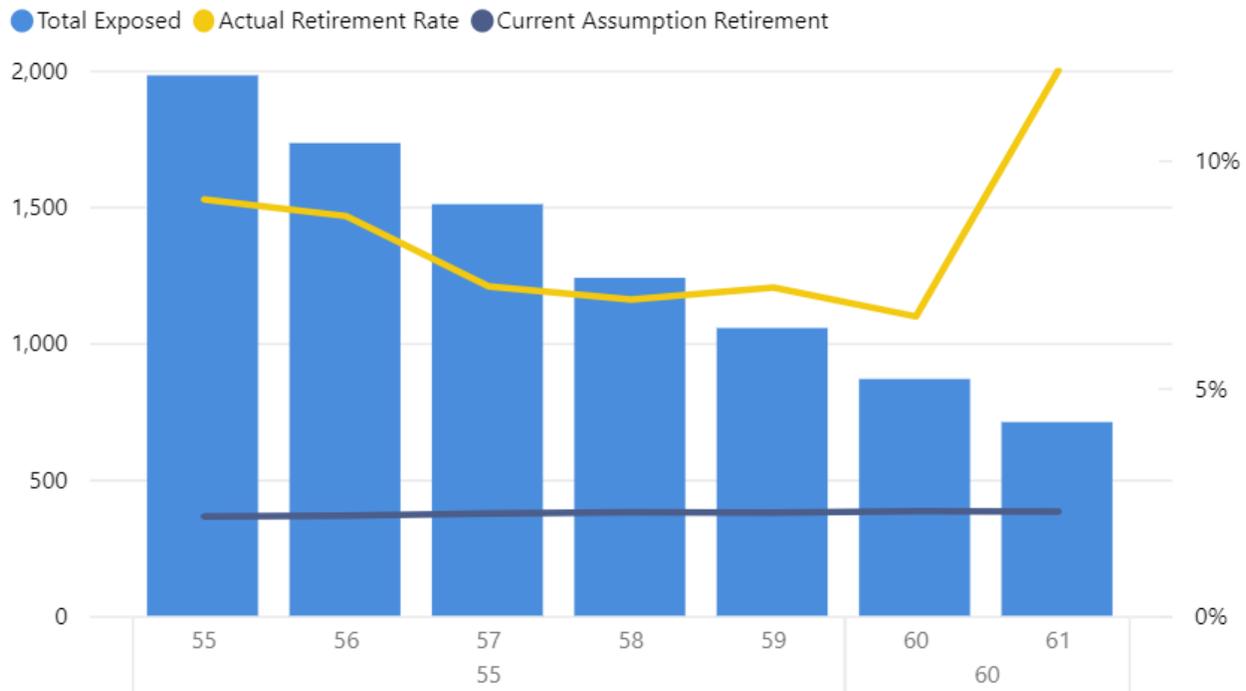
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



The following charts display the early retirement experience of specialty group plan members by age, for the age range 55 to 61 and service range 5 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	181	43.1	1,979	9.15%	2.18%	4.20
56	152	38.0	1,731	8.78%	2.20%	4.00
57	109	33.9	1,508	7.23%	2.25%	3.22
58	86	28.1	1,238	6.95%	2.27%	3.06
59	76	23.9	1,055	7.20%	2.26%	3.18
60	57	19.9	868	6.57%	2.30%	2.86
61	85	16.3	710	11.97%	2.29%	5.23
Total	746	203.2	9,089	8.21%	2.24%	3.67

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



Specific observations:

- In total, actual reduced retirements were much greater than anticipated by the termination assumption (actual rate of 8.21% versus 2.24%).
 - As some retirements that are recorded at 24 years of service may have occurred at 25 years of service or eligible for unreduced retirement, the actual retirement rate at this service point is higher. Even excluding it, the A/E ratio is still more than 3 times the rates of termination used.
- The actual rates of reduced retirement are correlated with service whereas the termination assumption is negatively correlated with service meaning that it decreases as service increases:
 - For the service range 5 – 9 years, the actual rate is 3.84%.
 - For the service range 10 – 14 years, the actual rate is 6.15%.
 - For the service range 15 – 19 years, the actual rate is 7.98%.
 - For the service range 20 – 23 years, the actual rate is 10.54%.
 - A higher rate at 20 years could be due to receiving the underlying Basic Plan benefit formula where a 2% multiplier applies to all years of service once 20 years are accrued.
- Members who elected an improved plan had higher rates of reduced retirement (8.88%) than members who were mandated into a plan (3.22%). The following two graphs shows the experience by age for these two groups:

The following charts display the early retirement experience of specialty group plan members by age, for the age range 55 to 61 and service range 5 to 23, during 2012 – 2019. Experience during the 24th year of service was excluded as that may reflect members retiring at completion of 25 years of service.

Improved Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	134	26.4	1,377	9.73%	1.92%	◆ 5.07
56	106	23.1	1,189	8.92%	1.95%	◆ 4.58
57	82	20.1	1,020	8.04%	1.97%	◆ 4.08
58	66	16.8	850	7.76%	1.98%	◆ 3.92
59	58	14.4	733	7.91%	1.96%	◆ 4.03
60	40	11.7	594	6.73%	1.97%	◆ 3.42
61	70	9.7	499	14.03%	1.94%	◆ 7.24
Total	556	122.2	6,262	8.88%	1.95%	◆ 4.55

Mandated Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	9	14.4	435	2.07%	3.31%	▲ 0.63
56	15	12.8	389	3.86%	3.28%	▲ 1.18
57	6	12.1	363	1.65%	3.32%	◆ 0.50
58	7	10.0	305	2.30%	3.30%	▲ 0.70
59	12	8.7	265	4.53%	3.28%	▲ 1.38
60	11	7.6	226	4.87%	3.35%	▲ 1.45
61	10	6.3	188	5.32%	3.34%	◆ 1.59
Total	70	71.8	2,171	3.22%	3.31%	● 0.98

Retirement Ages 62 to 69 (<25 Years)

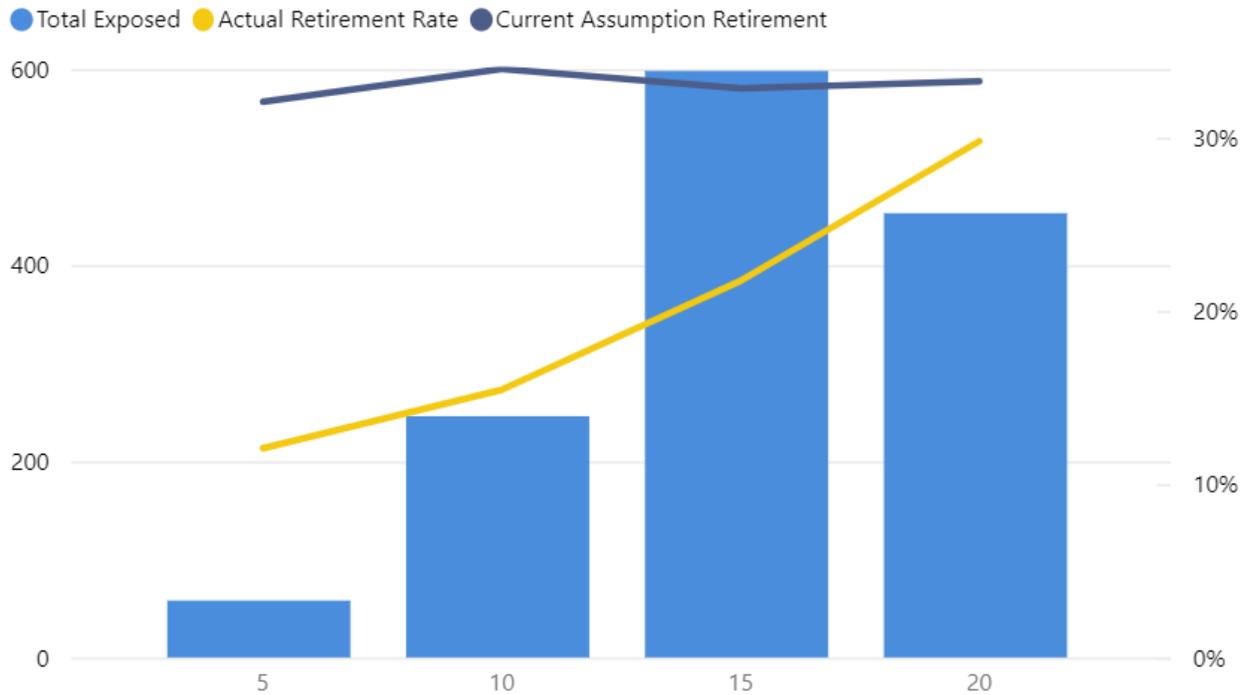
In this section, we review the experience of specialty plan group members with less than 25 years of service but eligible for normal retirement under the Basic Plan. OA applies rates of retirement which vary by whether the member elected an improved plan or was mandated into a plan.

Improved Plan

The following charts display the normal retirement experience of specialty group plan members who elected an improved plan, by service, for the age range 62 to 69 and service range 5 to 24, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	1	5.0	10	10.00%	50.00%	0.20
6	2	3.8	14	14.29%	26.79%	0.53
7	2	3.2	12	16.67%	26.67%	0.63
8	2	3.2	11	18.18%	28.64%	0.63
9	0	3.5	11	0.00%	31.82%	0.00
10	4	8.5	22	18.18%	38.41%	0.47
11	3	10.8	32	9.38%	33.75%	0.28
12	5	15.6	47	10.64%	33.09%	0.32
13	8	17.1	58	13.79%	29.48%	0.47
14	18	31.7	87	20.69%	36.38%	0.57
15	17	31.9	98	17.35%	32.50%	0.53
16	28	46.5	132	21.21%	35.23%	0.60
17	32	37.9	125	25.60%	30.32%	0.84
18	23	38.1	114	20.18%	33.42%	0.60
19	30	42.1	129	23.26%	32.60%	0.71
20	28	41.6	123	22.76%	33.78%	0.67
21	36	35.6	109	33.03%	32.66%	1.01
22	25	27.4	83	30.12%	32.95%	0.91
23	25	25.0	75	33.33%	33.27%	1.00
24	21	21.2	63	33.33%	33.65%	0.99
Total	310	449.2	1,355	22.88%	33.15%	0.69

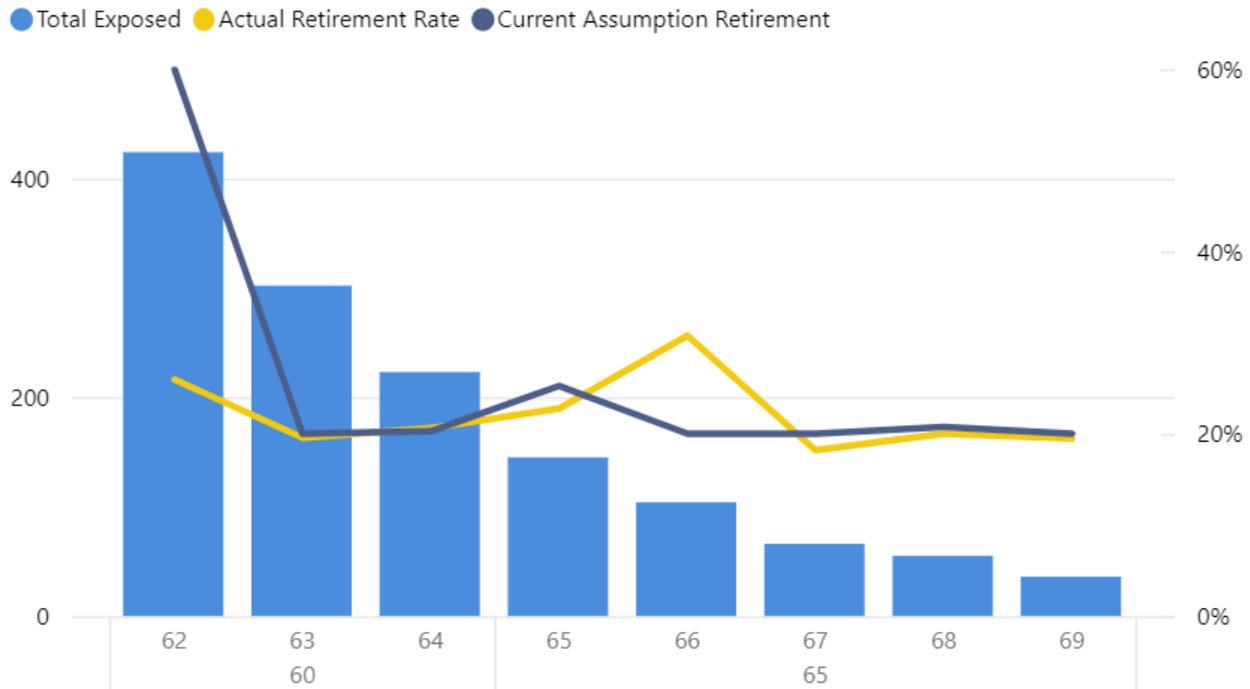
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



The following chart displays the normal retirement experience of specialty group plan members who elected an improved plan, by age, for the age range 62 to 69 and service range 5 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
62	110	254.4	424	25.94%	60.00%	0.43
63	59	60.4	302	19.54%	20.00%	0.98
64	46	45.2	223	20.63%	20.27%	1.02
65	33	36.6	145	22.76%	25.24%	0.90
66	32	20.8	104	30.77%	20.00%	1.54
67	12	13.2	66	18.18%	20.00%	0.91
68	11	11.4	55	20.00%	20.73%	0.96
69	7	7.2	36	19.44%	20.00%	0.97
Total	310	449.2	1,355	22.88%	33.15%	0.69

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



Specific observations:

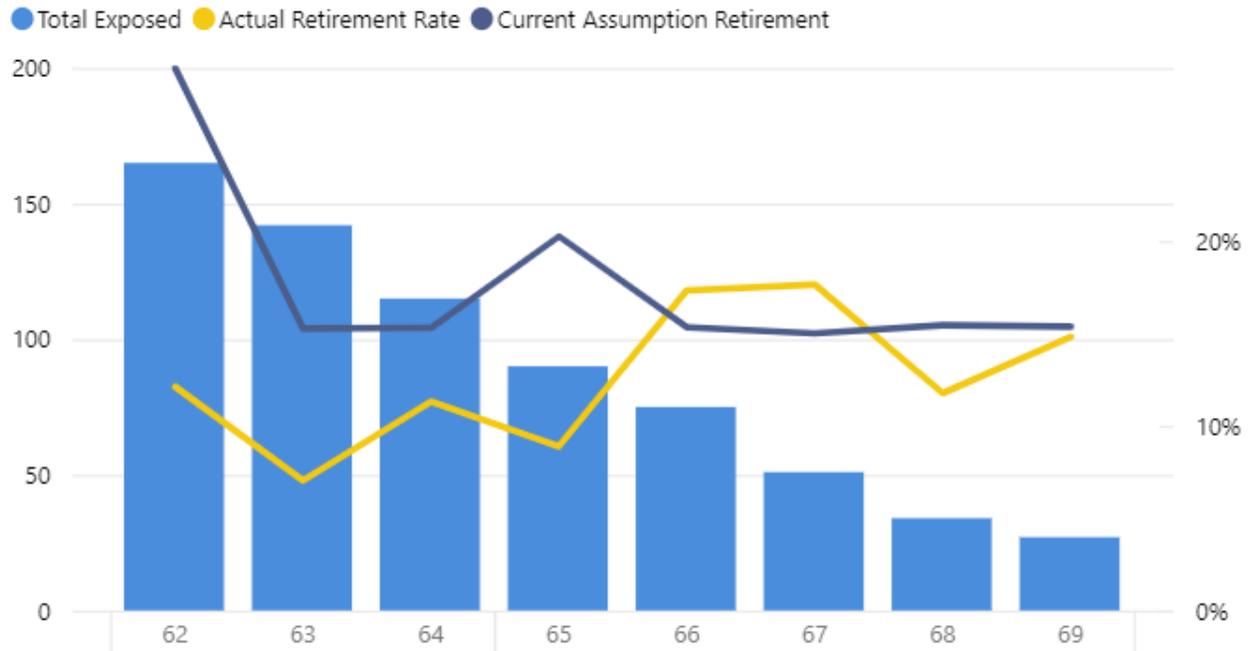
- In total, actual retirements were less than assumed by 31% (A/E ratio of 0.69).
- Actual rates of retirement are correlated to service, meaning that they increase as service increases while the assumption varies by age.
- At age 62, OA applies the first eligibility rate of 60% but this is much higher than the experience (A/E 0.43) .
- For the age range 63 to 69, the experience is similar to that expected (A/E ratio of 1.03).

Mandated Plan

The following charts display the normal retirement experience of specialty group plan mandated plan members, by age, for the age range 62 to 69 and service range 5 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
62	20	48.5	165	12.12%	29.37%	0.41
63	10	21.7	142	7.04%	15.26%	0.46
64	13	17.6	115	11.30%	15.30%	0.74
65	8	18.2	90	8.89%	20.25%	0.44
66	13	11.5	75	17.33%	15.32%	1.13
67	9	7.7	51	17.65%	15.00%	1.18
68	4	5.3	34	11.76%	15.44%	0.76
69	4	4.2	27	14.81%	15.37%	0.96
Total	81	134.5	699	11.59%	19.24%	0.60

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



Specific observations:

- There were much fewer retirements and exposures of mandated plan members than improved plan members.
- In total, actual retirements were less than assumed by 40% (A/E ratio of 0.60).

- Actual rates of retirement do not appear to be correlated to service as they were consistent across service periods, although there was nearly no experience at 20 or more years.
- At age 62, OA applies the first eligibility rate of 30% but this is much higher than the experience (A/E 0.41).
- For the age range 63 to 69, actual retirements were less than assumed by 29% (A/E ratio of 0.71).

Disability

The current ordinary disability assumption varies by age and gender but does not apply during the 10-year eligibility service period. Furthermore, a separate rate applies for accidental disability during all service periods. The ordinary and accidental 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. For accidental disability, some groups are eligible for either a 50% or 75% of final average salary minimum. The benefit is payable during the lifetime of the member and members may select any optional forms of payment. For members who have accrued at least 20 years of service, the service retirement benefit is greater than the ordinary disability retirement benefit if the member has met the conditions for an unreduced retirement benefit.

Ordinary Disability

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. We made adjustments as far back as 2012. Rates of disability were highest during the 2012 – 2014 period, moderate during the 2015 – 2018 period, declining during 2019 and low during the 2020 – 2021 period. Ordinary disability rates declined each year since 2016.

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.

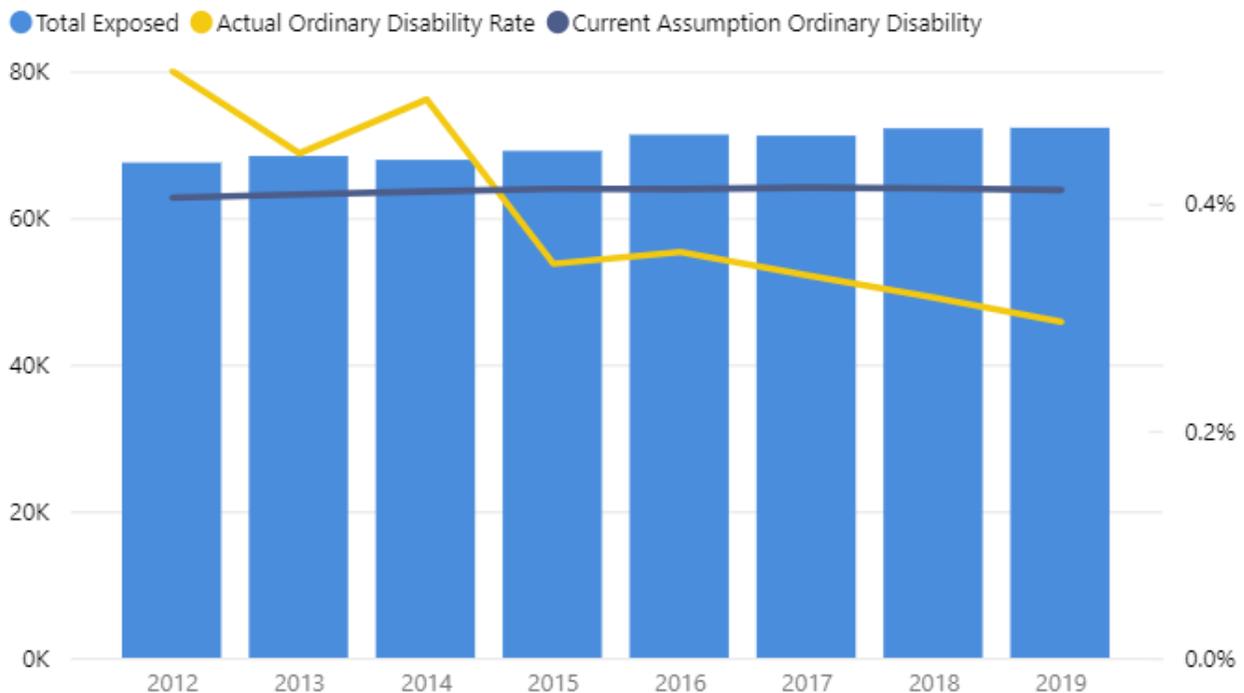
The following tables show the experience of ordinary disability retirement for all plans, by year, for males and females combined, for the age range 30 to 79 and service range 10 to 56, through 2021.

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	349	273.7	67,526	0.5168%	0.4053%	▲ 1.28
2013	304	279.3	68,424	0.4443%	0.4081%	● 1.09
2014	334	279.0	67,913	0.4918%	0.4108%	▲ 1.20
2015	240	285.5	69,118	0.3472%	0.4130%	▲ 0.84
2016	255	294.6	71,343	0.3574%	0.4129%	▲ 0.87
2017	240	294.9	71,205	0.3371%	0.4141%	▲ 0.81
2018	229	298.6	72,196	0.3172%	0.4136%	▲ 0.77
2019	214	297.9	72,286	0.2960%	0.4121%	▲ 0.72
2020	119	291.8	70,931	0.1678%	0.4114%	◆ 0.41
2021	31	287.1	69,810	0.0444%	0.4113%	◆ 0.11
Total	2,315	2,882.3	700,752	0.3304%	0.4113%	▲ 0.80

The following tables show the experience of ordinary disability retirement for all plans, by year, for males and females combined, for the age range 30 to 79 and service range 10 to 56 years, during 2012 - 2019.

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	349	273.7	67,526	0.5168%	0.4053%	▲ 1.28
2013	304	279.3	68,424	0.4443%	0.4081%	● 1.09
2014	334	279.0	67,913	0.4918%	0.4108%	▲ 1.20
2015	240	285.5	69,118	0.3472%	0.4130%	▲ 0.84
2016	255	294.6	71,343	0.3574%	0.4129%	▲ 0.87
2017	240	294.9	71,205	0.3371%	0.4141%	▲ 0.81
2018	229	298.6	72,196	0.3172%	0.4136%	▲ 0.77
2019	214	297.9	72,286	0.2960%	0.4121%	▲ 0.72
Total	2,165	2,303.4	560,011	0.3866%	0.4113%	● 0.94

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



Specific observations:

- Consistent with the assumption, rates of disability were higher for male members than female members.
- Based on the current assumptions, the actual rate of disability retirements was less than expected for both male members (A/E ratio of 0.92) and female members (A/E ratio of 0.96) from 2012 - 2019.
- Although there is not enough disability experience to be credible, we did notice that members in the Specialty Plan Group exhibited higher rates of disability than members in the Basic Plan Group for members with less than 25 years of service.

The following tables show the experience of ordinary disability retirement, for all plans, by age, based on the age range of 30 to 69, with the service range 10 to 39 years, by gender.

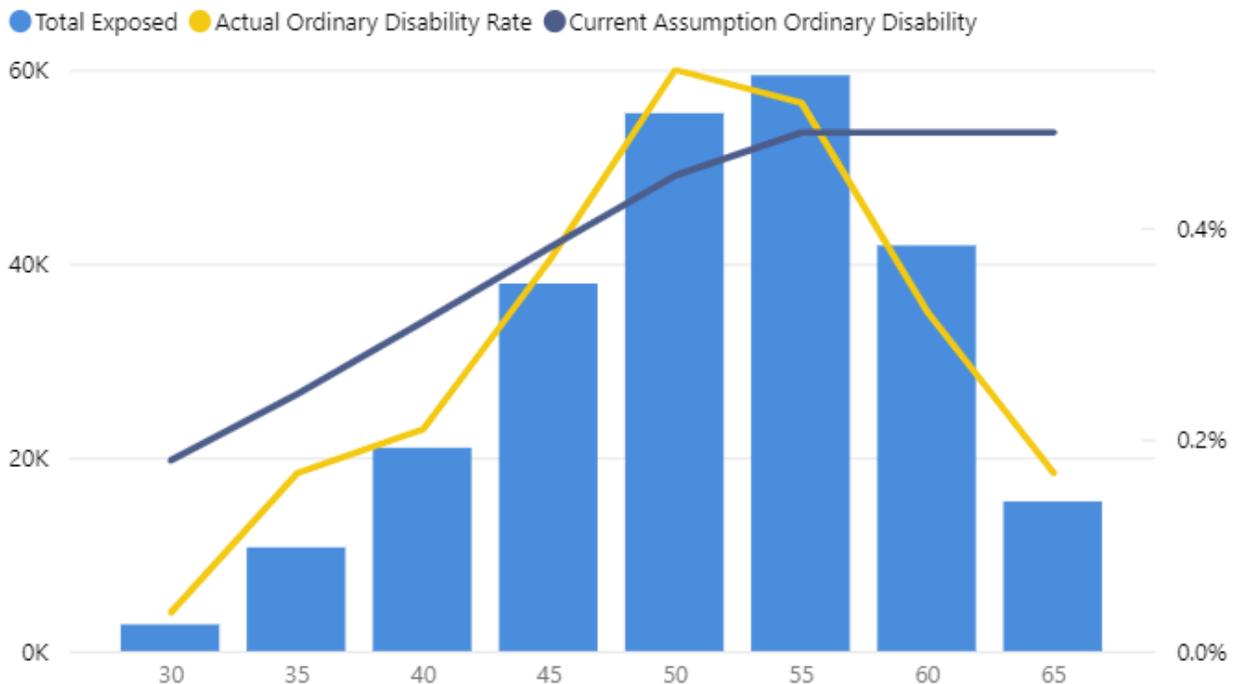
Males

The following tables are for male members.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.2	134	0.0000%	0.1400%	0.00
31	0	0.4	280	0.0000%	0.1540%	0.00
32	1	0.8	476	0.2101%	0.1680%	1.25
33	0	1.4	771	0.0000%	0.1820%	0.00
34	0	2.1	1,090	0.0000%	0.1960%	0.00
35	3	3.0	1,435	0.2091%	0.2100%	1.00
36	4	4.0	1,795	0.2228%	0.2240%	0.99
37	4	5.0	2,113	0.1893%	0.2380%	0.80
38	2	6.3	2,509	0.0797%	0.2520%	0.32
39	5	7.6	2,853	0.1753%	0.2660%	0.66
40	2	9.1	3,237	0.0618%	0.2800%	0.22
41	7	10.8	3,682	0.1901%	0.2940%	0.65
42	10	12.8	4,162	0.2403%	0.3080%	0.78
43	8	15.0	4,661	0.1716%	0.3220%	0.53
44	17	17.6	5,245	0.3241%	0.3360%	0.96
45	19	20.7	5,927	0.3206%	0.3500%	0.92
46	20	24.5	6,733	0.2970%	0.3640%	0.82
47	26	28.6	7,562	0.3438%	0.3780%	0.91
48	35	33.2	8,465	0.4135%	0.3920%	1.05
49	40	37.6	9,255	0.4322%	0.4060%	1.06
50	51	41.8	9,942	0.5130%	0.4200%	1.22

51	56	45.7	10,533	0.5317%	0.4340%	▲	1.23
52	82	50.1	11,175	0.7338%	0.4480%	◆	1.64
53	66	54.1	11,714	0.5634%	0.4620%	▲	1.22
54	50	57.9	12,164	0.4110%	0.4760%	▲	0.86
55	71	60.4	12,334	0.5756%	0.4900%	▲	1.17
56	72	59.6	12,164	0.5919%	0.4900%	▲	1.21
57	63	58.8	11,990	0.5254%	0.4900%	●	1.07
58	64	57.4	11,714	0.5464%	0.4900%	▲	1.12
59	38	55.1	11,245	0.3379%	0.4900%	▲	0.69
60	40	52.7	10,750	0.3721%	0.4900%	▲	0.76
61	39	49.7	10,139	0.3847%	0.4900%	▲	0.79
62	21	42.5	8,681	0.2419%	0.4900%	◆	0.49
63	19	32.7	6,670	0.2849%	0.4900%	▲	0.58
64	15	27.6	5,632	0.2663%	0.4900%	▲	0.54
65	10	23.0	4,692	0.2131%	0.4900%	◆	0.43
66	3	18.5	3,778	0.0794%	0.4900%	◆	0.16
67	2	14.0	2,863	0.0699%	0.4900%	◆	0.14
68	6	11.3	2,298	0.2611%	0.4900%	▲	0.53
69	5	8.9	1,820	0.2747%	0.4900%	▲	0.56
Total	976	1,062.6	244,683	0.3989%	0.4343%	●	0.92

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



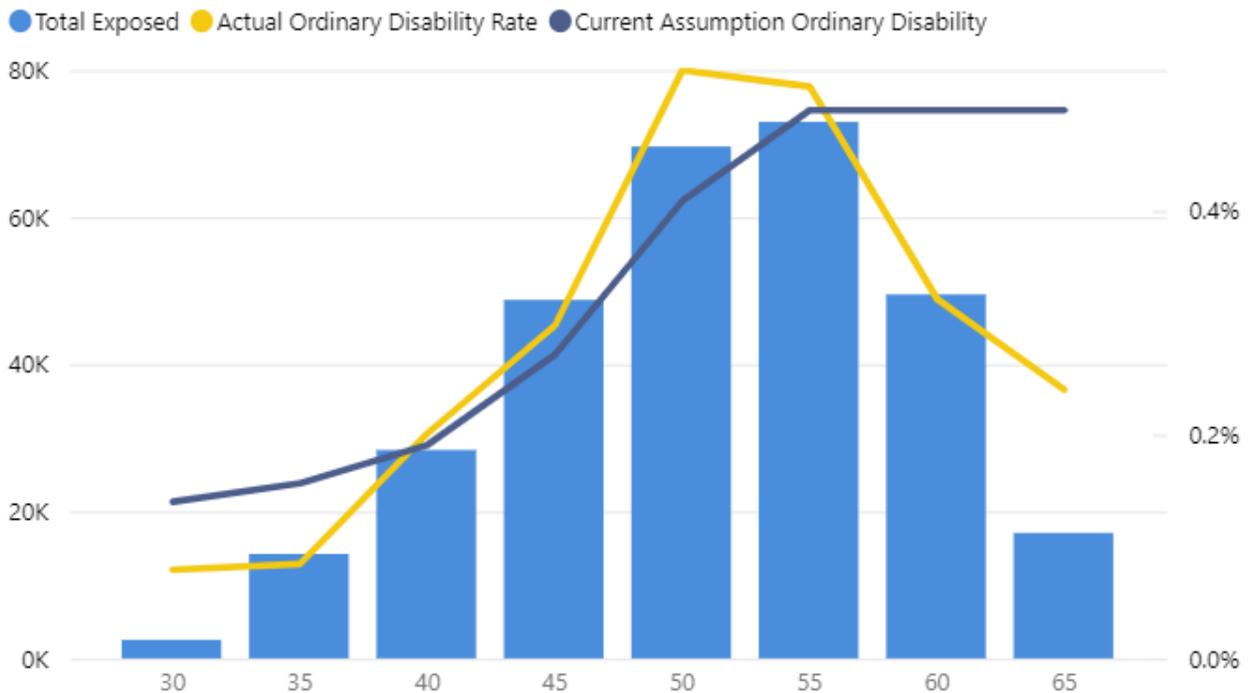
Females

The following tables are for female members.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.1	62	0.0000%	0.1400%	0.00
31	0	0.2	173	0.0000%	0.1400%	0.00
32	0	0.6	393	0.0000%	0.1400%	0.00
33	1	1.0	722	0.1385%	0.1400%	0.99
34	1	1.6	1,176	0.0850%	0.1400%	0.61
35	1	2.5	1,753	0.0570%	0.1400%	0.41
36	4	3.4	2,314	0.1729%	0.1470%	1.18
37	2	4.4	2,846	0.0703%	0.1540%	0.46
38	1	5.5	3,419	0.0292%	0.1610%	0.18
39	4	6.5	3,878	0.1031%	0.1680%	0.61
40	7	7.7	4,389	0.1595%	0.1750%	0.91
41	13	9.1	4,988	0.2606%	0.1820%	1.43
42	9	10.6	5,613	0.1603%	0.1890%	0.85
43	13	12.4	6,323	0.2056%	0.1960%	1.05
44	15	14.3	7,041	0.2130%	0.2030%	1.05
45	18	16.6	7,918	0.2273%	0.2100%	1.08
46	13	21.0	8,826	0.1473%	0.2380%	0.62
47	35	26.0	9,776	0.3580%	0.2660%	1.35
48	38	31.3	10,647	0.3569%	0.2940%	1.21
49	41	37.3	11,591	0.3537%	0.3220%	1.10
50	56	43.7	12,476	0.4489%	0.3500%	1.28

51	65	50.1	13,256	0.4903%	0.3780%	▲	1.30
52	79	56.9	14,023	0.5634%	0.4060%	▲	1.39
53	77	63.7	14,684	0.5244%	0.4340%	▲	1.21
54	89	70.2	15,189	0.5860%	0.4620%	▲	1.27
55	86	75.3	15,373	0.5594%	0.4900%	▲	1.14
56	89	74.1	15,129	0.5883%	0.4900%	▲	1.20
57	82	72.1	14,716	0.5572%	0.4900%	▲	1.14
58	66	69.4	14,171	0.4657%	0.4900%	●	0.95
59	50	66.6	13,593	0.3678%	0.4900%	▲	0.75
60	50	63.0	12,848	0.3892%	0.4900%	▲	0.79
61	29	58.6	11,966	0.2424%	0.4900%	◆	0.49
62	33	51.4	10,482	0.3148%	0.4900%	▲	0.64
63	28	37.9	7,743	0.3616%	0.4900%	▲	0.74
64	19	31.7	6,469	0.2937%	0.4900%	▲	0.60
65	17	26.4	5,389	0.3155%	0.4900%	▲	0.64
66	6	20.8	4,238	0.1416%	0.4900%	◆	0.29
67	8	15.2	3,106	0.2576%	0.4900%	▲	0.53
68	4	12.0	2,441	0.1639%	0.4900%	◆	0.33
69	6	9.3	1,899	0.3160%	0.4900%	▲	0.64
Total	1,155	1,180.6	303,039	0.3811%	0.3896%	●	0.98

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



Specific observations:

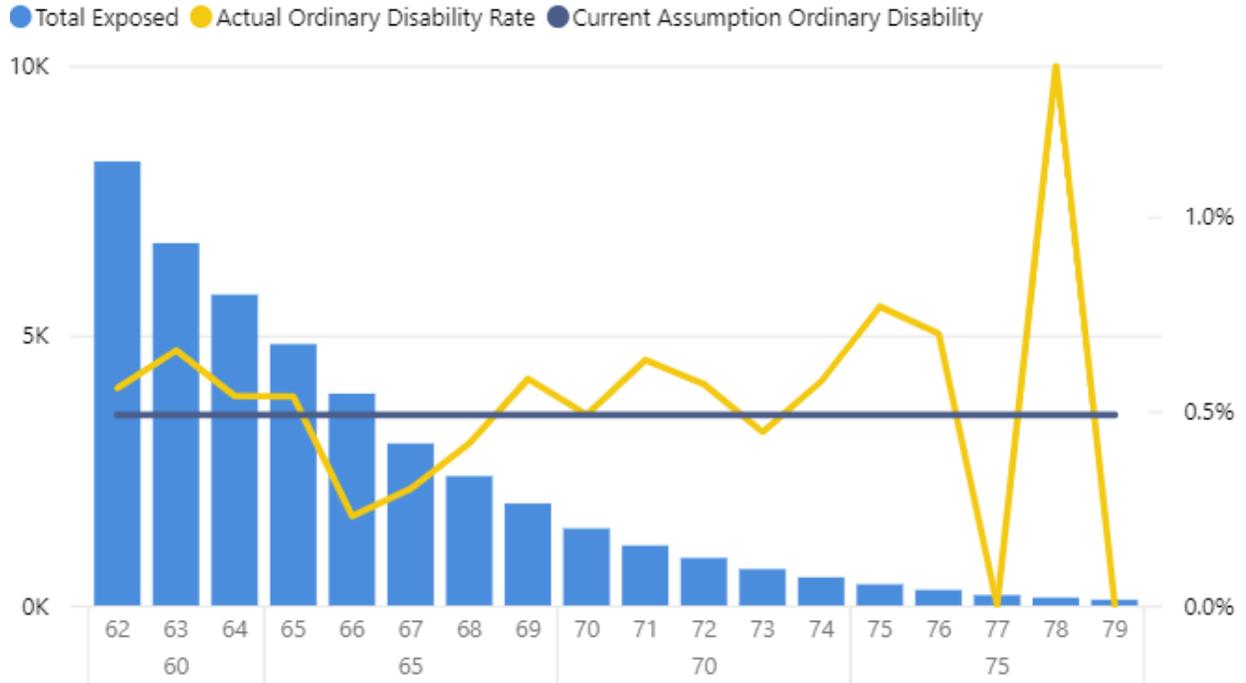
- The number of actual disabilities is influenced by whether the member has accrued 20 years of service or not for the Basic Plan Group or 25 years of service for the Special Plan Group. This finding is consistent with the fact that the disability benefit is smaller than the member's accrued benefit with 20 or more years of service for the Basic Plan Group.
- This issue was pronounced in the rates experienced for ages 62 and older. For members with at least 20 years of service, there were only 18 ordinary disability retirements but 235 expected for males and females combined.
- For members with less than 20 years of service, 62 years old and older, there were 218 ordinary disability retirements compared to 208 expected (A/E ratio of 1.05) for males and females combined.
- While the rates of disability vary by gender, the overall observations compared to expectations are consistent by gender and thus, the following tables are shown on a combined basis.

Age 62 and older

The following charts show the experience of members aged 62 and older with less than 20 years of service, males and females combined.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
62	46	40.3	8,224	0.5593%	0.4900%	▲ 1.14
63	44	32.9	6,710	0.6557%	0.4900%	▲ 1.34
64	31	28.2	5,757	0.5385%	0.4900%	● 1.10
65	26	23.7	4,840	0.5372%	0.4900%	● 1.10
66	9	19.2	3,924	0.2294%	0.4900%	◆ 0.47
67	9	14.7	3,000	0.3000%	0.4900%	▲ 0.61
68	10	11.7	2,395	0.4175%	0.4900%	▲ 0.85
69	11	9.3	1,888	0.5826%	0.4900%	▲ 1.19
70	7	7.0	1,426	0.4909%	0.4900%	● 1.00
71	7	5.4	1,109	0.6312%	0.4900%	▲ 1.29
72	5	4.3	879	0.5688%	0.4900%	▲ 1.16
73	3	3.3	672	0.4464%	0.4900%	● 0.91
74	3	2.5	520	0.5769%	0.4900%	▲ 1.18
75	3	1.9	390	0.7692%	0.4900%	◆ 1.57
76	2	1.4	286	0.6993%	0.4900%	▲ 1.43
77	0	0.9	190	0.0000%	0.4900%	◆ 0.00
78	2	0.7	144	1.3889%	0.4900%	◆ 2.83
79	0	0.5	105	0.0000%	0.4900%	◆ 0.00
Total	218	208.0	42,459	0.5134%	0.4900%	● 1.05

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

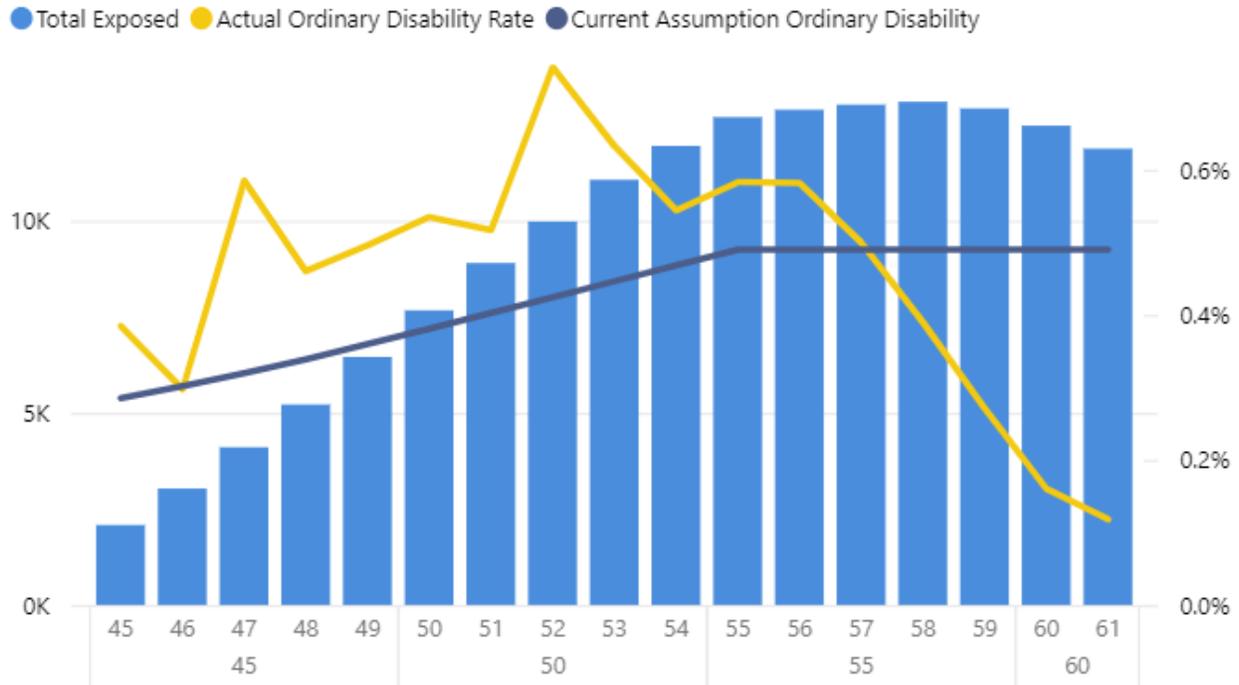


Service Greater than 20 Years and Less than Age 62 for Basic Plan Group

The following tables display the results for members of the Basic Plan Group for the age range 45 to 61 for members with at least 20 years of service, males and females combined.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
45	8	5.9	2,081	0.3844%	0.2853%	▲ 1.35
46	9	9.1	3,030	0.2970%	0.3014%	● 0.99
47	24	13.1	4,104	0.5848%	0.3195%	◆ 1.83
48	24	17.7	5,216	0.4601%	0.3389%	▲ 1.36
49	32	23.2	6,455	0.4957%	0.3598%	▲ 1.38
50	41	29.2	7,667	0.5348%	0.3809%	▲ 1.40
51	46	35.8	8,899	0.5169%	0.4026%	▲ 1.28
52	74	42.3	9,979	0.7416%	0.4242%	◆ 1.75
53	70	49.4	11,065	0.6326%	0.4461%	▲ 1.42
54	65	55.9	11,948	0.5440%	0.4681%	▲ 1.16
55	74	62.2	12,697	0.5828%	0.4900%	▲ 1.19
56	75	63.2	12,889	0.5819%	0.4900%	▲ 1.19
57	65	63.8	13,021	0.4992%	0.4900%	● 1.02
58	51	64.2	13,096	0.3894%	0.4900%	▲ 0.79
59	35	63.3	12,923	0.2708%	0.4900%	▲ 0.55
60	20	61.1	12,474	0.1603%	0.4900%	◆ 0.33
61	14	58.2	11,875	0.1179%	0.4900%	◆ 0.24
Total	727	717.7	159,419	0.4560%	0.4502%	● 1.01

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



Specific observations:

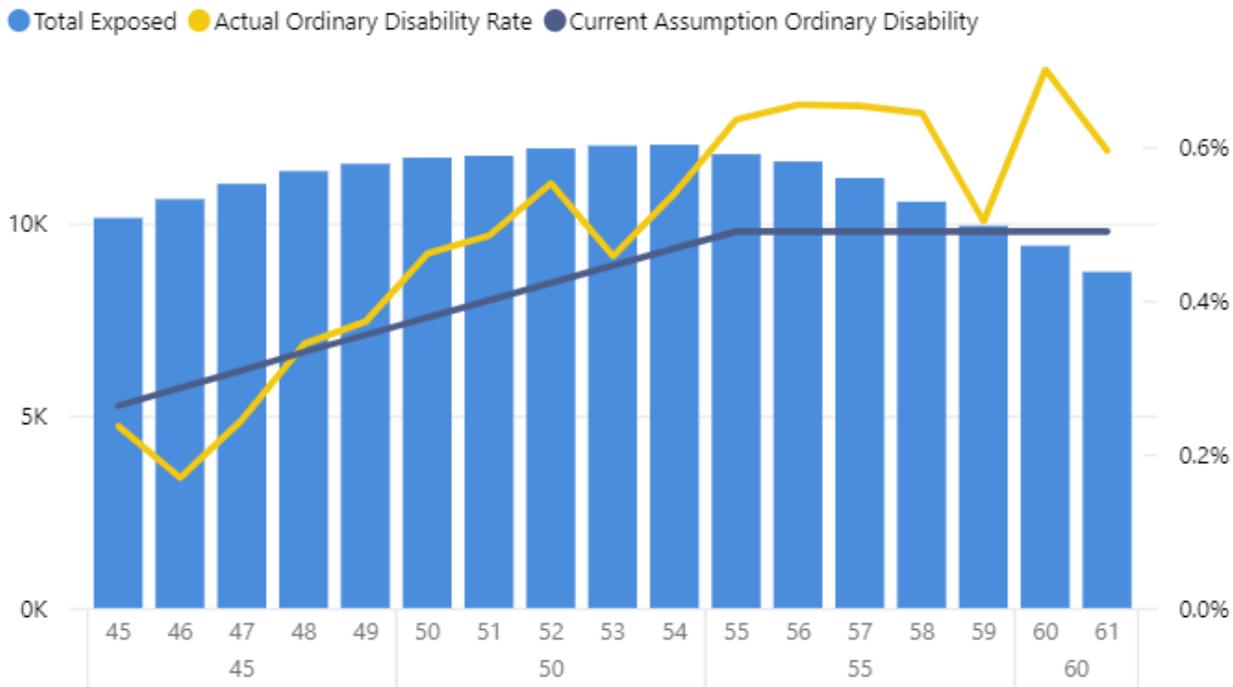
- Overall, for these ages, the number of actual ordinary disability retirements is consistent with expectations (A/E ratio of 1.01).
- The actual rate of disability retirements is highest for members in their early 50s; it declines beginning at age 55, when members become eligible for early retirement and Age 57 Plan members become eligible for retirement.
 - The A/E ratio is 1.33 for the age range 45 to 56.

Service Less than 20 Years and Under Age 62 for Basic Plan Group

The following tables display the experience by age for members of the Basic Plan Group with less than 20 years of service, and younger than age 62, males and females combined.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
45	24	26.7	10,137	0.2368%	0.2631%	▲ 0.90
46	18	30.4	10,627	0.1694%	0.2864%	▲ 0.59
47	27	34.1	11,024	0.2449%	0.3094%	▲ 0.79
48	39	37.8	11,354	0.3435%	0.3331%	● 1.03
49	43	41.0	11,543	0.3725%	0.3554%	● 1.05
50	54	44.2	11,704	0.4614%	0.3780%	▲ 1.22
51	57	47.1	11,754	0.4849%	0.4005%	▲ 1.21
52	66	50.5	11,942	0.5527%	0.4232%	▲ 1.31
53	55	53.5	12,016	0.4577%	0.4456%	● 1.03
54	65	56.3	12,041	0.5398%	0.4678%	▲ 1.15
55	75	57.8	11,795	0.6359%	0.4900%	▲ 1.30
56	76	56.9	11,603	0.6550%	0.4900%	▲ 1.34
57	73	54.7	11,173	0.6534%	0.4900%	▲ 1.33
58	68	51.7	10,558	0.6441%	0.4900%	▲ 1.31
59	50	48.7	9,933	0.5034%	0.4900%	● 1.03
60	66	46.1	9,415	0.7010%	0.4900%	▲ 1.43
61	52	42.8	8,736	0.5952%	0.4900%	▲ 1.21
Total	908	780.5	187,355	0.4846%	0.4166%	▲ 1.16

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



Specific observations:

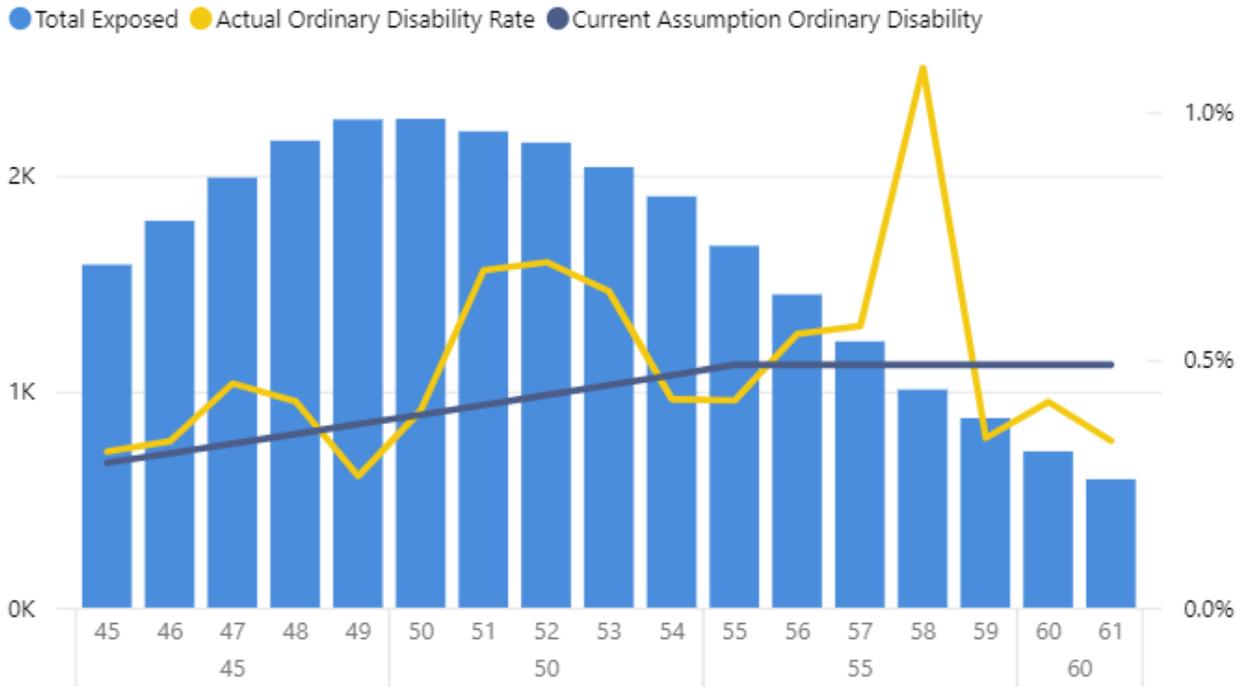
- Overall, for these ages, the number of actual ordinary disability retirements is more than expected (A/E ratio of 1.16).

Service Less than 25 Years and Under Age 62 for Specialty Plan Group

The following tables display the experience by age for members of the Specialty Plan Group with less than 25 years of service, and younger than age 62, males and females combined.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
45	5	4.6	1,587	0.3151%	0.2922%	● 1.08
46	6	5.6	1,790	0.3352%	0.3110%	● 1.08
47	9	6.6	1,990	0.4523%	0.3305%	▲ 1.37
48	9	7.6	2,161	0.4165%	0.3501%	▲ 1.19
49	6	8.4	2,259	0.2656%	0.3700%	▲ 0.72
50	9	8.8	2,262	0.3979%	0.3890%	● 1.02
51	15	9.0	2,204	0.6806%	0.4090%	◆ 1.66
52	15	9.2	2,152	0.6970%	0.4288%	◆ 1.63
53	13	9.1	2,038	0.6379%	0.4487%	▲ 1.42
54	8	8.9	1,903	0.4204%	0.4691%	▲ 0.90
55	7	8.2	1,674	0.4182%	0.4900%	▲ 0.85
56	8	7.1	1,449	0.5521%	0.4900%	▲ 1.13
57	7	6.0	1,232	0.5682%	0.4900%	▲ 1.16
58	11	4.9	1,009	1.0902%	0.4900%	◆ 2.22
59	3	4.3	877	0.3421%	0.4900%	▲ 0.70
60	3	3.5	723	0.4149%	0.4900%	▲ 0.85
61	2	2.9	594	0.3367%	0.4900%	▲ 0.69
Total	136	114.9	27,904	0.4874%	0.4116%	▲ 1.18

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



Specific observations:

- Overall, for these ages, the number of actual ordinary disability retirements is more than expected (A/E ratio of 1.18).

Summary

Retirement eligibility and for the Basic Plan Group 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. Consequently, consideration should be given to varying the rates of disability to take into account these two variables.

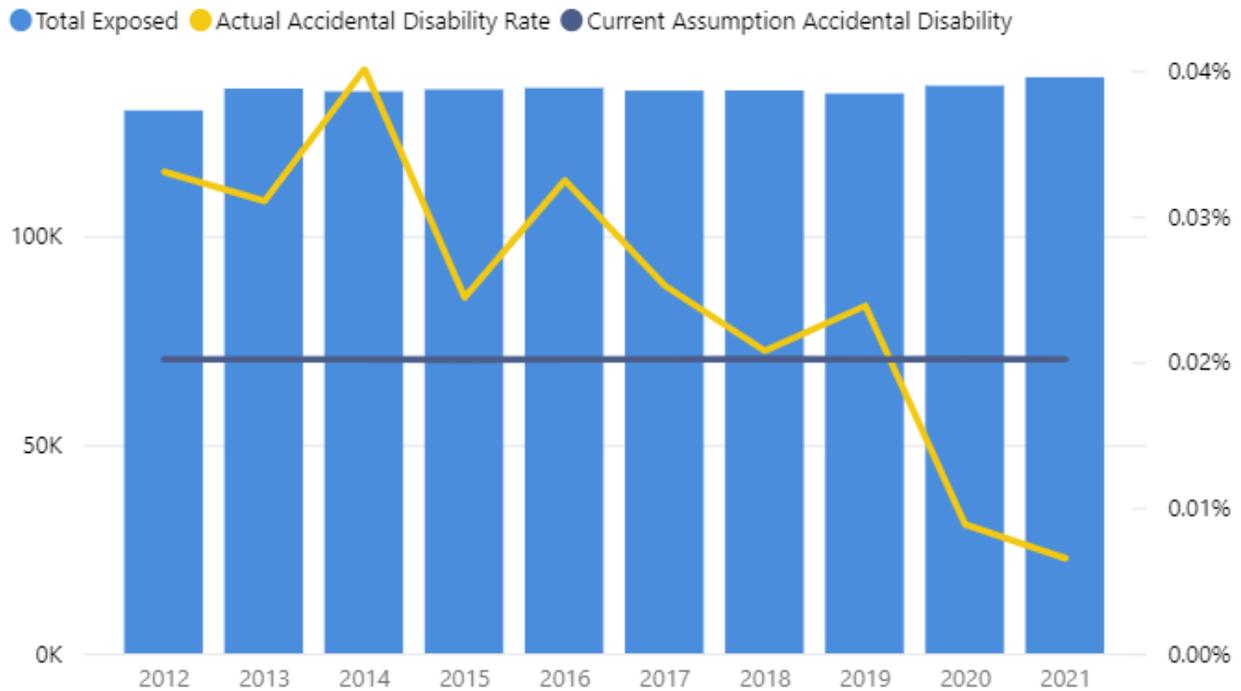
Accidental Disability

As noted in the ordinary disability section, 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. Rates of accidental disability began to decline in 2019 and were much lower in 2020 - 2021.

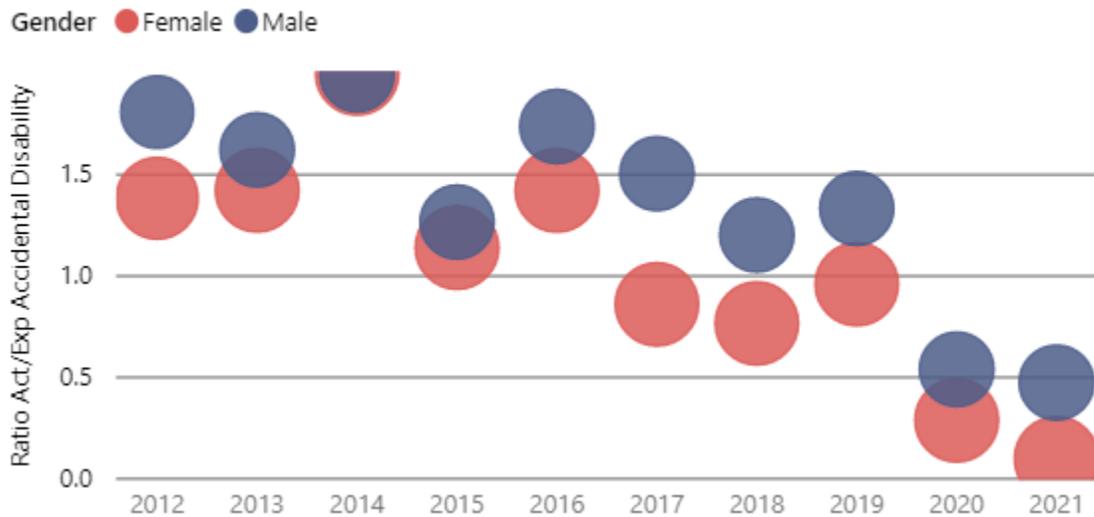
The following tables show the experience of accidental disability retirements, for all the plans, by year, for the age range 20 to 79, service range 0 to 56 years, for males and females combined.

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	43	26.3	130,052	0.0331%	0.0202%	1.64
2013	42	27.3	135,282	0.0310%	0.0202%	1.54
2014	54	27.2	134,603	0.0401%	0.0202%	1.99
2015	33	27.2	135,087	0.0244%	0.0202%	1.21
2016	44	27.3	135,453	0.0325%	0.0202%	1.61
2017	34	27.2	134,801	0.0252%	0.0202%	1.25
2018	28	27.2	134,855	0.0208%	0.0202%	1.03
2019	32	27.1	134,116	0.0239%	0.0202%	1.18
2020	12	27.5	135,964	0.0088%	0.0202%	0.44
2021	9	27.9	138,018	0.0065%	0.0202%	0.32
Total	331	272.1	1,348,231	0.0246%	0.0202%	1.22

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



Actual vs. Expected - Accidental Disability Rate w/ Exposure Bubbles; by Year



Specific observations:

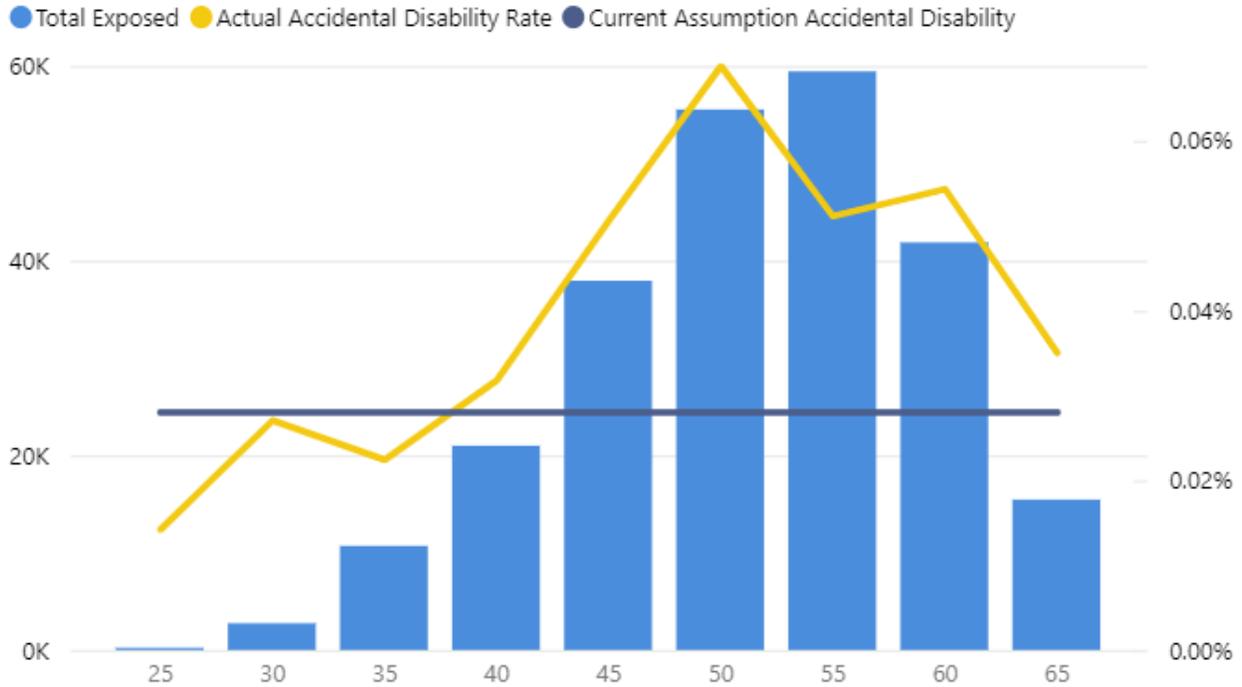
- The number of accidental disability retirements was highest in 2014.
- The current assumption anticipates twice as many males will receive a disability retirement benefit versus females while the actual experience seems to indicate that the ratio is about 2.6 times.

- The rates of accidental disability were significantly higher for the Specialty Plan Group than the Basic Plan Group.

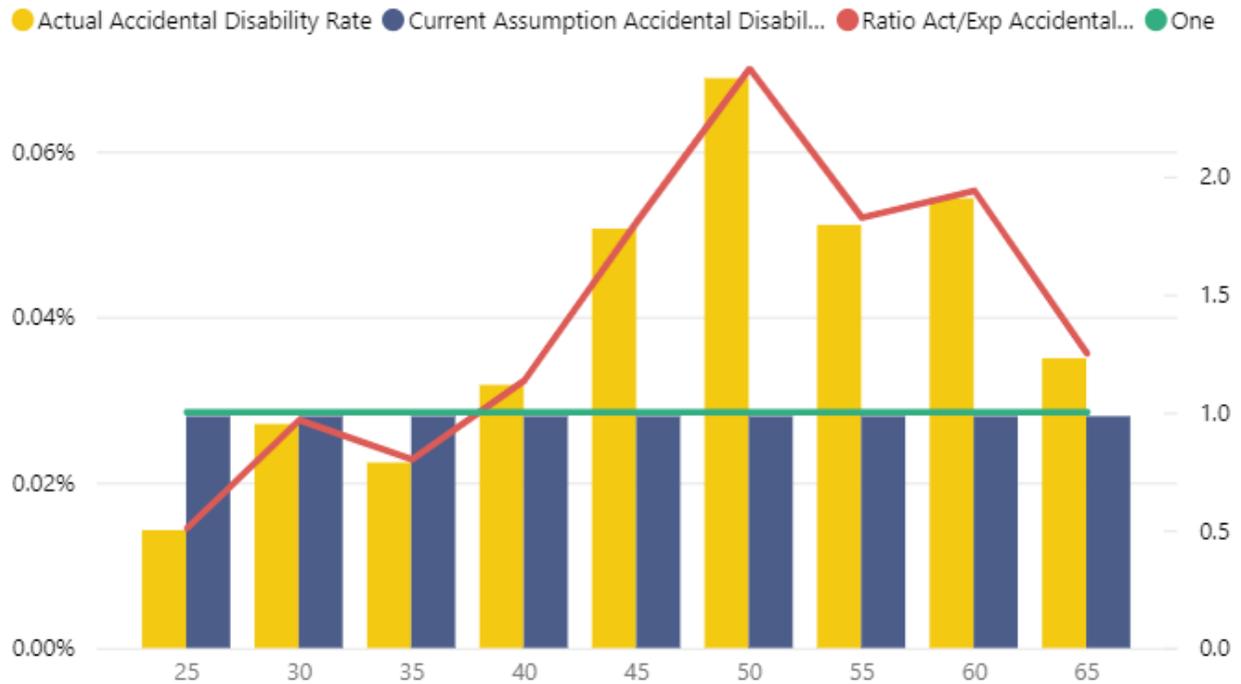
Males

The following tables display the experience by age of males with an age range of 25 to 69, and a service range 0 to 39 years during the period 2012 - 2019.

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



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



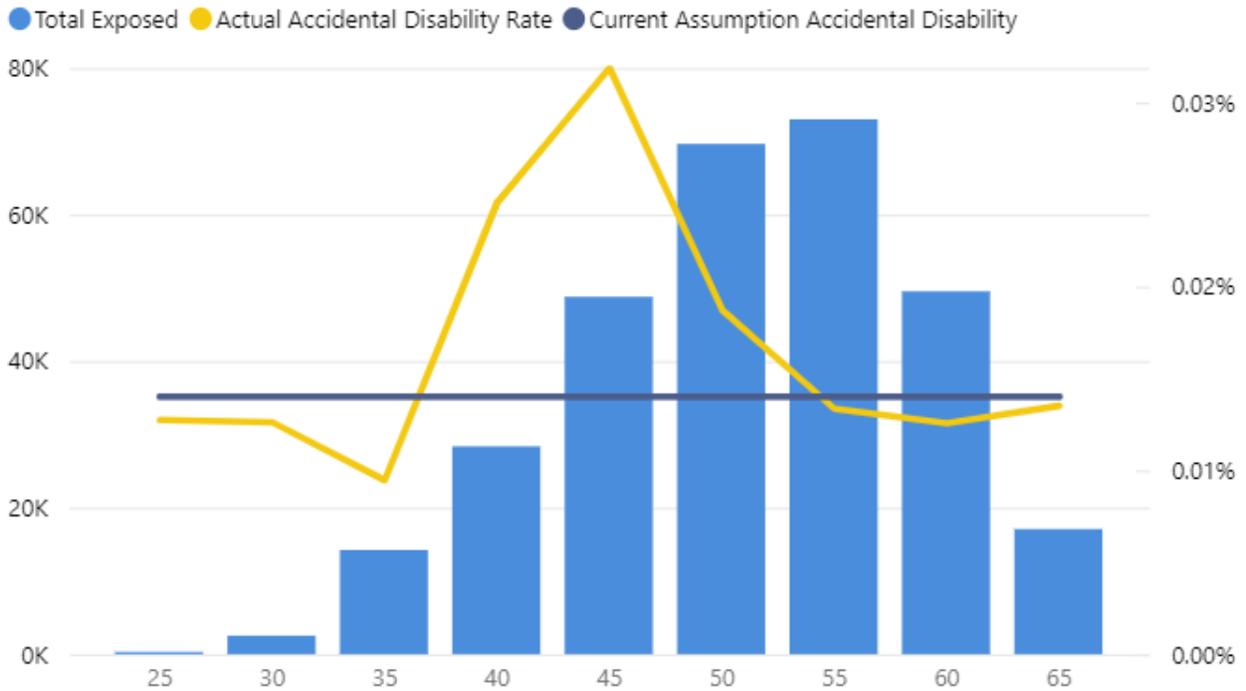
Specific observations:

- Overall, the actual number of accidental disability retirements was more than expected for male members (A/E ratio of 1.59).
- At age 45 and later, the number of accidental disability retirements exceeds the current assumption by nearly double (A/E ratio of 1.97).

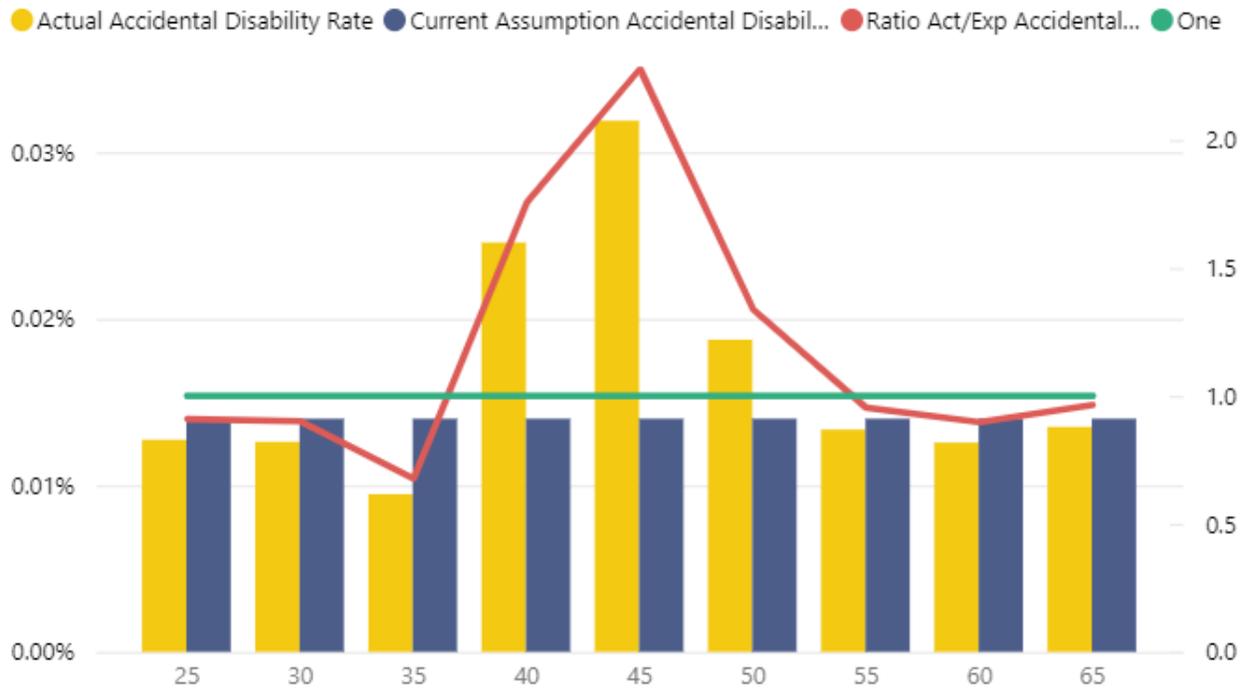
Females

The following tables display the experience by age of female members with an age range of 25 to 69, and a service range 0 to 39 years during the period 2012 - 2019.

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



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



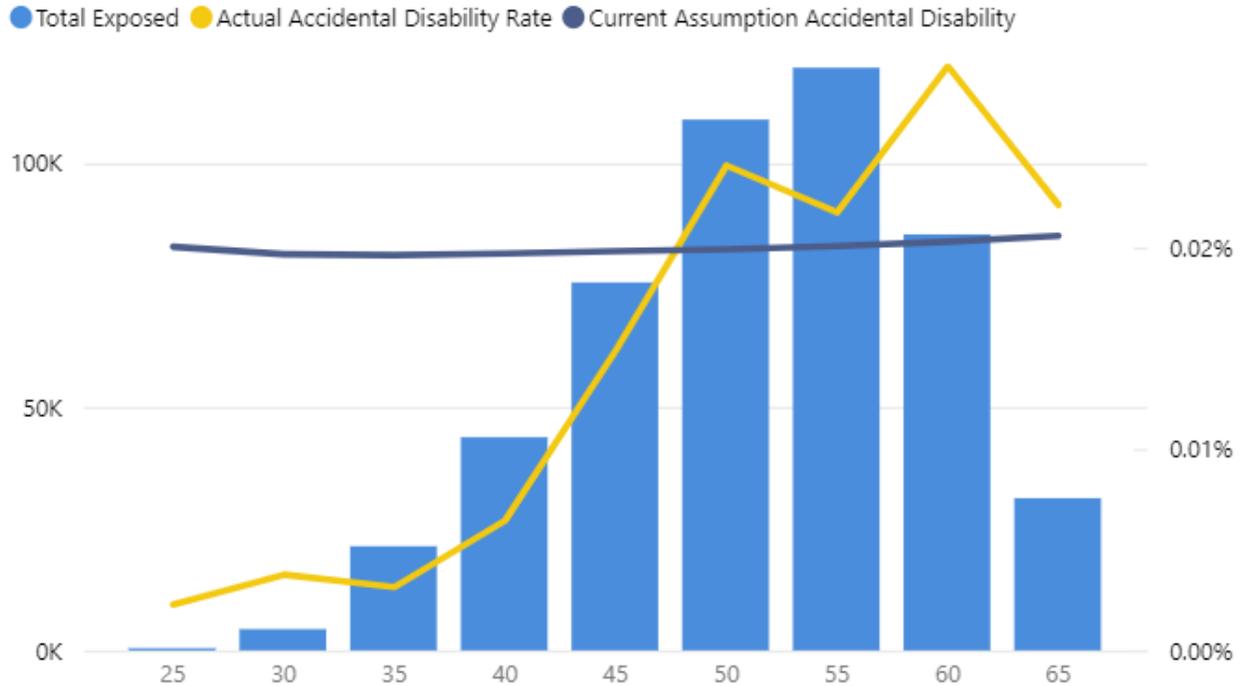
Specific observations:

- Overall, the actual number of accidental disability retirements was more than expected for male members (A/E ratio of 1.26).
- For the age range 40 to 54, the number of accidental disability retirements exceeds the current assumption by 76% (A/E ratio of 1.76).

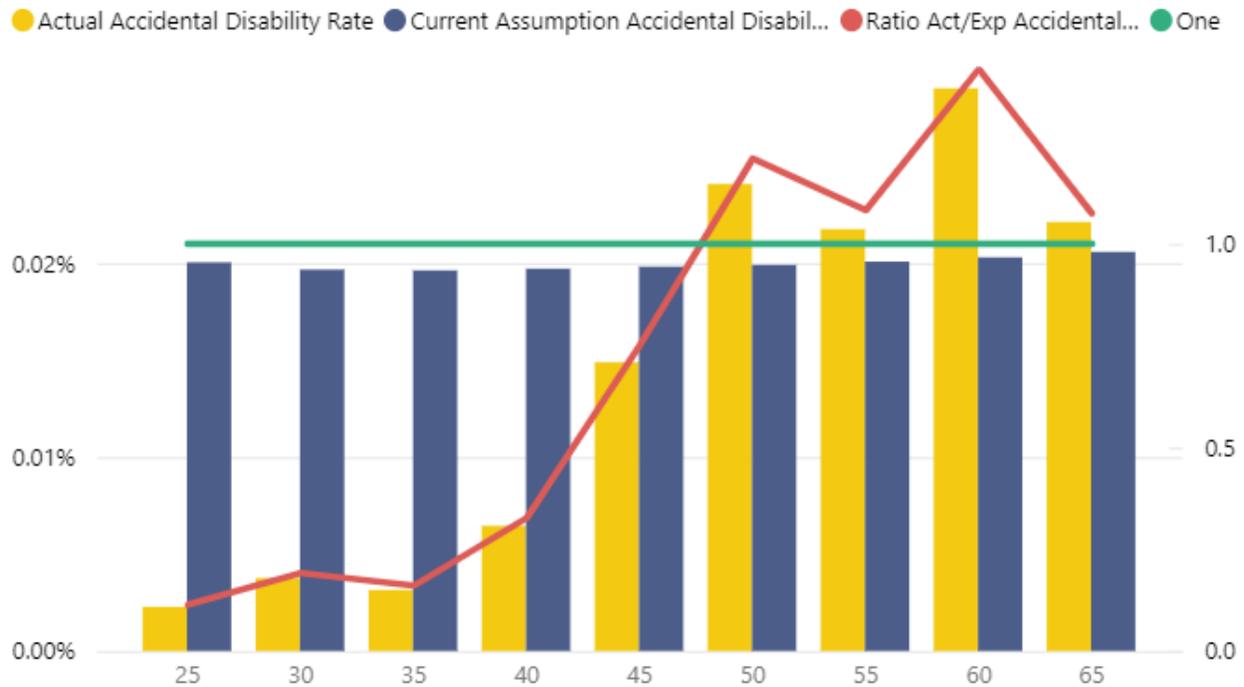
Basic Plan Group

The following tables display the experience by age for male and female members of the Basic Plan Group combined, with an age range of 25 to 69, and a service range 0 to 39 years during the period 2012 - 2019.

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



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



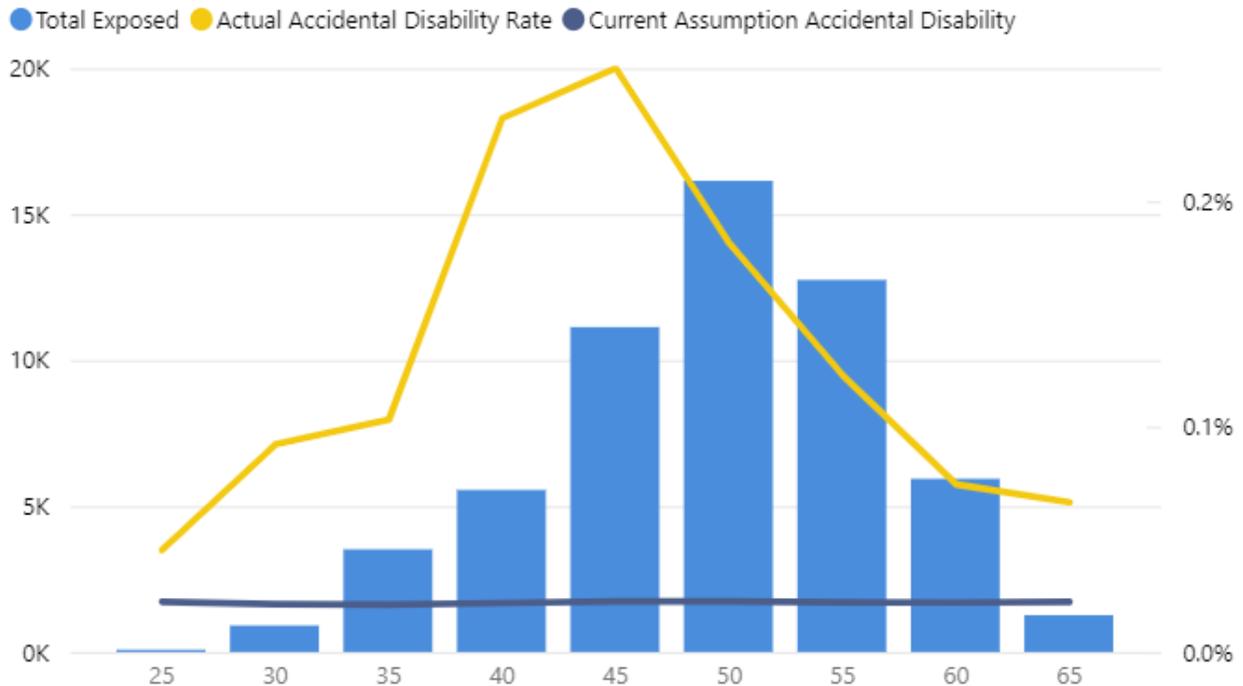
Specific observations:

- Overall, the actual number of accidental disability retirements was less than expected for the Basic Plan Group (A/E ratio of 0.80).
- Actual rates of accidental disability appear to increase as age increases.
- At age 50 and later, the number of accidental disability retirements exceeds the current assumption by 21% (A/E ratio of 1.21).

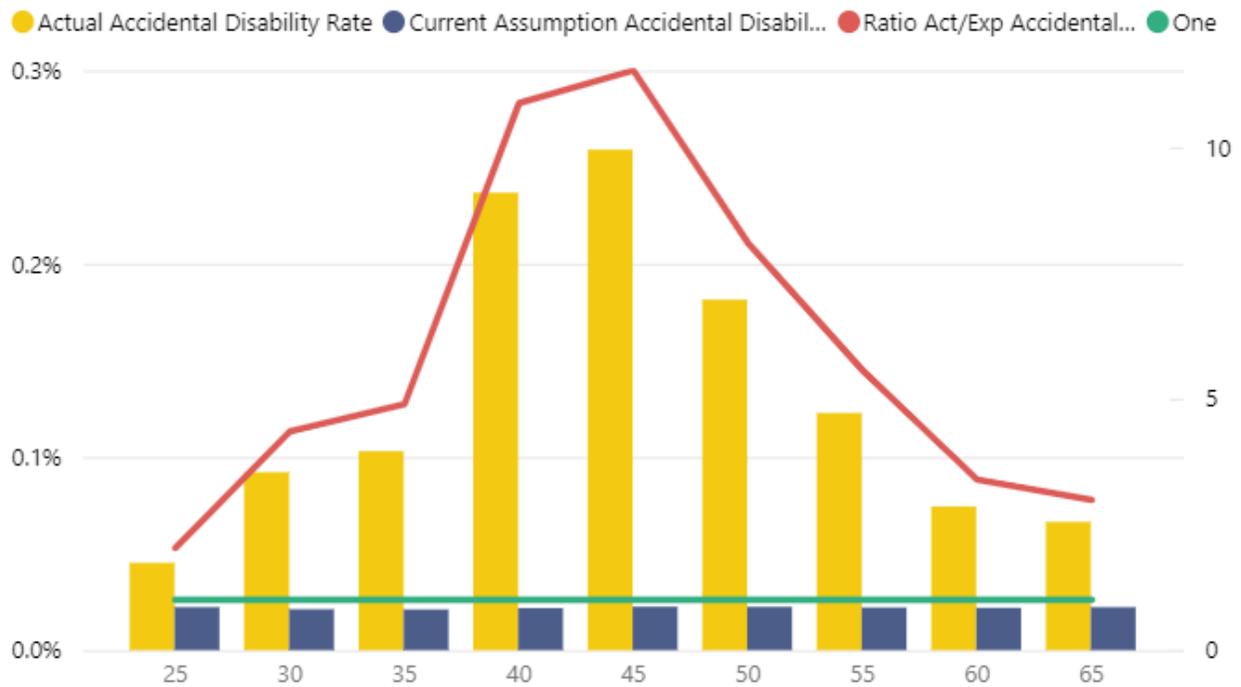
Specialty Plan Group

The following tables display the experience by age and by service, for male and female members of the Specialty Plan Group combined, with an age range of 25 to 69, and a service range 0 to 39 years during the period 2012 - 2019.

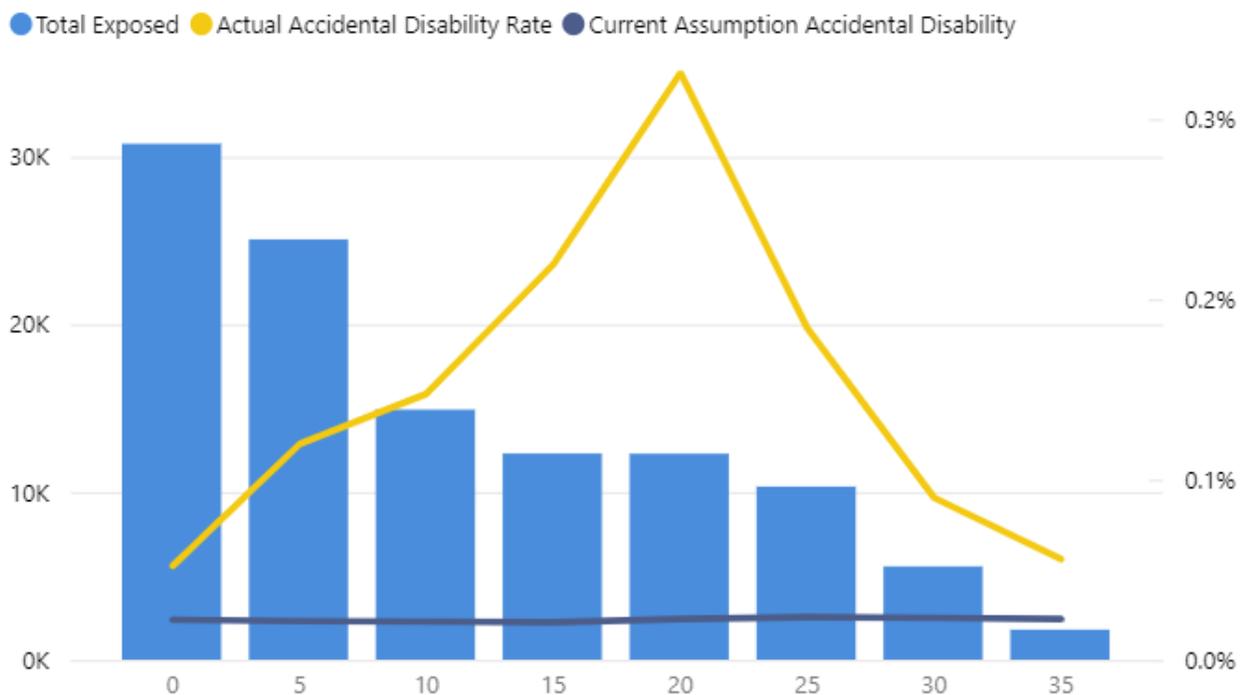
Exposure Distribution w/ Accidental Disability Rate - Actual and Expected; by Age



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



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



Specific observations:

- Overall, the actual number of accidental disability retirements was significantly more than expected for the Specialty Plan Group (A/E ratio of 6.46).
 - There were 160 actual accidental disability retirements versus 25 expected.
- Actual rates of accidental disability appear to increase as age increases, although rates peaked at the age range 45 – 49 and began declining thereafter.
- A similar result occurred by service as actual rates appear to increase as service increases, peaked at the service range 20 – 24 and began declining thereafter.

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 did not publish a MP-2022 scale.

In this study the base table 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. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

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 purpose of this analysis is to share our observations about the experience during the study period. In subsequent analyses, we will recommend changes to mortality assumptions as appropriate.

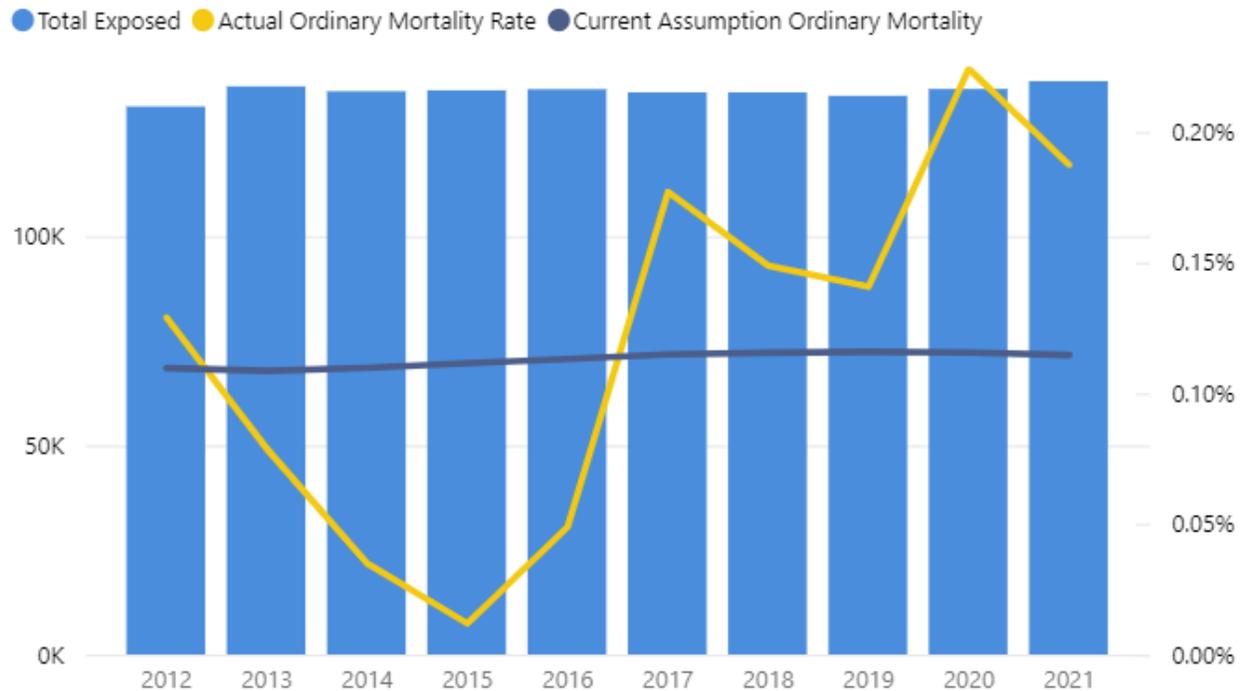
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Ordinary Death

The following charts show the experience of ordinary death by year, for males and females combined, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

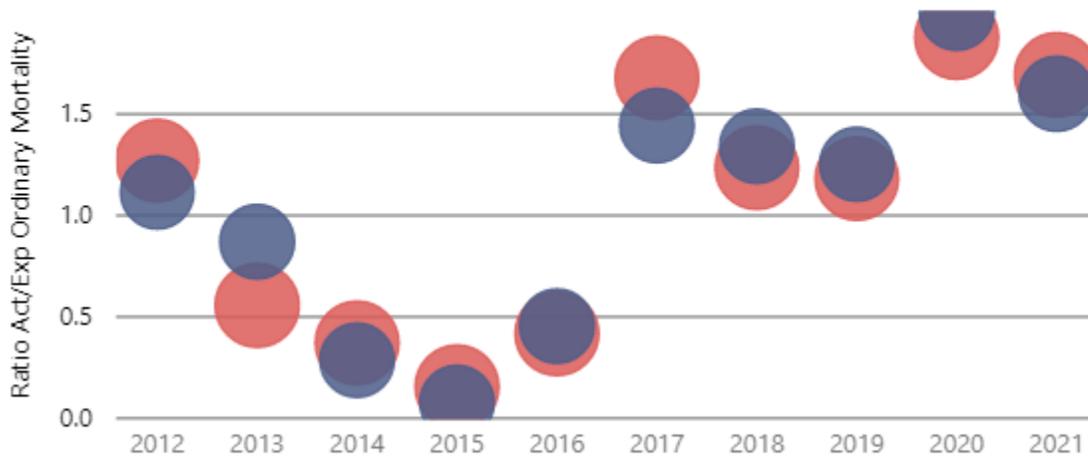
Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
2012	169	143.6	131,027	0.1290%	0.1096%	▲ 1.18
2013	107	147.5	135,835	0.0788%	0.1086%	▲ 0.73
2014	47	147.7	134,669	0.0349%	0.1097%	◆ 0.32
2015	16	150.5	134,905	0.0119%	0.1115%	◆ 0.11
2016	66	152.9	135,157	0.0488%	0.1131%	◆ 0.43
2017	238	154.4	134,411	0.1771%	0.1149%	◆ 1.54
2018	200	155.2	134,417	0.1488%	0.1155%	▲ 1.29
2019	188	154.7	133,577	0.1407%	0.1158%	▲ 1.21
2020	303	156.3	135,216	0.2241%	0.1156%	◆ 1.94
2021	257	157.1	137,089	0.1875%	0.1146%	◆ 1.64
Total	1,591	1,519.8	1,346,303	0.1182%	0.1129%	● 1.05

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



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

Gender ● Female ● Male



Specific observations:

- Actual deaths were slightly greater than expected during the study period (A/E ratio of 1.05).
- During 2020 - 2021, actual deaths were significantly greater than expected (A/E ratio of 1.79).
- Actual number of ordinary deaths during 2014 – 2016 were much less than other years (A/E ratio of 0.29). We don't know what generated these anomalous results; one potential cause is problems with the data. In the prior experience study report, there was no mention that mortality data may be unreliable, and this issue will be reviewed further with OA.
- Actual rates of death among males (A/E ratio of 1.05) were consistent with females (A/E ratio of 1.05)

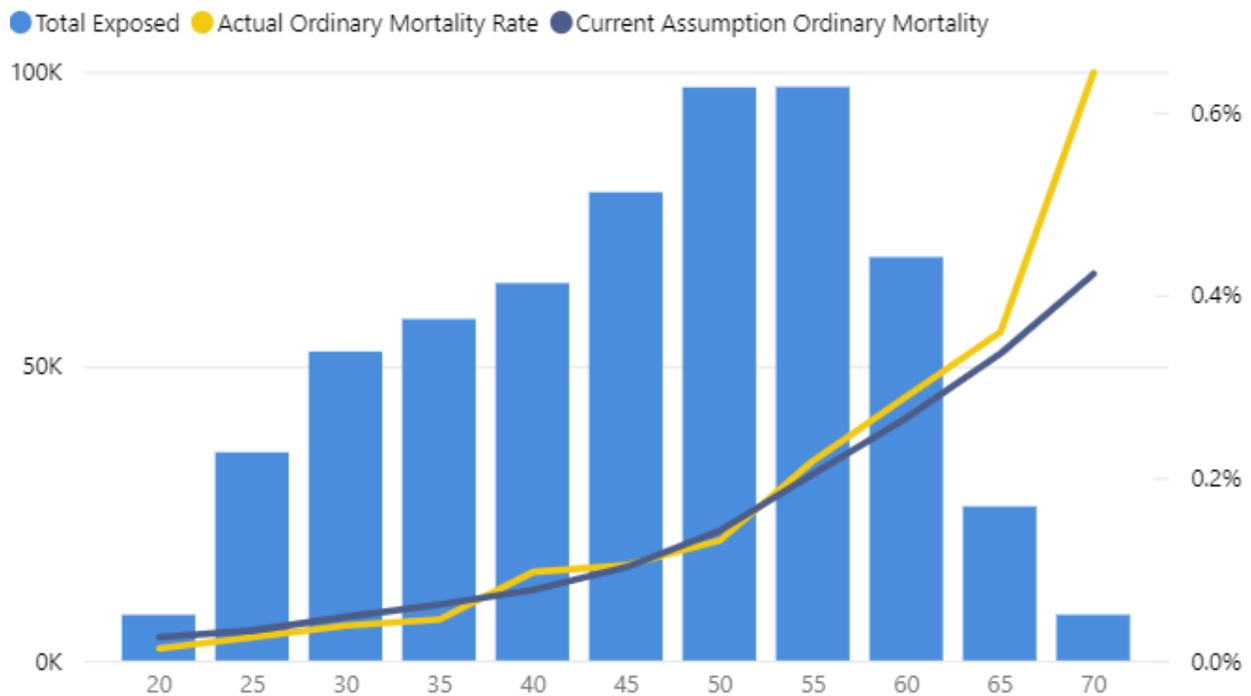
Due to the offsetting effects from 2014 – 2016 and 2020 – 2021, we have included all years in the following analysis despite the Covid pandemic.

Males

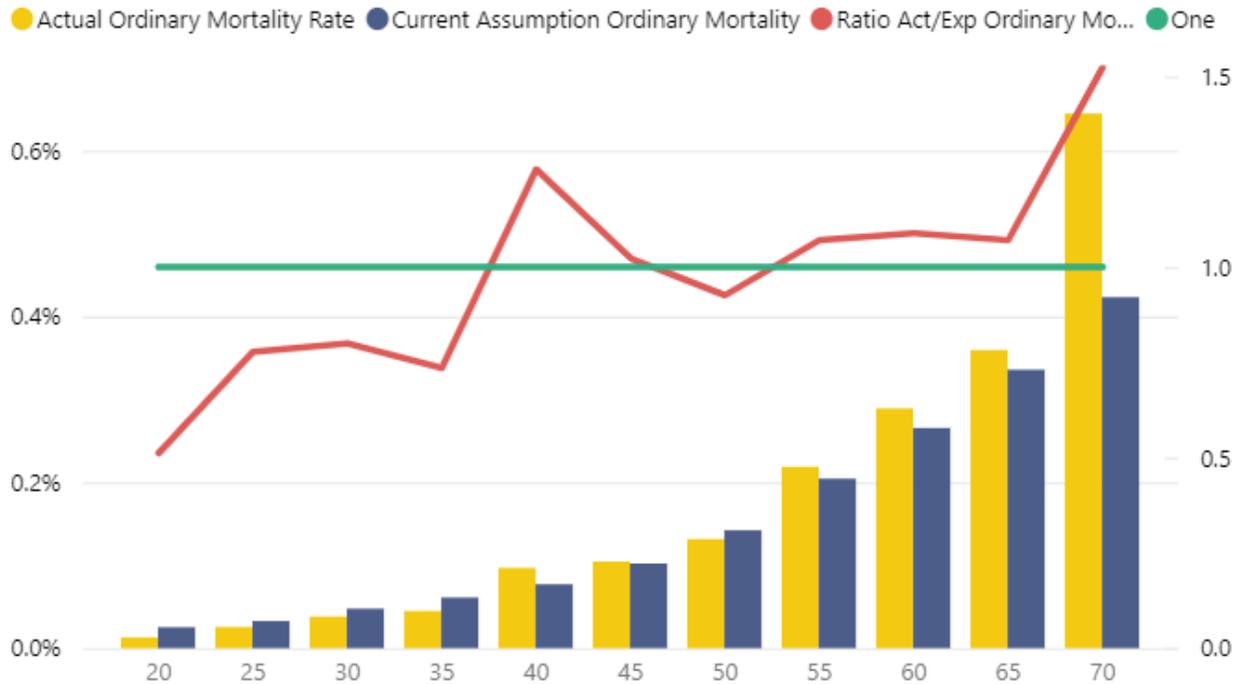
The following tables show the experience of ordinary death by age, for males, for the age range (20 to 74) and service range (0 to 39 years) during the period 2012 – 2021.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	1	2.0	7,749	0.0129%	0.0252%	▲ 0.51
25	9	11.6	35,341	0.0255%	0.0327%	▲ 0.78
30	20	25.0	52,458	0.0381%	0.0477%	▲ 0.80
35	26	35.4	57,983	0.0448%	0.0610%	▲ 0.73
40	62	49.4	64,077	0.0968%	0.0771%	▲ 1.26
45	83	81.2	79,520	0.1044%	0.1021%	● 1.02
50	128	138.3	97,323	0.1315%	0.1421%	● 0.93
55	213	199.0	97,394	0.2187%	0.2043%	● 1.07
60	198	181.9	68,494	0.2891%	0.2655%	● 1.09
65	94	87.8	26,155	0.3594%	0.3357%	● 1.07
70	50	32.8	7,757	0.6446%	0.4232%	◆ 1.52
Total	884	844.2	594,251	0.1488%	0.1421%	● 1.05

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



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



Specific observations:

- Actual deaths were less than expected for ages 20 – 39 (A/E ratio of 0.76).
- Actual deaths were greater than expected for ages 40 – 74 (A/E ratio of 1.07).

Females

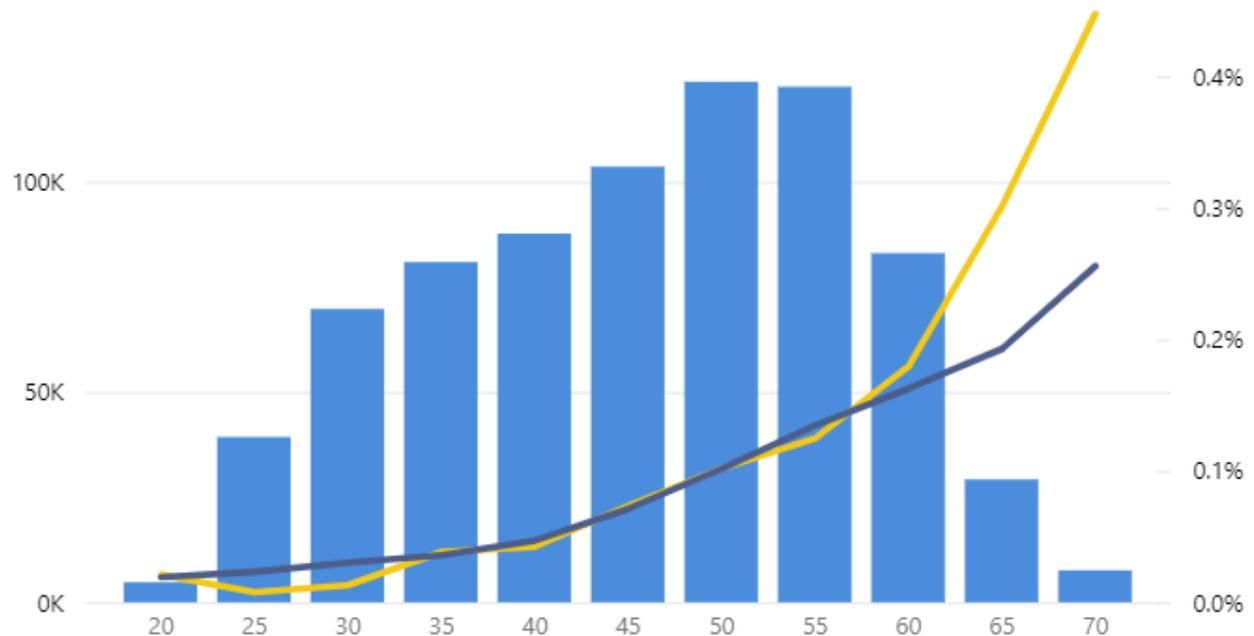
The following tables show the experience of ordinary death by age, for females, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	1	0.9	4,762	0.0210%	0.0191%	1.10
25	3	9.1	39,297	0.0076%	0.0231%	0.33
30	9	21.0	69,741	0.0129%	0.0300%	0.43
35	31	29.0	80,895	0.0383%	0.0358%	1.07
40	37	41.1	87,652	0.0422%	0.0469%	0.90
45	76	73.6	103,566	0.0734%	0.0710%	1.03
50	126	125.5	123,763	0.1018%	0.1014%	1.00
55	153	164.9	122,578	0.1248%	0.1346%	0.93
60	149	134.8	82,993	0.1795%	0.1625%	1.11
65	88	56.3	29,209	0.3013%	0.1926%	1.56
70	34	19.4	7,596	0.4476%	0.2557%	1.75
Total	707	675.6	752,052	0.0940%	0.0898%	1.05

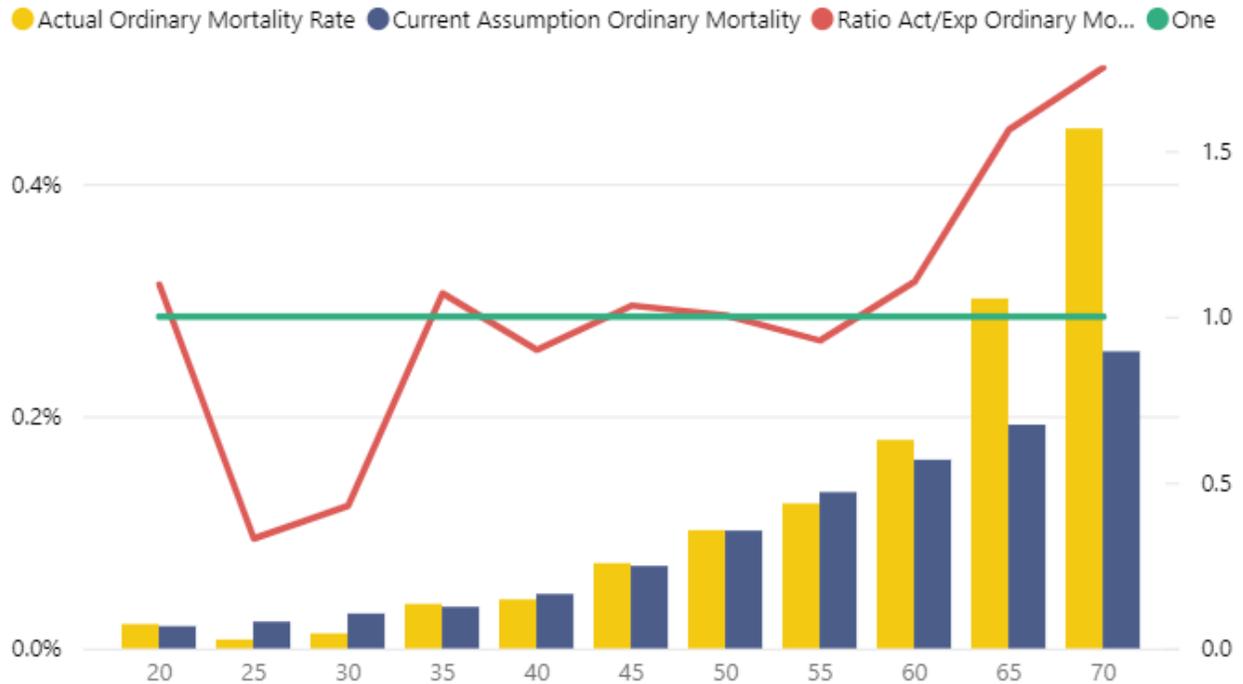
Exposure Distribution w/ Ordinary Mortality Rate - Actual and Expected; by Age



● Total Exposed ● Actual Ordinary Mortality Rate ● Current Assumption Ordinary Mortality



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



Specific observations:

- Actual deaths were less than expected for ages 20 – 39 (A/E ratio of 0.73).
- Actual deaths were greater than expected for ages 40 – 74 (A/E ratio of 1.08), mostly due to advanced ages 65 and older.

Accidental Death

There is no accidental death assumption for General employees. During the Covid pandemic, there were deaths characterized as accidental deaths. The following table shows the experience of accidental death by year.

Plan Year	Actual Accidental Deaths
2012	0
2013	0
2014	1
2015	0
2016	1
2017	0
2018	0
2019	1
2020	106
2021	29
Total	138

Specific observations:

- Excluding 2020 – 2021, there were only 3 accidental deaths out of over 1 million exposures.

Section I(B) – Correction Officers of New York City Employees’ Retirement System (NYCERS)

Exposures and Decrements

To set the exposures and actual decrements for NYCERS Correction Officers, 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.

NYCERS Retirement Eligibility Chart - Corrections

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
H	Correction Capt. - Imp Plan	BOTH	FALSE	0	20				
P	Correction Off. - 25 Year Plan	TRUE	TRUE	0	25	62	5	55	5
Q	Correction Capt. - Imp Plan	BOTH	FALSE	0	20				
X	Correction - 20 Year Plan - Tier 3	BOTH ¹	FALSE	0	20				
X	Correction - 20 Year Plan - Tier 6	BOTH ¹	FALSE	0	25			0	20

¹ Prior to 2018, all COR members in Plan X had a Mandated retirement code.

Please note that Plan Code X Correction - 20 Year Plan - Tier 6 represents Correction officers in the Tier 3 22-year plan.

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. Majority of Correction Officers were indicated as Mandated.

Due to the rounding of service, there can be members with service of 19 years who terminated, but actually retired when first completed 20 years. In this report, these records are not reflected in the retirement analysis, but we do note the potential impact. In our final report, we intend to treat them as retired with 20 years of service.

In the historical database, there were Correction records where the indicated Plan Code did not align with a Correction's Plan Code. This primarily impacted records from 2012 – 2014. As discussed with OA, these records were re-mapped to Plan X – Correction – 20 Year Plan. In reviewing the experience for Corrections, these re-mapped records may not have exhibited similar patterns as other Corrections records. As such, some analysis excludes these records or these years all together.

Withdrawal

The current withdrawal assumption varies by service.

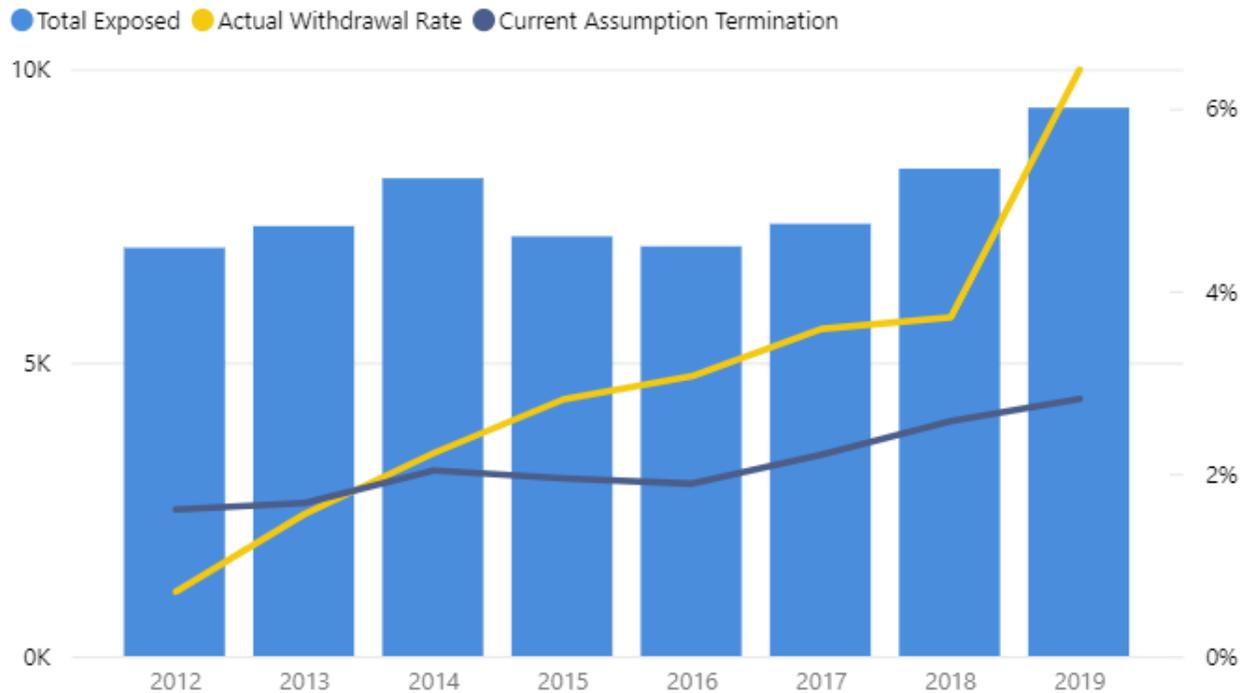
The following table shows the experience for withdrawal by year, for the age range (22 to 62), and service range (0 to 18 years). Based on the current assumptions, the overall expected rate of withdrawal averaged 2.13% whereas the actual rate was at 2.95%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	49	111.6	6,954	0.70%	1.60%	0.44
2013	114	122.8	7,324	1.56%	1.68%	0.93
2014	181	165.6	8,138	2.22%	2.03%	1.09
2015	201	139.1	7,148	2.81%	1.95%	1.44
2016	214	131.8	6,978	3.07%	1.89%	1.62
2017	264	162.4	7,363	3.59%	2.21%	1.63
2018	308	213.6	8,303	3.71%	2.57%	1.44
2019	601	263.2	9,341	6.43%	2.82%	2.28
2020	198	219.6	9,107	2.17%	2.41%	0.90
2021	194	142.9	8,041	2.41%	1.78%	1.36
Total	2,324	1,672.7	78,697	2.95%	2.13%	1.39

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. Note that from 2016 to 2020, between 5% and 11% of all NYCERS records with a status code of LOA were changed to rehire. Hence, between 89% and 95% of the LOA records are eventually coded as withdrawal, retired, disabled or death. Excluding these two years, the actual rate of termination of 3.14% exceeded the assumed rate of 2.13% for an A/E ratio of 1.47 as shown in the following tables.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	49	111.6	6,954	0.70%	1.60%	0.44
2013	114	122.8	7,324	1.56%	1.68%	0.93
2014	181	165.6	8,138	2.22%	2.03%	1.09
2015	201	139.1	7,148	2.81%	1.95%	1.44
2016	214	131.8	6,978	3.07%	1.89%	1.62
2017	264	162.4	7,363	3.59%	2.21%	1.63
2018	308	213.6	8,303	3.71%	2.57%	1.44
2019	601	263.2	9,341	6.43%	2.82%	2.28
Total	1,932	1,310.2	61,549	3.14%	2.13%	1.47

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



Specific observations on the results through 2019:

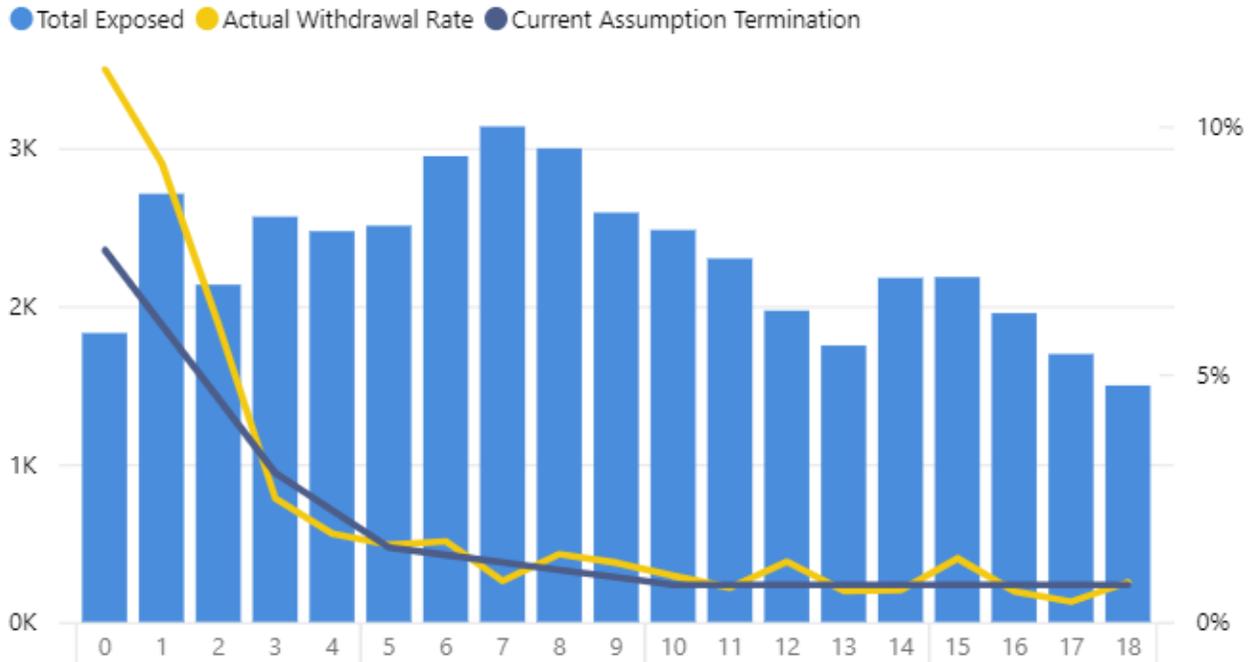
- The actual rate of withdrawal has increased each year during the study period.
- The actual rate of withdrawal during 2012 – 2013 was lower than more recent years of experience, especially 2012, which may be partially due to the records with the re-assigned plan codes.
- From 2014 to 2018, the actual rate exceeded the assumption (A/E ratio of 1.44).

- The actual rate of withdrawal exceeded 6% in 2019, which is more than double the rate of withdrawal that occurred between 2012 – 2018.
- Experience for members with 19 years of service was excluded as a significant number were recorded as terminations during 2020 and 2021 skewing the experience.

The following charts show the experience by service (0 to 18 years) in the experience study period through 2017, prior to the addition of new data.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	204	137.2	1,829	11.15%	7.50%	▲ 1.49
1	251	162.6	2,710	9.26%	6.00%	◆ 1.54
2	128	96.1	2,135	6.00%	4.50%	▲ 1.33
3	64	76.9	2,565	2.50%	3.00%	▲ 0.83
4	44	55.6	2,473	1.78%	2.25%	▲ 0.79
5	39	37.6	2,508	1.56%	1.50%	● 1.04
6	48	39.8	2,948	1.63%	1.35%	▲ 1.21
7	26	37.6	3,136	0.83%	1.20%	▲ 0.69
8	41	31.5	2,998	1.37%	1.05%	▲ 1.30
9	31	23.3	2,591	1.20%	0.90%	▲ 1.33
10	23	18.6	2,481	0.93%	0.75%	▲ 1.24
11	16	17.3	2,301	0.70%	0.75%	● 0.93
12	24	14.8	1,971	1.22%	0.75%	◆ 1.62
13	11	13.1	1,750	0.63%	0.75%	▲ 0.84
14	14	16.3	2,178	0.64%	0.75%	▲ 0.86
15	28	16.4	2,183	1.28%	0.75%	◆ 1.71
16	12	14.7	1,955	0.61%	0.75%	▲ 0.82
17	7	12.7	1,696	0.41%	0.75%	▲ 0.55
18	12	11.2	1,497	0.80%	0.75%	● 1.07
Total	1,023	833.4	43,905	2.33%	1.90%	▲ 1.23

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



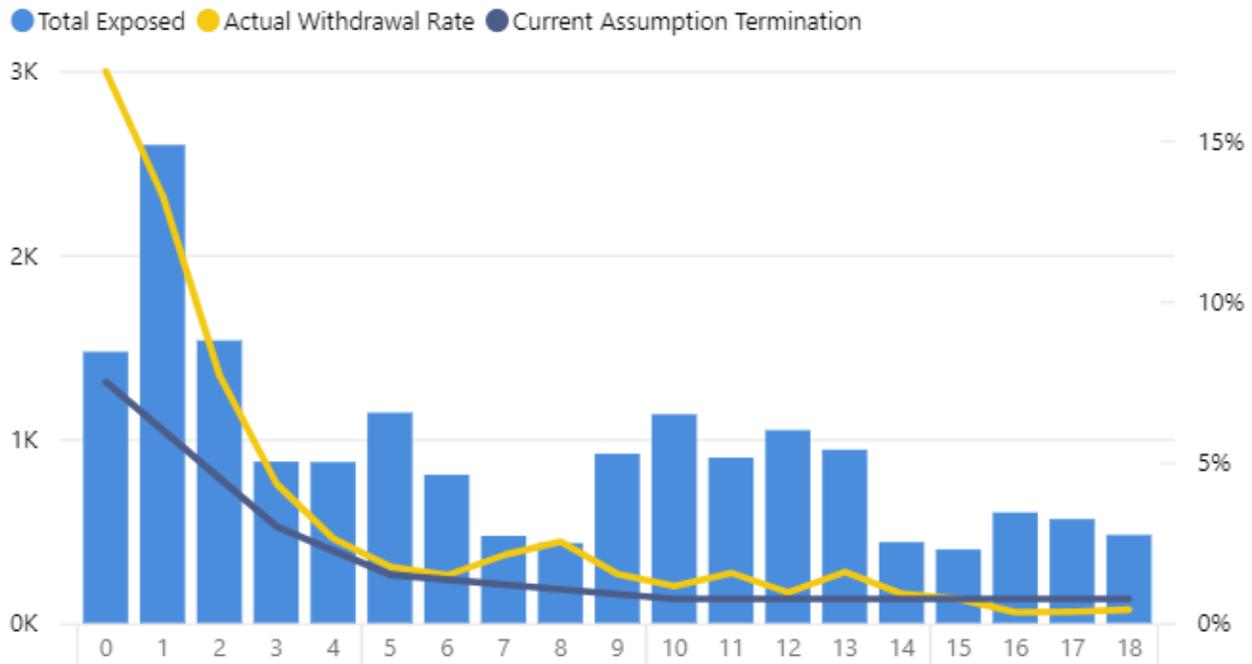
Specific observations:

- For short-service members with up to two years of service, the actual rate of withdrawal exceeded expectations (A/E ratio of 1.47).
- For members with between 3 and 18 years of service, the actual rate of withdrawal was similar to expectations (A/E ratio of 1.01).

The following chart shows the experience for the two-year period July 1, 2017 – June 30, 2019 (2018 and 2019) by service (0 to 18 years).

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	253	110.6	1,474	17.16%	7.50%	2.29
1	345	155.8	2,597	13.28%	6.00%	2.21
2	118	69.1	1,535	7.69%	4.50%	1.71
3	38	26.3	877	4.33%	3.00%	1.44
4	23	19.7	875	2.63%	2.25%	1.17
5	20	17.1	1,143	1.75%	1.50%	1.17
6	12	10.9	806	1.49%	1.35%	1.10
7	10	5.7	474	2.11%	1.20%	1.76
8	11	4.6	435	2.53%	1.05%	2.41
9	14	8.3	920	1.52%	0.90%	1.69
10	13	8.5	1,134	1.15%	0.75%	1.53
11	14	6.7	899	1.56%	0.75%	2.08
12	10	7.9	1,048	0.95%	0.75%	1.27
13	15	7.1	942	1.59%	0.75%	2.12
14	4	3.3	440	0.91%	0.75%	1.21
15	3	3.0	400	0.75%	0.75%	1.00
16	2	4.5	601	0.33%	0.75%	0.44
17	2	4.2	565	0.35%	0.75%	0.47
18	2	3.6	479	0.42%	0.75%	0.56
Total	909	476.8	17,644	5.15%	2.70%	1.91

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



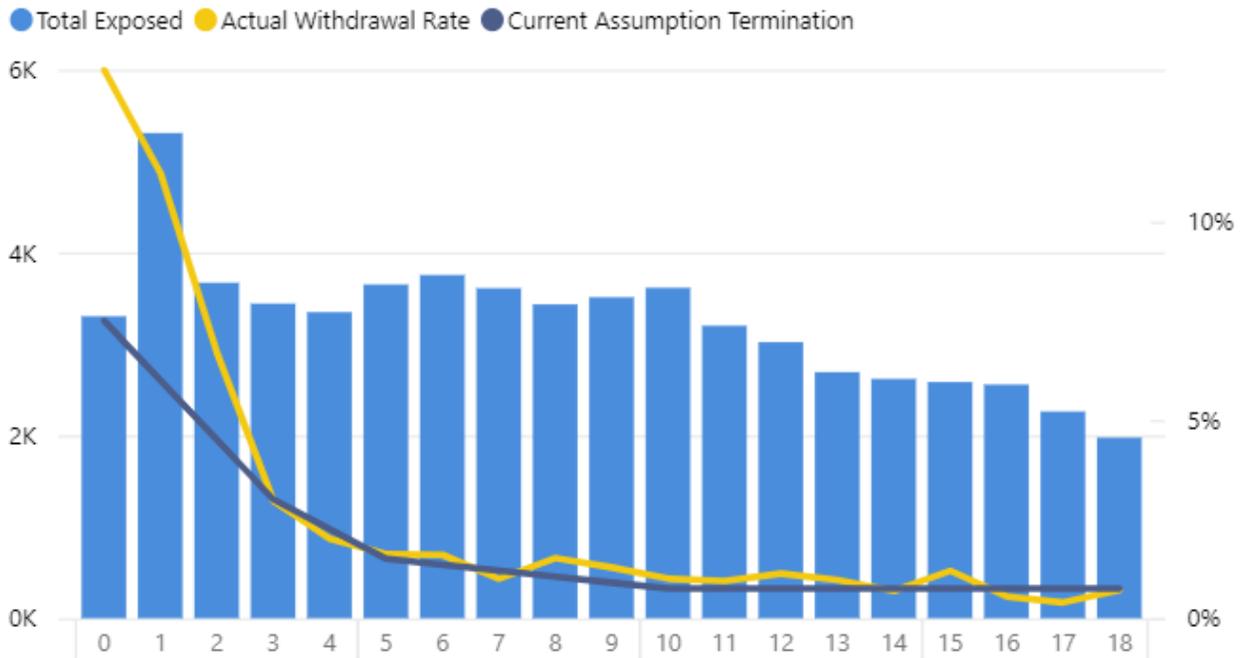
Specific observations for the 2-year period 2018-2019:

- The experience during 2018 – 2019 exhibited similar patterns to the experience from 2012 – 2017, although the overall level of withdrawal was higher.
 - For service periods between 0 and 2 years, the A/E ratio was 2.13, which is higher than the 1.47 A/E ratio of the period 2012 to 2017.
 - For service periods 3 to 18 years, the A/E ratio was 1.37 vs 1.01.

The following charts show the combined experience for 2012 – 2019, by service (0 to 18 years), for the age range of 22 to 69.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	457	247.7	3,303	13.84%	7.50%	1.84
1	596	318.4	5,307	11.23%	6.00%	1.87
2	246	165.2	3,670	6.70%	4.50%	1.49
3	102	103.3	3,442	2.96%	3.00%	0.99
4	67	75.3	3,348	2.00%	2.25%	0.89
5	59	54.8	3,651	1.62%	1.50%	1.08
6	60	50.7	3,754	1.60%	1.35%	1.18
7	36	43.3	3,610	1.00%	1.20%	0.83
8	52	36.0	3,433	1.51%	1.05%	1.44
9	45	31.6	3,511	1.28%	0.90%	1.42
10	36	27.1	3,615	1.00%	0.75%	1.33
11	30	24.0	3,200	0.94%	0.75%	1.25
12	34	22.6	3,019	1.13%	0.75%	1.50
13	26	20.2	2,692	0.97%	0.75%	1.29
14	18	19.6	2,618	0.69%	0.75%	0.92
15	31	19.4	2,583	1.20%	0.75%	1.60
16	14	19.2	2,556	0.55%	0.75%	0.73
17	9	17.0	2,261	0.40%	0.75%	0.53
18	14	14.8	1,976	0.71%	0.75%	0.94
Total	1,932	1,310.2	61,549	3.14%	2.13%	1.47

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



Specific observations for the period 2012 – 2019:

- For service periods from 0 to 2 years, actual withdrawal rates were 78% greater than the assumed rates (A/E ratio of 1.78).
- For those with between 3 and 18 years of service, the actual experience was slightly greater than the assumed rates (A/E ratio of 1.09).

Summary

Actual withdrawal experience is significantly higher than expected by the current assumption for service periods 0 to 2 years, and somewhat higher than expected for service periods 3 to 18 years.

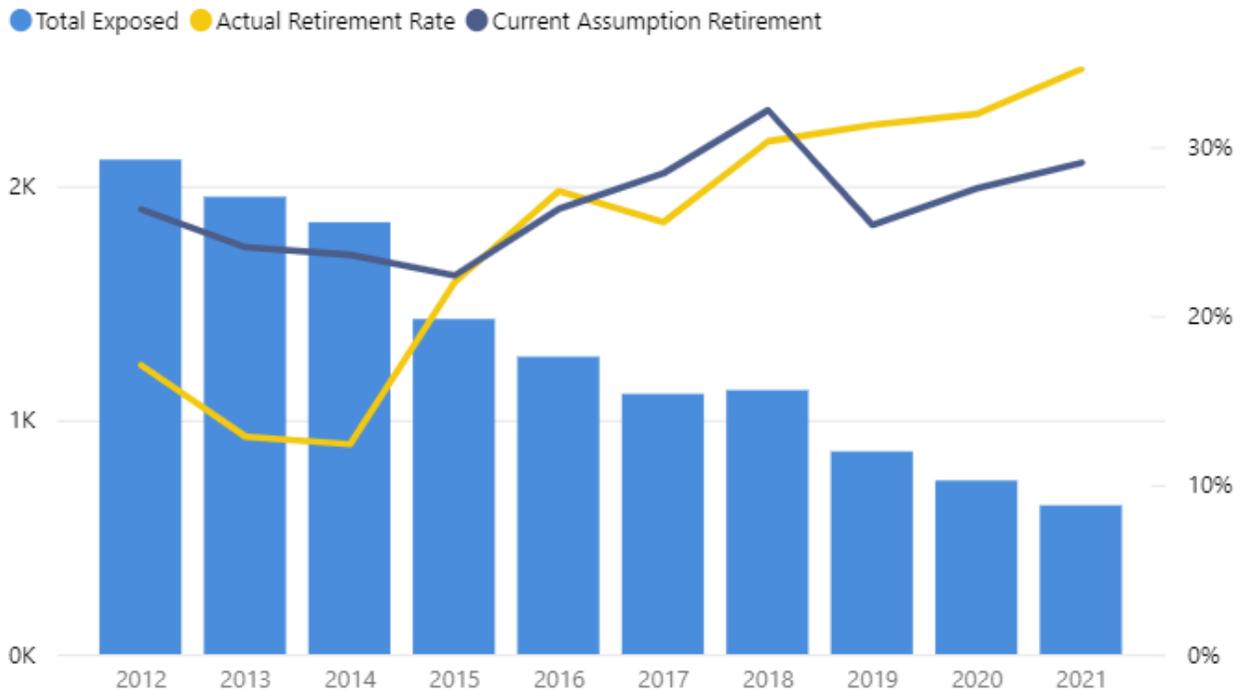
Retirement

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 following table shows the retirement experience of all the plans by year, for the age range (40 to 62) and service range (20 to 39 years). Based on the current assumptions, the overall expected rate of retirement averaged 25.97% during this period, whereas the actual rate was 21.82% for an A/E ratio of 0.84. However, this excludes 504 retirements with 19 years of service. Reflecting these retirements, the overall A/E ratio would increase to approximately 0.91.

Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	361	555.0	2,113	17.08%	26.27%	▲ 0.65
2013	251	469.4	1,954	12.85%	24.02%	▲ 0.53
2014	229	435.0	1,845	12.41%	23.58%	▲ 0.53
2015	315	320.3	1,432	22.00%	22.36%	● 0.98
2016	348	334.7	1,271	27.38%	26.33%	● 1.04
2017	284	316.1	1,112	25.54%	28.43%	▲ 0.90
2018	342	362.7	1,128	30.32%	32.15%	● 0.94
2019	271	219.7	866	31.29%	25.37%	▲ 1.23
2020	237	204.4	742	31.94%	27.55%	▲ 1.16
2021	220	184.8	636	34.59%	29.06%	▲ 1.19
Total	2,858	3,402.0	13,099	21.82%	25.97%	▲ 0.84

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



The rate of retirement during 2020 and 2021 may be slightly lower than shown in this report due to the treatment of members with a LOA status code. While the percentage of members with a LOA code who have a retired status code in the following two years is approximately 2%, the number of retirements not captured in each of these two years could be roughly 700 for all NYCERS members. We have not tabulated the specific breakdown for this group. We do note that there were more retirements in 2020 – 2021 than expected.

Specific observations:

- The actual rate of retirement in 2012 – 2014 was much lower than expected (A/E ratio of 0.58) , which may be partially due to the records with the re-assigned plan codes.
- The actual rate of retirement exceeded the assumption from 2019 – 2021 (A/E ratio of 1.20).

Due to the significant contrast in rates of retirement prior to 2015, we will review the experience from 2015 – 2021 by plan code. Plan codes will be combined by retirement eligibility; 20 years of service versus 25 years of service as shown below.

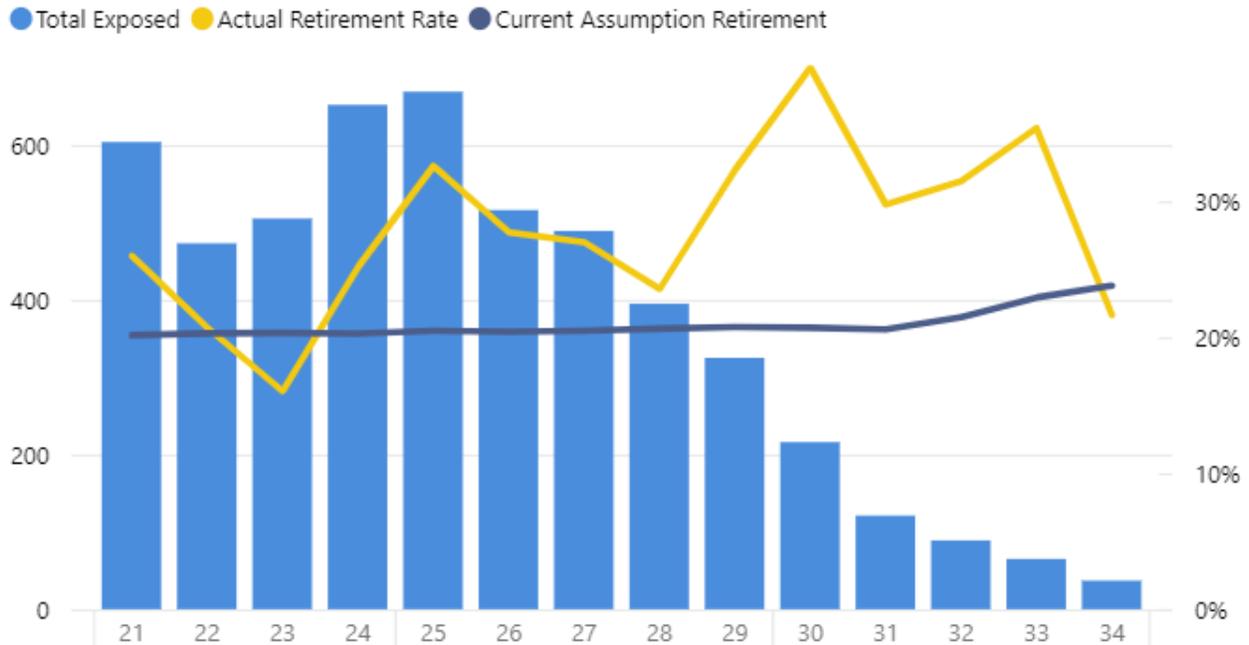
1. 20 Years of Service:
 - a. Correction Capt. – Imp Plan
 - b. Correction Off. – Imp Plan
 - c. Correction – 20 Year Plan
2. 25 Years of Service:
 - a. Correction Off. – 25 Year Plan

20 Years of Service Retirement Plans

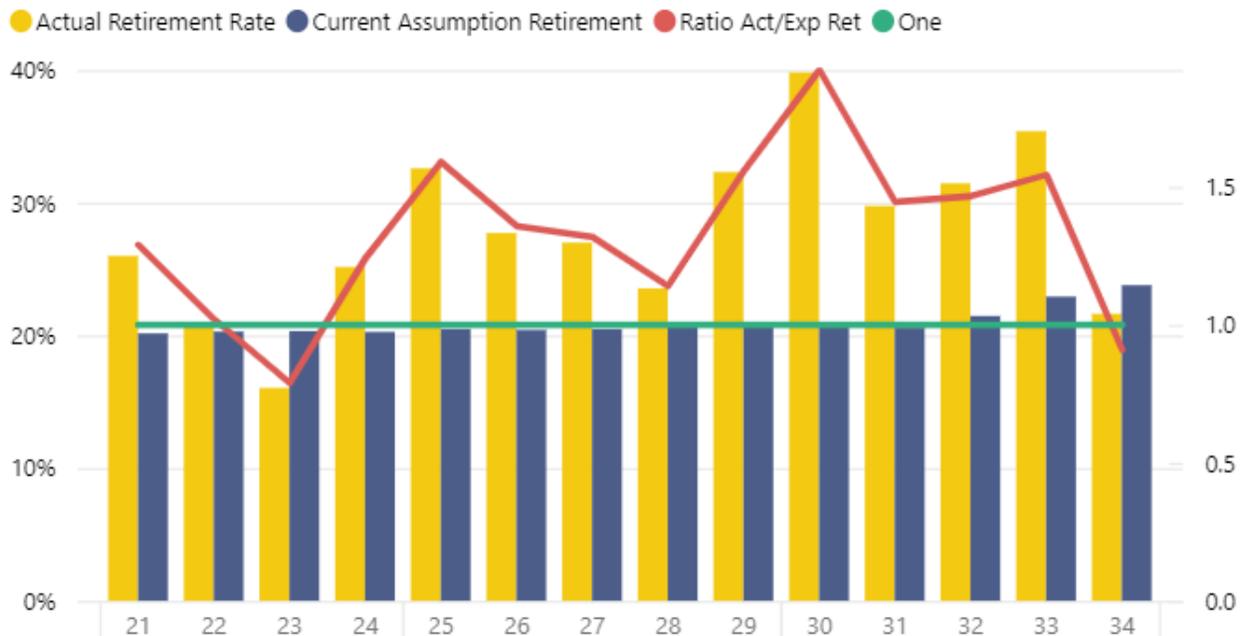
The following charts display the experience of the 20 Years of Service retirement plans, by service (21 to 34) for the age range 45 to 62, during 2015 – 2021.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
21	157	121.7	604	25.99%	20.15%	▲ 1.29
22	98	95.9	473	20.72%	20.29%	● 1.02
23	81	102.6	505	16.04%	20.32%	▲ 0.79
24	164	132.1	652	25.15%	20.26%	▲ 1.24
25	218	137.0	669	32.59%	20.48%	◆ 1.59
26	143	105.3	516	27.71%	20.41%	▲ 1.36
27	132	100.1	489	26.99%	20.47%	▲ 1.32
28	93	81.5	395	23.54%	20.63%	▲ 1.14
29	105	67.4	325	32.31%	20.74%	◆ 1.56
30	86	44.7	216	39.81%	20.69%	◆ 1.92
31	36	24.9	121	29.75%	20.58%	▲ 1.45
32	28	19.1	89	31.46%	21.46%	▲ 1.47
33	23	14.9	65	35.38%	22.92%	◆ 1.54
34	8	8.8	37	21.62%	23.78%	● 0.91
Total	1,372	1,056.1	5,156	26.61%	20.48%	▲ 1.30

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



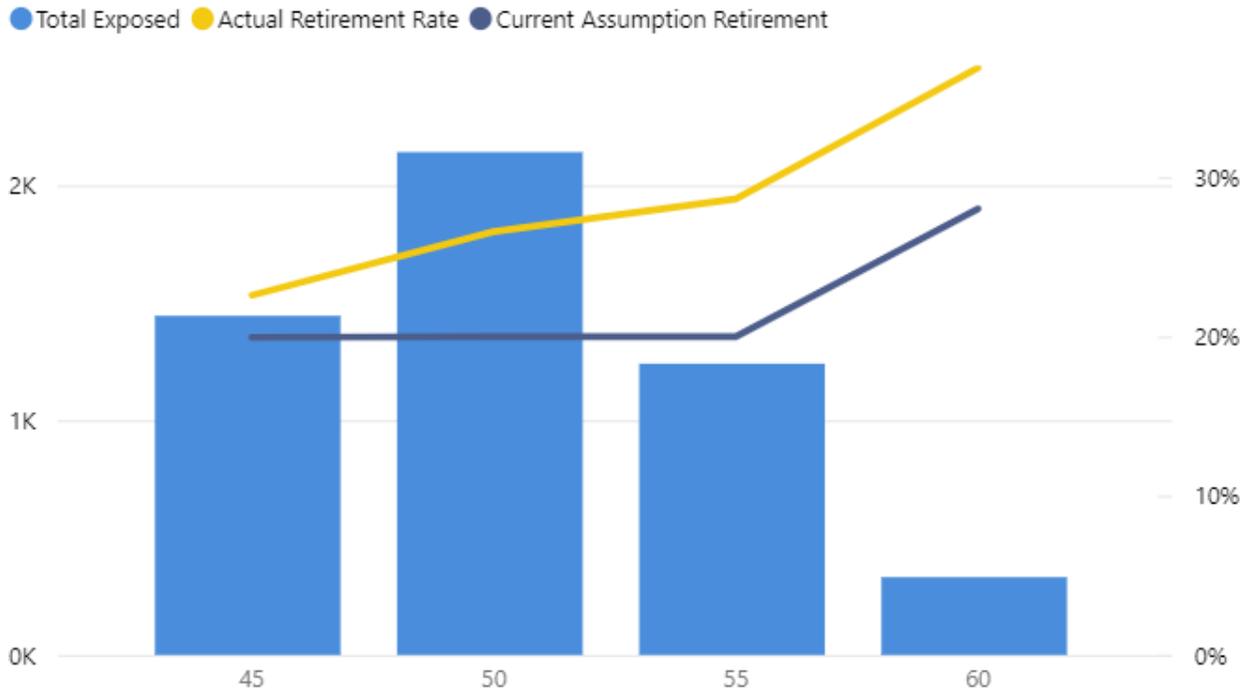
Retirement Rate - Actual, Expected, and Ratio; by Service



The following charts display the experience of the 20 Years of Service retirement plans, by age, for the service range 21 to 34 and the age range 45 to 62, during 2015 – 2021.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
45	27	28.2	140	19.29%	20.16%	0.96
46	33	40.7	204	16.18%	19.93%	0.81
47	72	59.0	297	24.24%	19.88%	1.22
48	88	72.6	365	24.11%	19.90%	1.21
49	106	87.3	438	24.20%	19.93%	1.21
50	103	91.4	457	22.54%	20.00%	1.13
51	152	96.9	486	31.28%	19.94%	1.57
52	116	84.2	422	27.49%	19.95%	1.38
53	96	78.8	394	24.37%	20.00%	1.22
54	102	76.4	382	26.70%	20.00%	1.34
55	86	69.2	346	24.86%	20.00%	1.24
56	100	61.6	309	32.36%	19.94%	1.62
57	73	48.8	244	29.92%	20.00%	1.50
58	50	36.6	183	27.32%	20.00%	1.37
59	46	31.6	158	29.11%	20.00%	1.46
60	55	28.8	144	38.19%	20.00%	1.91
61	44	32.7	109	40.37%	30.00%	1.35
62	23	31.2	78	29.49%	40.00%	0.74
Total	1,372	1,056.1	5,156	26.61%	20.48%	1.30

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



Specific observations:

- Overall, actual retirements exceeded the assumption by 30% (A/E ratio of 1.30).
- Actual experience was higher across all service periods and nearly all ages.

Since retirements at first eligibility may have been recorded at 19 years of service, we have excluded the first eligibility experience in the charts above. We have estimated that the number of retirements was less than expected (A/E ratio 0.93) at first eligibility.

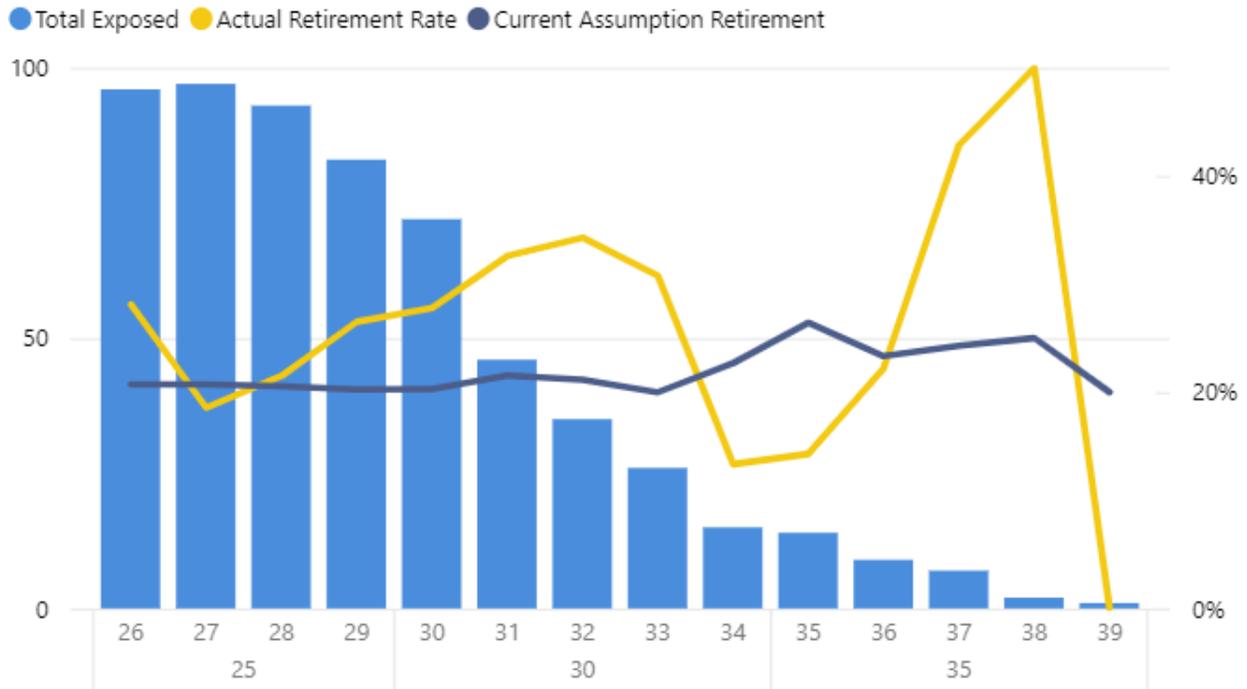
Also, it is assumed that all Correction Officers who have attained at least age 63 would retire. The experience indicates that approximately 30% of these members retired.

25 Years of Service Retirement Plans

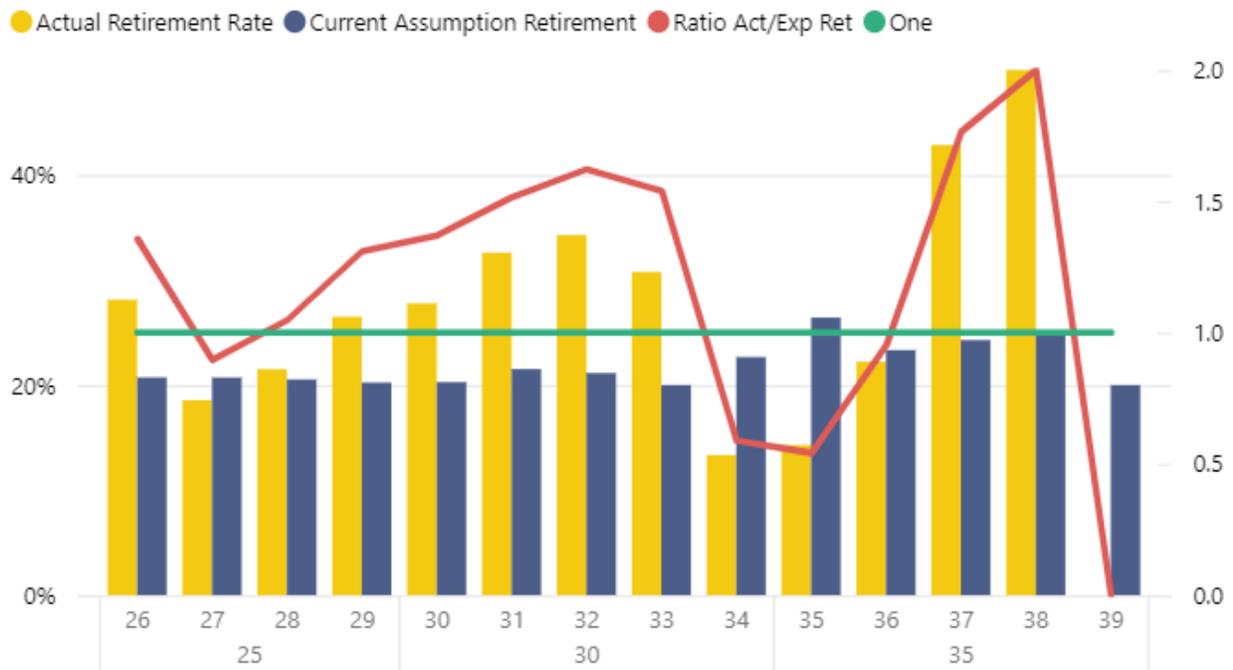
The following charts display the experience of the 25 Years of Service retirement plan, by service (26 to 39) for the age range 45 to 62, during 2015 – 2021.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
26	27	19.9	96	28.13%	20.73%	▲ 1.36
27	18	20.1	97	18.56%	20.72%	▲ 0.90
28	20	19.1	93	21.51%	20.54%	● 1.05
29	22	16.8	83	26.51%	20.24%	▲ 1.31
30	20	14.6	72	27.78%	20.28%	▲ 1.37
31	15	9.9	46	32.61%	21.52%	◆ 1.52
32	12	7.4	35	34.29%	21.14%	◆ 1.62
33	8	5.2	26	30.77%	20.00%	◆ 1.54
34	2	3.4	15	13.33%	22.67%	▲ 0.59
35	2	3.7	14	14.29%	26.43%	▲ 0.54
36	2	2.1	9	22.22%	23.33%	● 0.95
37	3	1.7	7	42.86%	24.29%	◆ 1.76
38	1	0.5	2	50.00%	25.00%	◆ 2.00
39	0	0.2	1	0.00%	20.00%	◆ 0.00
Total	152	124.6	596	25.50%	20.91%	▲ 1.22

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 the 25 Years of Service retirement plan, by age for the service range 26 to 39 and the age range 45 to 62, during 2015 – 2021.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
46	1	0.4	2	50.00%	20.00%	2.50
47	5	2.0	10	50.00%	20.00%	2.50
48	4	3.2	16	25.00%	20.00%	1.25
49	5	5.4	27	18.52%	20.00%	0.93
50	10	7.2	36	27.78%	20.00%	1.39
51	8	8.2	41	19.51%	20.00%	0.98
52	16	10.2	51	31.37%	20.00%	1.57
53	14	11.0	55	25.45%	20.00%	1.27
54	8	10.2	51	15.69%	20.00%	0.78
55	14	11.6	58	24.14%	20.00%	1.21
56	6	10.0	50	12.00%	20.00%	0.60
57	15	9.8	49	30.61%	20.00%	1.53
58	12	8.0	40	30.00%	20.00%	1.50
59	7	8.2	41	17.07%	20.00%	0.85
60	12	6.2	31	38.71%	20.00%	1.94
61	9	6.6	22	40.91%	30.00%	1.36
62	6	6.4	16	37.50%	40.00%	0.94
Total	152	124.6	596	25.50%	20.91%	1.22

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



Specific observations:

- Overall, actual retirements exceeded the assumption by 22% (A/E ratio of 1.22) similar to the 20 years of service plans, although the volume of experience data is not credible.

Since retirements at first eligibility may have been recorded at 24 years of service, we have excluded the first eligibility experience in the charts above. We have estimated that the number of retirements was less than expected (A/E ratio 0.85) at first eligibility, which is slightly less than the experience of the 20 years of service plans.

Also, it is assumed that all Correction Officers who have attained at least age 63 would retire. Experience indicates that approximately 45% of these members retired.

Disability

Current ordinary disability assumptions vary by age and do not apply during the 10-year eligibility service period. Furthermore, different rates apply to accidental disability; these rates depend on age and Tier and apply during all service periods. 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. For accidental disability, a higher final average salary minimum applies; 50% for Tier 3 non-enhanced disability members and 75% for all other members. The benefit is payable during the lifetime of the member and members may select any optional forms of payment.

Ordinary Disability

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. We made adjustments as far back as 2012. The volume of disability experience data is very small for Correction officers and it is difficult to determine what impact this may have on them.

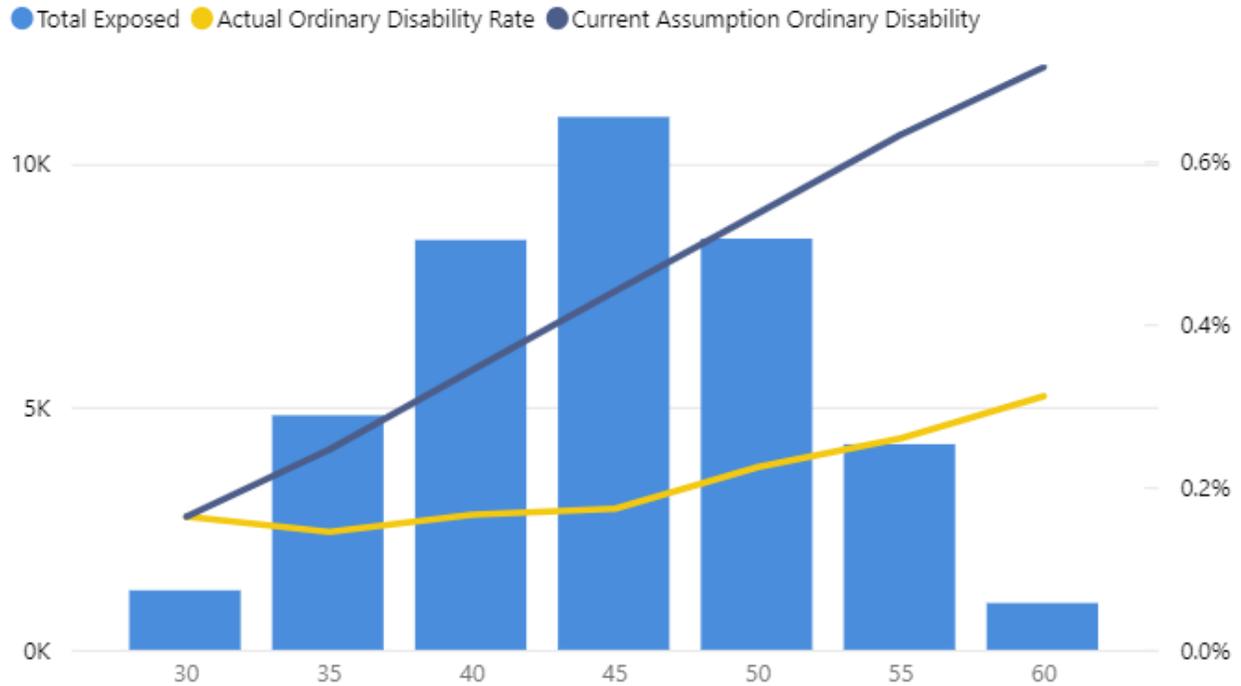
The following tables show the experience of ordinary disability retirement for all plans, by year, for the age range 30 to 62 and the service range 10 to 34 years, through 2021.

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	19	25.0	5,693	0.3337%	0.4390%	▲ 0.76
2013	11	24.9	5,591	0.1967%	0.4452%	◆ 0.44
2014	6	24.6	5,384	0.1114%	0.4568%	◆ 0.24
2015	4	19.6	4,420	0.0905%	0.4431%	◆ 0.20
2016	17	20.2	4,628	0.3673%	0.4357%	▲ 0.84
2017	6	19.2	4,505	0.1332%	0.4273%	◆ 0.31
2018	3	18.3	4,370	0.0686%	0.4183%	◆ 0.16
2019	9	18.5	4,537	0.1984%	0.4074%	◆ 0.49
2020	7	17.3	4,246	0.1649%	0.4078%	◆ 0.40
2021	3	16.3	4,004	0.0749%	0.4079%	◆ 0.18
Total	85	203.9	47,378	0.1794%	0.4304%	◆ 0.42

The following tables show the experience of ordinary disability retirement, for all plans, by age, for the age range 30 to 62 and the service range 10 to 34 years, during the period 2012 – 2019.

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	11	0.0000%	0.1000%	0.00
31	0	0.1	77	0.0000%	0.1200%	0.00
32	1	0.3	182	0.5495%	0.1400%	3.92
33	0	0.6	382	0.0000%	0.1600%	0.00
34	1	1.0	572	0.1748%	0.1800%	0.97
35	1	1.3	664	0.1506%	0.2000%	0.75
36	1	1.8	836	0.1196%	0.2200%	0.54
37	0	2.4	997	0.0000%	0.2400%	0.00
38	1	2.9	1,100	0.0909%	0.2600%	0.35
39	4	3.4	1,231	0.3249%	0.2800%	1.16
40	3	4.1	1,371	0.2188%	0.3000%	0.73
41	6	4.9	1,528	0.3927%	0.3200%	1.23
42	1	5.8	1,717	0.0582%	0.3400%	0.17
43	3	6.6	1,845	0.1626%	0.3600%	0.45
44	1	7.5	1,979	0.0505%	0.3800%	0.13
45	4	8.3	2,081	0.1922%	0.4000%	0.48
46	6	9.3	2,209	0.2716%	0.4200%	0.65
47	2	10.0	2,277	0.0878%	0.4400%	0.20
48	2	10.3	2,249	0.0889%	0.4600%	0.19
49	5	10.3	2,156	0.2319%	0.4800%	0.48
50	4	10.2	2,031	0.1969%	0.5000%	0.39
51	6	9.8	1,882	0.3188%	0.5200%	0.61
52	4	9.1	1,679	0.2382%	0.5400%	0.44
53	3	8.5	1,512	0.1984%	0.5600%	0.35
54	2	7.9	1,363	0.1467%	0.5800%	0.25
55	3	7.0	1,161	0.2584%	0.6000%	0.43
56	4	6.2	1,008	0.3968%	0.6200%	0.64
57	2	5.3	835	0.2395%	0.6400%	0.37
58	2	4.5	681	0.2937%	0.6600%	0.44
59	0	3.7	549	0.0000%	0.6800%	0.00
60	1	3.0	423	0.2364%	0.7000%	0.34
61	1	2.3	323	0.3096%	0.7200%	0.43
62	1	1.6	217	0.4608%	0.7400%	0.62
Total	75	170.2	39,128	0.1917%	0.4351%	0.44

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



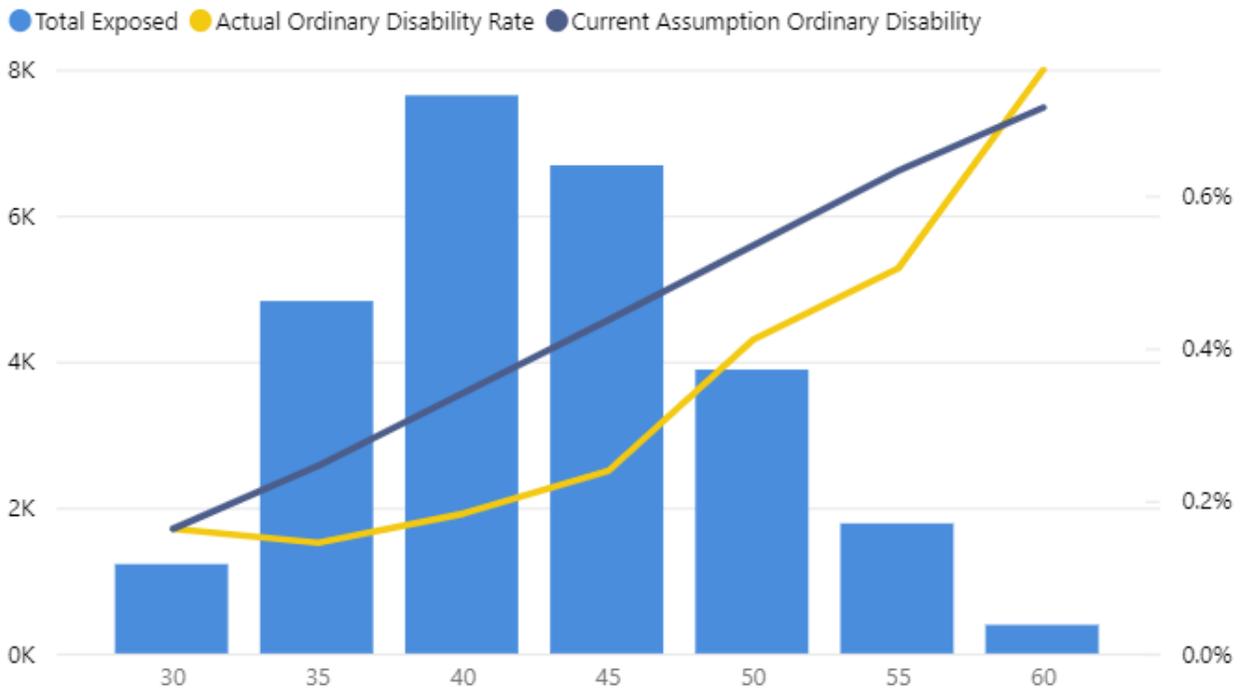
Specific observations:

- Overall, the number of ordinary disability retirements was much less than expected (A/E ratio of 0.44).
- The number of actual disabilities is influenced by whether the member has accrued 20 years of service.

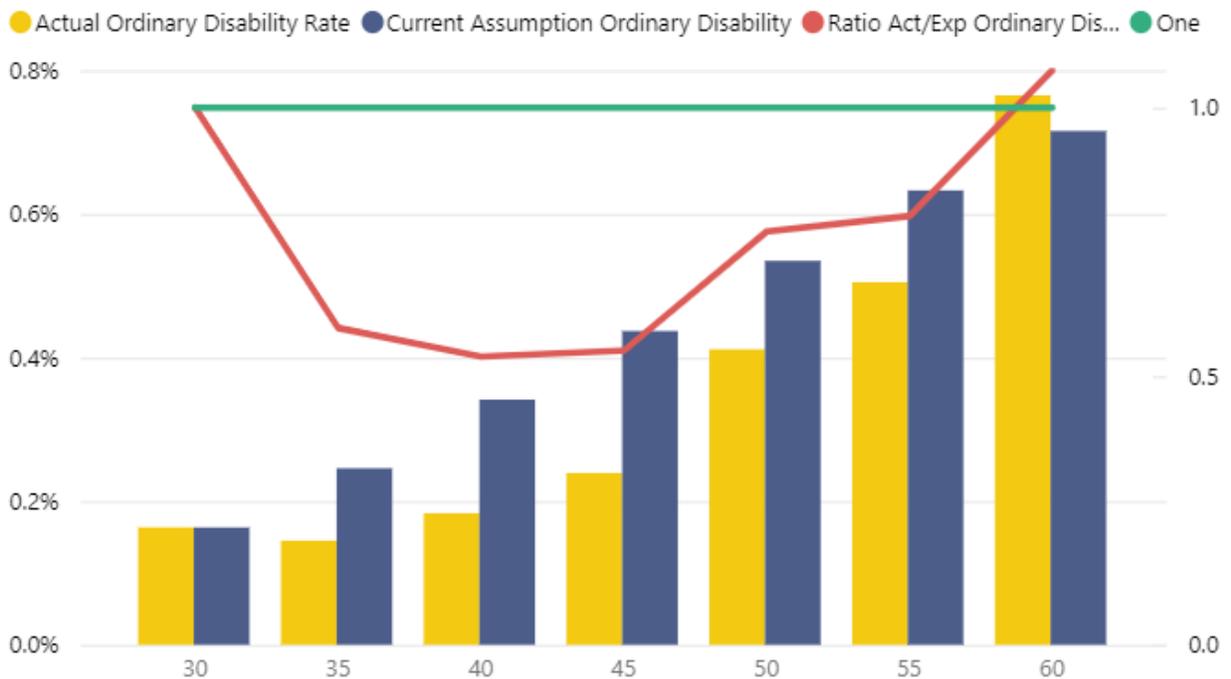
Service Less than 20 Years

The following charts show the experience of members for the service range 10 to 19 years.

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



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



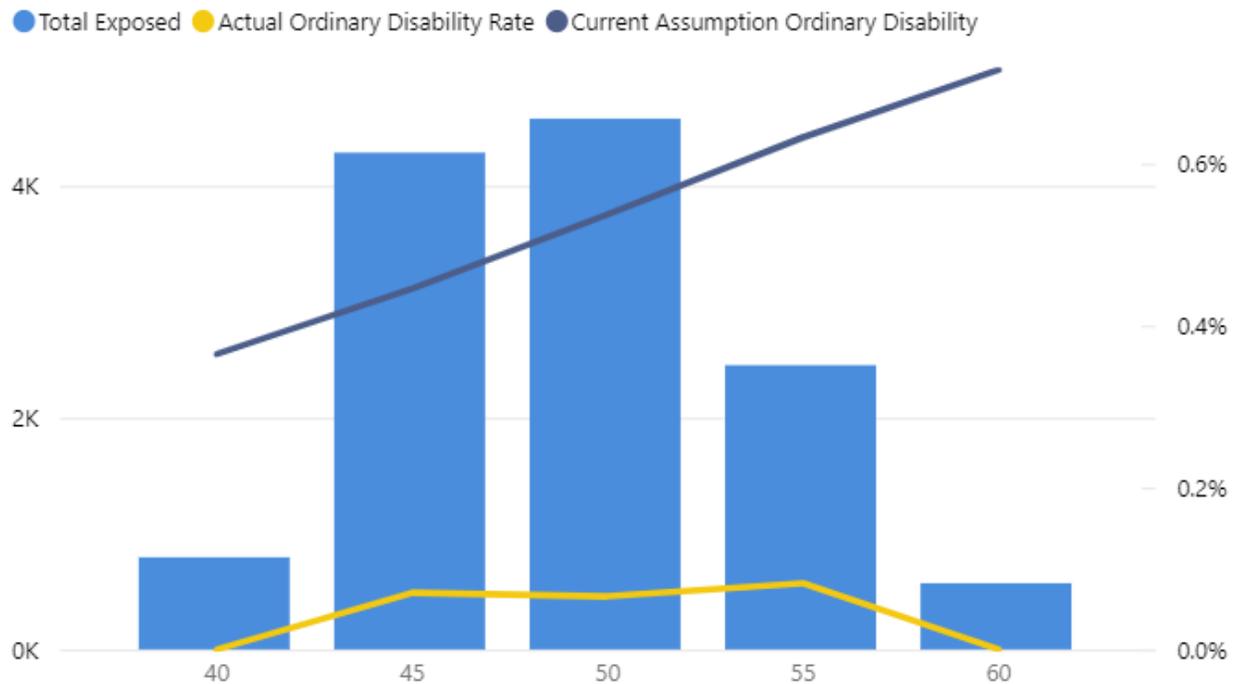
Specific observations:

- Rates of ordinary disability are higher for members who are not eligible for retirement than members who are. Excluding members who are eligible for retirement increases the A/E ratio from 0.44 to 0.64.

Service Greater than 20 Years

The following charts show the experience of members who accrued at least 20 years of service.

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



Specific observations:

- For members with at least 20 years of service, there were only 8 ordinary disability retirements but 66 expected.

Summary

Retirement eligibility appears to have a significant impact on the members who apply for a disability retirement. Consequently, it may be desirable to use disability rates to account for this variable.

Accidental Disability

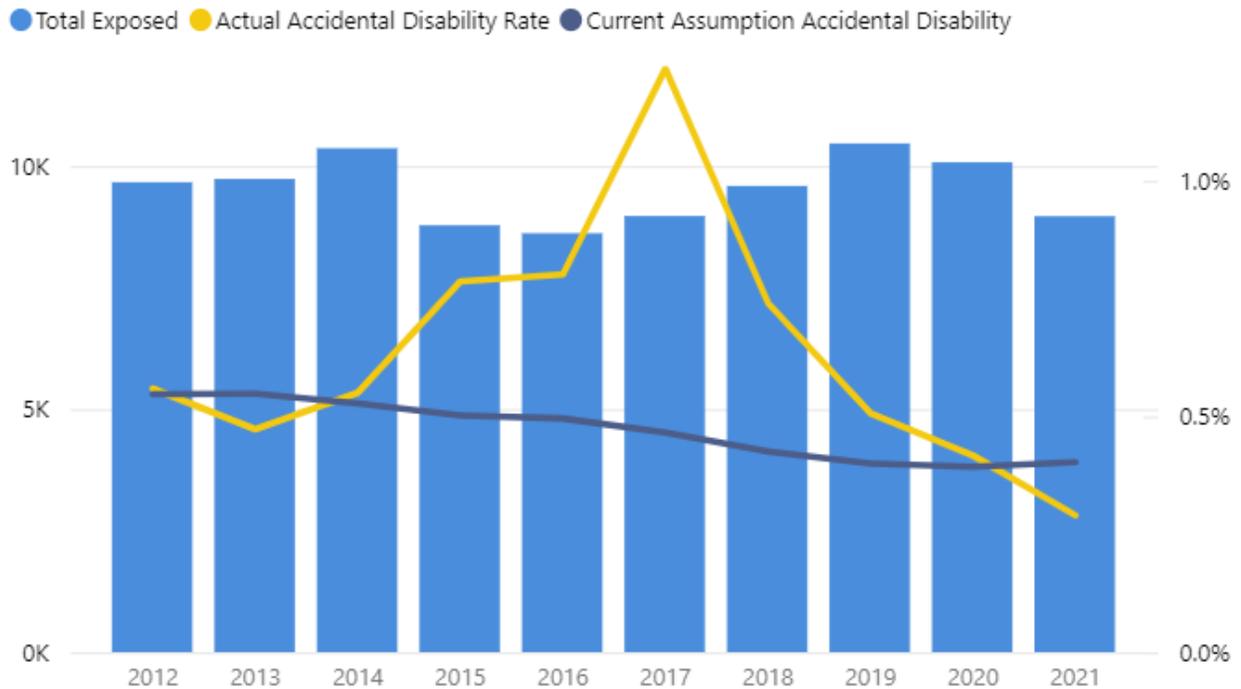
As noted in the section of ordinary disability, it is necessary to reassign disability retirement codes retroactively to reflect the eventual approval of a disability retirement. Members with a disability code in a given year had all inactive status codes in prior years changed to a disability status code. Rates of accidental disability were highest between 2016 – 2018 and declined each year thereafter.

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.

The following tables show the experience of accidental disability retirement for all plans, by year, for the age range 22 to 62 and the service range 0 to 34 years, through 2021.

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	54	52.8	9,663	0.5588%	0.5469%	1.02
2013	46	53.4	9,731	0.4727%	0.5483%	0.86
2014	57	54.6	10,362	0.5501%	0.5272%	1.04
2015	69	44.1	8,777	0.7861%	0.5020%	1.57
2016	69	42.7	8,614	0.8010%	0.4955%	1.62
2017	111	41.7	8,968	1.2377%	0.4653%	2.66
2018	71	40.8	9,586	0.7407%	0.4255%	1.74
2019	53	41.8	10,461	0.5066%	0.4000%	1.27
2020	42	39.6	10,072	0.4170%	0.3932%	1.06
2021	26	36.1	8,964	0.2900%	0.4030%	0.72
Total	598	447.7	95,198	0.6282%	0.4702%	1.34

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



The rates of accidental disability retirement vary by the following characteristics:

1. Tier 2 and Tier 3 22-year plan enhanced members
2. Tier 3 22-year plan non-enhanced members.

Please note that we excluded members coded as Tier 4 as this represents the records with the re-assigned plan codes. Also, records labeled Tier 6 represents Tier 3 22-year plan non-enhanced members.

Tier 2 and Tier 3 22-Year Plan Enhanced

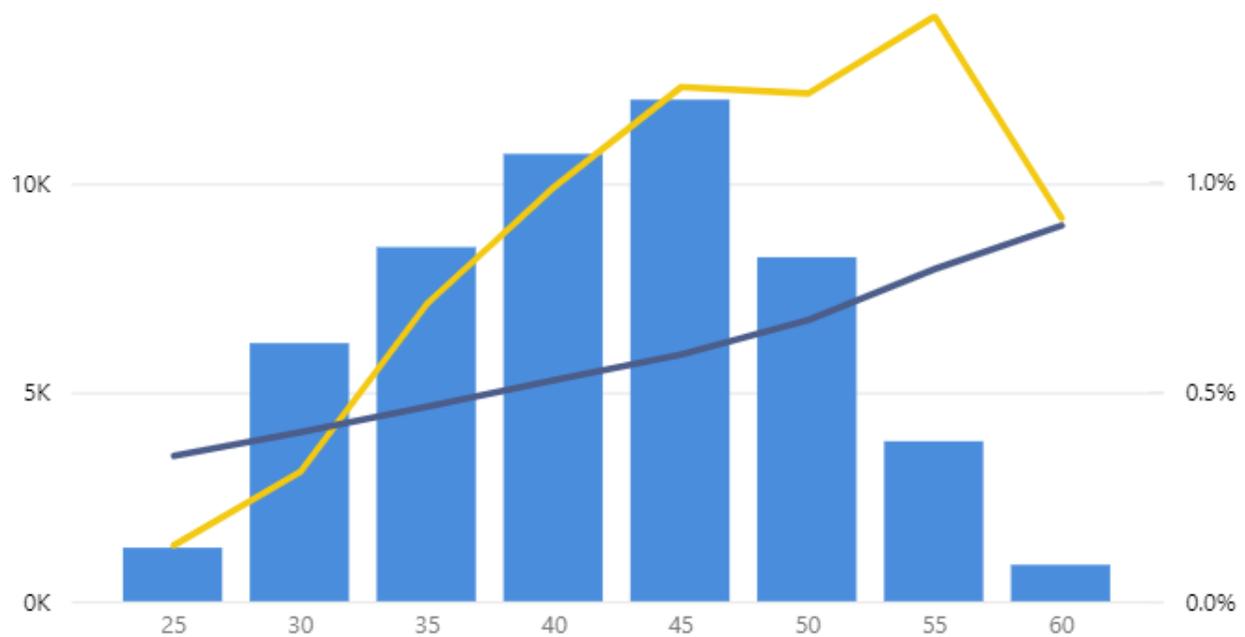
The following tables display the experience of Tier 2 and Tier 3 22-year plan enhanced members by age, for the age range 25 to 62 and the service range 0 to 34 years, during 2012 – 2019.

Age	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
25	0	0.6	188	0.0000%	0.3125%	0.00
26	0	1.2	382	0.0000%	0.3250%	0.00
27	0	2.0	593	0.0000%	0.3375%	0.00
28	2	2.8	808	0.2475%	0.3500%	0.71
29	2	3.8	1,038	0.1927%	0.3625%	0.53
30	3	4.7	1,263	0.2375%	0.3750%	0.63
31	1	5.6	1,443	0.0693%	0.3875%	0.18
32	2	6.4	1,609	0.1243%	0.4000%	0.31
33	8	7.0	1,707	0.4687%	0.4125%	1.14
34	10	7.5	1,765	0.5666%	0.4250%	1.33
35	9	7.8	1,772	0.5079%	0.4375%	1.16
36	9	8.4	1,870	0.4813%	0.4500%	1.07
37	18	8.8	1,893	0.9509%	0.4625%	2.06
38	13	9.1	1,925	0.6753%	0.4750%	1.42
39	18	9.7	1,987	0.9059%	0.4875%	1.86
40	27	10.3	2,057	1.3126%	0.5000%	2.63
41	10	11.1	2,170	0.4608%	0.5125%	0.90
42	17	12.1	2,306	0.7372%	0.5250%	1.40
43	27	12.8	2,373	1.1378%	0.5375%	2.12
44	31	13.4	2,444	1.2684%	0.5500%	2.31
45	30	14.0	2,491	1.2043%	0.5625%	2.14
46	37	14.7	2,552	1.4498%	0.5750%	2.52
47	32	15.0	2,557	1.2515%	0.5875%	2.13
48	30	14.7	2,452	1.2235%	0.6000%	2.04
49	22	14.0	2,284	0.9632%	0.6125%	1.57
50	25	13.0	2,078	1.2031%	0.6250%	1.92

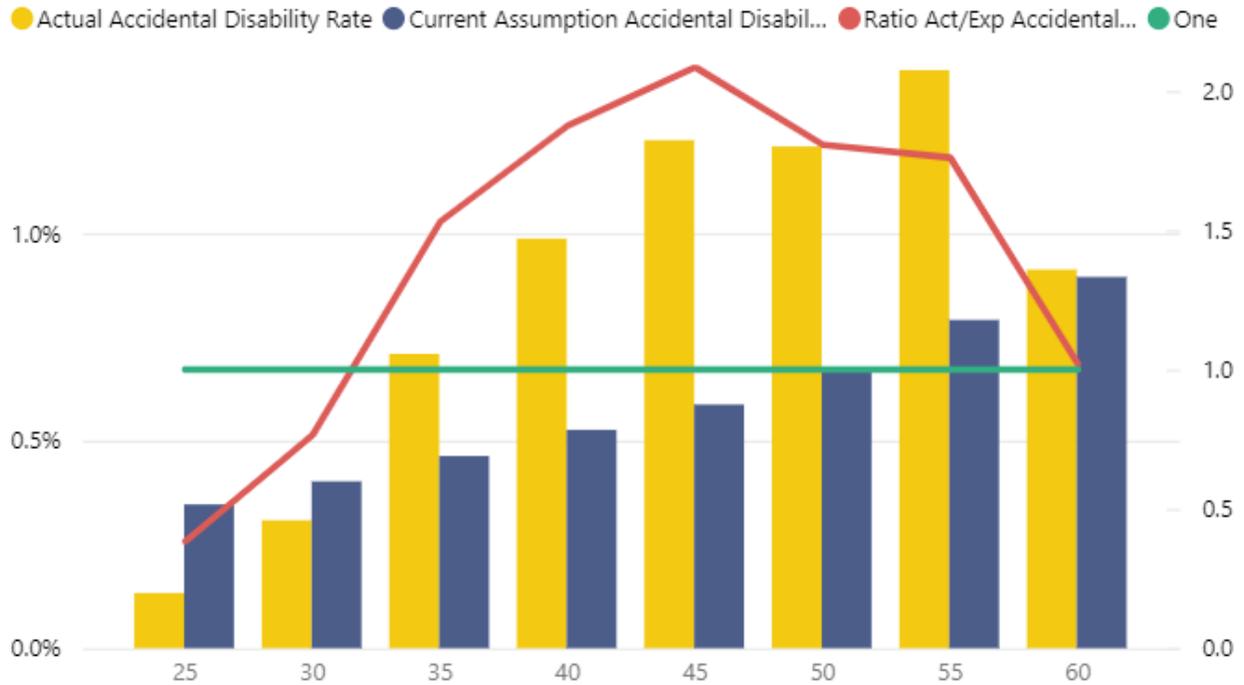
51	27	12.2	1,871	1.4431%	0.6500%	◇	2.22
52	15	11.2	1,654	0.9069%	0.6750%	▲	1.34
53	13	10.2	1,461	0.8898%	0.7000%	▲	1.27
54	21	9.4	1,291	1.6266%	0.7250%	◇	2.24
55	14	8.0	1,060	1.3208%	0.7500%	◇	1.76
56	10	7.1	920	1.0870%	0.7750%	▲	1.40
57	11	6.1	759	1.4493%	0.8000%	◇	1.81
58	10	5.3	637	1.5699%	0.8250%	◇	1.90
59	9	4.3	501	1.7964%	0.8500%	◇	2.11
60	1	3.4	388	0.2577%	0.8750%	◇	0.29
61	4	2.6	293	1.3652%	0.9000%	◇	1.52
62	3	1.8	196	1.5306%	0.9250%	◇	1.65
Total	521	312.0	57,038	0.9134%	0.5470%	◇	1.67

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

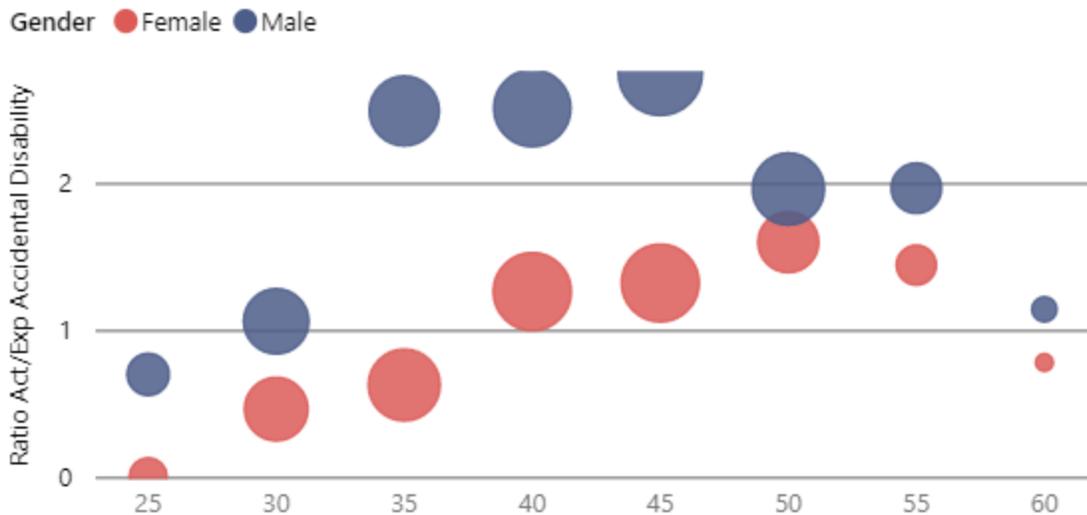
● Total Exposed ● Actual Accidental Disability Rate ● Current Assumption Accidental Disability



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



Actual vs. Expected - Accidental Disability Rate w/ Exposure Bubbles; by Age



Specific observations:

- Overall, the actual number of accidental disability retirements was greater than expected (A/E ratio of 1.67).
- Males exhibited a higher rate of accidental disability (A/E ratio of 2.15) versus females (A/E ratio of 1.11).

Tier 3 22-Year Plan Non-Enhanced

The following tables display the experience of Tier 3 22-year plan non-enhanced members by year, for the age range 22 to 62 and the service range 0 to 34 years.

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2014	0	1.8	892	0.0000%	0.2052%	0.00
2015	1	2.5	1,215	0.0823%	0.2091%	0.39
2016	1	3.2	1,502	0.0666%	0.2116%	0.31
2017	5	5.0	2,379	0.2102%	0.2108%	1.00
2018	0	7.8	3,704	0.0000%	0.2094%	0.00
2019	2	9.8	4,651	0.0430%	0.2097%	0.21
2020	6	10.4	4,833	0.1241%	0.2151%	0.58
2021	4	9.5	4,227	0.0946%	0.2240%	0.42
Total	19	49.9	23,403	0.0812%	0.2134%	0.38

Specific observations:

- There were no exposures among Tier 3 22-year plan non-enhanced members prior to 2014.
- Overall, fewer accidental disability retirements occurred during the study period than expected (A/E ratio of 0.38).
- Since there are so few accidental disability retirements among Tier 3 22-year plan non-enhanced members, we did not produce any further analysis.

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 did not publish a MP-2022 scale.

In this study the base table 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. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

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 the base rate.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and the treatment of excess deaths due to the Covid pandemic which occurred in 2020 – 2022. The purpose of this analysis is to share our observations about the experience during the study period. In subsequent analyses, we will recommend changes to mortality assumptions as appropriate.

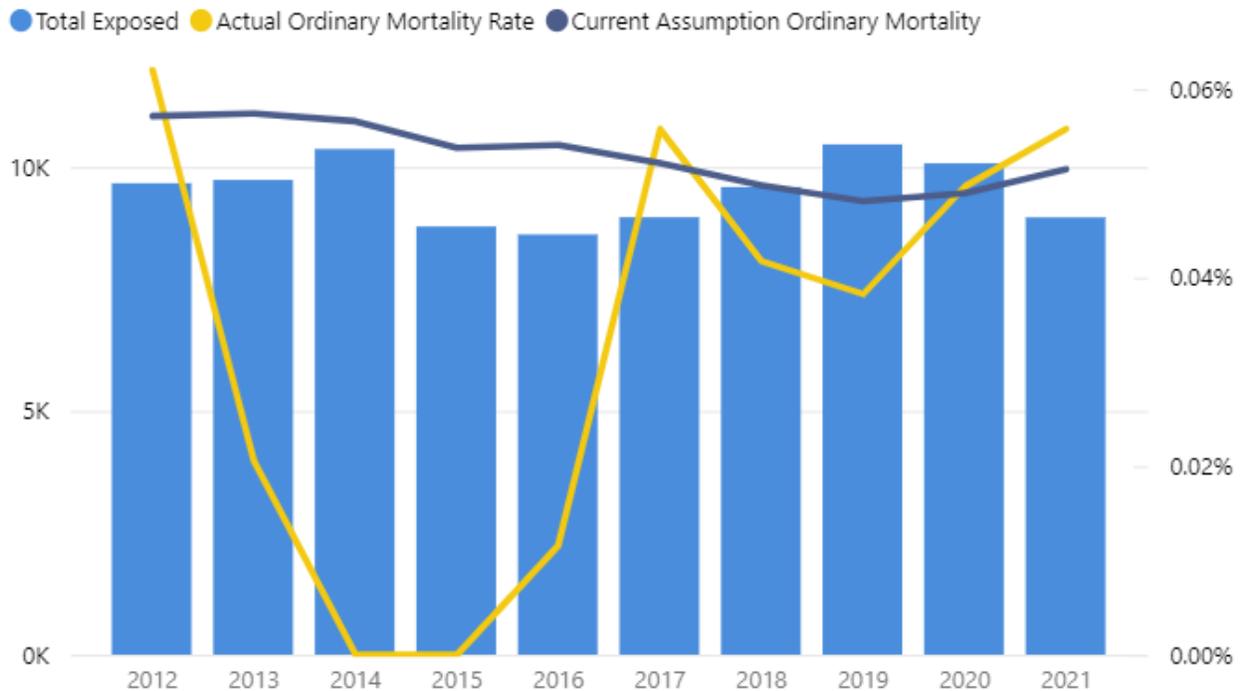
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Ordinary Death

The following charts show the experience of ordinary death by year, for males and females combined, for the age range (20 to 62) and service range (0 to 34), during the period 2012 – 2021.

Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
2012	6	5.5	9,664	0.0621%	0.0571%	1.09
2013	2	5.6	9,733	0.0205%	0.0574%	0.36
2014	0	5.9	10,367	0.0000%	0.0566%	0.00
2015	0	4.7	8,777	0.0000%	0.0538%	0.00
2016	1	4.7	8,614	0.0116%	0.0541%	0.21
2017	5	4.7	8,968	0.0558%	0.0521%	1.07
2018	4	4.8	9,587	0.0417%	0.0498%	0.84
2019	4	5.0	10,461	0.0382%	0.0481%	0.79
2020	5	4.9	10,073	0.0496%	0.0489%	1.01
2021	5	4.6	8,965	0.0558%	0.0515%	1.08
Total	32	50.4	95,209	0.0336%	0.0529%	0.64

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



Specific observations:

- Actual deaths were less than expected during the study period (A/E ratio of 0.64).
- During 2020 – 2021, actual deaths were slightly greater than expected (A/E ratio of 1.05).
- There was only one ordinary death recorded during 2014 – 2016. We don't know what generated these anomalous results; one potential cause is problems with the data. In the prior experience study report, there was no mention that mortality data may be unreliable, and this issue will be reviewed further with OA.
- Actual rates of death among males (A/E ratio of 0.62) were consistent with females (0.66).
- The rates of ordinary deaths are nearly half than those used for General employees and the experience is consistent with that assumption.
- Due to the small number of deaths during the study period, we did not include any gender specific analysis.

Accidental Death

The accidental death rate assumption is a constant percentage that does not vary by gender nor age and is not subject to mortality improvements. During the Covid pandemic, there were deaths characterized as accidental deaths. The following table shows the experience of accidental death by year.

Plan Year	Actual Accidental Deaths	Expected Accidental Deaths	Total Exposed	Actual Accidental Mortality Rate	Current Assumption Accidental Mortality	Ratio Act/Exp Accidental Mortality
2012	0	0.5	9,728	0.0000%	0.0050%	0.00
2013	0	0.5	9,821	0.0000%	0.0050%	0.00
2014	0	0.5	10,493	0.0000%	0.0049%	0.00
2015	0	0.4	8,833	0.0000%	0.0050%	0.00
2016	0	0.4	8,691	0.0000%	0.0050%	0.00
2017	0	0.4	9,071	0.0000%	0.0050%	0.00
2018	0	0.5	9,689	0.0000%	0.0050%	0.00
2019	0	0.5	10,563	0.0000%	0.0050%	0.00
2020	7	0.5	10,174	0.0688%	0.0050%	13.87
2021	0	0.4	9,078	0.0000%	0.0049%	0.00
Total	7	4.8	96,141	0.0073%	0.0050%	1.47

Specific observations:

- Excluding 2020 – 2021, there were no accidental deaths during the study period.

Section I(C) – Sanitation Employees of New York City Employees’ Retirement System (NYCERS)

Exposures and Decrements

To set the exposures and actual decrements for NYCERS Sanitation employees, 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.

NYCERS Retirement Eligibility Chart - Sanitation

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
F	Basic 62/5	TRUE	TRUE	62	5			55	5
M	Sanitation - Improved Plan - Tier 4	BOTH	FALSE	0	20				
M	Sanitation - Improved Plan - Tier 6	TRUE	FALSE	0	25			0	20

Please note that Plan Code M Sanitation - Improved Plan – Tier 6 represents Sanitation employees in the Tier 3 22-year plan.

For Sanitation employees in the Basic 62/5 Plan, OA applies the General employee actuarial assumptions. Therefore, these members are included in the General employee experience.

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. A little more than half of the number of Sanitation employees were indicated as electing an improved plan.

Due to the rounding of service, there can be members with service of 19 years who terminated, but actually retired when first completed 20 years. In this report, these records are not reflected in the retirement analysis, but we do note the potential impact. In our final report we intend to treat them as retired with 20 years of service.

Withdrawal

The current withdrawal assumption varies by service.

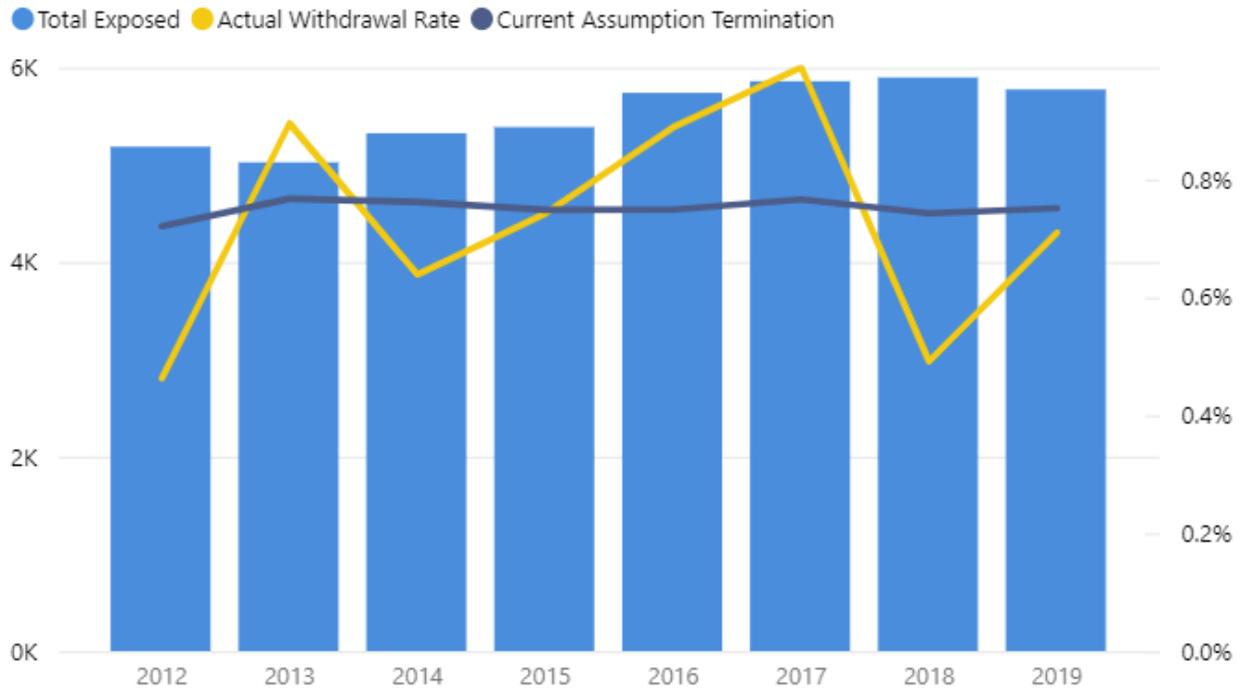
The following table shows the experience for withdrawal by year, for the age range (25 to 54), and service range (0 to 18 years). Based on the current assumptions, the overall expected rate of withdrawal averaged 0.76% whereas the actual rate was at 0.72%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	24	37.4	5,186	0.46%	0.72%	▲ 0.64
2013	45	38.6	5,025	0.90%	0.77%	▲ 1.17
2014	34	40.6	5,324	0.64%	0.76%	▲ 0.84
2015	40	40.3	5,388	0.74%	0.75%	● 0.99
2016	51	43.0	5,740	0.89%	0.75%	▲ 1.19
2017	58	44.9	5,859	0.99%	0.77%	▲ 1.29
2018	29	43.8	5,898	0.49%	0.74%	▲ 0.66
2019	41	43.4	5,775	0.71%	0.75%	● 0.95
2020	36	46.1	5,578	0.65%	0.83%	▲ 0.78
2021	43	44.7	5,626	0.76%	0.79%	● 0.96
Total	401	422.7	55,399	0.72%	0.76%	● 0.95

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. Note that from 2016 to 2020, between 5% and 11% of all NYCERS records with a status code of LOA were changed to rehire. Hence, between 89% and 95% of the LOA records are eventually coded as withdrawal, retired, disabled or death. Excluding these two years, the actual rate of termination of 0.73% was nearly equal to the assumed rate of 0.75% for an A/E ratio of 0.97 as shown in the following tables.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	24	37.4	5,186	0.46%	0.72%	▲ 0.64
2013	45	38.6	5,025	0.90%	0.77%	▲ 1.17
2014	34	40.6	5,324	0.64%	0.76%	▲ 0.84
2015	40	40.3	5,388	0.74%	0.75%	● 0.99
2016	51	43.0	5,740	0.89%	0.75%	▲ 1.19
2017	58	44.9	5,859	0.99%	0.77%	▲ 1.29
2018	29	43.8	5,898	0.49%	0.74%	▲ 0.66
2019	41	43.4	5,775	0.71%	0.75%	● 0.95
Total	322	331.9	44,195	0.73%	0.75%	● 0.97

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



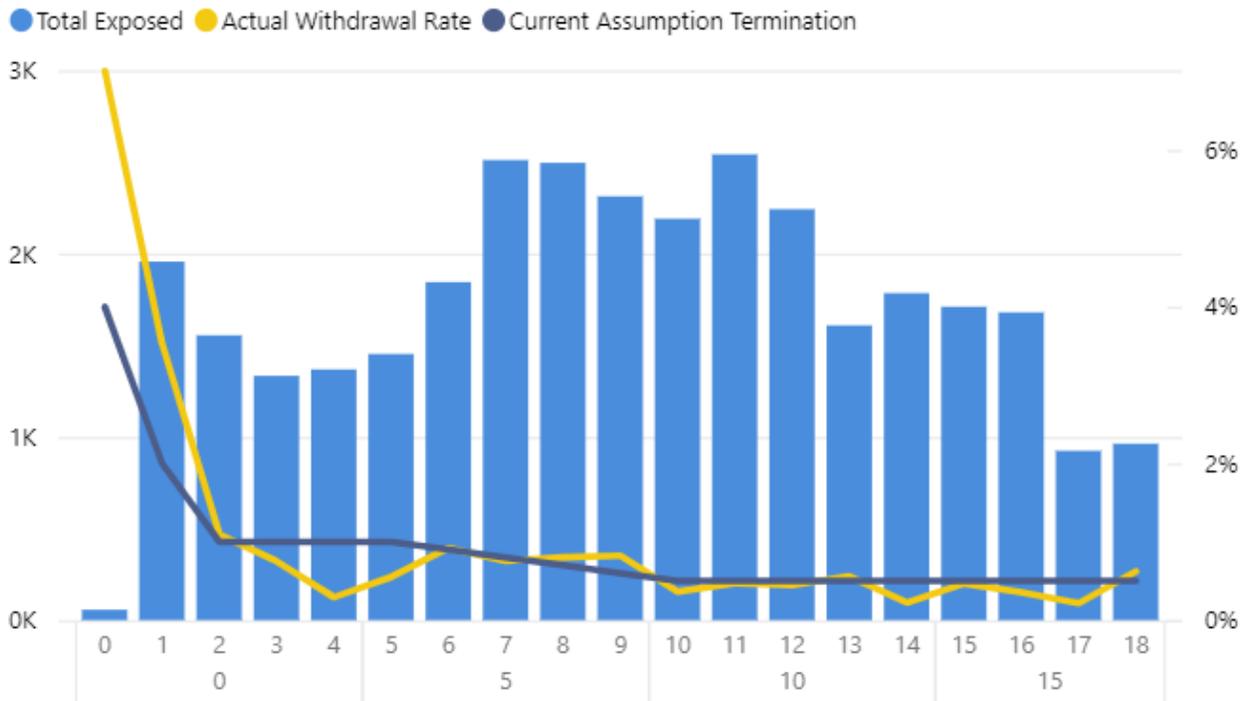
Specific observations on the results through 2019:

- The actual rates of withdrawal are much less than other groups as no year exceeded 1%.
- Experience for members with 19 years of service was excluded as a significant number were recorded as terminations during 2020 which skewed the experience.

The following charts show the experience by service (0 to 18 years) in the experience study period through 2017, prior to the addition of new data.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	4	2.3	57	7.02%	4.00%	◆ 1.75
1	69	39.1	1,956	3.53%	2.00%	◆ 1.76
2	17	15.5	1,554	1.09%	1.00%	● 1.09
3	10	13.3	1,333	0.75%	1.00%	▲ 0.75
4	4	13.7	1,368	0.29%	1.00%	◆ 0.29
5	8	14.5	1,452	0.55%	1.00%	▲ 0.55
6	17	16.6	1,844	0.92%	0.90%	● 1.02
7	19	20.1	2,510	0.76%	0.80%	● 0.95
8	20	17.5	2,495	0.80%	0.70%	▲ 1.15
9	19	13.9	2,312	0.82%	0.60%	▲ 1.37
10	8	10.9	2,190	0.37%	0.50%	▲ 0.73
11	12	12.7	2,541	0.47%	0.50%	● 0.94
12	10	11.2	2,242	0.45%	0.50%	▲ 0.89
13	9	8.0	1,608	0.56%	0.50%	▲ 1.12
14	4	8.9	1,784	0.22%	0.50%	◆ 0.45
15	8	8.5	1,710	0.47%	0.50%	● 0.94
16	6	8.4	1,679	0.36%	0.50%	▲ 0.71
17	2	4.6	924	0.22%	0.50%	◆ 0.43
18	6	4.8	963	0.62%	0.50%	▲ 1.25
Total	252	244.7	32,522	0.77%	0.75%	● 1.03

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



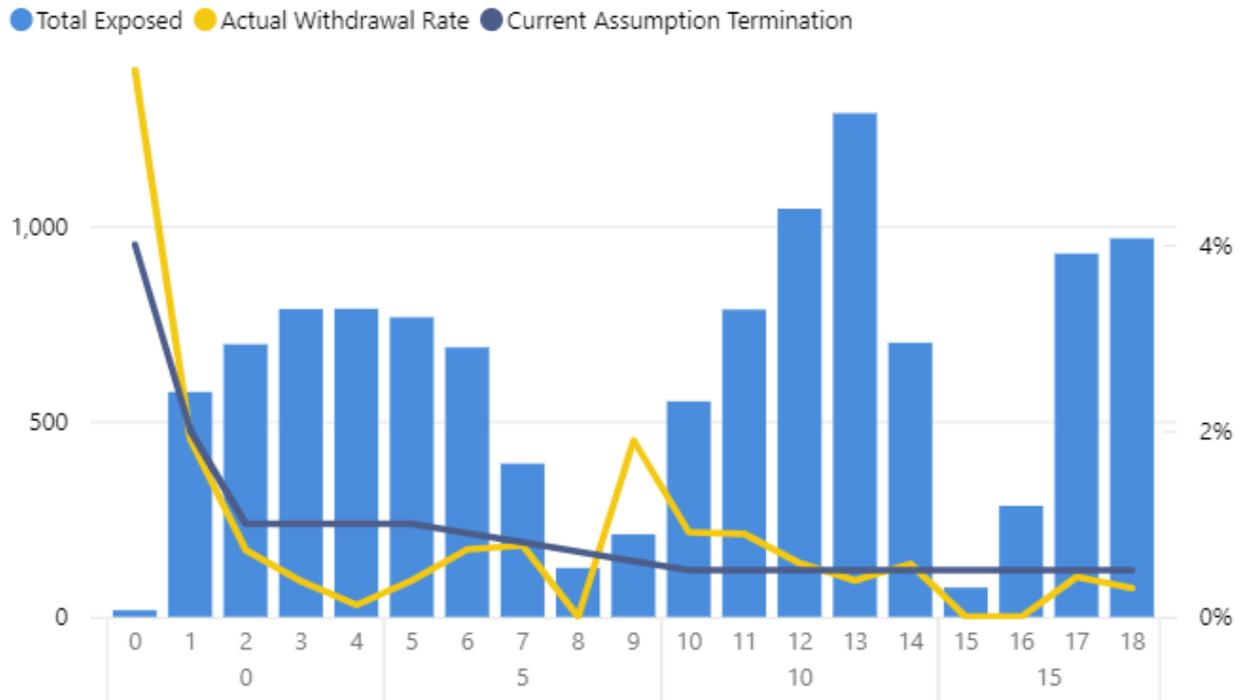
Specific observations:

- For short-service members with up to one year of service, the actual rate of withdrawal exceeded expectations (A/E ratio of 1.76).
- For members with between 2 and 5 years of service, the actual rate of withdrawal was less than expected (A/E ratio of 0.68).
- For members with between 6 and 18 years of service, the actual rate of withdrawal was similar to expectations (A/E ratio of 0.96).

The following chart shows the experience for the two-year period July 1, 2017 – June 30, 2019 (2018 and 2019) by service (0 to 18 years).

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	1	0.7	17	5.88%	4.00%	▲ 1.47
1	11	11.5	575	1.91%	2.00%	● 0.96
2	5	7.0	697	0.72%	1.00%	▲ 0.72
3	3	7.9	787	0.38%	1.00%	◆ 0.38
4	1	7.9	788	0.13%	1.00%	◆ 0.13
5	3	7.7	766	0.39%	1.00%	◆ 0.39
6	5	6.2	689	0.73%	0.90%	▲ 0.81
7	3	3.1	392	0.77%	0.80%	● 0.96
8	0	0.9	125	0.00%	0.70%	◆ 0.00
9	4	1.3	211	1.90%	0.60%	◆ 3.16
10	5	2.8	551	0.91%	0.50%	◆ 1.81
11	7	3.9	786	0.89%	0.50%	◆ 1.78
12	6	5.2	1,044	0.57%	0.50%	▲ 1.15
13	5	6.4	1,288	0.39%	0.50%	▲ 0.78
14	4	3.5	701	0.57%	0.50%	▲ 1.14
15	0	0.4	75	0.00%	0.50%	◆ 0.00
16	0	1.4	284	0.00%	0.50%	◆ 0.00
17	4	4.6	929	0.43%	0.50%	▲ 0.86
18	3	4.8	968	0.31%	0.50%	▲ 0.62
Total	70	87.2	11,673	0.60%	0.75%	▲ 0.80

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



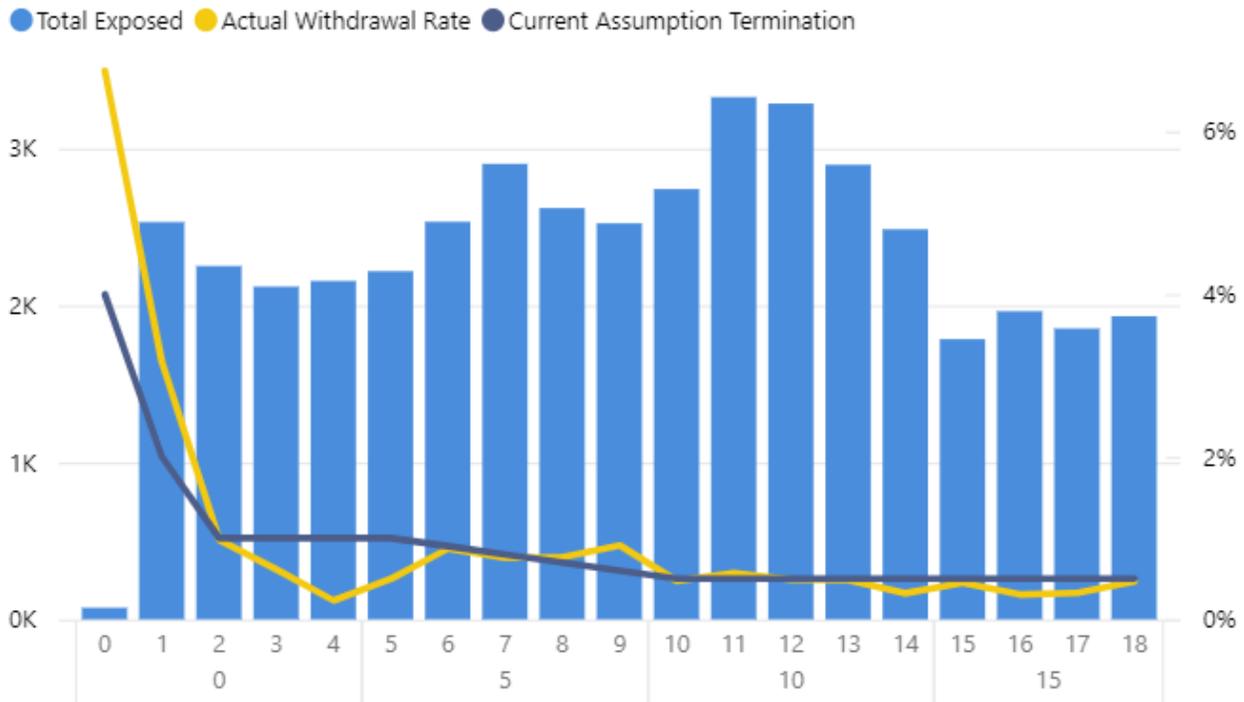
Specific observations for the 2-year period 2018-2019:

- The experience during 2018 – 2019 exhibited similar patterns to the experience from 2012 – 2017, although the overall level of withdrawal was lower.
 - For service periods between 0 and 1 years, the A/E ratio was 0.99, which is lower than the 1.76 A/E ratio of the period 2012 to 2017.
 - For service periods 2 to 5 years of service, the A/E ratio was 0.39 vs 0.68.
 - For service periods 6 to 18 years, the A/E ratio was 1.03 vs 0.96.

The following charts show the combined experience for 2012 – 2019, by service (0 to 18 years), for the age range of 25 to 54.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	5	3.0	74	6.76%	4.00%	◆ 1.69
1	80	50.6	2,531	3.16%	2.00%	◆ 1.58
2	22	22.5	2,251	0.98%	1.00%	● 0.98
3	13	21.2	2,120	0.61%	1.00%	▲ 0.61
4	5	21.6	2,156	0.23%	1.00%	◆ 0.23
5	11	22.2	2,218	0.50%	1.00%	◆ 0.50
6	22	22.8	2,533	0.87%	0.90%	● 0.97
7	22	23.2	2,902	0.76%	0.80%	● 0.95
8	20	18.3	2,620	0.76%	0.70%	● 1.09
9	23	15.1	2,523	0.91%	0.60%	◆ 1.52
10	13	13.7	2,741	0.47%	0.50%	● 0.95
11	19	16.6	3,327	0.57%	0.50%	▲ 1.14
12	16	16.4	3,286	0.49%	0.50%	● 0.97
13	14	14.5	2,896	0.48%	0.50%	● 0.97
14	8	12.4	2,485	0.32%	0.50%	▲ 0.64
15	8	8.9	1,785	0.45%	0.50%	▲ 0.90
16	6	9.8	1,963	0.31%	0.50%	▲ 0.61
17	6	9.3	1,853	0.32%	0.50%	▲ 0.65
18	9	9.7	1,931	0.47%	0.50%	● 0.93
Total	322	331.9	44,195	0.73%	0.75%	● 0.97

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



Specific observations for the period 2012 - 2019:

- For service periods from 0 to 1 year, actual withdrawal rates were 59% greater than the assumed rates (A/E ratio of 1.59).
- For those with between 2 and 5 years of service, the actual experience was less than the assumed rates (A/E ratio of 0.58).
- For those with between 6 and 18 years of service, the actual experience was less than the assumed rates (A/E ratio of 0.97).

Summary

Greater rates of withdrawal occurred during the first two years of employment, but this was offset by fewer withdrawals during the study period 2 to 5 years. For service periods 6 to 18 years, the experience was similar to expectations.

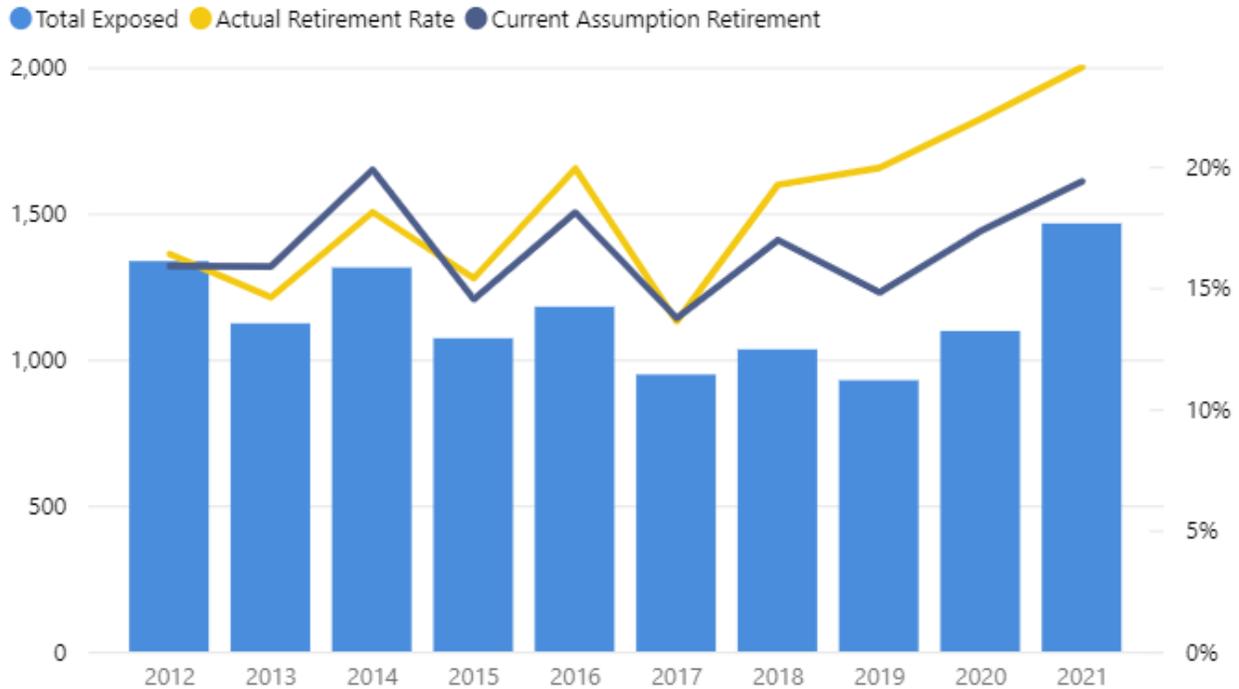
Retirement

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 following table shows the retirement experience of all the plans by year, for the age range (40 to 69) and service range (20 to 39 years). Based on the current assumptions, the overall expected rate of retirement averaged 16.83% during this period, whereas the actual rate was 18.46% for an A/E ratio of 1.10. This excludes 180 retirements with 19 years of service. Reflecting these retirements, the overall A/E ratio would increase to approximately 1.16.

Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	219	212.3	1,336	16.39%	15.89%	1.03
2013	164	178.3	1,123	14.60%	15.87%	0.92
2014	238	261.2	1,314	18.11%	19.88%	0.91
2015	165	155.7	1,072	15.39%	14.52%	1.06
2016	235	213.6	1,181	19.90%	18.08%	1.10
2017	129	130.3	949	13.59%	13.73%	0.99
2018	199	175.9	1,038	19.17%	16.94%	1.13
2019	185	137.5	932	19.85%	14.75%	1.35
2020	241	190.6	1,106	21.79%	17.23%	1.26
2021	354	284.8	1,480	23.92%	19.25%	1.24
Total	2,129	1,940.1	11,531	18.46%	16.83%	1.10

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



The rate of retirement during 2020 and 2021 may be slightly lower than shown in this report due to the treatment of members with a LOA status code. While the percentage of members with a LOA code who have a retired status code in the following two years is approximately 2%, the number of retirements not captured in each of these two years could be roughly 700 for all NYCERS members. We have not tabulated the specific breakdown for this group. We do note that there were more retirements in 2020 – 2021 than expected.

Specific observations:

- The actual rate of retirement during 2012 – 2017 was very similar to expectations (A/E ratio of 1.00).
- The actual rate of retirement exceeded the assumption from 2018 – 2021 (A/E ratio of 1.24).
- A higher retirement assumption applies to members who elected an improved plan versus other members and actual experience was consistent with that assertion. Average rate of retirement for those who elected an improved plan code was 19.34% versus 17.77% for other members.

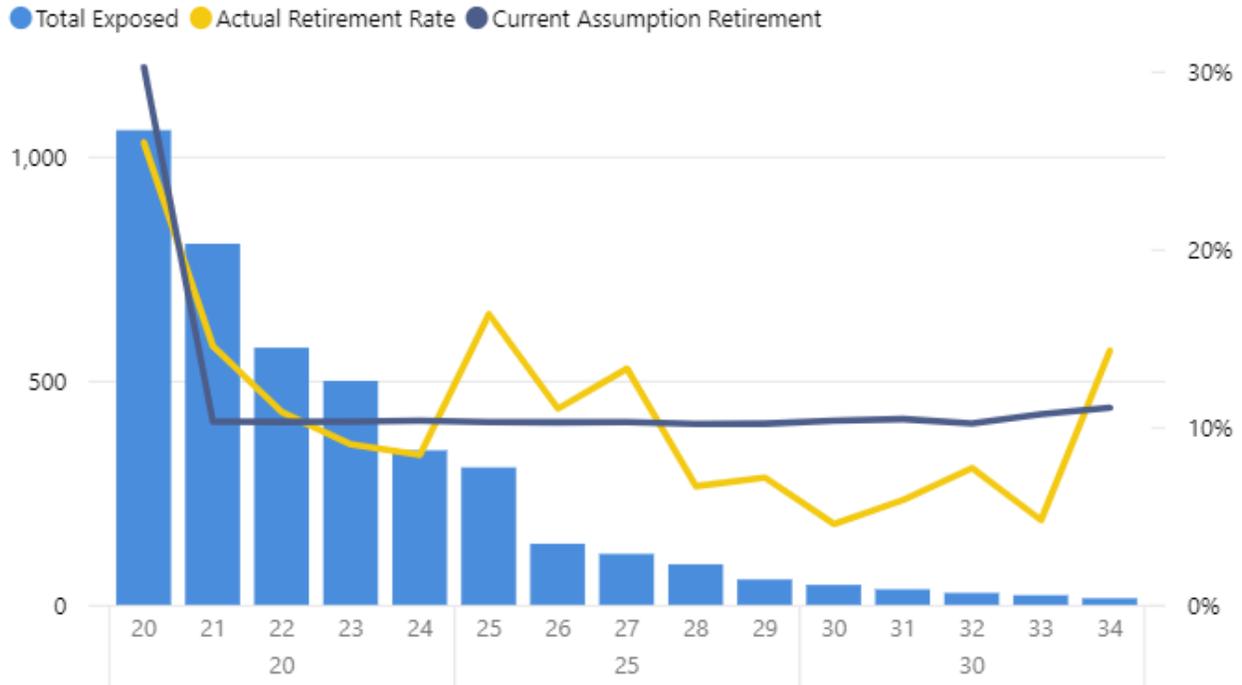
We will review the retirement experience split by mandated versus improved plan members.

Mandated Plan

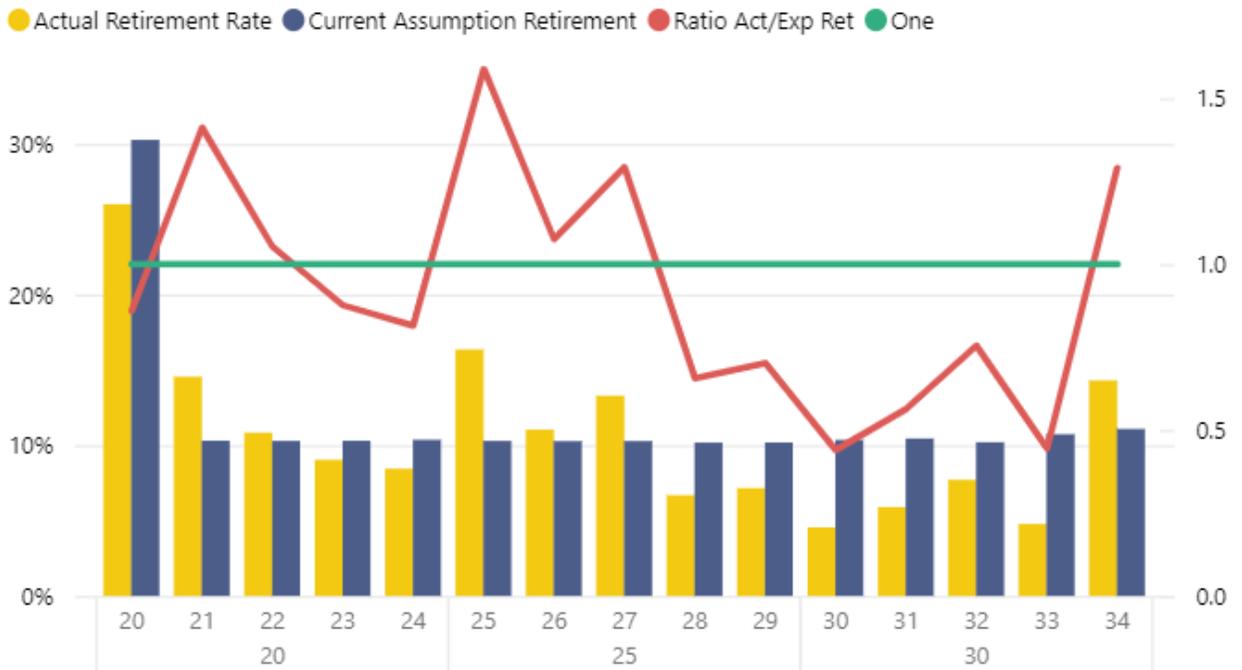
The following charts display the experience of mandated plan members, by service (20 to 34) for the age range 40 to 69, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
20	275	320.2	1,060	25.94%	30.21%	▲ 0.86
21	117	82.9	807	14.50%	10.28%	▲ 1.41
22	62	59.0	575	10.78%	10.26%	● 1.05
23	45	51.4	501	8.98%	10.26%	▲ 0.88
24	29	35.6	344	8.43%	10.35%	▲ 0.81
25	50	31.7	307	16.29%	10.34%	◆ 1.57
26	15	14.1	137	10.95%	10.26%	● 1.07
27	15	11.6	113	13.27%	10.27%	▲ 1.29
28	6	9.2	90	6.67%	10.17%	▲ 0.66
29	4	5.7	56	7.14%	10.18%	▲ 0.70
30	2	4.6	44	4.55%	10.34%	◆ 0.44
31	2	3.6	34	5.88%	10.44%	▲ 0.56
32	2	2.7	26	7.69%	10.19%	▲ 0.75
33	1	2.3	21	4.76%	10.71%	◆ 0.44
34	2	1.6	14	14.29%	11.07%	▲ 1.29
Total	627	635.9	4,129	15.19%	15.40%	● 0.99

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



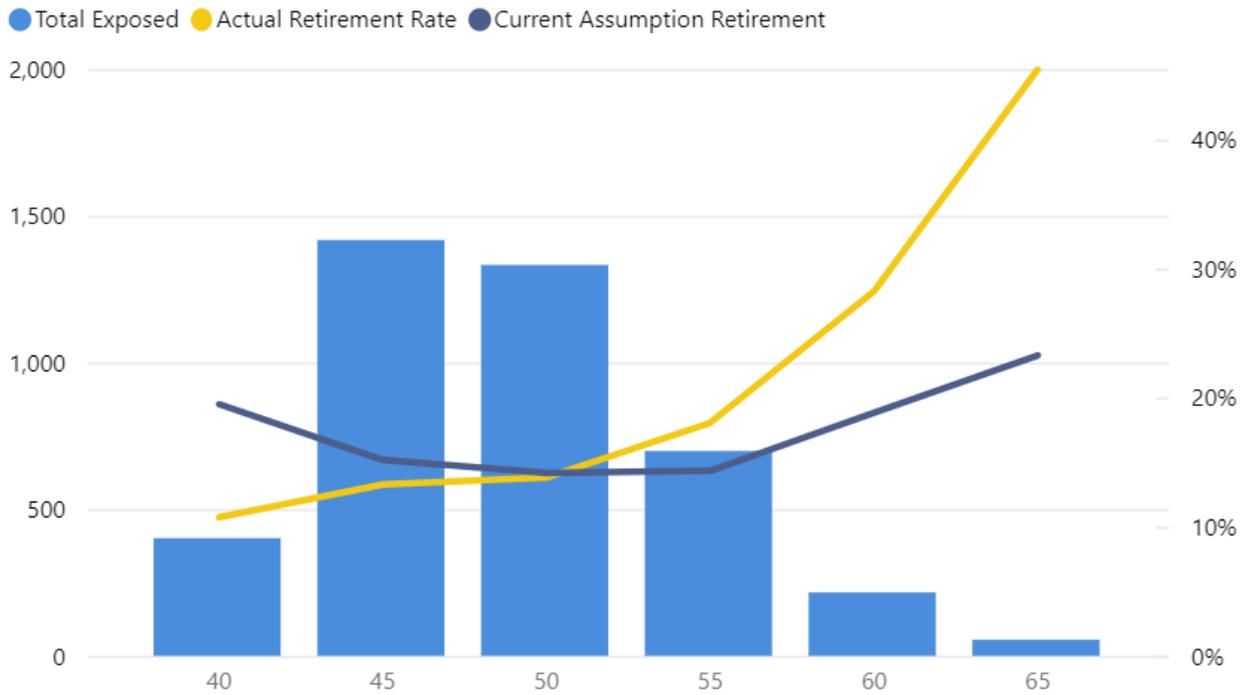
Retirement Rate - Actual, Expected, and Ratio; by Service



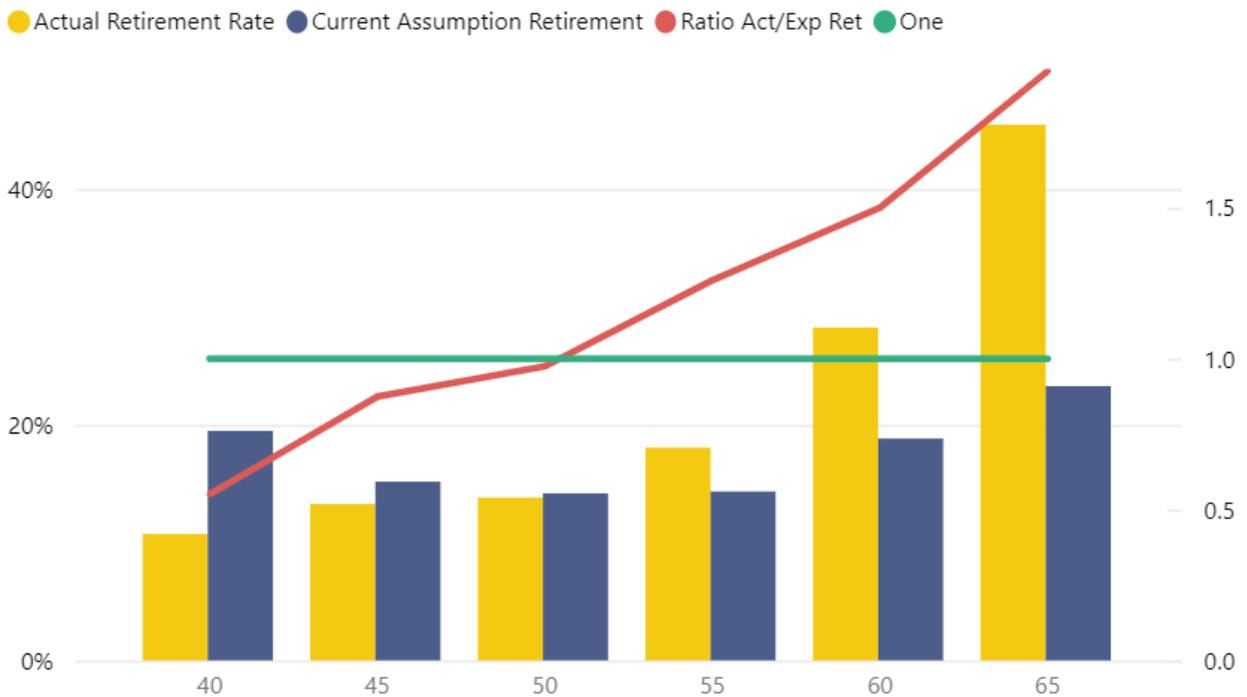
The following charts display the experience of mandated plan members, by age, for the age range 40 to 69 and service range 20 to 34, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
40	1	3.1	13	7.69%	23.85%	0.32
41	5	7.4	34	14.71%	21.76%	0.68
42	7	16.8	76	9.21%	22.11%	0.42
43	13	20.5	113	11.50%	18.10%	0.64
44	17	30.4	167	10.18%	18.22%	0.56
45	35	35.1	215	16.28%	16.33%	1.00
46	34	44.2	275	12.36%	16.09%	0.77
47	35	48.8	313	11.18%	15.60%	0.72
48	50	45.6	320	15.63%	14.25%	1.10
49	34	41.2	296	11.49%	13.92%	0.83
50	33	46.1	303	10.89%	15.21%	0.72
51	38	39.3	291	13.06%	13.51%	0.97
52	45	36.4	263	17.11%	13.86%	1.23
53	29	34.0	247	11.74%	13.77%	0.85
54	39	33.4	233	16.74%	14.36%	1.17
55	31	26.3	194	15.98%	13.57%	1.18
56	34	25.2	166	20.48%	15.18%	1.35
57	16	17.7	127	12.60%	13.94%	0.90
58	22	16.9	115	19.13%	14.70%	1.30
59	23	13.9	97	23.71%	14.33%	1.65
60	13	9.2	68	19.12%	13.53%	1.41
61	19	9.8	54	35.19%	18.06%	1.95
62	8	10.6	38	21.05%	27.89%	0.75
63	10	6.0	30	33.33%	20.00%	1.67
64	11	5.1	26	42.31%	19.62%	2.16
65	6	5.3	19	31.58%	27.89%	1.13
66	10	2.7	14	71.43%	19.29%	3.70
67	4	2.1	9	44.44%	23.33%	1.90
68	2	1.5	7	28.57%	21.43%	1.33
69	3	1.2	6	50.00%	20.00%	2.50
Total	627	635.9	4,129	15.19%	15.40%	0.99

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



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



Specific observations:

- Overall, actual retirements of mandated plan members were very similar to that expected (A/E ratio of 0.99).
- For the age range 55 to 69, actual retirements exceeded the assumption by 38% (A/E ratio of 1.38).

Since retirements at first eligibility may have been recorded at 19 years of service, the rates of retirement at first eligibility may thus be understated in the charts above. We have estimated that the number of retirements was greater than expected (A/E ratio 1.07) at first eligibility.

Improved Plan

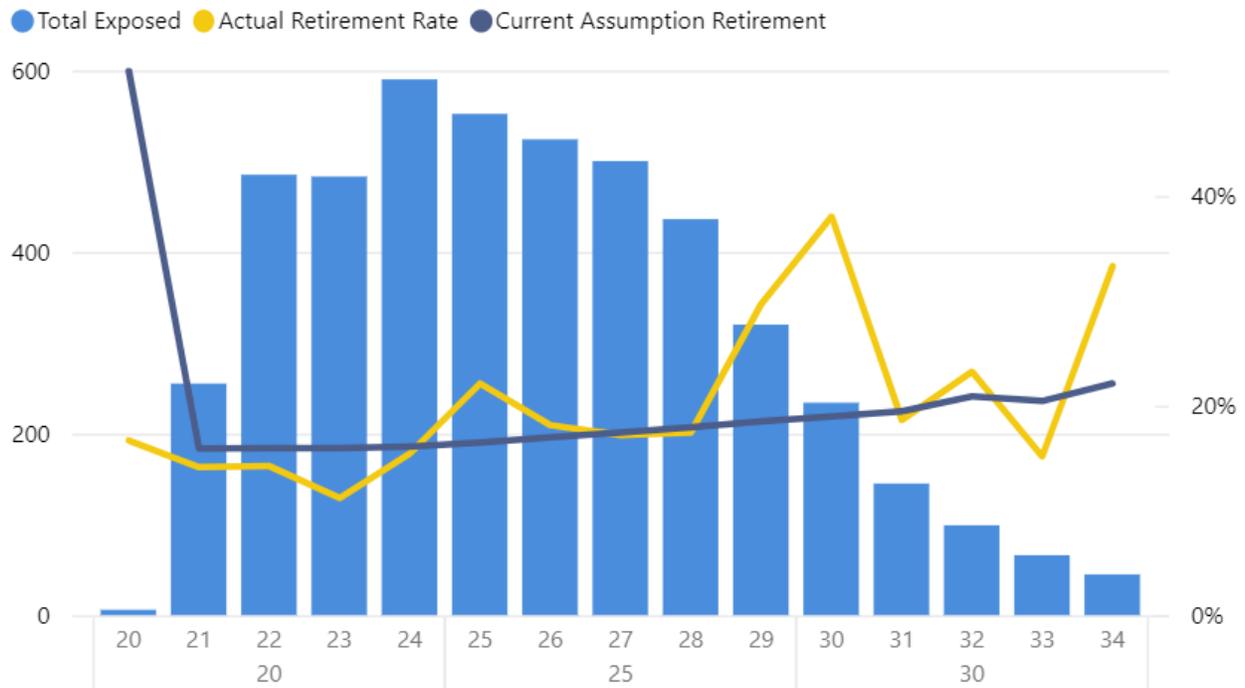
The number of improved plan members has been declining during the study period. The following chart displays the experience of improved plan members, by year for the age range 40 to 69 and service range service 20 to 34, during 2012 – 2019.

Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	200	189.2	1,133	17.65%	16.70%	1.06
2013	143	153.7	921	15.53%	16.69%	0.93
2014	133	130.4	762	17.45%	17.11%	1.02
2015	120	105.7	611	19.64%	17.29%	1.14
2016	114	84.9	480	23.75%	17.68%	1.34
2017	66	63.1	352	18.75%	17.93%	1.05
2018	69	49.9	278	24.82%	17.95%	1.38
2019	44	37.3	203	21.67%	18.39%	1.18
Total	889	814.1	4,740	18.76%	17.18%	1.09

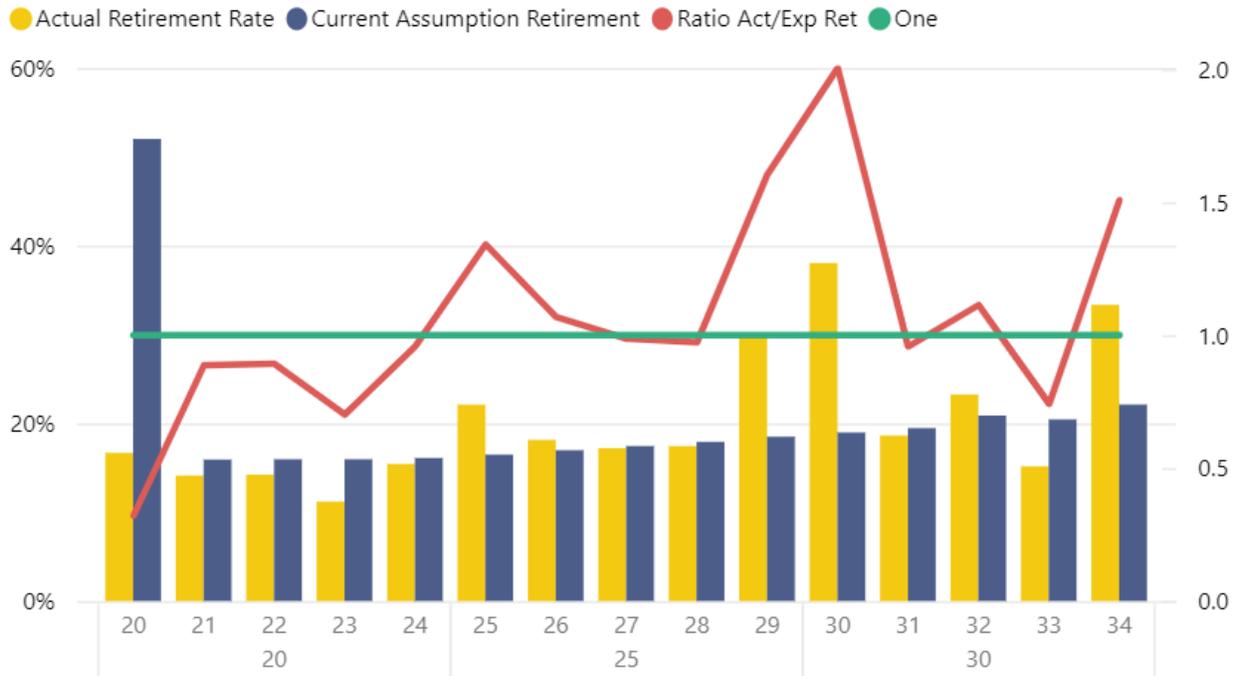
The following charts display the experience of improved plan members, by service (20 to 34) for the age range 40 to 69, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
20	1	3.1	6	16.67%	52.00%	0.32
21	36	40.6	255	14.12%	15.92%	0.89
22	69	77.4	485	14.23%	15.95%	0.89
23	54	77.1	483	11.18%	15.95%	0.70
24	91	94.9	590	15.42%	16.09%	0.96
25	122	90.9	552	22.10%	16.47%	1.34
26	95	88.9	524	18.13%	16.97%	1.07
27	86	87.2	500	17.20%	17.44%	0.99
28	76	78.1	436	17.43%	17.92%	0.97
29	95	59.2	320	29.69%	18.49%	1.61
30	89	44.4	234	38.03%	18.97%	2.01
31	27	28.2	145	18.62%	19.46%	0.96
32	23	20.7	99	23.23%	20.87%	1.11
33	10	13.5	66	15.15%	20.44%	0.74
34	15	10.0	45	33.33%	22.11%	1.51
Total	889	814.1	4,740	18.76%	17.18%	1.09

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



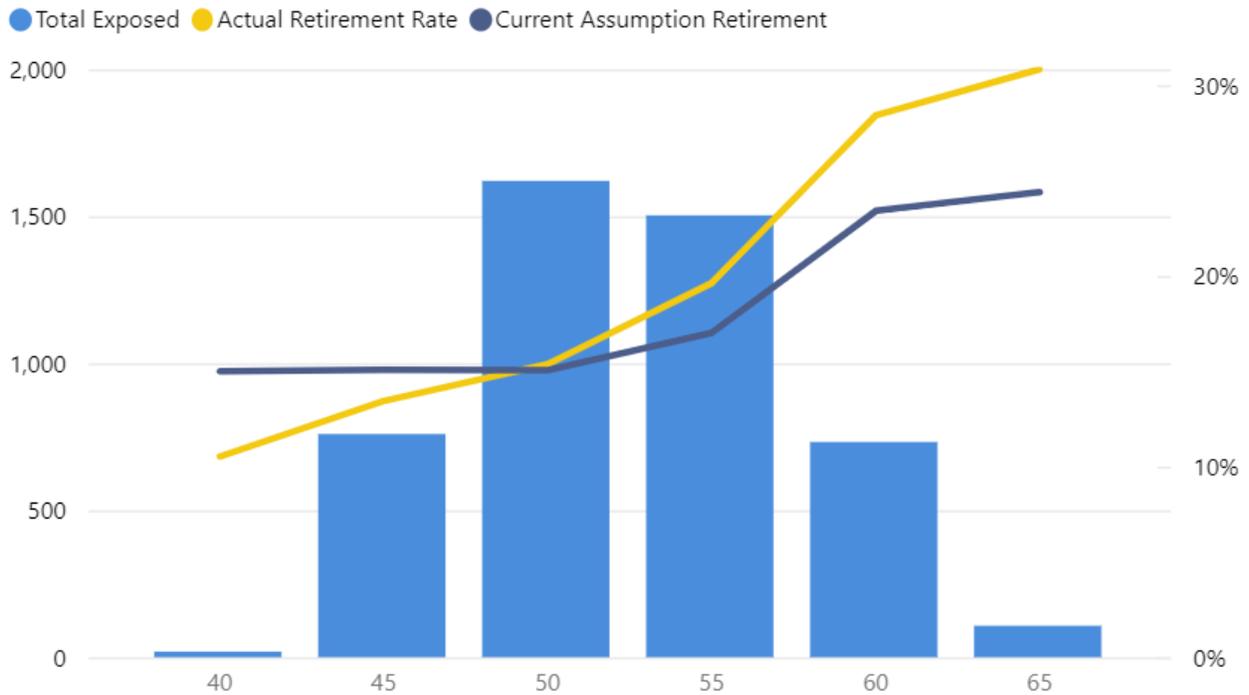
Retirement Rate - Actual, Expected, and Ratio; by Service



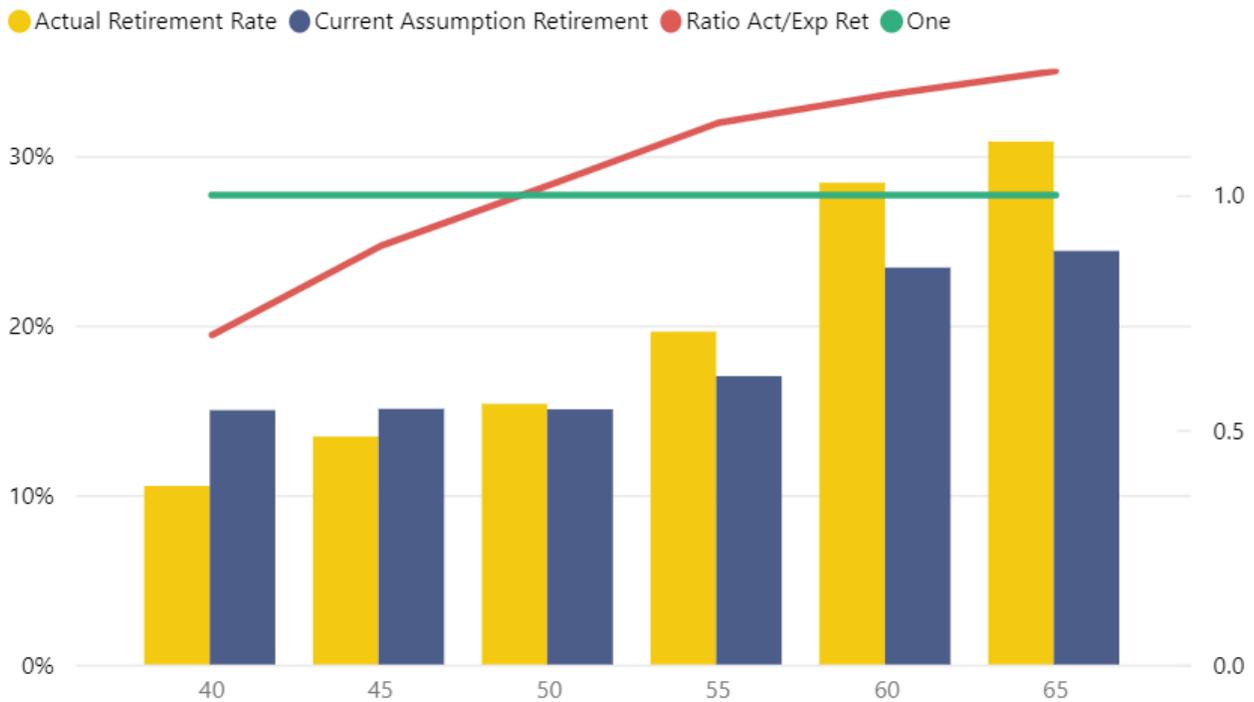
The following charts display the experience of improved plan members, by age, for the age range 40 to 69 and service range 20 to 34, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
42	1	0.2	1	100.00%	15.00%	6.67
43	0	0.3	2	0.00%	15.00%	0.00
44	1	2.4	16	6.25%	15.00%	0.42
45	8	6.6	42	19.05%	15.60%	1.22
46	8	14.1	94	8.51%	15.00%	0.57
47	19	22.4	149	12.75%	15.00%	0.85
48	28	32.7	218	12.84%	15.00%	0.86
49	39	38.7	256	15.23%	15.13%	1.01
50	37	43.7	289	12.80%	15.12%	0.85
51	45	49.2	328	13.72%	15.00%	0.91
52	52	51.5	341	15.25%	15.11%	1.01
53	58	51.6	344	16.86%	15.00%	1.12
54	57	47.7	318	17.92%	15.00%	1.19
55	61	46.1	304	20.07%	15.15%	1.32
56	47	47.2	295	15.93%	16.00%	1.00
57	63	53.9	317	19.87%	17.00%	1.17
58	54	54.2	301	17.94%	18.00%	1.00
59	70	54.3	286	24.48%	19.00%	1.29
60	44	46.8	232	18.97%	20.17%	0.94
61	67	48.3	193	34.72%	25.00%	1.39
62	50	44.7	149	33.56%	30.00%	1.12
63	30	18.6	93	32.26%	20.00%	1.61
64	17	13.0	65	26.15%	20.00%	1.31
65	16	14.1	47	34.04%	30.00%	1.13
66	11	5.2	26	42.31%	20.00%	2.12
67	0	2.8	14	0.00%	20.00%	0.00
68	4	2.6	13	30.77%	20.00%	1.54
69	2	1.4	7	28.57%	20.00%	1.43
Total	889	814.1	4,740	18.76%	17.18%	1.09

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



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



Specific observations:

- Overall, actual retirements of improved plan members exceeded the assumption by 9% (A/E ratio of 1.09).
- Rates of retirement were greater for improved plan members versus mandated plan members.
- There was very little experience for members at 20 years of service.
- Rates of retirement spiked at 25 and 30 years of service.
- Similar to mandated plan members, actual retirements exceeded the assumption by 18% for the age range 55 to 69 (A/E ratio of 1.18).

Disability

Current ordinary disability assumptions vary by age and do not apply during the 10-year eligibility service period. Furthermore, different rates apply to accidental disability; these rates depend on age and Tier and apply during all service periods. 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. For accidental disability, a higher final average salary minimum applies; 50% for Tier 3 non-enhanced disability members and 75% for all other members. The benefit is payable during the lifetime of the member and members may select any optional forms of payment.

Ordinary Disability

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. We made adjustments as far back as 2012. Although the volume of disability experience data is very small for Sanitation Employees, the number of ordinary disabilities were smallest during 2019 - 2021.

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.

The following tables show the experience of ordinary disability retirement for all plans, by year, for the age range 30 to 64 and the service range 10 to 34 years, through 2021.

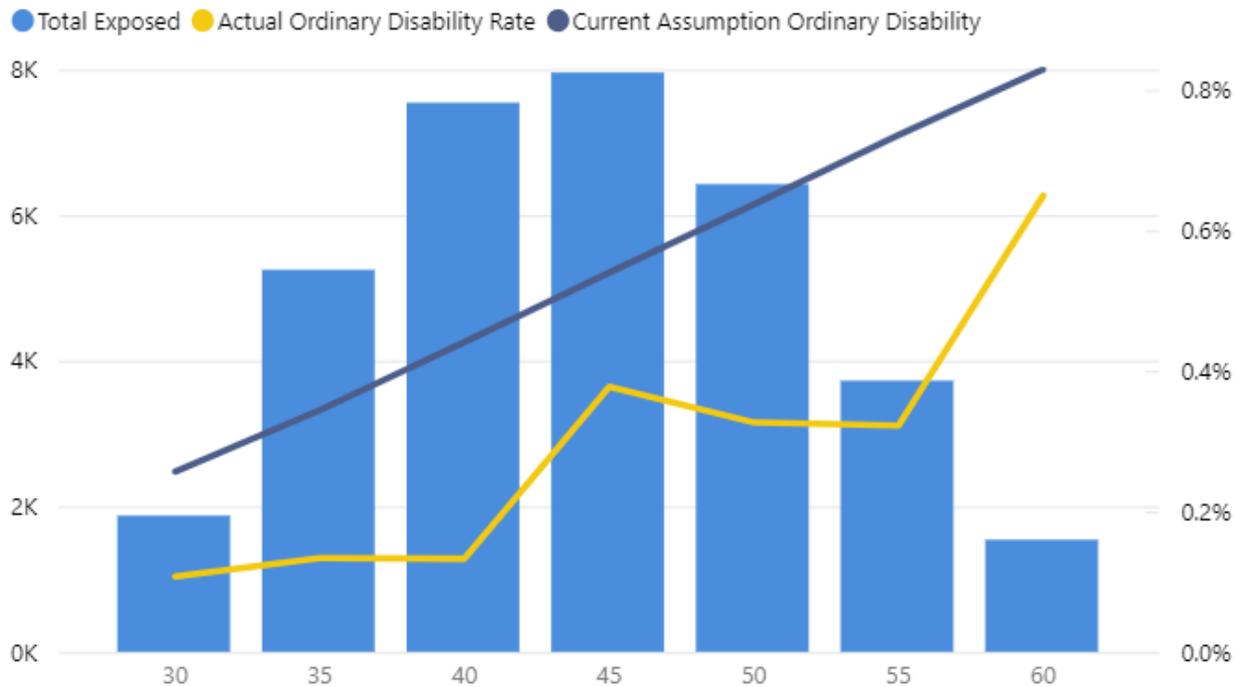
Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	15	21.5	4,079	0.3677%	0.5274%	▲ 0.70
2013	9	20.5	3,830	0.2350%	0.5357%	◆ 0.44
2014	10	19.6	3,594	0.2782%	0.5445%	▲ 0.51
2015	10	21.3	4,046	0.2472%	0.5270%	◆ 0.47
2016	18	23.4	4,531	0.3973%	0.5166%	▲ 0.77
2017	9	23.9	4,649	0.1936%	0.5136%	◆ 0.38
2018	17	25.1	4,839	0.3513%	0.5187%	▲ 0.68
2019	4	24.8	4,734	0.0845%	0.5240%	◆ 0.16
2020	11	24.1	4,526	0.2430%	0.5336%	◆ 0.46
2021	3	22.7	4,204	0.0714%	0.5396%	◆ 0.13
Total	106	227.0	43,032	0.2463%	0.5274%	◆ 0.47

The following tables show the experience of ordinary disability retirement, for all plans, by age, for the age range 30 to 64 and the service range 10 to 34 years, during the period 2012 - 2019.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.2	86	0.0000%	0.2000%	0.00
31	0	0.4	189	0.0000%	0.2200%	0.00
32	0	0.9	370	0.0000%	0.2400%	0.00
33	1	1.4	545	0.1835%	0.2600%	0.71
34	1	1.9	681	0.1468%	0.2800%	0.52
35	2	2.5	823	0.2430%	0.3000%	0.81
36	1	3.0	927	0.1079%	0.3200%	0.34
37	0	3.6	1,059	0.0000%	0.3400%	0.00
38	1	4.2	1,168	0.0856%	0.3600%	0.24
39	3	4.8	1,270	0.2362%	0.3800%	0.62
40	1	5.6	1,409	0.0710%	0.4000%	0.18
41	2	6.3	1,494	0.1339%	0.4200%	0.32
42	1	6.7	1,534	0.0652%	0.4400%	0.15
43	4	7.1	1,546	0.2587%	0.4600%	0.56
44	2	7.5	1,558	0.1284%	0.4800%	0.27
45	8	7.9	1,573	0.5086%	0.5000%	1.02
46	4	8.5	1,633	0.2449%	0.5200%	0.47
47	6	8.6	1,598	0.3755%	0.5400%	0.70
48	7	9.0	1,609	0.4351%	0.5600%	0.78
49	5	8.9	1,542	0.3243%	0.5800%	0.56
50	4	8.9	1,477	0.2708%	0.6000%	0.45
51	6	8.7	1,404	0.4274%	0.6200%	0.69
52	7	8.4	1,313	0.5331%	0.6400%	0.83
53	2	7.8	1,184	0.1689%	0.6600%	0.26
54	2	7.1	1,045	0.1914%	0.6800%	0.28

55	2	6.5	924	0.2165%	0.7000%	◇	0.31
56	3	5.8	811	0.3699%	0.7200%	▲	0.51
57	0	5.4	734	0.0000%	0.7400%	◇	0.00
58	4	5.1	665	0.6015%	0.7600%	▲	0.79
59	3	4.6	591	0.5076%	0.7800%	▲	0.65
60	1	3.8	474	0.2110%	0.8000%	◇	0.26
61	3	3.3	398	0.7538%	0.8200%	●	0.92
62	1	2.5	303	0.3300%	0.8400%	◇	0.39
63	2	1.8	209	0.9569%	0.8600%	▲	1.11
64	3	1.4	156	1.9231%	0.8800%	◇	2.19
Total	92	180.1	34,302	0.2682%	0.5251%	▲	0.51

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



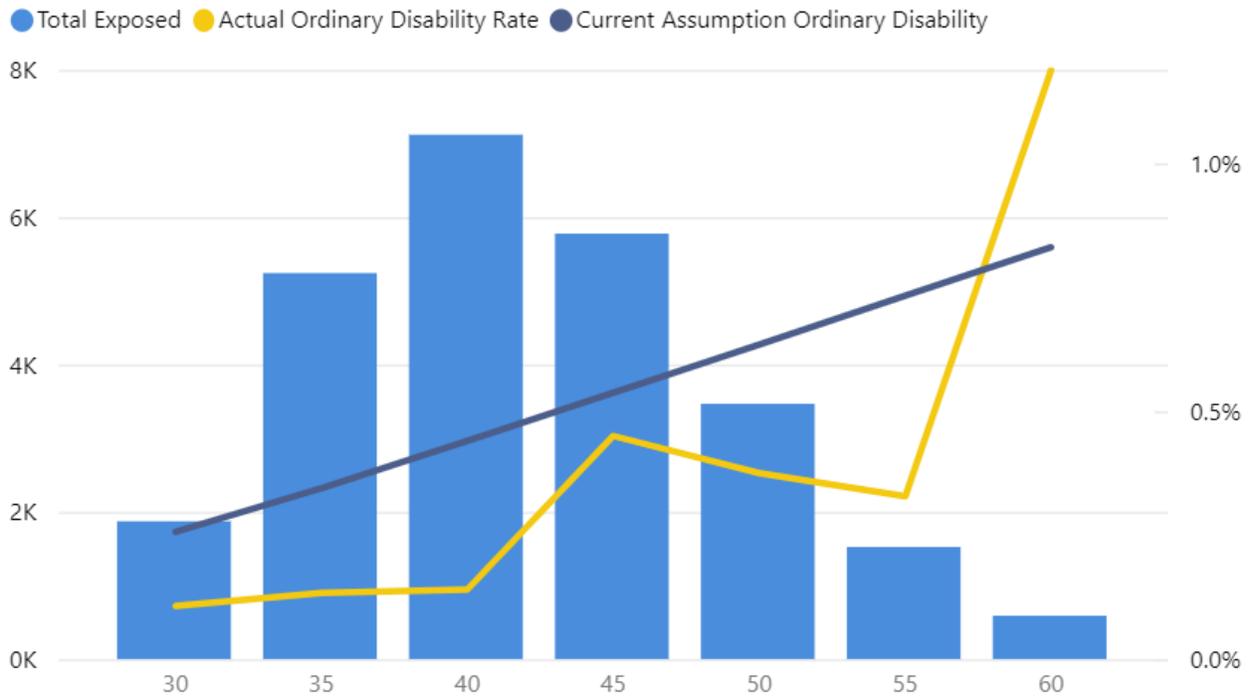
Specific observations:

- Overall, the number of ordinary disability retirements was much less than expected (A/E ratio of 0.51).
- The number of actual disabilities is influenced by whether the member has accrued 20 years of service.

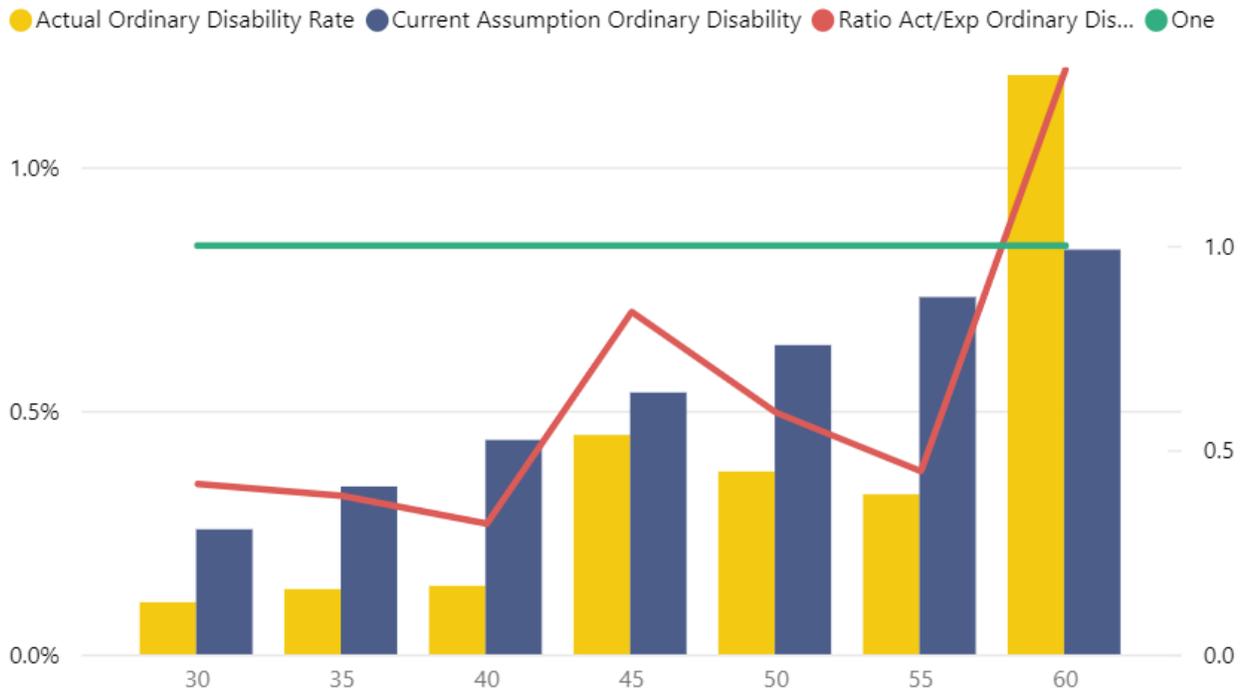
Service Less than 20 Years

The following charts show the results of members for the service range 10 to 19 years.

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



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



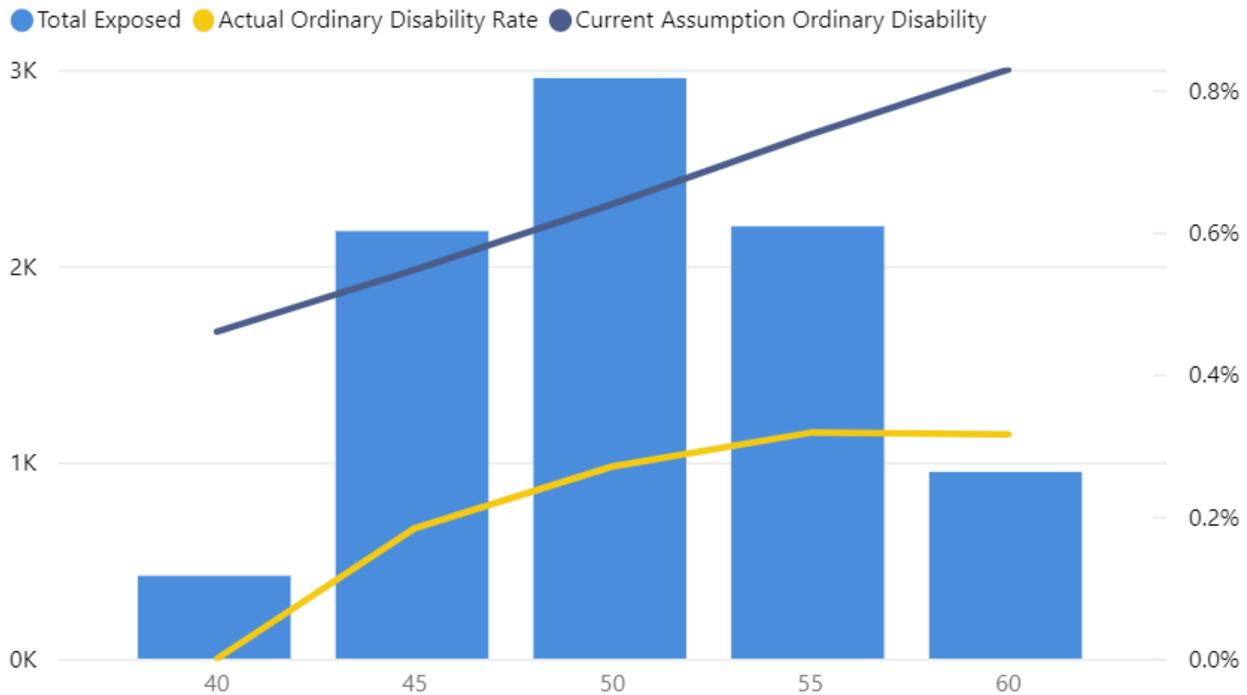
Specific observations:

- Rates of ordinary disability are higher for members who are not eligible for retirement than members who are. Excluding members who are eligible for retirement increases the A/E ratio from 0.51 to 0.57.

Service Greater than 20 Years

The following charts show the results of members who accrued at least 20 years of service.

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



Specific observations:

- For members with at least 20 years of service, there were only 22 ordinary disability retirements but 57 expected.

Summary

Retirement eligibility appears to have a significant impact on the members who apply for a disability retirement. Consequently, it may be desirable to use disability rates to account for this variable.

Accidental Disability

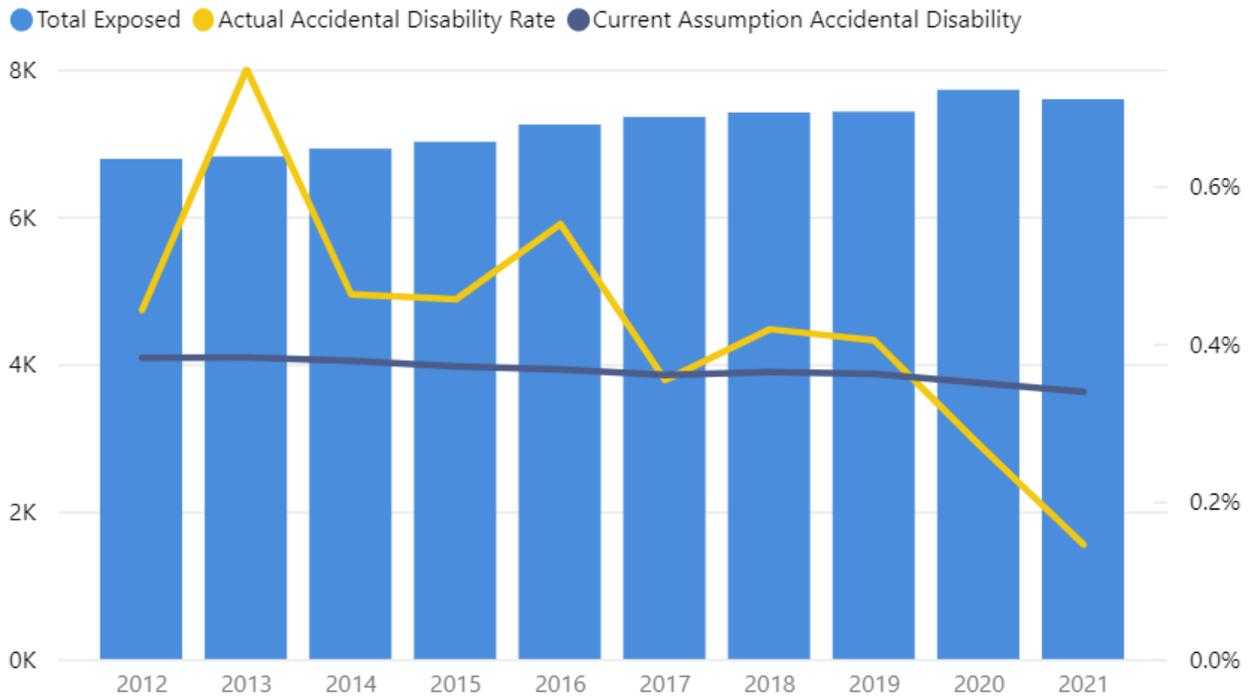
As noted in the section of ordinary disability, it is necessary to reassign disability retirement codes retroactively to reflect the eventual approval of a disability retirement. Members with a disability code in a given year had all inactive status codes in prior years changed to a disability status code. Although the volume of disability experience data is very small for Sanitation Employees, the number of accidental disabilities were smallest during 2020 - 2021.

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 2020 – 2021.

The following tables show the experience of accidental disability retirement for all plans, by year, for the age range 25 to 69 and the service range 0 to 34 years, through 2021.

Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	30	25.9	6,785	0.4422%	0.3822%	▲ 1.16
2013	51	26.1	6,817	0.7481%	0.3826%	◆ 1.96
2014	32	26.2	6,922	0.4623%	0.3782%	▲ 1.22
2015	32	26.0	7,015	0.4562%	0.3712%	▲ 1.23
2016	40	26.6	7,248	0.5519%	0.3672%	◆ 1.50
2017	26	26.5	7,354	0.3535%	0.3602%	● 0.98
2018	31	27.0	7,413	0.4182%	0.3638%	▲ 1.15
2019	30	26.8	7,425	0.4040%	0.3614%	▲ 1.12
2020	21	27.1	7,721	0.2720%	0.3504%	▲ 0.78
2021	11	25.7	7,594	0.1449%	0.3389%	◆ 0.43
Total	304	263.9	72,294	0.4205%	0.3651%	▲ 1.15

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



The rates of accidental disability retirement vary by the following characteristics:

1. Tier 2 and 3 22-year plan enhanced members
2. Tier 3 22-year plan non-enhanced members.
 - a. There were only 6 accidental disability retirements during the study period so no analysis was included.

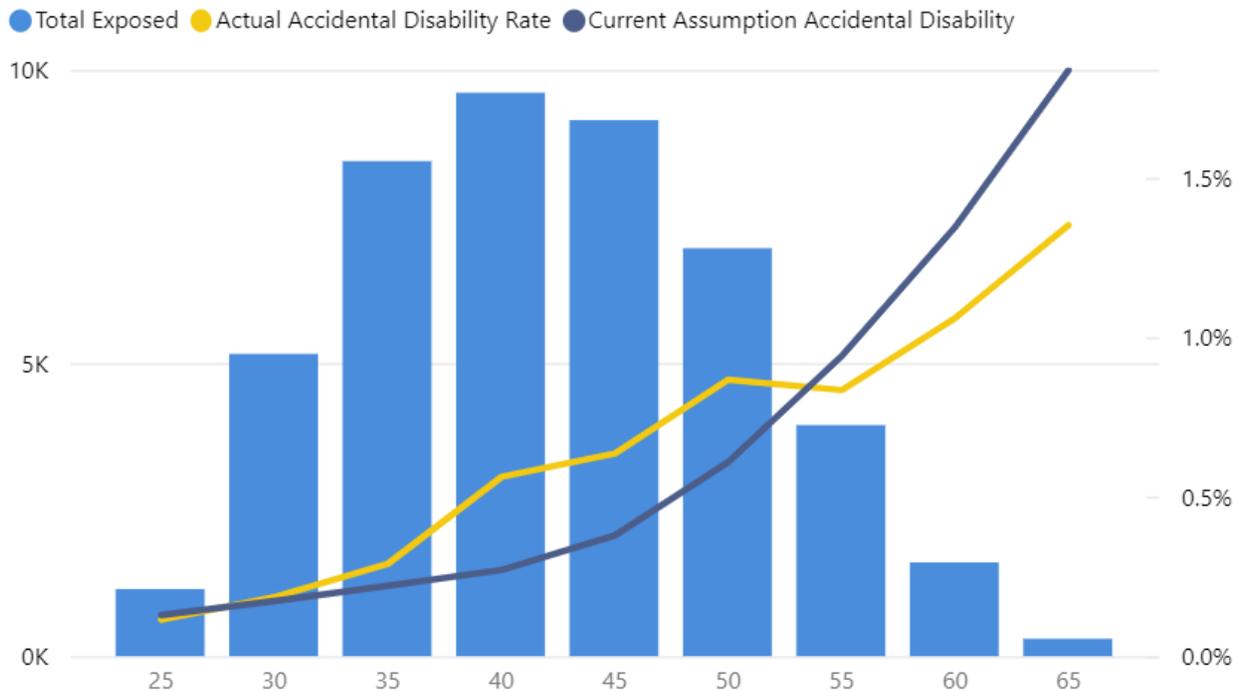
Please note that records coded as Tier 4 represent Tier 2 and Tier 3 22-year plan enhanced member records whereas Tier 6 represents Tier 3 non-enhanced members.

Tier 2 and Tier 3 22-Year Plan Enhanced

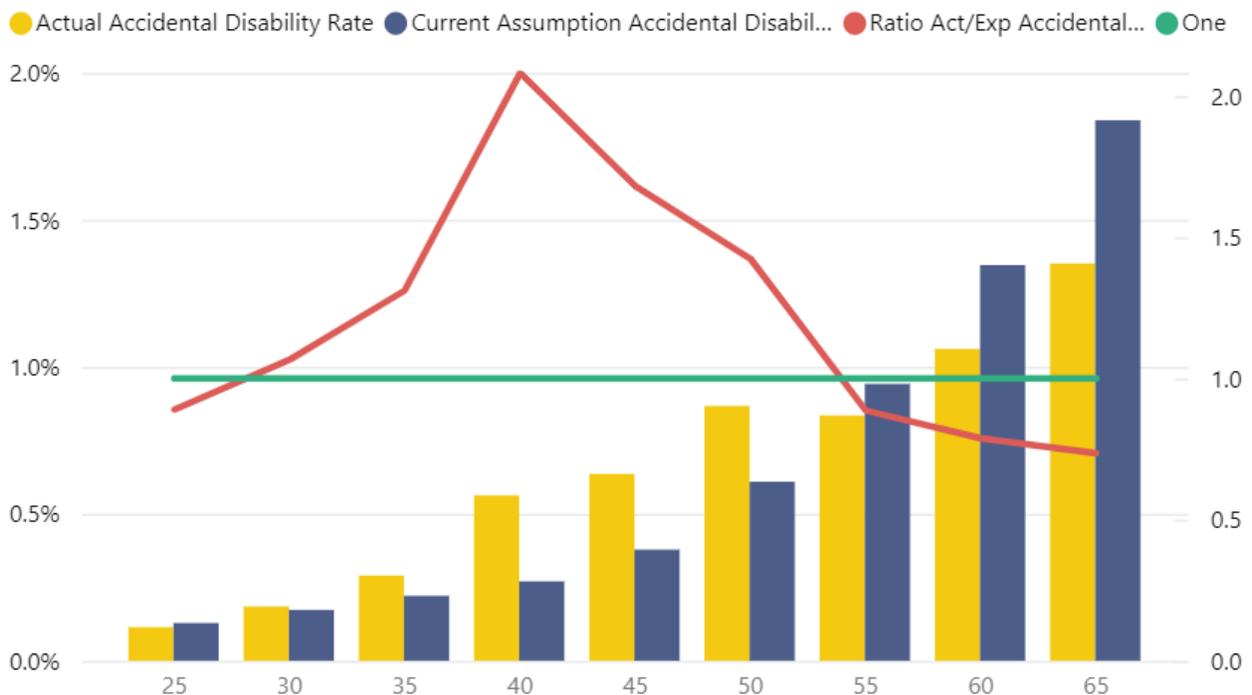
The following tables display the experience of Tier 2 and Tier 3 22-year plan enhanced members by age, for the age range 25 to 69 and the service range 0 to 34 years, during 2012 - 2019.

Age	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
25	0	0.1	87	0.0000%	0.1000%	0.00
26	0	0.2	194	0.0000%	0.1100%	0.00
27	1	0.4	318	0.3145%	0.1200%	2.62
28	0	0.6	493	0.0000%	0.1300%	0.00
29	1	0.9	661	0.1513%	0.1400%	1.08
30	1	1.2	824	0.1214%	0.1500%	0.81
31	2	1.6	1,028	0.1946%	0.1600%	1.22
32	0	2.0	1,186	0.0000%	0.1700%	0.00
33	4	2.5	1,384	0.2890%	0.1800%	1.61
34	4	2.9	1,539	0.2599%	0.1900%	1.37
35	2	3.3	1,658	0.1206%	0.2000%	0.60
36	8	3.6	1,722	0.4646%	0.2100%	2.21
37	4	4.0	1,812	0.2208%	0.2200%	1.00
38	9	4.3	1,860	0.4839%	0.2300%	2.10
39	3	4.6	1,922	0.1561%	0.2400%	0.65
40	8	5.0	1,994	0.4012%	0.2500%	1.60
41	10	5.2	2,006	0.4985%	0.2600%	1.92
42	10	5.4	2,017	0.4958%	0.2700%	1.84
43	18	5.6	1,991	0.9041%	0.2800%	3.23
44	10	5.7	1,954	0.5118%	0.2900%	1.76
45	8	5.8	1,925	0.4156%	0.3000%	1.39
46	16	6.6	1,945	0.8226%	0.3400%	2.42
47	10	7.1	1,856	0.5388%	0.3800%	1.42
48	13	7.7	1,828	0.7112%	0.4200%	1.69
49	12	8.0	1,733	0.6924%	0.4600%	1.51
50	8	8.2	1,644	0.4866%	0.5000%	0.97
51	15	8.7	1,546	0.9702%	0.5600%	1.73
52	15	8.9	1,432	1.0475%	0.6200%	1.69
53	9	8.8	1,289	0.6982%	0.6800%	1.03
54	14	8.3	1,128	1.2411%	0.7400%	1.68
55	7	7.9	989	0.7078%	0.8000%	0.88
56	4	7.6	868	0.4608%	0.8800%	0.52
57	8	7.5	781	1.0243%	0.9600%	1.07
58	8	7.3	698	1.1461%	1.0400%	1.10
59	6	6.9	619	0.9693%	1.1200%	0.87
60	8	6.0	496	1.6129%	1.2000%	1.34
Total	269	201.5	48,830	0.5509%	0.4126%	1.34

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



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



Specific observations:

- Overall, the actual number of accidental disability retirements was greater than expected (A/E ratio of 1.34).
- For the age range 25 to 54, the actual number of accidental disability retirements was 57% greater than expected (A/E ratio of 1.57).

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 did not publish a MP-2022 scale.

In this study the base table 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. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

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 the base rate.

There is much discussion in the actuarial profession and among retirement systems about the development of mortality tables and the treatment of excess deaths due to the Covid pandemic which occurred in 2020 – 2022. The purpose of this analysis is to share our observations about the experience during the study period. In subsequent analyses, we will recommend changes to mortality assumptions as appropriate.

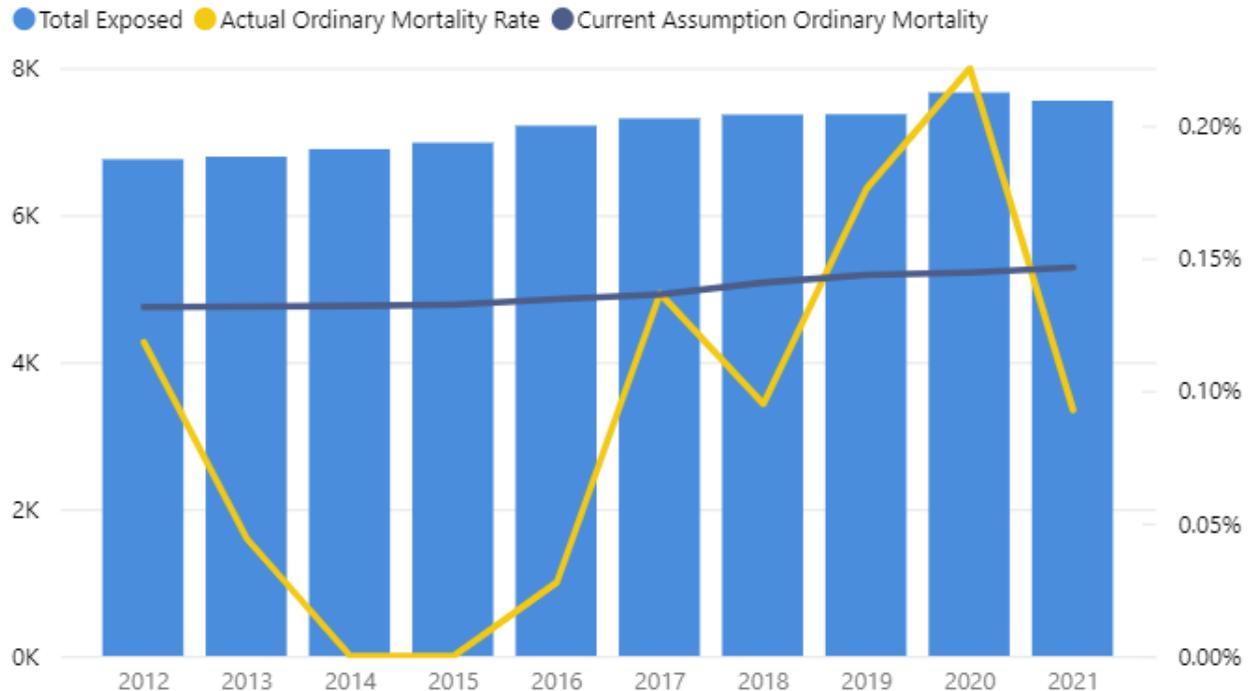
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Ordinary Death

The following charts show the results of ordinary death by year, for males and females combined, for the age range (25 to 64) and service range (0 to 34), during the period 2012 – 2021.

Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
2012	8	8.9	6,758	0.1184%	0.1316%	0.90
2013	3	8.9	6,793	0.0442%	0.1317%	0.34
2014	0	9.1	6,896	0.0000%	0.1320%	0.00
2015	0	9.3	6,983	0.0000%	0.1325%	0.00
2016	2	9.7	7,215	0.0277%	0.1345%	0.21
2017	10	10.0	7,314	0.1367%	0.1363%	1.00
2018	7	10.4	7,365	0.0950%	0.1408%	0.68
2019	13	10.6	7,370	0.1764%	0.1437%	1.23
2020	17	11.1	7,666	0.2218%	0.1446%	1.53
2021	7	11.1	7,554	0.0927%	0.1465%	0.63
Total	67	99.0	71,914	0.0932%	0.1376%	0.68

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



Specific observations:

- Actual deaths were less than expected during the study period (A/E ratio of 0.68).
- During 2020, actual deaths were greater than expected but less than expected during 2021 (A/E ratio of 1.08 for the two years combined).
- There were only two ordinary deaths recorded during 2014 – 2016. We don't know what generated these anomalous results; one potential cause is problems with the data. In the prior experience study report, there was no mention that mortality data may be unreliable, and this issue will be reviewed further with OA.
- The rates of ordinary deaths are greater than those used for General employees, but the Sanitation experience indicates a lower rate of death than General.
- Due to the small number of deaths during the study period, we did not include any gender specific analysis.
- We may wish to combine the Sanitation experience with General experience.

Accidental Death

The accidental death rate assumption is a constant percentage that does not vary by gender nor age and is not subject to mortality improvements. During the Covid pandemic, there were deaths characterized as accidental deaths. The following table shows the experience of accidental death by year.

Plan Year	Actual Accidental Deaths	Expected Accidental Deaths	Total Exposed	Actual Accidental Mortality Rate	Current Assumption Accidental Mortality	Ratio Act/Exp Accidental Mortality
2012	0	0.7	6,831	0.0000%	0.0100%	0.00
2013	0	0.7	6,867	0.0000%	0.0100%	0.00
2014	0	0.7	6,962	0.0000%	0.0100%	0.00
2015	0	0.7	7,047	0.0000%	0.0100%	0.00
2016	0	0.7	7,273	0.0000%	0.0100%	0.00
2017	0	0.7	7,390	0.0000%	0.0100%	0.00
2018	0	0.7	7,481	0.0000%	0.0100%	0.00
2019	1	0.7	7,492	0.0133%	0.0100%	1.34
2020	2	0.8	7,810	0.0256%	0.0100%	2.56
2021	3	0.8	7,667	0.0391%	0.0100%	3.92
Total	6	7.3	72,820	0.0082%	0.0100%	0.82

Specific observations:

- Excluding 2020 – 2021, there was only one accidental death during the study period.

Section I(D) – TBTA and Transit Employees of New York City Employees’ Retirement System (NYCERS)

Exposures and Decrements

Since the same withdrawal and disability assumptions apply to TBTA and Transit Employees, we have combined their analysis into this section. Retirement experience will be reviewed independently by plan code.

To set the exposures and actual decrements for TBTA and Transit Employees, 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.

NYCERS Retirement Eligibility Chart - TBTA

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
F	Basic 62/5	TRUE	TRUE	62	5			55	5
I	57/5 Plan	TRUE	TRUE	57	5				
I	57/5 Plan - Physically Taxing	TRUE	TRUE	50	25	57	5		
N	55/25 Plan - Tier 4	FALSE	TRUE	55	25	62	5		
R	TBTA - 50/20 Plan	BOTH	FALSE	50	20				
Y	63/5 Plan	TRUE	TRUE	63	10			55	10

NYCERS Retirement Eligibility Chart - Transit

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
F	Basic 62/5	TRUE	TRUE	62	5			55	5
I	57/5 Plan	TRUE	TRUE	57	5				
L	Special Officers - Tier 4	BOTH	Under Basic Tier 4	0	25	62	5		
L	Special Officers - Tier 6	BOTH	Under Basic Tier 6	0	25	63	10		
N	55/25 Plan - Tier 4	FALSE	TRUE	55	25	62	5		
T	Auto Workers - Tier 4	BOTH	Under Basic Tier 4	50	25	62	5		
T	Auto Workers - Tier 6	TRUE	Under Basic Tier 6	50	25	63	10		
U	Transit - Improved Plan - Tier 4	BOTH	Under Basic Tier 4	55	25	62	5		
U	Transit - Improved Plan - Tier 6	TRUE	Under Basic Tier 6	55	25	63	10		
Y	63/5 Plan	TRUE	TRUE	63	10			55	10

For TBTA employees in the Basic 62/5 Plan and Tier 6 63/5 Plan and Transit employees in all plans other than the Transit – Improved Plan, OA applies the General employee actuarial assumptions. Therefore, these members are included in the General employee experience in Section 1(A).

For the various Tier 6 plans, 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.

Please note that TBTA and Transit members may elect to retire under the Basic Plan rather than their specific Plan. When a member is eligible for reduced retirement under the Basic Plan and

not eligible for unreduced retirement under their specific plan, OA utilizes the rates of withdrawal during this period, but values an immediate reduced early retirement benefit. The experience of these members during this period is included in the retirement analysis.

Withdrawal

The current withdrawal assumption varies by service.

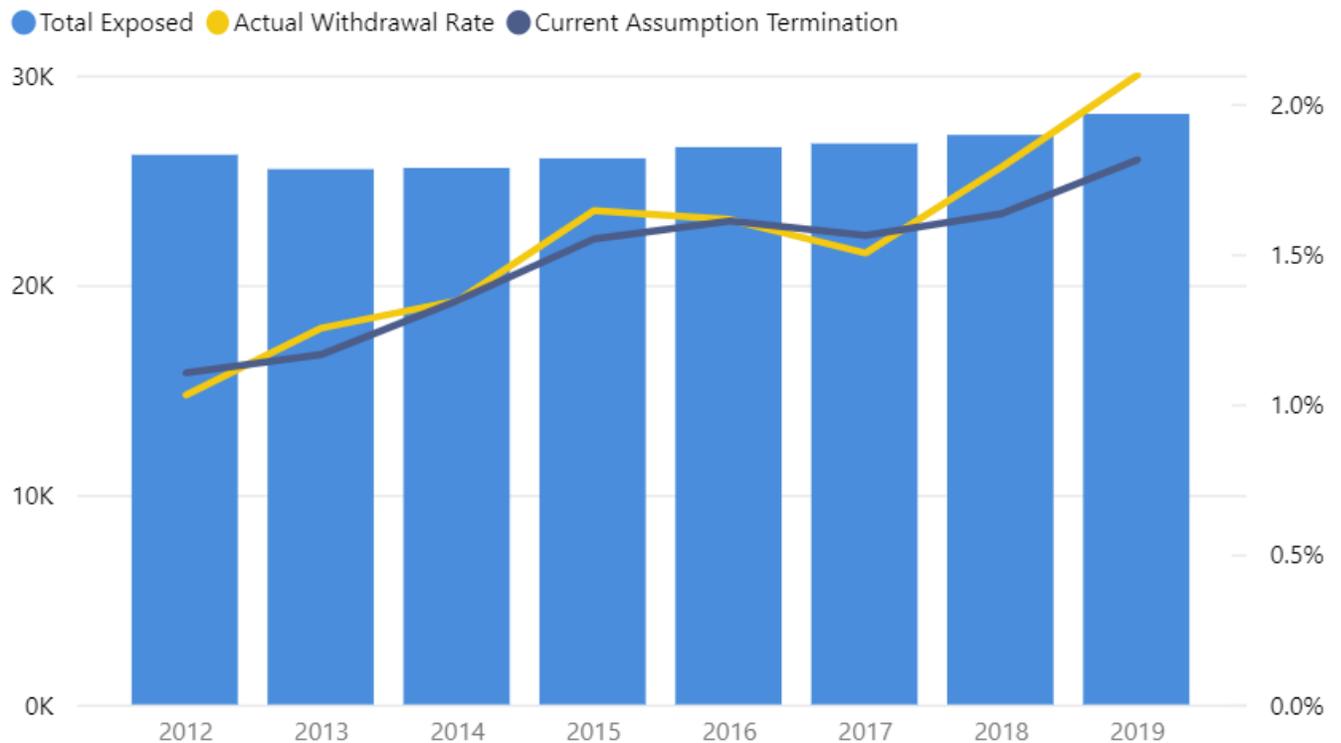
The following table shows the experience for withdrawal by year for the age range (20 to 64), and for the service range (0 to 34). Based on the current assumptions, the overall expected rate of withdrawal averaged 1.49%, whereas the actual rate was 1.53%.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	270	289.4	26,204	1.03%	1.10%	0.93
2013	320	297.5	25,523	1.25%	1.17%	1.08
2014	344	344.2	25,579	1.34%	1.35%	1.00
2015	428	403.5	26,033	1.64%	1.55%	1.06
2016	429	427.4	26,541	1.62%	1.61%	1.00
2017	402	417.5	26,702	1.51%	1.56%	0.96
2018	484	443.5	27,115	1.78%	1.64%	1.09
2019	590	510.5	28,140	2.10%	1.81%	1.16
2020	335	427.2	27,338	1.23%	1.56%	0.78
2021	457	382.6	26,357	1.73%	1.45%	1.19
Total	4,059	3,943.3	265,532	1.53%	1.49%	1.03

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. Note that from 2016 to 2020, between 5% and 11% of all NYCERS records with a status code of LOA were changed to rehire. Hence, between 89% and 95% of the LOA records are eventually coded as withdrawal, retired, disabled or death. Excluding these two years, the actual rate of termination of 1.54% exceeded the assumed rate of 1.48% for an A/E ratio of 1.04 as shown in the following tables.

Plan Year	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
2012	270	289.4	26,204	1.03%	1.10%	0.93
2013	320	297.5	25,523	1.25%	1.17%	1.08
2014	344	344.2	25,579	1.34%	1.35%	1.00
2015	428	403.5	26,033	1.64%	1.55%	1.06
2016	429	427.4	26,541	1.62%	1.61%	1.00
2017	402	417.5	26,702	1.51%	1.56%	0.96
2018	484	443.5	27,115	1.78%	1.64%	1.09
2019	590	510.5	28,140	2.10%	1.81%	1.16
Total	3,267	3,133.4	211,837	1.54%	1.48%	1.04

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



Specific observations on results through 2019:

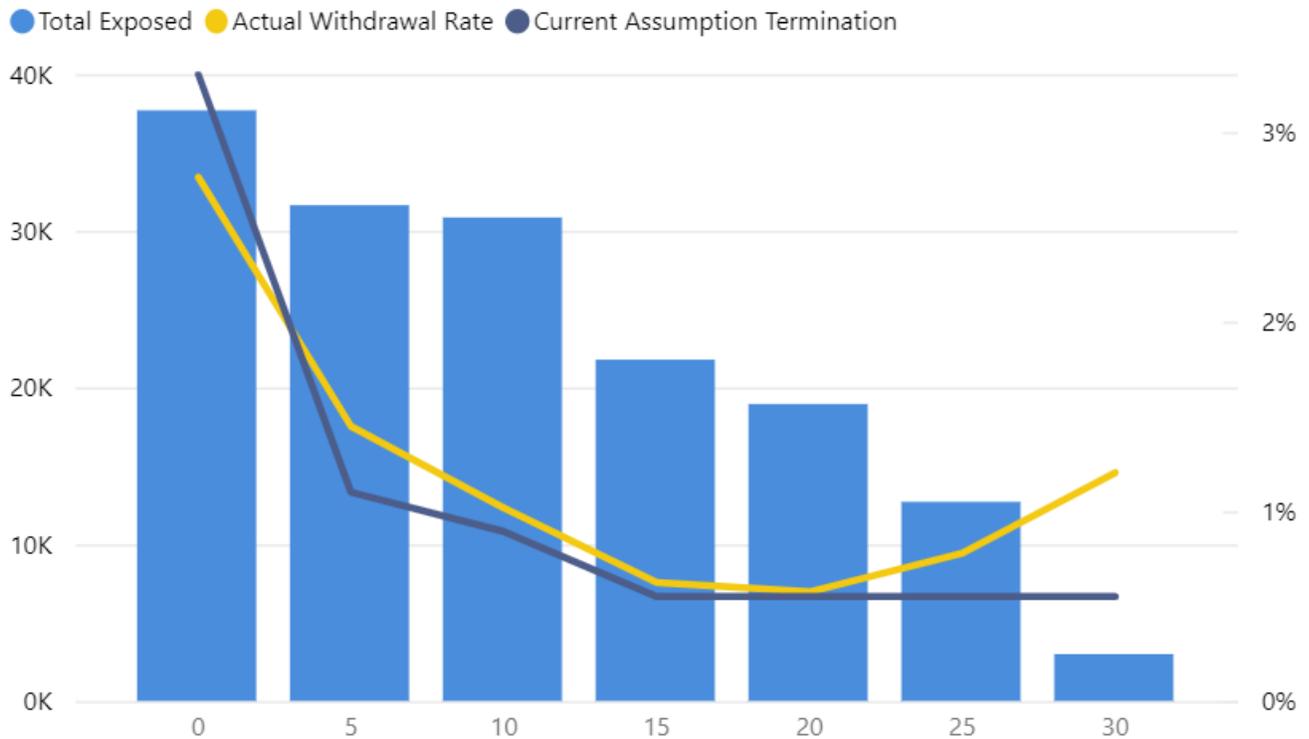
- The actual rate of withdrawal exceeded the assumption from 2013 – 2016 and 2018 - 2019.
- The number of withdrawals and rates of withdrawals were highest during 2018 - 2019.
- The actual rate of withdrawal of female members (A/E ratio of 1.58) was greater than male members (A/E ratio of 0.93).

- The actual rate of withdrawal of TBTA members (A/E ratio of 2.17) was much greater than Transit members (A/E ratio of 1.01).

The following charts show the experience for withdrawal by service for the age range 20 to 64, and the service range 0 to 34, during 2012 - 2017, prior to the addition of new data.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	272	438.5	4,872	5.58%	9.00%	▲ 0.62
1	374	439.1	9,758	3.83%	4.50%	▲ 0.85
2	173	164.8	8,242	2.10%	2.00%	● 1.05
3	103	108.2	7,213	1.43%	1.50%	● 0.95
4	119	95.0	7,598	1.57%	1.25%	▲ 1.25
5	94	72.5	6,592	1.43%	1.10%	▲ 1.30
6	96	72.2	6,567	1.46%	1.10%	▲ 1.33
7	92	70.8	6,438	1.43%	1.10%	▲ 1.30
8	90	68.4	6,221	1.45%	1.10%	▲ 1.32
9	86	63.9	5,813	1.48%	1.10%	▲ 1.34
10	67	62.8	5,712	1.17%	1.10%	● 1.07
11	62	58.3	5,830	1.06%	1.00%	● 1.06
12	75	57.4	6,381	1.18%	0.90%	▲ 1.31
13	60	52.6	6,581	0.91%	0.80%	▲ 1.14
14	50	44.4	6,342	0.79%	0.70%	▲ 1.13
15	34	31.7	5,770	0.59%	0.55%	● 1.07
16	39	25.4	4,622	0.84%	0.55%	◆ 1.53
17	24	23.0	4,180	0.57%	0.55%	● 1.04
18	15	20.0	3,632	0.41%	0.55%	▲ 0.75
19	24	19.7	3,575	0.67%	0.55%	▲ 1.22
20	18	18.7	3,391	0.53%	0.55%	● 0.97
21	21	19.9	3,617	0.58%	0.55%	● 1.06
22	17	22.0	3,992	0.43%	0.55%	▲ 0.77
23	29	22.9	4,162	0.70%	0.55%	▲ 1.27
24	24	20.8	3,787	0.63%	0.55%	▲ 1.15
25	23	17.8	3,235	0.71%	0.55%	▲ 1.29
26	26	17.1	3,104	0.84%	0.55%	◆ 1.52
27	17	14.7	2,674	0.64%	0.55%	▲ 1.16
28	21	11.6	2,110	1.00%	0.55%	◆ 1.81
29	12	8.7	1,582	0.76%	0.55%	▲ 1.38
30	14	6.7	1,213	1.15%	0.55%	◆ 2.10
31	13	4.7	856	1.52%	0.55%	◆ 2.76
32	6	2.8	514	1.17%	0.55%	◆ 2.12
33	2	1.5	265	0.75%	0.55%	▲ 1.37
34	1	0.8	141	0.71%	0.55%	▲ 1.29
Total	2,193	2,179.5	156,582	1.40%	1.39%	● 1.01

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



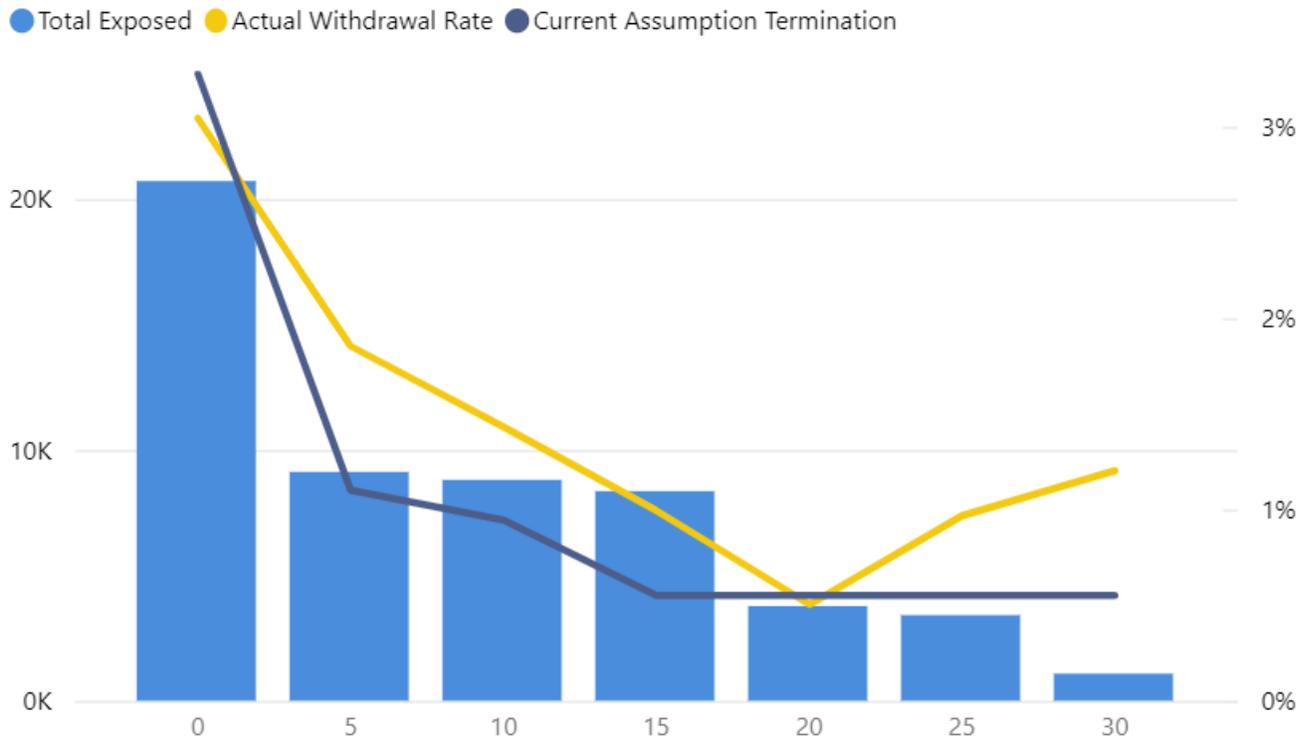
Specific observations:

- Overall, the actual withdrawal rates were similar to that expected (A/E 1.01).
- Although the greatest number of withdrawals occurred during service periods 0 to 1 year, the rate was less than expected (A/E 0.74).
- For service periods from 2 to 24 years, actual withdrawal rates were greater than the assumed rates (A/E ratio of 1.16).
- For service periods from 25 to 34 years of service, the actual experience was greater than the assumed rates (A/E ratio of 1.56).

The following chart shows the experience for the two-year period July 1, 2017 – June 30, 2019 (2018 and 2019) by service (0 to 34 years). As noted earlier, the actual rates of withdrawal were higher than expected for these two years.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	179	252.9	2,810	6.37%	9.00%	▲ 0.71
1	218	218.4	4,854	4.49%	4.50%	● 1.00
2	71	88.5	4,426	1.60%	2.00%	▲ 0.80
3	87	68.8	4,586	1.90%	1.50%	▲ 1.26
4	76	50.5	4,037	1.88%	1.25%	◆ 1.51
5	51	29.3	2,660	1.92%	1.10%	◆ 1.74
6	41	22.9	2,086	1.97%	1.10%	◆ 1.79
7	22	14.9	1,353	1.63%	1.10%	▲ 1.48
8	23	13.7	1,249	1.84%	1.10%	◆ 1.67
9	32	19.5	1,771	1.81%	1.10%	◆ 1.64
10	37	27.1	2,467	1.50%	1.10%	▲ 1.36
11	37	23.4	2,336	1.58%	1.00%	◆ 1.58
12	21	15.4	1,713	1.23%	0.90%	▲ 1.36
13	20	9.8	1,225	1.63%	0.80%	◆ 2.04
14	11	7.4	1,060	1.04%	0.70%	▲ 1.48
15	15	6.6	1,202	1.25%	0.55%	◆ 2.27
16	19	9.4	1,705	1.11%	0.55%	◆ 2.03
17	19	10.6	1,923	0.99%	0.55%	◆ 1.80
18	17	10.5	1,902	0.89%	0.55%	◆ 1.63
19	13	8.9	1,621	0.80%	0.55%	▲ 1.46
20	8	5.8	1,048	0.76%	0.55%	▲ 1.39
21	3	3.7	666	0.45%	0.55%	▲ 0.82
22	4	2.5	452	0.88%	0.55%	◆ 1.61
23	3	3.8	692	0.43%	0.55%	▲ 0.79
24	1	5.0	917	0.11%	0.55%	◆ 0.20
25	6	4.9	893	0.67%	0.55%	▲ 1.22
26	4	3.7	668	0.60%	0.55%	● 1.09
27	9	3.1	567	1.59%	0.55%	◆ 2.89
28	3	3.6	647	0.46%	0.55%	▲ 0.84
29	11	3.5	638	1.72%	0.55%	◆ 3.13
30	4	2.5	455	0.88%	0.55%	◆ 1.60
31	1	1.4	254	0.39%	0.55%	▲ 0.72
32	1	0.9	167	0.60%	0.55%	● 1.09
33	6	0.7	136	4.41%	0.55%	◆ 8.02
34	1	0.4	69	1.45%	0.55%	◆ 2.64
Total	1,074	954.0	55,255	1.94%	1.73%	▲ 1.13

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



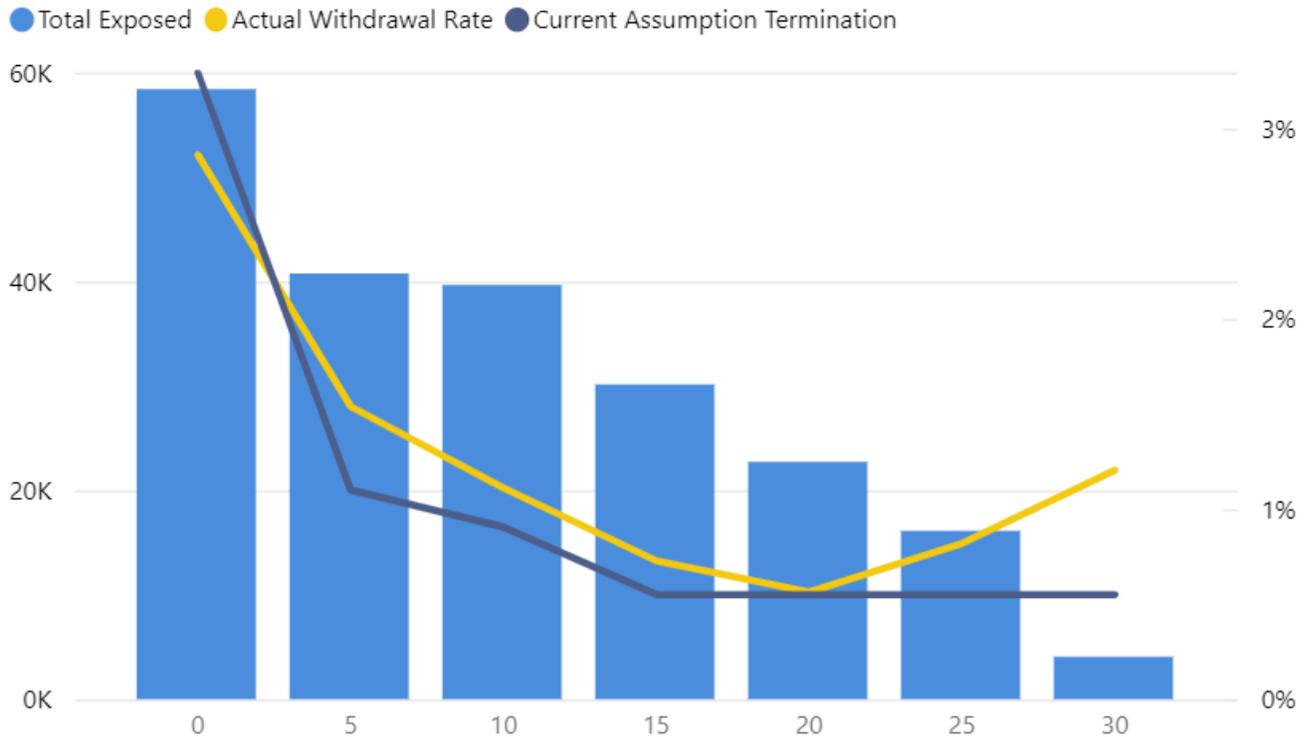
Specific observations for the 2-year period 2018-2019:

- The experience during 2018 – 2019 exhibited similar patterns to the experience from 2012 – 2017, although the overall level of withdrawal was higher.
 - For service periods between 0 and 1 year, the A/E ratio was 0.84, which is higher than the 0.74 A/E ratio of the period 2012 to 2017.
 - For service periods between 2 and 24 years, the A/E ratio was 1.38 vs 1.16.
 - For service periods between 25 and 34 years, the A/E ratio was 1.86 vs 1.56.

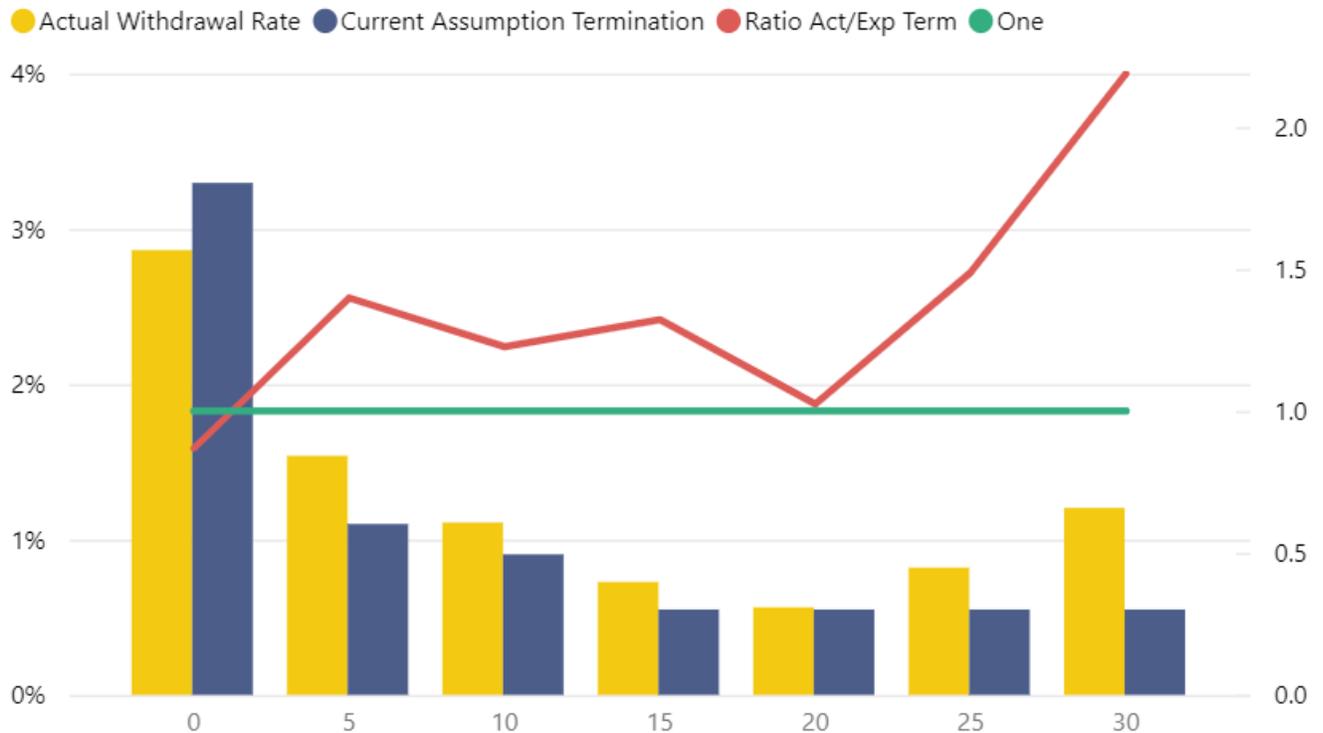
The following charts show the combined experience for 2012 - 2019 by service (0 to 34 years) for ages 20 to 64.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	451	691.4	7,682	5.87%	9.00%	▲ 0.65
1	592	657.5	14,612	4.05%	4.50%	● 0.90
2	244	253.4	12,668	1.93%	2.00%	● 0.96
3	190	177.0	11,799	1.61%	1.50%	● 1.07
4	195	145.4	11,635	1.68%	1.25%	▲ 1.34
5	145	101.8	9,252	1.57%	1.10%	▲ 1.42
6	137	95.2	8,653	1.58%	1.10%	▲ 1.44
7	114	85.7	7,791	1.46%	1.10%	▲ 1.33
8	113	82.2	7,470	1.51%	1.10%	▲ 1.38
9	118	83.4	7,584	1.56%	1.10%	▲ 1.41
10	104	90.0	8,179	1.27%	1.10%	▲ 1.16
11	99	81.7	8,166	1.21%	1.00%	▲ 1.21
12	96	72.8	8,094	1.19%	0.90%	▲ 1.32
13	80	62.4	7,806	1.02%	0.80%	▲ 1.28
14	61	51.8	7,402	0.82%	0.70%	▲ 1.18
15	49	38.3	6,972	0.70%	0.55%	▲ 1.28
16	58	34.8	6,327	0.92%	0.55%	◆ 1.67
17	43	33.6	6,103	0.70%	0.55%	▲ 1.28
18	32	30.4	5,534	0.58%	0.55%	● 1.05
19	37	28.6	5,196	0.71%	0.55%	▲ 1.29
20	26	24.4	4,439	0.59%	0.55%	● 1.06
21	24	23.6	4,283	0.56%	0.55%	● 1.02
22	21	24.4	4,444	0.47%	0.55%	▲ 0.86
23	32	26.7	4,854	0.66%	0.55%	▲ 1.20
24	25	25.9	4,704	0.53%	0.55%	● 0.97
25	29	22.7	4,128	0.70%	0.55%	▲ 1.28
26	30	20.7	3,772	0.80%	0.55%	▲ 1.45
27	26	17.8	3,241	0.80%	0.55%	▲ 1.46
28	24	15.2	2,757	0.87%	0.55%	◆ 1.58
29	23	12.2	2,220	1.04%	0.55%	◆ 1.88
30	18	9.2	1,668	1.08%	0.55%	◆ 1.96
31	14	6.1	1,110	1.26%	0.55%	◆ 2.29
32	7	3.7	681	1.03%	0.55%	◆ 1.87
33	8	2.2	401	2.00%	0.55%	◆ 3.63
34	2	1.2	210	0.95%	0.55%	◆ 1.73
Total	3,267	3,133.4	211,837	1.54%	1.48%	● 1.04

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

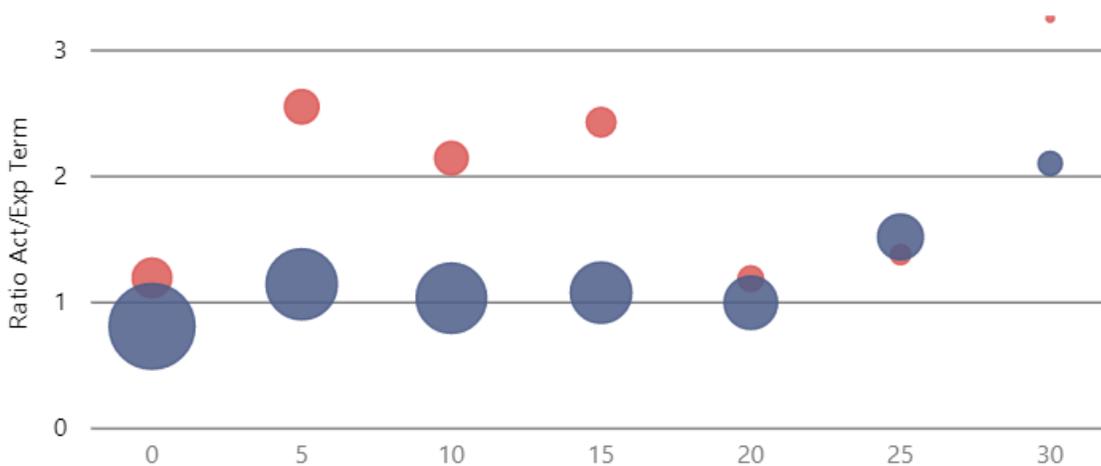


Withdrawal Rate - Actual, Expected, and Ratio; by Service



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

Gender ● Female ● Male



Specific observations:

- The actual rate of withdrawal of TBTA members (A/E ratio of 2.17) was much greater than Transit members (A/E ratio of 1.01).
- The actual rate of withdrawal of female members (A/E ratio of 1.58) was greater than male members (A/E ratio of 0.93).

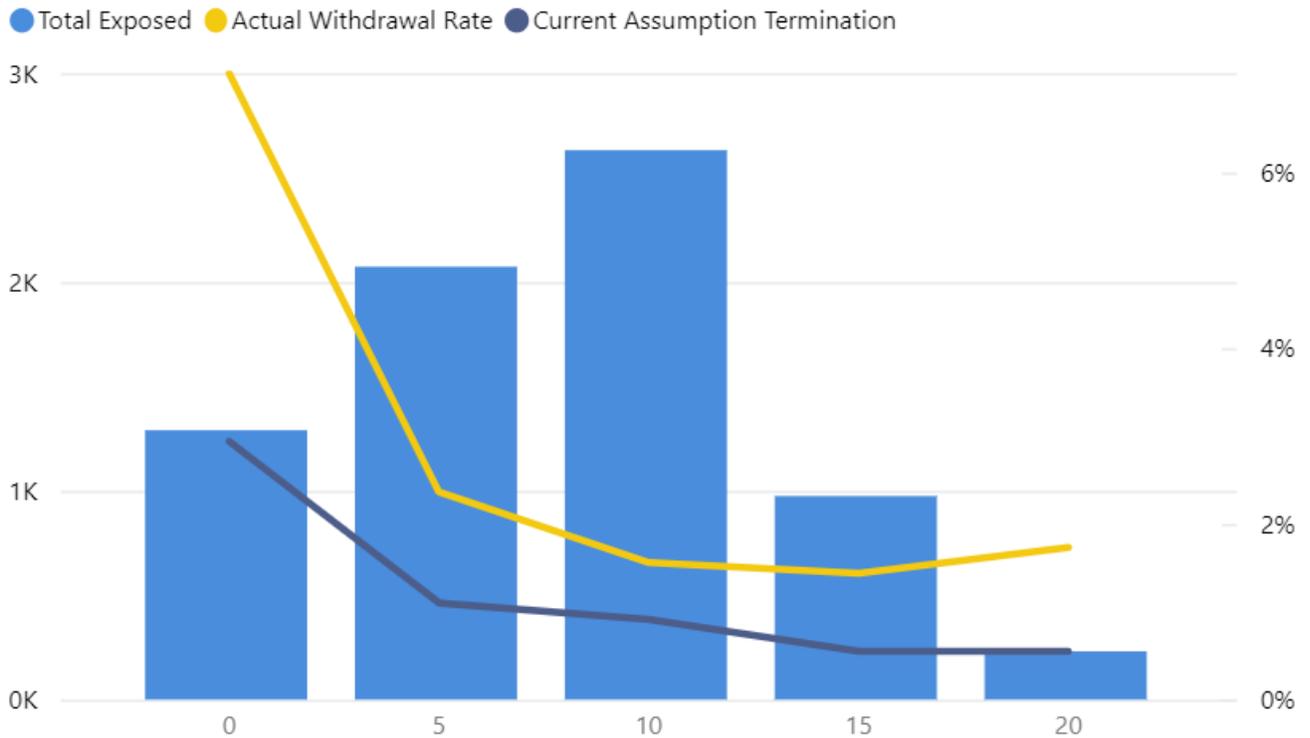
In the following sections, we review the experience separately for TBTA and Transit.

TBTA

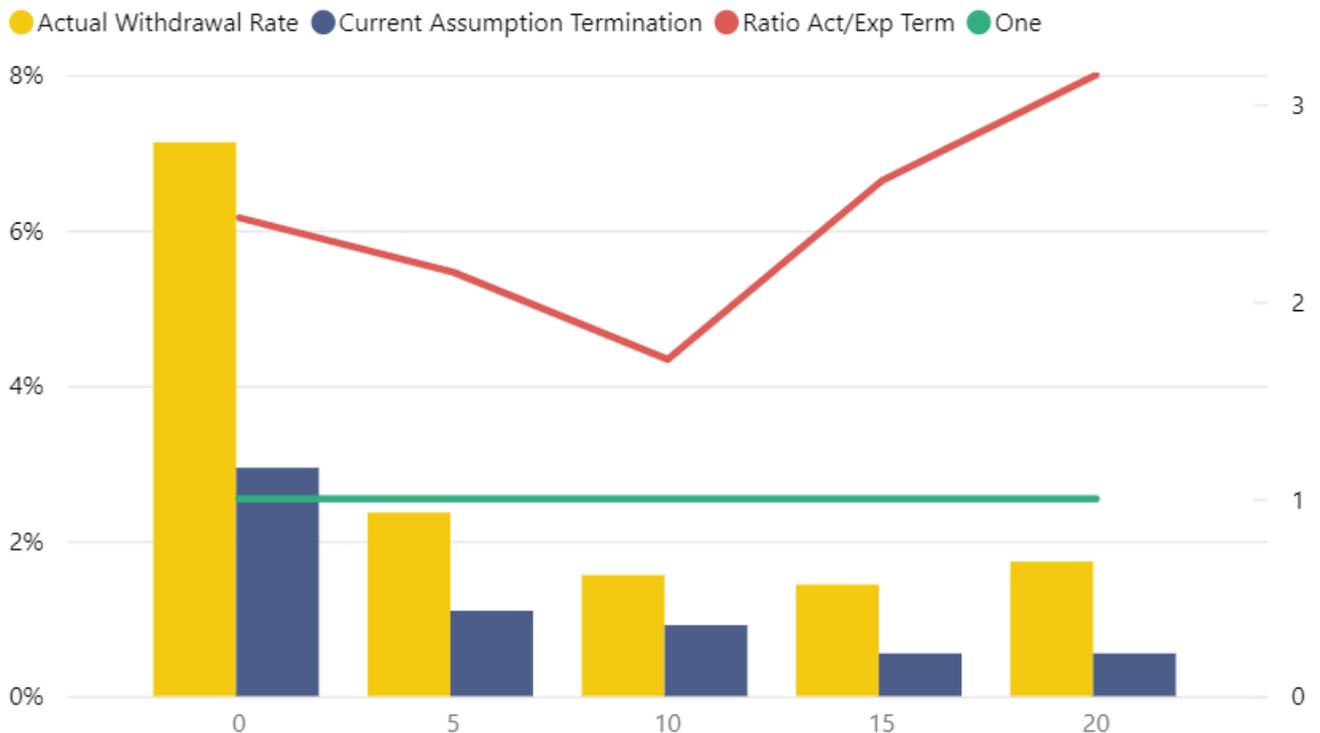
The following charts show the experience of TBTA members by service (0 to 24 years) for ages 20 to 64 during the period 2012 – 2019.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	9	11.1	123	7.32%	9.00%	▲ 0.81
1	34	13.5	301	11.30%	4.50%	◆ 2.51
2	12	5.6	278	4.32%	2.00%	◆ 2.16
3	14	4.4	294	4.76%	1.50%	◆ 3.17
4	23	3.9	313	7.35%	1.25%	◆ 5.88
5	10	3.5	317	3.15%	1.10%	◆ 2.87
6	10	3.7	337	2.97%	1.10%	◆ 2.70
7	10	4.5	413	2.42%	1.10%	◆ 2.20
8	10	5.0	459	2.18%	1.10%	◆ 1.98
9	9	6.0	549	1.64%	1.10%	▲ 1.49
10	9	6.1	551	1.63%	1.10%	▲ 1.48
11	6	6.1	610	0.98%	1.00%	● 0.98
12	10	4.9	544	1.84%	0.90%	◆ 2.04
13	8	3.9	493	1.62%	0.80%	◆ 2.03
14	8	3.0	433	1.85%	0.70%	◆ 2.64
15	3	1.8	330	0.91%	0.55%	◆ 1.65
16	5	1.4	263	1.90%	0.55%	◆ 3.46
17	3	1.0	185	1.62%	0.55%	◆ 2.95
18	1	0.7	128	0.78%	0.55%	▲ 1.42
19	2	0.4	69	2.90%	0.55%	◆ 5.27
20	1	0.3	53	1.89%	0.55%	◆ 3.43
21	0	0.3	51	0.00%	0.55%	◆ 0.00
22	1	0.3	51	1.96%	0.55%	◆ 3.57
23	2	0.2	44	4.55%	0.55%	◆ 8.26
24	0	0.2	32	0.00%	0.55%	◆ 0.00
Total	200	92.0	7,221	2.77%	1.27%	◆ 2.17

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



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



Specific observations of TBTA:

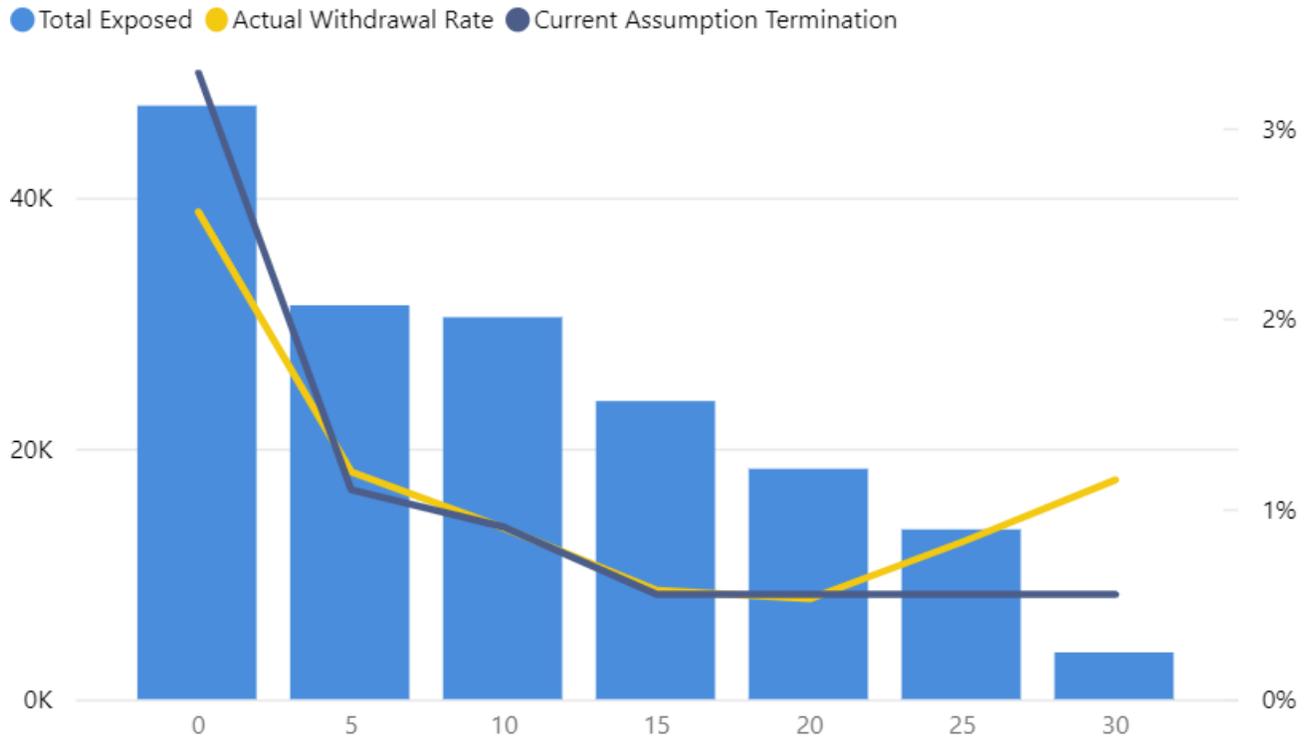
- Although the number of withdrawals is relatively small, the actual rate of withdrawal is approximately double the assumption at nearly all service points.

Transit Males

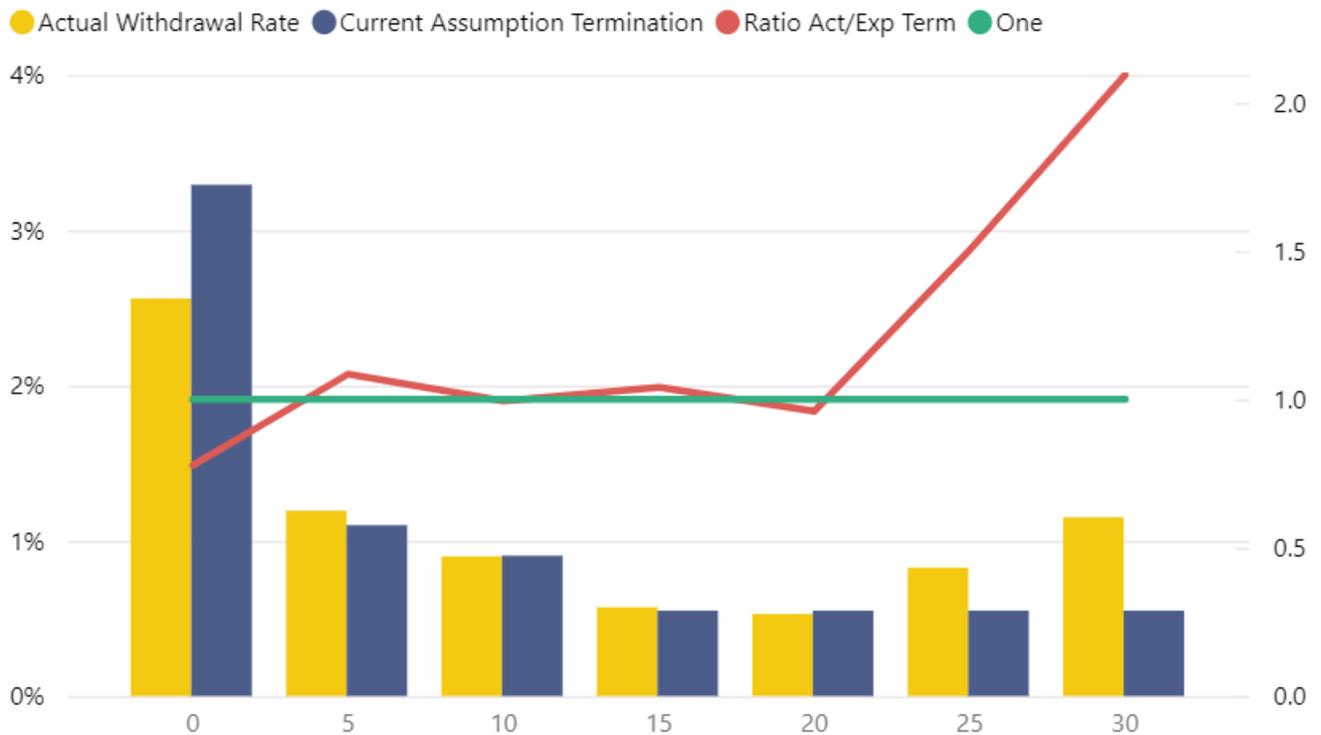
The following charts show the experience of Transit male members by service (0 to 34 years) for ages 20 to 64 during the period 2012 – 2019.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	347	562.7	6,252	5.55%	9.00%	▲ 0.62
1	416	527.9	11,732	3.55%	4.50%	▲ 0.79
2	171	205.3	10,265	1.67%	2.00%	▲ 0.83
3	144	144.6	9,638	1.49%	1.50%	● 1.00
4	134	118.2	9,458	1.42%	1.25%	▲ 1.13
5	87	79.9	7,261	1.20%	1.10%	● 1.09
6	88	74.6	6,780	1.30%	1.10%	▲ 1.18
7	64	66.1	6,008	1.07%	1.10%	● 0.97
8	65	62.2	5,657	1.15%	1.10%	● 1.04
9	71	62.9	5,716	1.24%	1.10%	▲ 1.13
10	69	69.1	6,281	1.10%	1.10%	● 1.00
11	59	62.2	6,216	0.95%	1.00%	● 0.95
12	56	55.6	6,181	0.91%	0.90%	● 1.01
13	49	48.4	6,047	0.81%	0.80%	● 1.01
14	41	40.2	5,746	0.71%	0.70%	● 1.02
15	32	29.9	5,444	0.59%	0.55%	● 1.07
16	36	27.3	4,968	0.72%	0.55%	▲ 1.32
17	27	26.6	4,836	0.56%	0.55%	● 1.02
18	20	24.2	4,394	0.46%	0.55%	▲ 0.83
19	21	22.8	4,137	0.51%	0.55%	● 0.92
20	19	19.6	3,558	0.53%	0.55%	● 0.97
21	17	18.8	3,419	0.50%	0.55%	● 0.90
22	17	19.7	3,589	0.47%	0.55%	▲ 0.86
23	24	21.7	3,950	0.61%	0.55%	▲ 1.10
24	20	21.3	3,865	0.52%	0.55%	● 0.94
25	23	18.6	3,382	0.68%	0.55%	▲ 1.24
26	26	17.2	3,131	0.83%	0.55%	◆ 1.51
27	22	15.1	2,738	0.80%	0.55%	▲ 1.46
28	22	13.0	2,358	0.93%	0.55%	◆ 1.70
29	19	10.7	1,938	0.98%	0.55%	◆ 1.78
30	14	8.2	1,496	0.94%	0.55%	◆ 1.70
31	14	5.6	1,015	1.38%	0.55%	◆ 2.51
32	7	3.5	636	1.10%	0.55%	◆ 2.00
33	7	2.1	384	1.82%	0.55%	◆ 3.31
34	1	1.1	203	0.49%	0.55%	▲ 0.90
Total	2,249	2,506.8	168,679	1.33%	1.49%	▲ 0.90

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



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



Specific observations of Transit males:

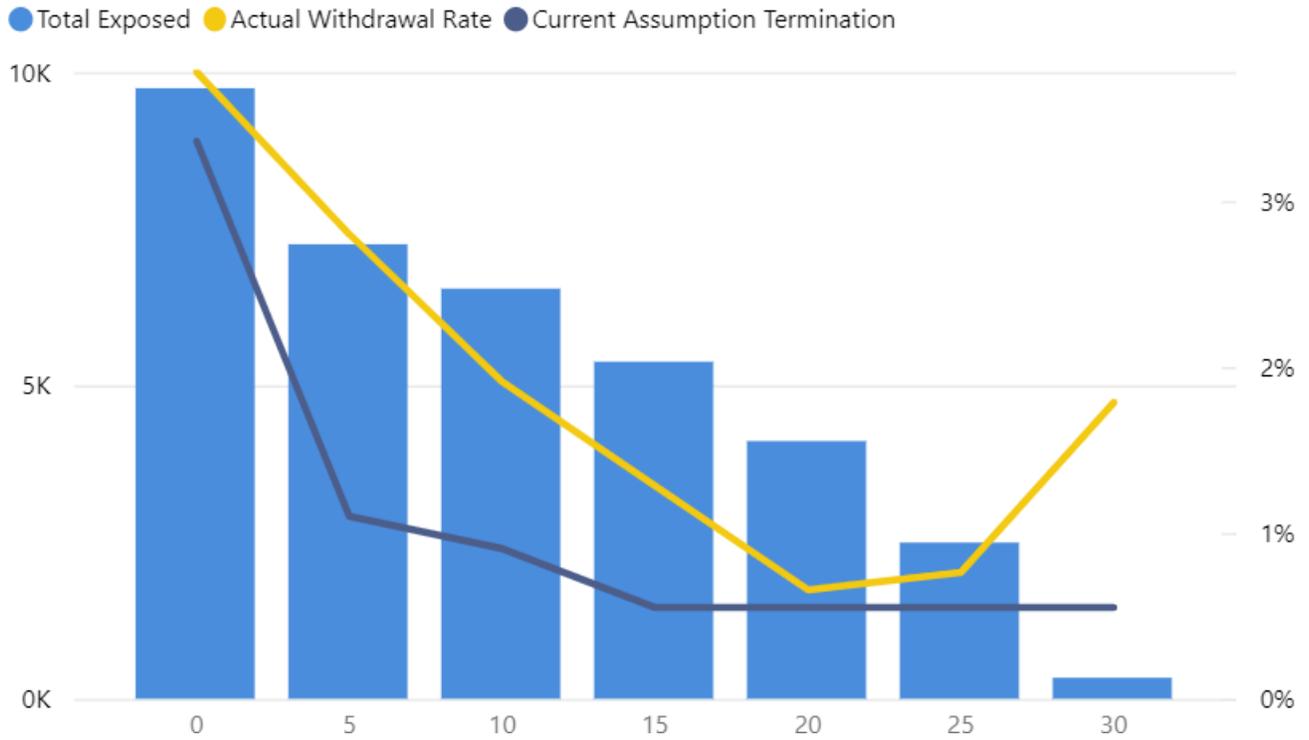
- Overall, the actual withdrawal rates were less than expected (A/E 0.90).
- This was primarily due to fewer withdrawals than expected for the service range 0 to 2 years (A/E 0.72).
- For service periods from 3 to 24 years, actual withdrawal rates were slightly greater than the assumed rates (A/E ratio of 1.04).
- For service periods from 25 to 34 years of service, the actual experience was greater than the assumed rates (A/E ratio of 1.63).
 - This may be due to the fact that once a member completes 25 years of service, the benefit is payable unreduced at age 55 rather than at age 62.
 - The majority of this experience is for members in the age range 50 to 54.

Transit Females

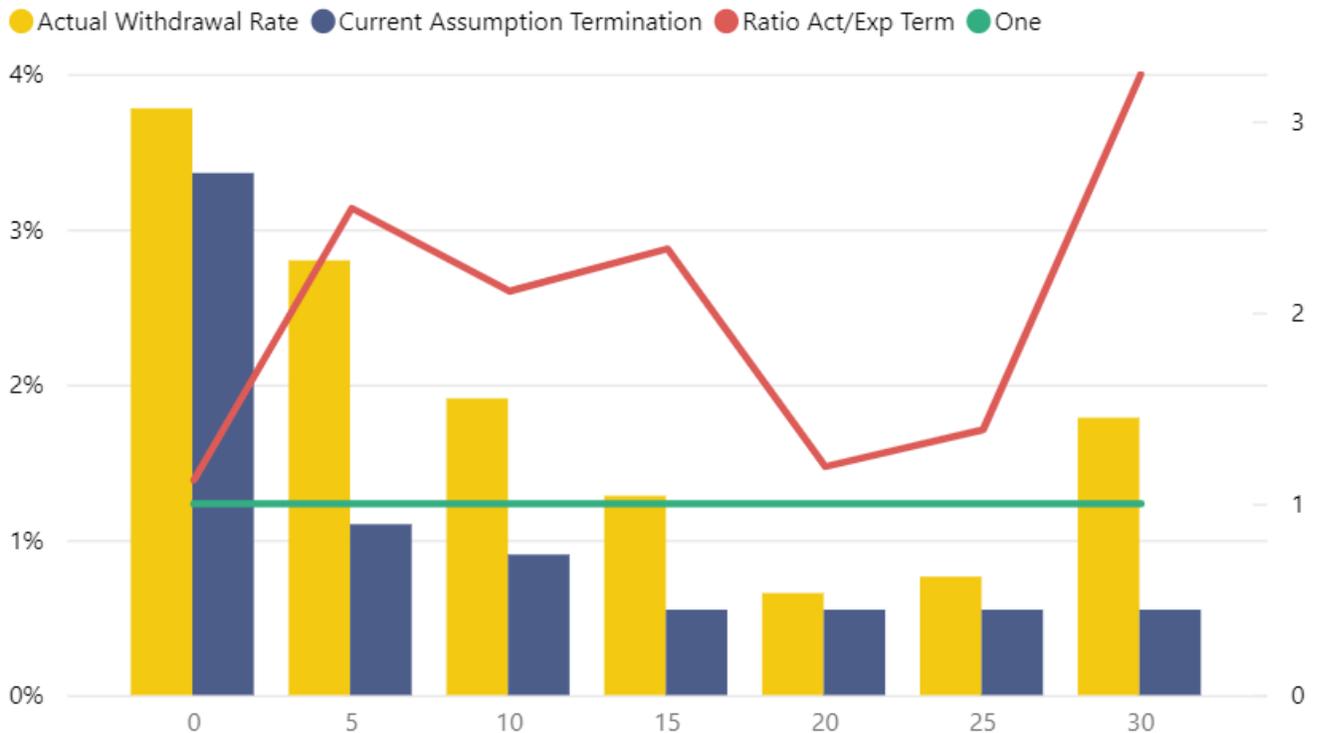
The following charts show the experience of Transit female members by service (0 to 34 years) for ages 20 to 64 during the period 2012 – 2019.

Service	Actual Withdrawals	Expected Withdrawals	Total Exposed	Actual Withdrawal Rate	Current Assumption Termination	Ratio Act/Exp Term
0	95	117.6	1,307	7.27%	9.00%	▲ 0.81
1	142	116.1	2,579	5.51%	4.50%	▲ 1.22
2	61	42.5	2,125	2.87%	2.00%	▲ 1.44
3	32	28.0	1,867	1.71%	1.50%	▲ 1.14
4	38	23.3	1,864	2.04%	1.25%	◆ 1.63
5	48	18.4	1,674	2.87%	1.10%	◆ 2.61
6	39	16.9	1,536	2.54%	1.10%	◆ 2.31
7	40	15.1	1,370	2.92%	1.10%	◆ 2.65
8	38	14.9	1,354	2.81%	1.10%	◆ 2.55
9	38	14.5	1,319	2.88%	1.10%	◆ 2.62
10	26	14.8	1,347	1.93%	1.10%	◆ 1.75
11	34	13.4	1,340	2.54%	1.00%	◆ 2.54
12	30	12.3	1,369	2.19%	0.90%	◆ 2.43
13	23	10.1	1,266	1.82%	0.80%	◆ 2.27
14	12	8.6	1,223	0.98%	0.70%	▲ 1.40
15	14	6.6	1,198	1.17%	0.55%	◆ 2.12
16	17	6.0	1,096	1.55%	0.55%	◆ 2.82
17	13	6.0	1,082	1.20%	0.55%	◆ 2.18
18	11	5.6	1,012	1.09%	0.55%	◆ 1.98
19	14	5.4	990	1.41%	0.55%	◆ 2.57
20	6	4.6	828	0.72%	0.55%	▲ 1.32
21	7	4.5	813	0.86%	0.55%	◆ 1.57
22	3	4.4	804	0.37%	0.55%	▲ 0.68
23	6	4.7	860	0.70%	0.55%	▲ 1.27
24	5	4.4	807	0.62%	0.55%	▲ 1.13
25	6	3.9	714	0.84%	0.55%	◆ 1.53
26	4	3.4	618	0.65%	0.55%	▲ 1.18
27	3	2.7	489	0.61%	0.55%	▲ 1.12
28	2	2.2	392	0.51%	0.55%	● 0.93
29	4	1.5	279	1.43%	0.55%	◆ 2.61
30	4	0.9	172	2.33%	0.55%	◆ 4.23
31	0	0.5	95	0.00%	0.55%	◆ 0.00
32	0	0.2	45	0.00%	0.55%	◆ 0.00
33	1	0.1	17	5.88%	0.55%	◆ 10.70
34	1	0.0	7	14.29%	0.55%	◆ 25.90
Total	817	534.2	35,858	2.28%	1.49%	◆ 1.53

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



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



Specific observations of Transit females:

- Overall, the actual withdrawal rates were much greater than expected (A/E 1.53).
- For service periods from 3 to 24 years, actual withdrawal rates were double the assumed rates (A/E ratio of 2.04).
- For service periods from 25 to 34 years of service, the actual experience was greater than the assumed rates (A/E ratio of 1.61), which is similar to male members.
 - This may be due to the fact that once a member completes 25 years of service, the benefit is payable unreduced at age 55 rather than at age 62.
 - The majority of this experience is for members in the age range 50 to 54.

Summary

We find that rates of withdrawal are higher among TBTA members and Transit female members than Transit male members. Rates of withdrawal were higher among members who accrued at least 25 years of service.

Retirement

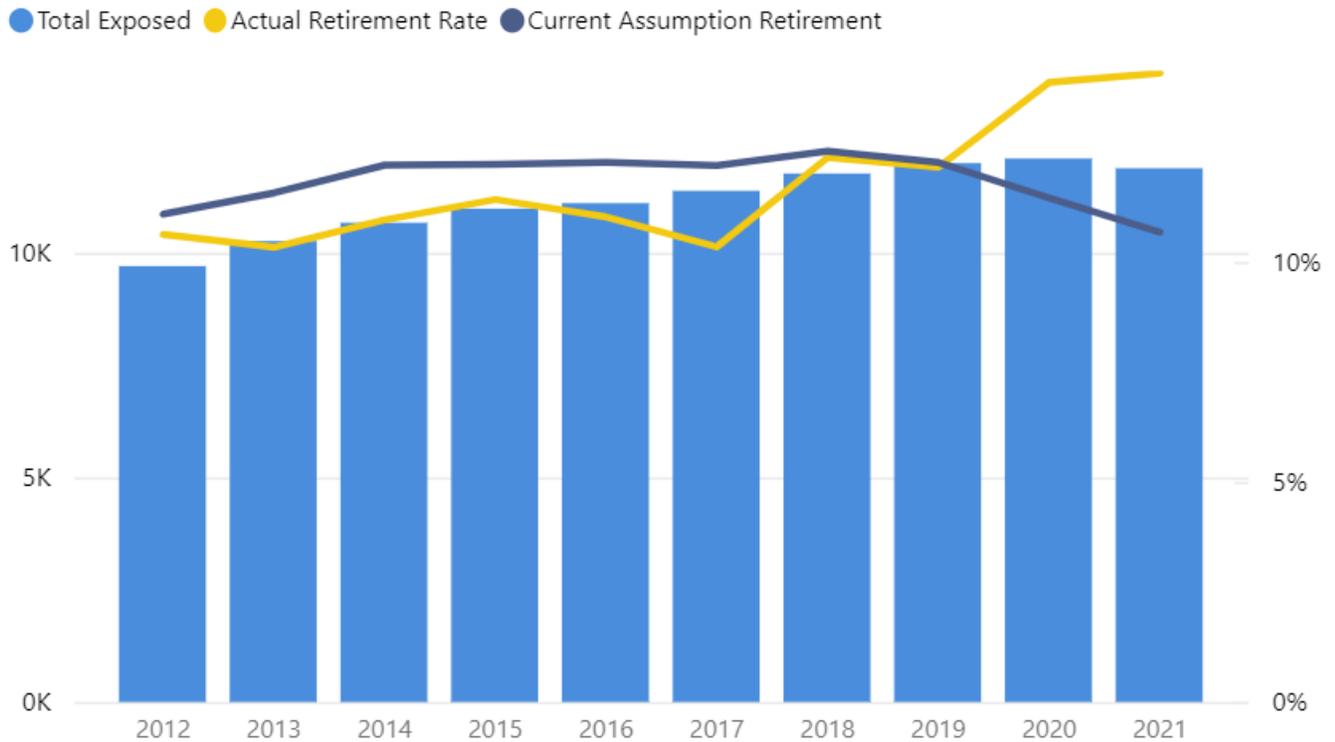
The current retirement assumption varies by age and eligibility for unreduced retirement with higher rates occurring at first eligibility. Furthermore, higher rates of retirement are assumed for members who had the option to elect an improved program. For Transit, the rates are lower at younger ages.

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. 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 retirement experience results of all the plans by year based on the age range (55 – 79) and service range (5 – 44). Based on the current assumptions, the overall expected rate of retirement averaged 11.85% which was nearly identical to the actual rate of 11.83%, for an A/E ratio of 1.00.

Plan Year	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
2012	1,031	1,075.7	9,705	10.62%	11.08%	0.96
2013	1,060	1,186.8	10,259	10.33%	11.57%	0.89
2014	1,169	1,301.4	10,669	10.96%	12.20%	0.90
2015	1,254	1,341.8	10,983	11.42%	12.22%	0.93
2016	1,224	1,362.1	11,106	11.02%	12.26%	0.90
2017	1,177	1,387.0	11,380	10.34%	12.19%	0.85
2018	1,455	1,472.7	11,765	12.37%	12.52%	0.99
2019	1,458	1,471.0	11,997	12.15%	12.26%	0.99
2020	1,704	1,385.8	12,099	14.08%	11.45%	1.23
2021	1,698	1,268.8	11,882	14.29%	10.68%	1.34
Total	13,230	13,253.2	111,845	11.83%	11.85%	1.00

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



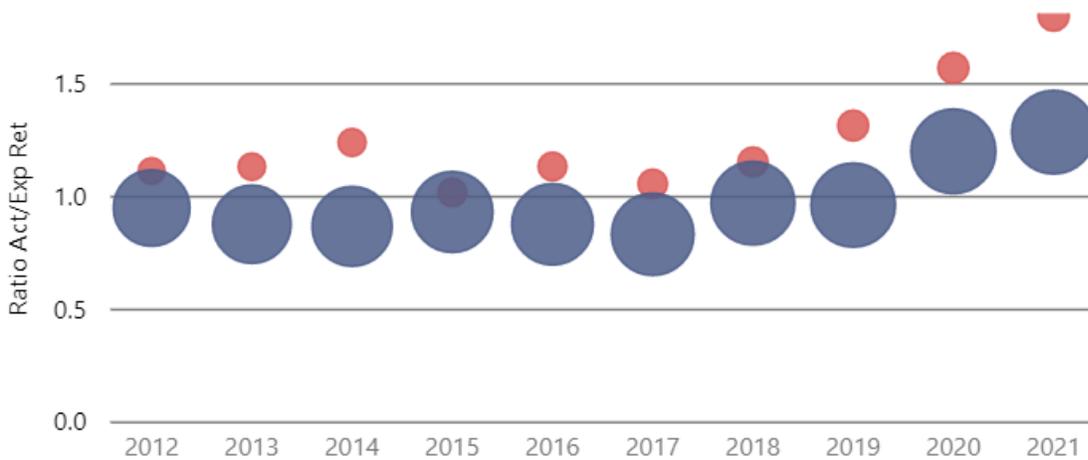
The rate of retirement during 2020 and 2021 may be slightly lower than shown in this report due to the treatment of members with a LOA status code. While the percentage of members with a LOA code who have a retired status code in the following two years is approximately 2%, the number of retirements not captured in each of these two years could be roughly 700 for all NYCERS members. We have not tabulated the specific breakdown for this group. We do note that there were more retirements in 2020 – 2021 than expected.

Specific observations:

- From 2020 – 2021, the actual number of retirements was greater than expected by 11% (A/E ratio of 1.28).
- From 2012 – 2019, the actual number of retirements was less than expected (A/E ratio of 0.93).
- A higher retirement assumption applies to members who elected an improved plan versus other members and actual experience was consistent with that assertion. Average rate of retirement for those who elected an improved plan was 21.23% versus 8.43% for mandated plan members.
- The rate of retirement was nearly identical for TBTA (11.84%) across all retirement plans versus Transit (11.83%)
- Experience for Transit females is greater than Transit males as shown in the following graph.

Actual vs. Expected - Retirement Rate w/ Exposure Bubbles; by Year

Gender ● Female ● Male



Analysis

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

1. TBTA - 50/20 Plan (plan code R) – normal retirement age 50 with 20 years of service mandated plan retirement rates. Members are coded as both mandated and elected.
2. Transit Improved Plan (plan code U) - normal retirement age 50 with 25 years of service mandated plan retirement rates. Members are coded as both mandated and elected.
3. Basic Plan Early Retirement Ages (55 to 61) - reduced retirement at age 55 with 5 years of service. We have separated out the experience for the age range 55 to 61. Members are coded as both mandated and elected.
4. Retirement Ages 62 to 69 – For members with less than 25 years of service, we have separated out the experience for the age range 62 to 69. Members are coded as both mandated and elected.
5. Age 57/5 Plan (plan code I) – normal retirement at age 57 and mandated plan retirement rates. Physically Taxing members are eligible for unreduced retirement at age 50 with 25 years of service, but there are very few of these exposures.

TBTA 50/20 Plan (20+ Years of Service)

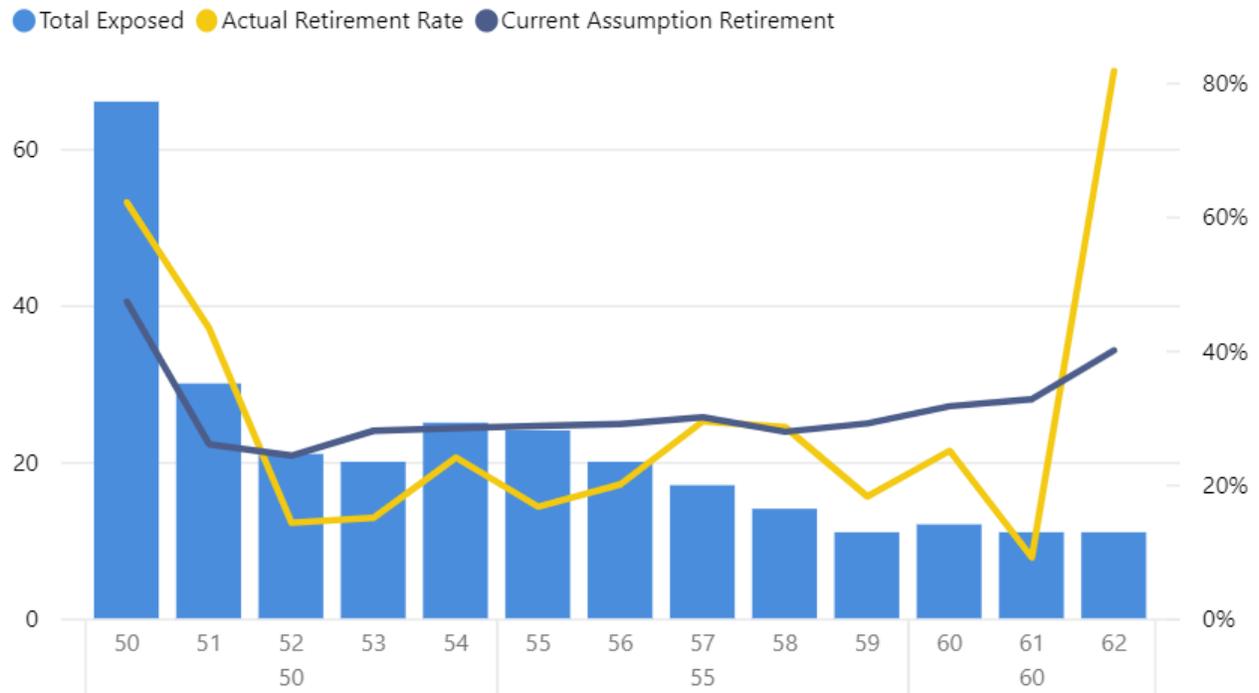
The following chart displays the experience of TBTA 50/20 Plan members by service, for the age range 50 to 62 and service range 20 to 34, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
20	12	11.1	25	48.00%	44.40%	1.08
21	2	4.4	15	13.33%	29.33%	0.45
22	7	6.4	22	31.82%	29.09%	1.09
23	9	8.4	26	34.62%	32.31%	1.07
24	13	8.8	27	48.15%	32.59%	1.48
25	7	9.6	26	26.92%	36.92%	0.73
26	14	13.4	36	38.89%	37.22%	1.04
27	5	7.5	25	20.00%	30.00%	0.67
28	7	7.4	24	29.17%	30.83%	0.95
29	7	5.6	19	36.84%	29.47%	1.25
30	9	4.8	15	60.00%	32.00%	1.88
31	1	1.8	7	14.29%	25.71%	0.56
32	0	1.9	7	0.00%	27.14%	0.00
33	5	2.2	7	71.43%	31.43%	2.27
34	0	0.2	1	0.00%	20.00%	0.00
Total	98	93.5	282	34.75%	33.16%	1.05

The following chart displays the experience of TBTA 50/20 Plan members by age, for the age range 50 to 62 and service range 20 to 34, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
50	41	31.2	66	62.12%	47.27%	▲ 1.31
51	13	7.8	30	43.33%	26.00%	◆ 1.67
52	3	5.1	21	14.29%	24.29%	▲ 0.59
53	3	5.6	20	15.00%	28.00%	▲ 0.54
54	6	7.1	25	24.00%	28.40%	▲ 0.85
55	4	6.9	24	16.67%	28.75%	▲ 0.58
56	4	5.8	20	20.00%	29.00%	▲ 0.69
57	5	5.1	17	29.41%	30.00%	● 0.98
58	4	3.9	14	28.57%	27.86%	● 1.03
59	2	3.2	11	18.18%	29.09%	▲ 0.63
60	3	3.8	12	25.00%	31.67%	▲ 0.79
61	1	3.6	11	9.09%	32.73%	◆ 0.28
62	9	4.4	11	81.82%	40.00%	◆ 2.05
Total	98	93.5	282	34.75%	33.16%	● 1.05

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



Specific observations:

- Overall, the actual rate of retirement was greater than expected (A/E ratio of 1.05).
- Retirements at first eligibility were greater than expected (A/E ratio of 1.25) despite the fact that retirements recorded in the 20th year of service or at age 49 may have actually occurred upon completion of 20 years or attainment of age 50. If we include all retirements in the 19th year and at age 49, the A/E ratio increases to approximately 1.40.
- Members who elected an improved plan had higher rates of retirement (38.33% for an A/E ratio of 0.99) than members who were mandated into a plan (28.43% for an A/E ratio of 1.20). The following two graphs shows the experience by age for these two groups:

Improved Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
50	28	22.8	38	73.68%	60.00%	▲ 1.23
51	8	4.2	13	61.54%	32.31%	◆ 1.90
52	1	2.7	9	11.11%	30.00%	◆ 0.37
53	1	3.6	10	10.00%	36.00%	◆ 0.28
54	4	4.8	15	26.67%	32.00%	▲ 0.83
55	1	4.8	14	7.14%	34.29%	◆ 0.21
56	3	4.8	15	20.00%	32.00%	▲ 0.63
57	4	4.2	13	30.77%	32.31%	● 0.95
58	4	3.3	11	36.36%	30.00%	▲ 1.21
59	2	3.0	10	20.00%	30.00%	▲ 0.67
60	3	3.6	11	27.27%	32.73%	▲ 0.83
61	1	3.6	11	9.09%	32.73%	◆ 0.28
62	9	4.0	10	90.00%	40.00%	◆ 2.25
Total	69	69.4	180	38.33%	38.56%	● 0.99

Mandated Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
50	13	8.4	28	46.43%	30.00%	1.55
51	5	3.6	17	29.41%	21.18%	1.39
52	2	2.4	12	16.67%	20.00%	0.83
53	2	2.0	10	20.00%	20.00%	1.00
54	2	2.3	10	20.00%	23.00%	0.87
55	3	2.1	10	30.00%	21.00%	1.43
56	1	1.0	5	20.00%	20.00%	1.00
57	1	0.9	4	25.00%	22.50%	1.11
58	0	0.6	3	0.00%	20.00%	0.00
59	0	0.2	1	0.00%	20.00%	0.00
60	0	0.2	1	0.00%	20.00%	0.00
62	0	0.4	1	0.00%	40.00%	0.00
Total	29	24.1	102	28.43%	23.63%	1.20

Transit Improved Plan (Age 55/25)

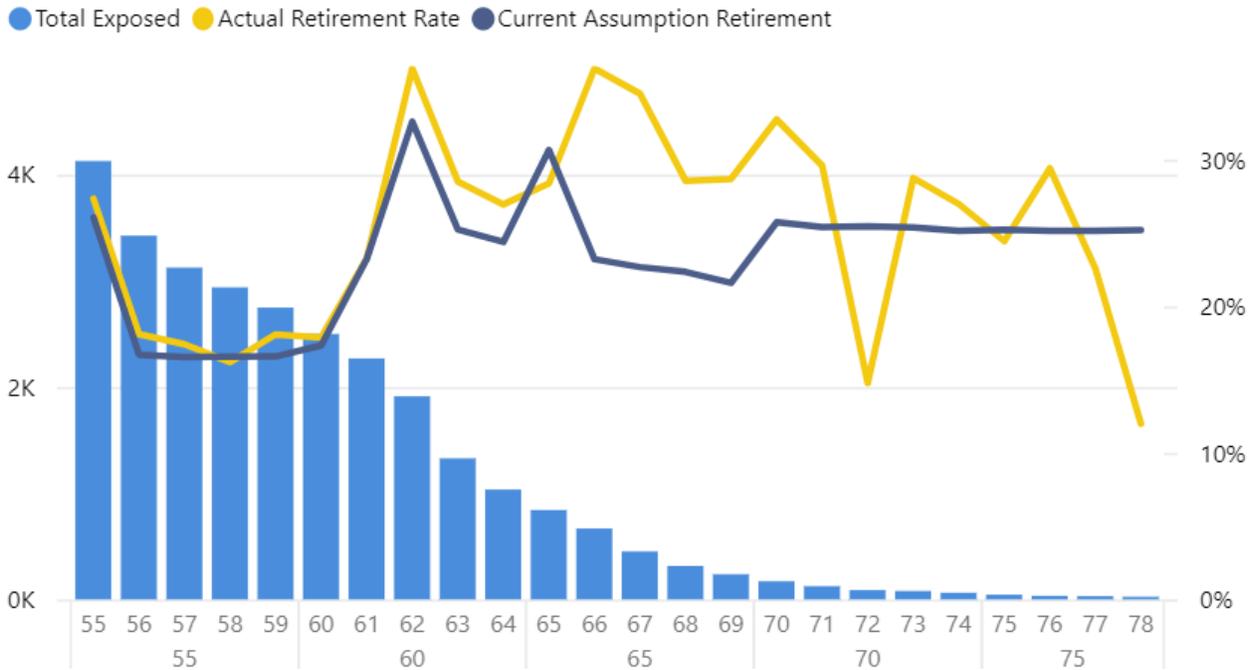
The following chart displays the experience of Transit Improved plan members by service, for the age range 55 to 79 and service range 25 to 39, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
25	1,006	1,121.2	4,076	24.68%	27.51%	0.90
26	692	680.5	3,538	19.56%	19.23%	1.02
27	622	631.8	3,221	19.31%	19.62%	0.98
28	607	623.3	3,139	19.34%	19.86%	0.97
29	637	611.7	3,028	21.04%	20.20%	1.04
30	724	571.2	2,816	25.71%	20.28%	1.27
31	535	470.6	2,276	23.51%	20.67%	1.14
32	497	400.9	1,955	25.42%	20.51%	1.24
33	432	334.7	1,611	26.82%	20.78%	1.29
34	316	239.3	1,139	27.74%	21.01%	1.32
35	206	166.9	781	26.38%	21.38%	1.23
36	145	115.1	525	27.62%	21.93%	1.26
37	90	71.4	302	29.80%	23.66%	1.26
38	45	35.1	143	31.47%	24.55%	1.28
39	17	17.4	63	26.98%	27.62%	0.98
Total	6,571	6,091.1	28,613	22.97%	21.29%	1.08

The following chart displays the experience of Transit Improved plan members by age, for the age range 55 to 79 and service range 25 to 39, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	1,129	1,076.2	4,129	27.34%	26.06%	1.05
56	620	572.3	3,426	18.10%	16.70%	1.08
57	544	516.9	3,125	17.41%	16.54%	1.05
58	476	486.6	2,939	16.20%	16.56%	0.98
59	497	455.6	2,748	18.09%	16.58%	1.09
60	447	433.5	2,500	17.88%	17.34%	1.03
61	528	527.3	2,270	23.26%	23.23%	1.00
62	693	623.6	1,913	36.23%	32.60%	1.11
63	379	335.5	1,329	28.52%	25.24%	1.13
64	279	252.4	1,035	26.96%	24.39%	1.11
65	239	258.2	842	28.38%	30.67%	0.93
66	242	155.1	668	36.23%	23.22%	1.56
67	156	102.5	452	34.51%	22.68%	1.52
68	90	70.4	315	28.57%	22.35%	1.28
69	68	51.2	237	28.69%	21.60%	1.33
70	56	44.0	171	32.75%	25.73%	1.27
71	37	31.8	125	29.60%	25.40%	1.17
72	13	22.4	88	14.77%	25.45%	0.58
73	23	20.3	80	28.75%	25.38%	1.13
74	17	15.9	63	26.98%	25.16%	1.07
75	11	11.4	45	24.44%	25.22%	0.97
76	10	8.6	34	29.41%	25.15%	1.17
77	7	7.8	31	22.58%	25.16%	0.90
78	3	6.3	25	12.00%	25.20%	0.48
79	7	5.8	23	30.43%	25.00%	1.22
Total	6,571	6,091.1	28,613	22.97%	21.29%	1.08

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



Specific observations:

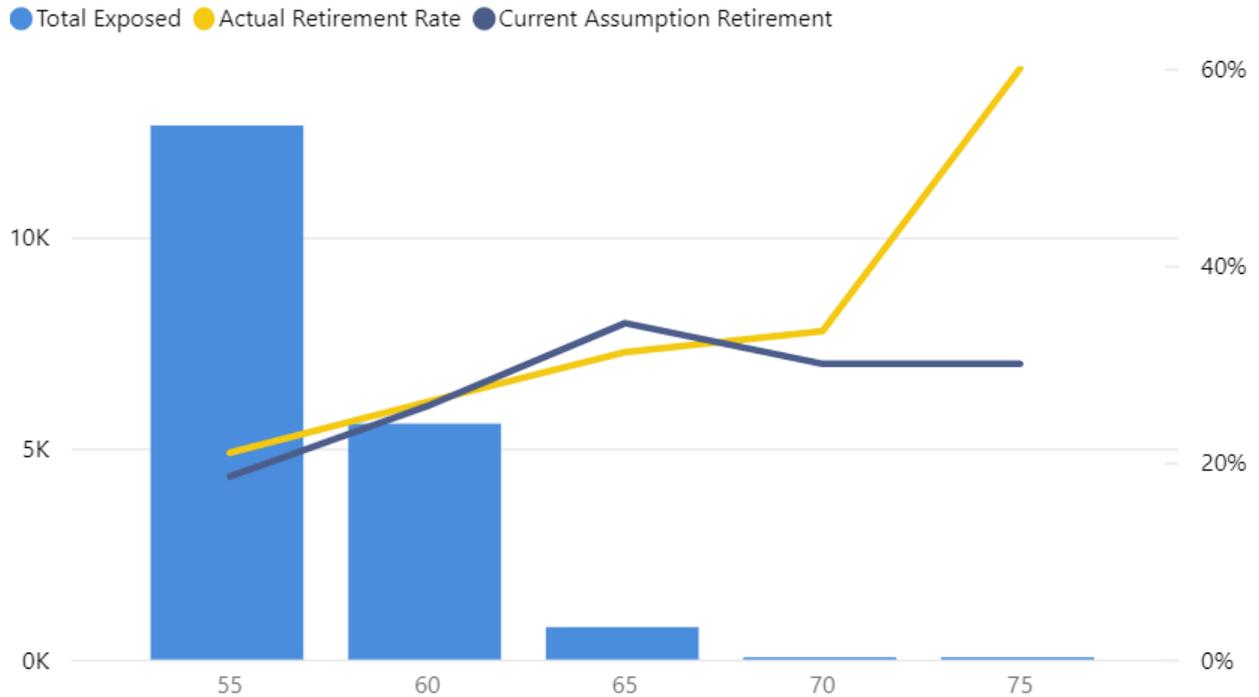
- Overall, the actual rate of retirement was greater than expected (A/E ratio of 1.08).
- Retirements at first eligibility were less than expected (A/E ratio of 0.93). However, retirements recorded in the 25th year of service or at age 54 may have actually occurred upon completion of 25 years or attainment of age 55. If we include all retirements in the 24th year and at age 54, the A/E ratio increases to approximately 1.17.
- For the age range 55 to 61, OA assumes that Transit members who elected an improved plan have *lower* rates of retirement than mandated members. For this age range actual rates of retirement were *higher* (21.08% for an A/E ratio of 1.13) than members who were mandated into a plan (16.97% for an A/E ratio of 0.80).
- For the age range 62 to 79, Transit members who elected an improved plan had higher rates of retirement (32.42% for an A/E ratio of 0.93) than members who were mandated into a plan (30.26% for an A/E ratio of 1.42).

The following two graphs shows the experience by age for these two groups:

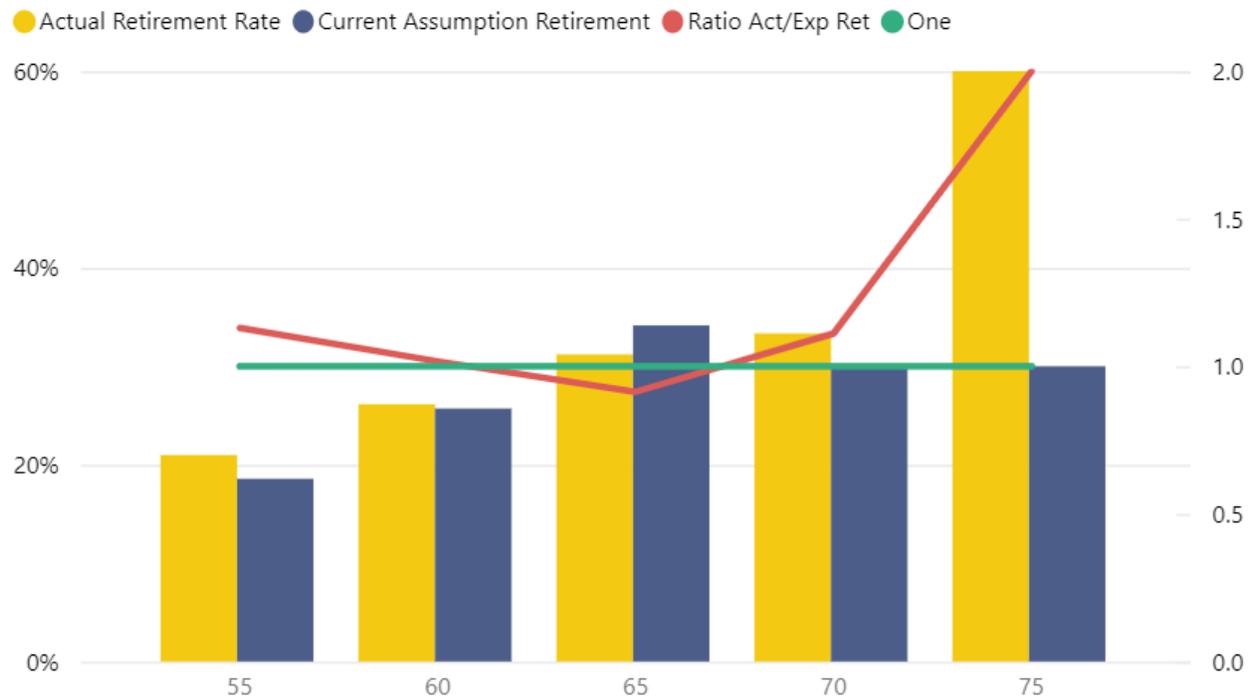
Improved Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	917	812.8	3,251	28.21%	25.00%	▲ 1.13
56	507	441.5	2,675	18.95%	16.50%	▲ 1.15
57	441	393.9	2,415	18.26%	16.31%	▲ 1.12
58	388	368.5	2,251	17.24%	16.37%	● 1.05
59	400	331.2	2,054	19.47%	16.12%	▲ 1.21
60	346	293.1	1,775	19.49%	16.51%	▲ 1.18
61	356	324.0	1,496	23.80%	21.66%	● 1.10
62	423	473.8	1,164	36.34%	40.70%	▲ 0.89
63	207	209.1	697	29.70%	30.00%	● 0.99
64	128	136.2	454	28.19%	30.00%	● 0.94
65	90	127.2	318	28.30%	40.00%	▲ 0.71
66	78	64.5	215	36.28%	30.00%	▲ 1.21
67	38	36.3	121	31.40%	30.00%	● 1.05
68	25	22.2	74	33.78%	30.00%	▲ 1.13
69	8	11.4	38	21.05%	30.00%	▲ 0.70
70	11	7.5	25	44.00%	30.00%	▲ 1.47
71	3	3.0	10	30.00%	30.00%	● 1.00
72	2	2.4	8	25.00%	30.00%	▲ 0.83
73	1	1.8	6	16.67%	30.00%	▲ 0.56
74	0	0.6	2	0.00%	30.00%	◆ 0.00
75	1	0.6	2	50.00%	30.00%	◆ 1.67
76	1	0.3	1	100.00%	30.00%	◆ 3.33
77	0	0.3	1	0.00%	30.00%	◆ 0.00
78	1	0.3	1	100.00%	30.00%	◆ 3.33
Total	4,372	4,062.4	19,054	22.95%	21.32%	● 1.08

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



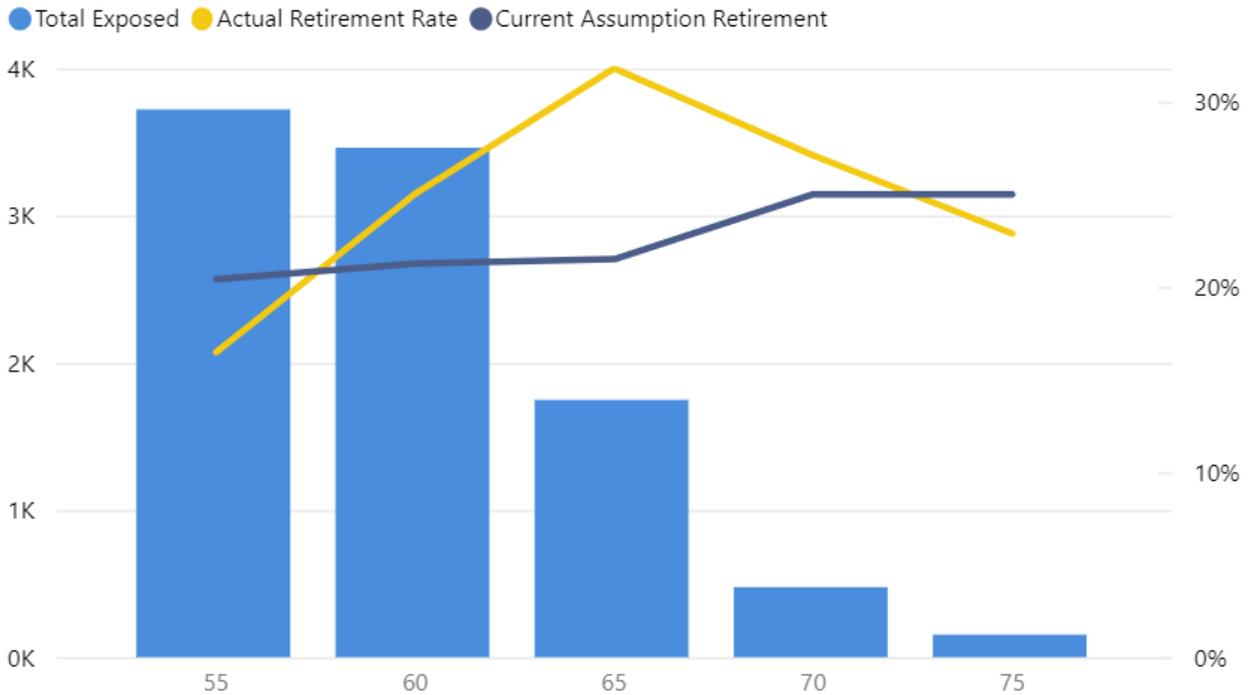
Retirement Rate - Actual, Expected, and Ratio; by Age



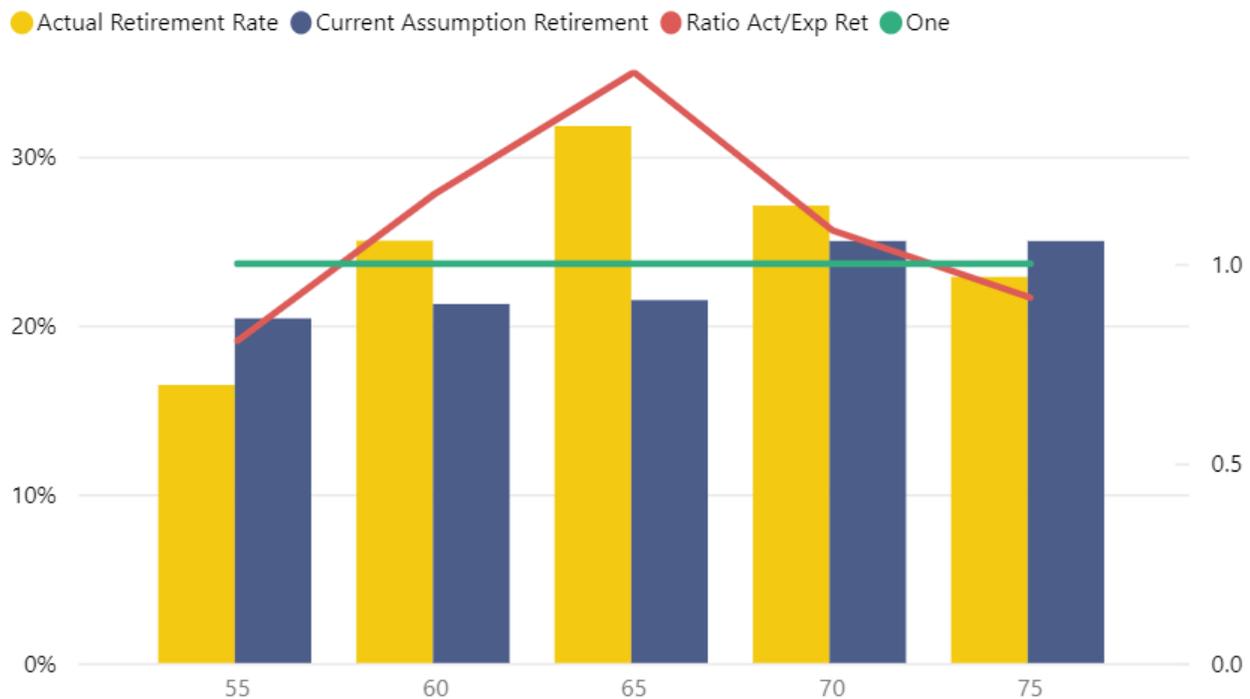
Mandated Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	212	263.4	878	24.15%	30.00%	▲ 0.80
56	113	130.8	751	15.05%	17.42%	▲ 0.86
57	103	123.0	710	14.51%	17.32%	▲ 0.84
58	88	118.0	688	12.79%	17.16%	▲ 0.75
59	97	124.3	694	13.98%	17.92%	▲ 0.78
60	101	140.3	725	13.93%	19.36%	▲ 0.72
61	172	203.3	774	22.22%	26.27%	▲ 0.85
62	270	149.8	749	36.05%	20.00%	◆ 1.80
63	172	126.4	632	27.22%	20.00%	▲ 1.36
64	151	116.2	581	25.99%	20.00%	▲ 1.30
65	149	131.0	524	28.44%	25.00%	▲ 1.14
66	164	90.6	453	36.20%	20.00%	◆ 1.81
67	118	66.2	331	35.65%	20.00%	◆ 1.78
68	65	48.2	241	26.97%	20.00%	▲ 1.35
69	60	39.8	199	30.15%	20.00%	◆ 1.51
70	45	36.5	146	30.82%	25.00%	▲ 1.23
71	34	28.8	115	29.57%	25.00%	▲ 1.18
72	11	20.0	80	13.75%	25.00%	▲ 0.55
73	22	18.5	74	29.73%	25.00%	▲ 1.19
74	17	15.3	61	27.87%	25.00%	▲ 1.11
75	10	10.8	43	23.26%	25.00%	● 0.93
76	9	8.3	33	27.27%	25.00%	● 1.09
77	7	7.5	30	23.33%	25.00%	● 0.93
78	2	6.0	24	8.33%	25.00%	◆ 0.33
79	7	5.8	23	30.43%	25.00%	▲ 1.22
Total	2,199	2,028.7	9,559	23.00%	21.22%	● 1.08

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



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



Specific observations:

- For the age range 62 to 69, Mandated and Improved Plan members exhibited similar retirement patterns with the highest rates occurring at ages 62, 66 and 67.
- For improved plan members, most seemed to have retired by age 70 while the assumption includes members assumed to work to age 80.

Basic Plan Early Retirement Ages (55 to 61)

In this section, we review the experience of TBTA 50/20 Plan members with less than 20 years of service and Transit members with less than 25 years of service but eligible for reduced retirement under the Basic Plan. OA applies rates of termination which vary by service during this period. While there are mandated and improved plan members, the rate of termination does not vary by this characteristic.

The following chart displays the early retirement experience of TBTA 50/20 plan members by age, for the age range 55 to 61 and service range 5 to 19, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	1	0.9	108	0.93%	0.84%	▲ 1.11
56	0	0.8	92	0.00%	0.82%	◆ 0.00
57	6	0.6	80	7.50%	0.79%	◆ 9.49
58	1	0.5	66	1.52%	0.82%	◆ 1.85
59	6	0.5	63	9.52%	0.80%	◆ 11.83
60	3	0.4	52	5.77%	0.80%	◆ 7.23
61	4	0.3	40	10.00%	0.83%	◆ 12.10
Total	21	4.1	501	4.19%	0.81%	◆ 5.15

Specific observations:

- While the volume of data is not enough to be credible, but similar to other groups, more retirements occurred than assumed by the termination assumption.

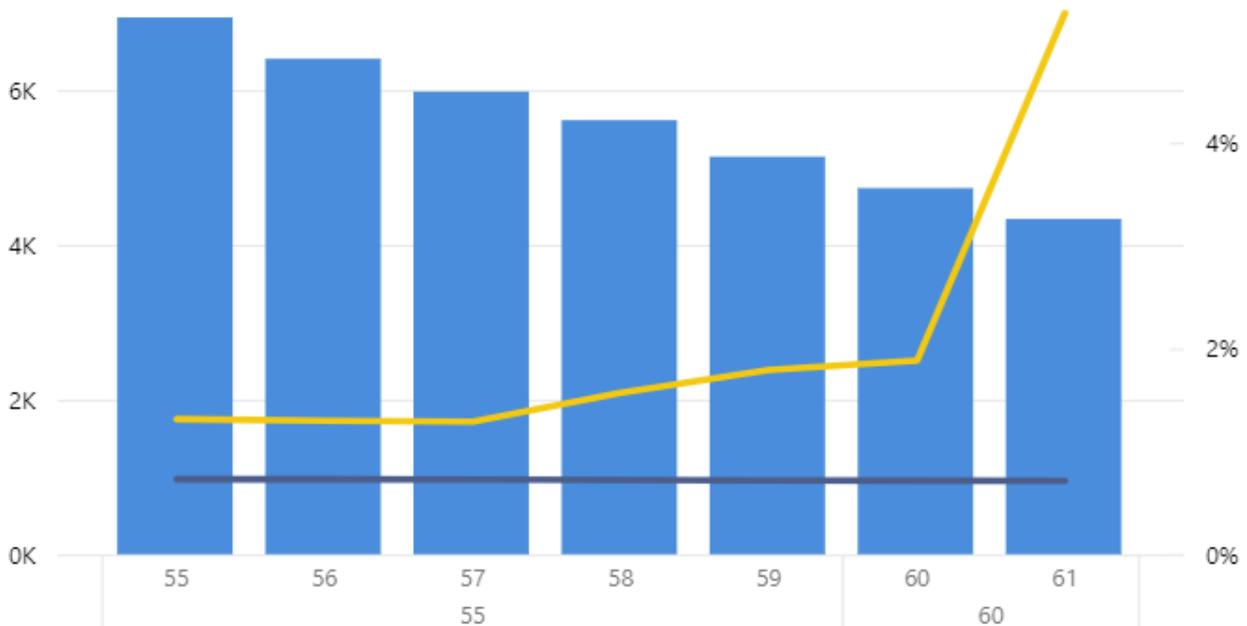
The following charts display the early retirement experience of Transit members by age, for the age range 55 to 61 and service range 5 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	91	50.6	6,937	1.31%	0.73%	1.80
56	83	46.7	6,403	1.30%	0.73%	1.78
57	77	43.3	5,978	1.29%	0.73%	1.78
58	88	40.5	5,609	1.57%	0.72%	2.17
59	92	36.9	5,138	1.79%	0.72%	2.49
60	89	33.8	4,732	1.88%	0.72%	2.63
61	228	30.8	4,333	5.26%	0.71%	7.40
Total	748	282.7	39,130	1.91%	0.72%	2.65

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



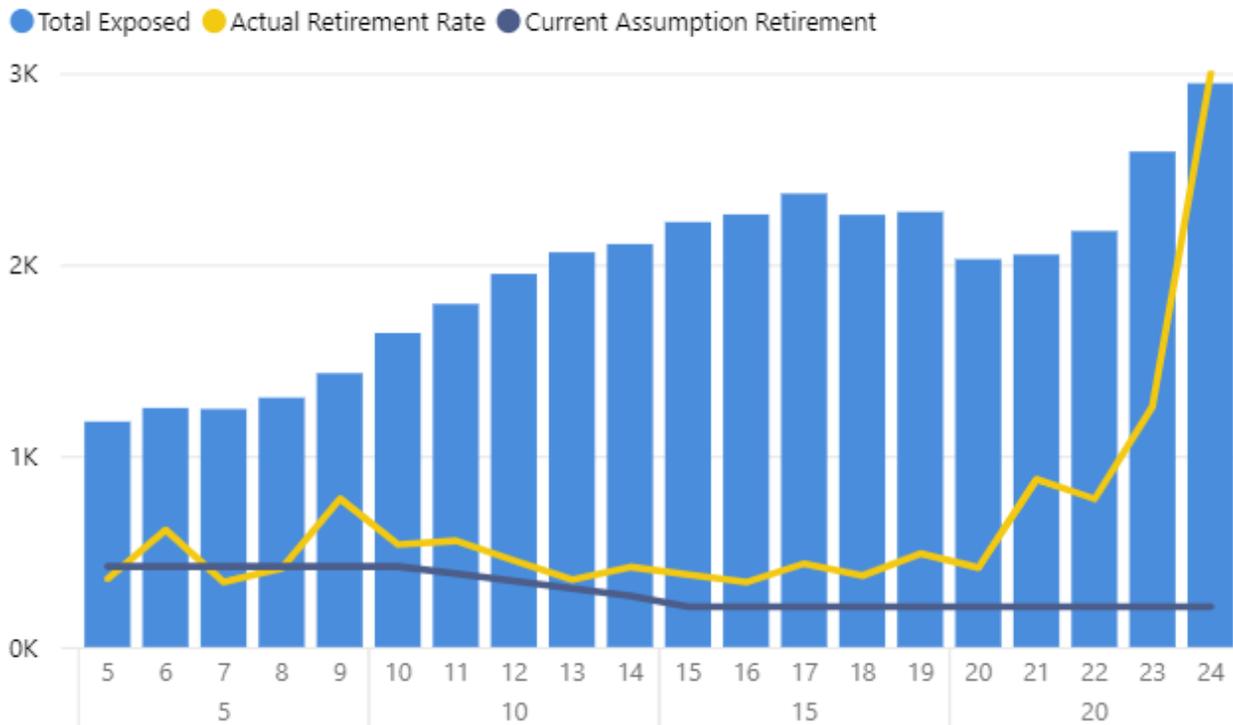
● Total Exposed ● Actual Retirement Rate ● Current Assumption Retirement



The following charts display the early retirement experience of Transit members by service, for the age range 55 to 61 and service range 5 to 24, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	11	13.0	1,178	0.93%	1.10%	▲ 0.85
6	20	13.7	1,249	1.60%	1.10%	▲ 1.46
7	11	13.7	1,244	0.88%	1.10%	▲ 0.80
8	14	14.3	1,303	1.07%	1.10%	● 0.98
9	29	15.7	1,431	2.03%	1.10%	◆ 1.84
10	23	18.0	1,641	1.40%	1.10%	▲ 1.27
11	26	17.9	1,793	1.45%	1.00%	▲ 1.45
12	23	17.5	1,950	1.18%	0.90%	▲ 1.31
13	19	16.5	2,063	0.92%	0.80%	▲ 1.15
14	23	14.7	2,106	1.09%	0.70%	◆ 1.56
15	22	12.2	2,221	0.99%	0.55%	◆ 1.80
16	20	12.4	2,261	0.88%	0.55%	◆ 1.61
17	27	13.0	2,370	1.14%	0.55%	◆ 2.07
18	22	12.4	2,259	0.97%	0.55%	◆ 1.77
19	29	12.5	2,274	1.28%	0.55%	◆ 2.32
20	22	11.1	2,027	1.09%	0.55%	◆ 1.97
21	47	11.3	2,051	2.29%	0.55%	◆ 4.17
22	44	12.0	2,174	2.02%	0.55%	◆ 3.68
23	85	14.2	2,589	3.28%	0.55%	◆ 5.97
24	231	16.2	2,946	7.84%	0.55%	◆ 14.26
Total	748	282.7	39,130	1.91%	0.72%	◆ 2.65

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



Specific observations:

- In total, actual reduced retirements were more than twice that anticipated by the termination assumption (actual rate of 1.91% versus 0.72%).
 - As some retirements that are recorded at 24 years of service may have occurred at 25 years of service or eligible for unreduced retirement, the actual retirement rate at this service point is much higher. Even excluding it, the A/E ratio is still nearly doubled the rates of termination used.
- The actual rates of reduced retirement are consistent by service for the service range 5 to 20. From 21 to 24 years of service, the rates of termination increase as service increases. The termination assumption is negatively correlated with service meaning that it decreases as service increases.
 - A higher rate at 20 years could be due to receiving the underlying Basic Plan benefit formula where a 2% multiplier applies to all years of service once 20 years are accrued.
- Members who elected an improved plan had higher rates of reduced retirement (4.07%) than members who were mandated into a plan (1.58%). The following two graphs shows the experience by age for these two groups:

Improved Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	39	7.5	1,364	2.86%	0.55%	◆ 5.18
56	27	6.2	1,119	2.41%	0.55%	◆ 4.37
57	35	5.1	919	3.81%	0.55%	◆ 6.90
58	33	3.8	695	4.75%	0.55%	◆ 8.60
59	31	2.8	505	6.14%	0.55%	◆ 11.10
60	20	1.9	346	5.78%	0.56%	◆ 10.41
61	26	1.3	241	10.79%	0.55%	◆ 19.47
Total	211	28.7	5,189	4.07%	0.55%	◆ 7.36

Mandated Plan

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
55	52	43.0	5,573	0.93%	0.77%	▲ 1.21
56	56	40.5	5,284	1.06%	0.77%	▲ 1.38
57	42	38.3	5,059	0.83%	0.76%	● 1.10
58	55	36.7	4,914	1.12%	0.75%	◆ 1.50
59	61	34.1	4,633	1.32%	0.74%	◆ 1.79
60	69	31.9	4,386	1.57%	0.73%	◆ 2.16
61	201	29.5	4,091	4.91%	0.72%	◆ 6.82
Total	536	254.0	33,940	1.58%	0.75%	◆ 2.11

Retirement Ages 62 to 69 (<25 Years)

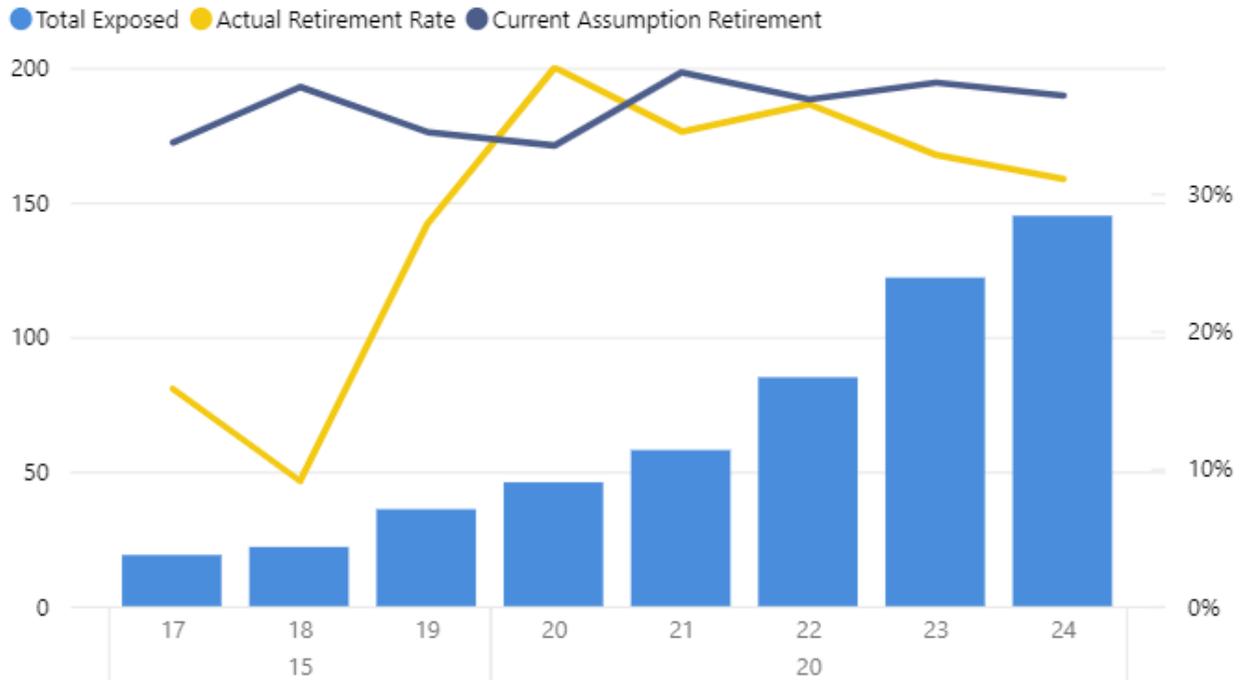
In this section, we review the experience of TBTA and Transit members with less than 25 years of service but eligible for normal retirement under the Basic Plan. OA applies rates of retirement which vary by whether the member elected an improved plan or was mandated into a plan.

Improved Plan

The following charts display the normal retirement experience of Transit members who elected an improved plan, by service, for the age range 62 to 69 and service range 17 to 24, during 2012 – 2019. There was nearly no experience for TBTA members and for service between 5 and 16 years for Transit so these periods were excluded.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
17	3	6.4	19	15.79%	33.68%	0.47
18	2	8.3	22	9.09%	37.73%	0.24
19	10	12.4	36	27.78%	34.44%	0.81
20	18	15.4	46	39.13%	33.48%	1.17
21	20	22.5	58	34.48%	38.79%	0.89
22	31	31.3	85	36.47%	36.82%	0.99
23	40	46.4	122	32.79%	38.03%	0.86
24	45	53.8	145	31.03%	37.10%	0.84
Total	169	196.5	533	31.71%	36.87%	0.86

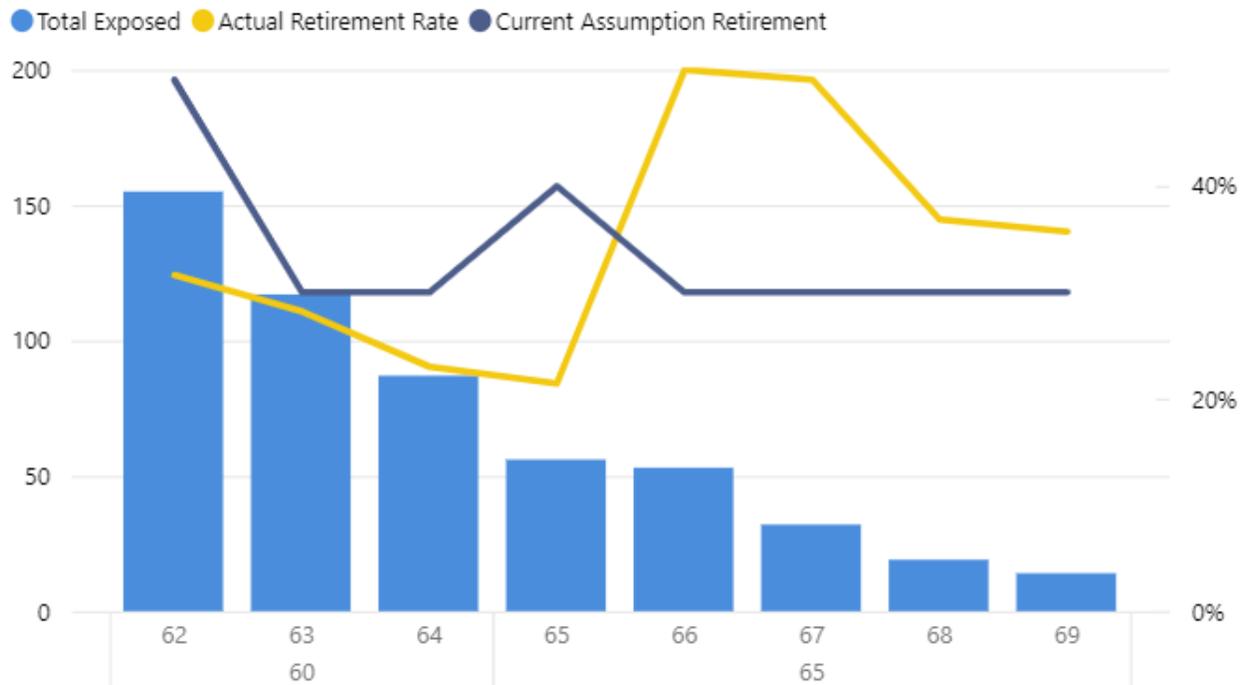
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



The following charts display the normal retirement experience of Transit members who elected an improved plan, by age, for the age range 62 to 69 and service range 17 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
62	49	77.5	155	31.61%	50.00%	▲ 0.63
63	33	35.1	117	28.21%	30.00%	● 0.94
64	20	26.1	87	22.99%	30.00%	▲ 0.77
65	12	22.4	56	21.43%	40.00%	▲ 0.54
66	27	15.9	53	50.94%	30.00%	◆ 1.70
67	16	9.6	32	50.00%	30.00%	◆ 1.67
68	7	5.7	19	36.84%	30.00%	▲ 1.23
69	5	4.2	14	35.71%	30.00%	▲ 1.19
Total	169	196.5	533	31.71%	36.87%	▲ 0.86

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



Specific observations:

- In total, actual retirements were less than assumed by 14% (A/E ratio of 0.86).

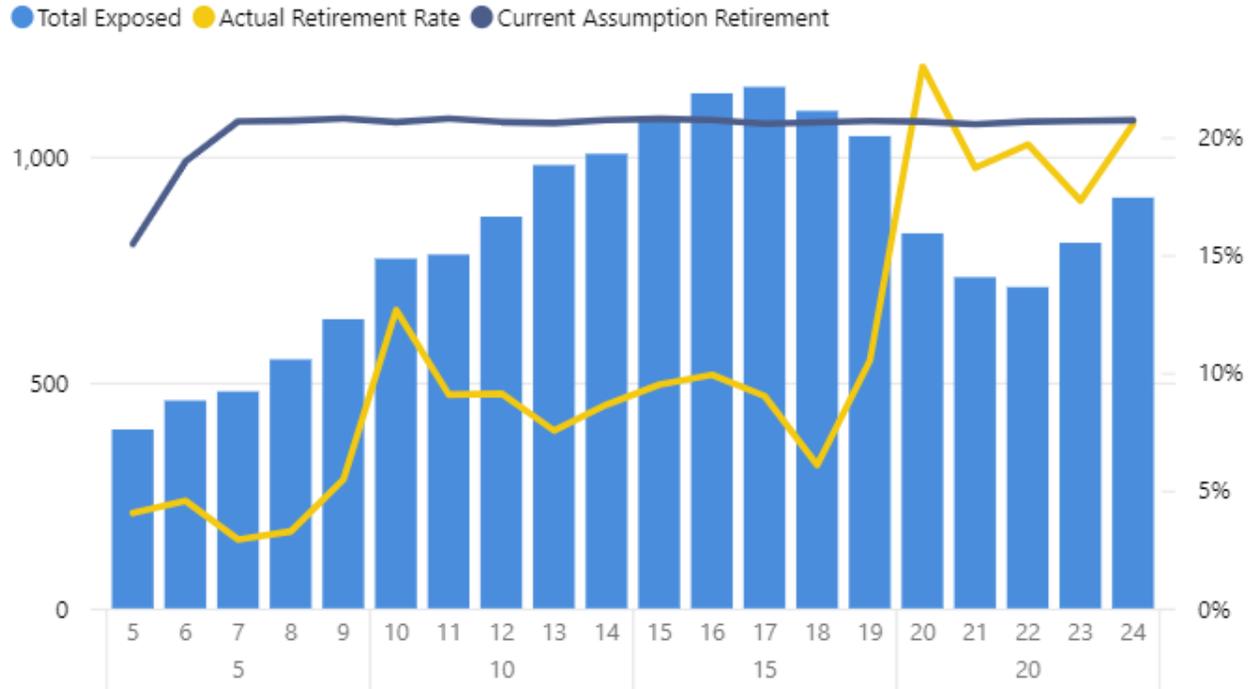
- At age 62, OA applies the first eligibility rate of 50% but this is much higher than the experience (A/E 0.63) although actual retirements recorded at age 61 may occur at age 62.
- For the age range 63 to 69, the experience is similar to that expected (A/E ratio of 1.01).

Mandated Plan

The following charts display the normal retirement experience of Transit mandated plan members by service, for the age range 62 to 69 and service range 5 to 24, during 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	16	61.2	396	4.04%	15.47%	0.26
6	21	87.3	460	4.57%	18.97%	0.24
7	14	99.2	480	2.92%	20.67%	0.14
8	18	114.0	551	3.27%	20.70%	0.16
9	35	133.1	640	5.47%	20.79%	0.26
10	98	159.8	774	12.66%	20.64%	0.61
11	71	162.7	783	9.07%	20.78%	0.44
12	79	179.0	867	9.11%	20.64%	0.44
13	74	202.1	981	7.54%	20.60%	0.37
14	87	208.6	1,006	8.65%	20.73%	0.42
15	103	225.5	1,085	9.49%	20.78%	0.46
16	113	236.3	1,140	9.91%	20.73%	0.48
17	104	237.4	1,154	9.01%	20.57%	0.44
18	67	227.1	1,101	6.09%	20.62%	0.30
19	110	216.2	1,045	10.53%	20.68%	0.51
20	191	171.5	830	23.01%	20.66%	1.11
21	137	150.7	733	18.69%	20.55%	0.91
22	140	146.9	711	19.69%	20.65%	0.95
23	140	167.4	809	17.31%	20.69%	0.84
24	187	188.3	909	20.57%	20.72%	0.99
Total	1,805	3,373.7	16,455	10.97%	20.50%	0.54

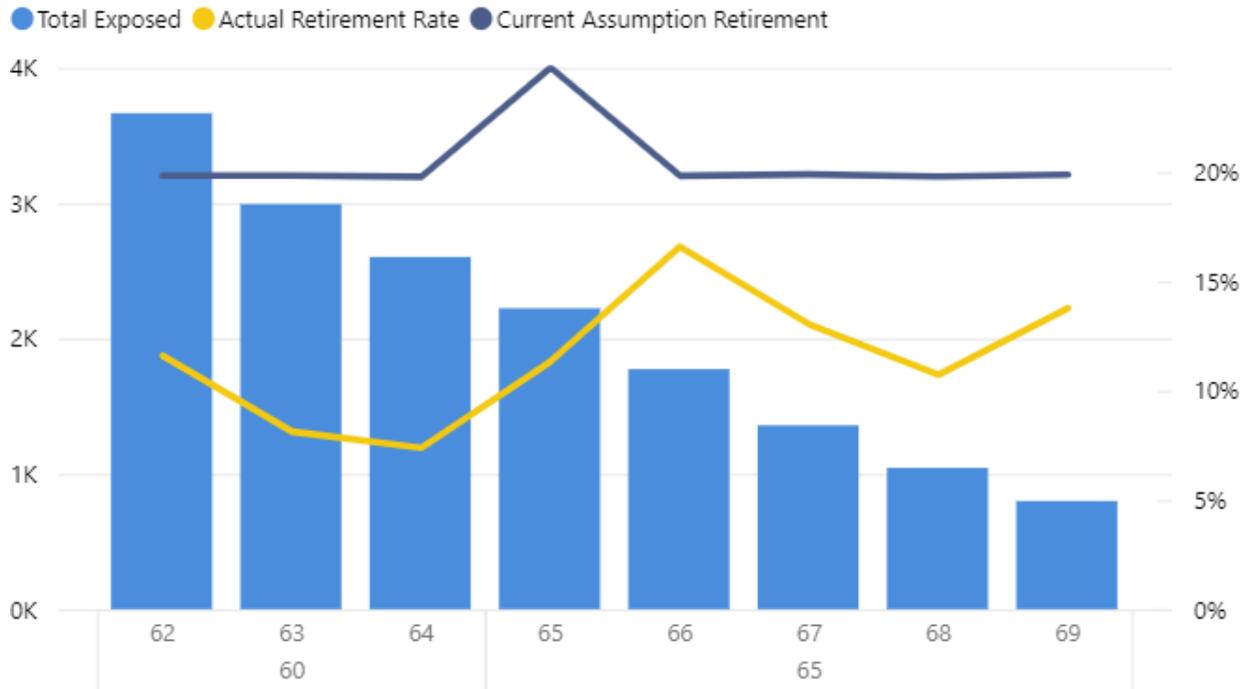
Exposure Distribution w/ Retirement Rate - Actual and Expected; by Service



The following charts display the normal retirement experience of Transit mandated plan members by age, for the age range 62 to 69 and service range 17 to 24, during 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
62	425	727.1	3,664	11.60%	19.85%	▲ 0.58
63	243	593.7	2,992	8.12%	19.84%	◆ 0.41
64	192	514.9	2,602	7.38%	19.79%	◆ 0.37
65	252	550.7	2,223	11.34%	24.77%	◆ 0.46
66	294	351.6	1,773	16.58%	19.83%	▲ 0.84
67	177	270.1	1,358	13.03%	19.89%	▲ 0.66
68	112	206.7	1,044	10.73%	19.80%	▲ 0.54
69	110	158.9	799	13.77%	19.88%	▲ 0.69
Total	1,805	3,373.7	16,455	10.97%	20.50%	▲ 0.54

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



Specific observations:

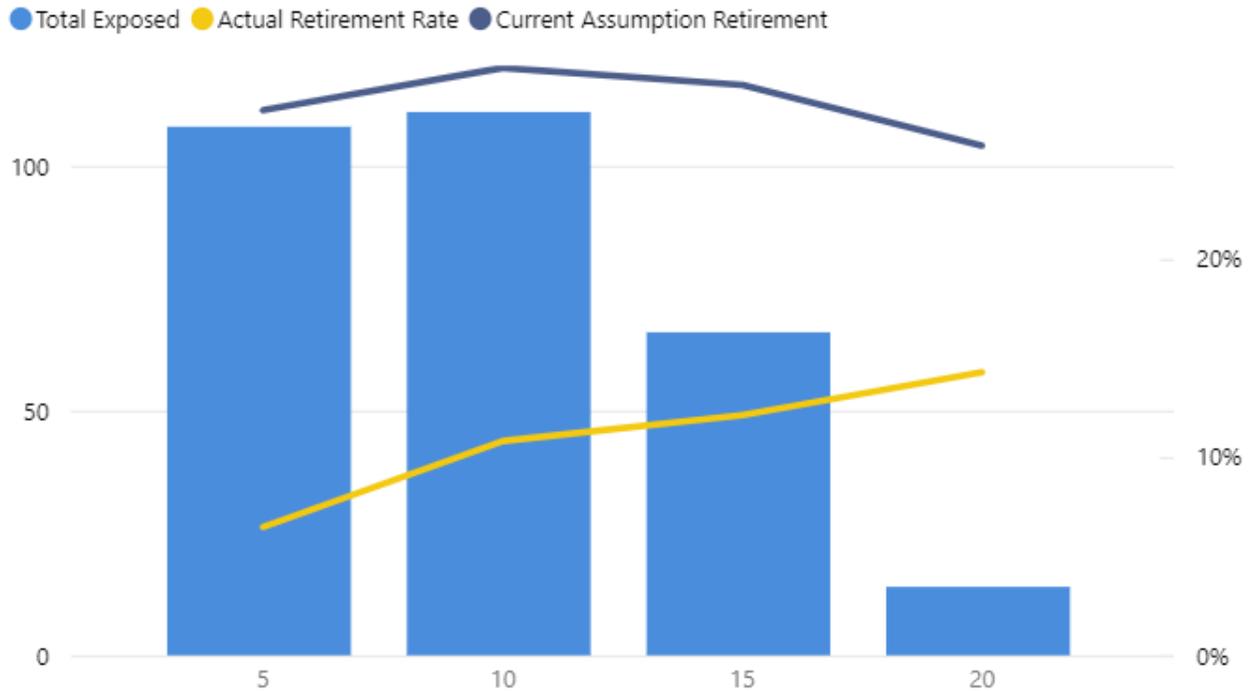
- In total, actual retirements were much less than expected (A/E ratio of 0.54).
- For service periods 5 to 19, actual retirements were 60% less than expected (A/E ratio of 0.40).
- For the service period 20 to 24 years, the experience is similar to that expected (A/E ratio of 0.96).

Age 57/5 Plan

The following charts display the experience of the Age 57/5 Plan, by service (5 - 24 years), for the age range (57 – 69), during the period 2012 – 2019.

Service	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
5	1	3.4	11	9.09%	30.91%	0.29
6	0	4.2	16	0.00%	26.25%	0.00
7	2	5.9	23	8.70%	25.65%	0.34
8	0	7.2	26	0.00%	27.69%	0.00
9	4	9.0	32	12.50%	28.13%	0.44
10	3	8.3	28	10.71%	29.64%	0.36
11	2	6.0	21	9.52%	28.57%	0.33
12	2	6.6	22	9.09%	30.00%	0.30
13	2	5.5	19	10.53%	28.95%	0.36
14	3	6.5	21	14.29%	30.95%	0.46
15	2	6.1	21	9.52%	29.05%	0.33
16	2	3.9	15	13.33%	26.00%	0.51
17	4	4.3	14	28.57%	30.71%	0.93
18	0	2.3	8	0.00%	28.75%	0.00
19	0	2.4	8	0.00%	30.00%	0.00
20	2	1.7	6	33.33%	28.33%	1.18
21	0	0.5	2	0.00%	25.00%	0.00
22	0	0.5	2	0.00%	25.00%	0.00
23	0	0.4	2	0.00%	20.00%	0.00
24	0	0.5	2	0.00%	25.00%	0.00
Total	29	85.2	299	9.70%	28.49%	0.34

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



The following charts display the experience of the Age 57/5 Plan, by age, for the age range 57 to 69 and the service range 5 – 24 years, during the period 2012 – 2019.

Age	Actual Retirements	Expected Retirements	Total Exposed	Actual Retirement Rate	Current Assumption Retirement	Ratio Act/Exp Ret
57	5	9.9	33	15.15%	30.00%	▲ 0.51
58	2	6.3	30	6.67%	21.00%	◆ 0.32
59	3	7.2	35	8.57%	20.57%	◆ 0.42
60	2	6.5	32	6.25%	20.31%	◆ 0.31
61	2	7.8	26	7.69%	30.00%	◆ 0.26
62	2	10.0	25	8.00%	40.00%	◆ 0.20
63	1	7.8	26	3.85%	30.00%	◆ 0.13
64	5	7.8	26	19.23%	30.00%	▲ 0.64
65	1	8.4	21	4.76%	40.00%	◆ 0.12
66	3	4.8	16	18.75%	30.00%	▲ 0.63
67	1	3.6	12	8.33%	30.00%	◆ 0.28
68	2	3.0	10	20.00%	30.00%	▲ 0.67
69	0	2.1	7	0.00%	30.00%	◆ 0.00
Total	29	85.2	299	9.70%	28.49%	◆ 0.34

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



Specific observations:

- Overall, the number of retirements was much less than expected (A/E ratio of 0.34)
- Due to when this plan was adopted, there were virtually no retirement experience for members with 20 or more years of service.
- Under the current assumptions, higher first eligibility rates apply when members are first eligible for retirement, which includes members in their fifth year of service after attaining age 57. However, the actual rate of retirement of these members was smaller than expected (A/E ratio of 0.48).
 - Please note that due to rounding there were members with an assigned retirement age of 56 who retired when they first attained age 57. We will review potential adjustments in subsequent analyses. However, even with adjustments, the actual number of retirements is expected to be much smaller than expected.
- There was virtually no experience of Physically Taxing members.

Disability

The current ordinary disability assumption varies by age but does not apply during the 10-year eligibility service period. Furthermore, a separate rate applies for accidental disability during all service periods. The ordinary and accidental 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 benefit is payable during the lifetime of the member and members may select any optional forms of payment. For members who have accrued at least 20 years of service, the service retirement benefit is greater than the ordinary disability retirement benefit if the member has met the conditions for an unreduced retirement benefit.

Ordinary Disability

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. We made adjustments as far back as 2012. Rates of disability were highest during the 2012 – 2016 period, declining from 2017 – 2019 and low during the 2020 – 2021 period. Ordinary disability rates declined each year since 2016.

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.

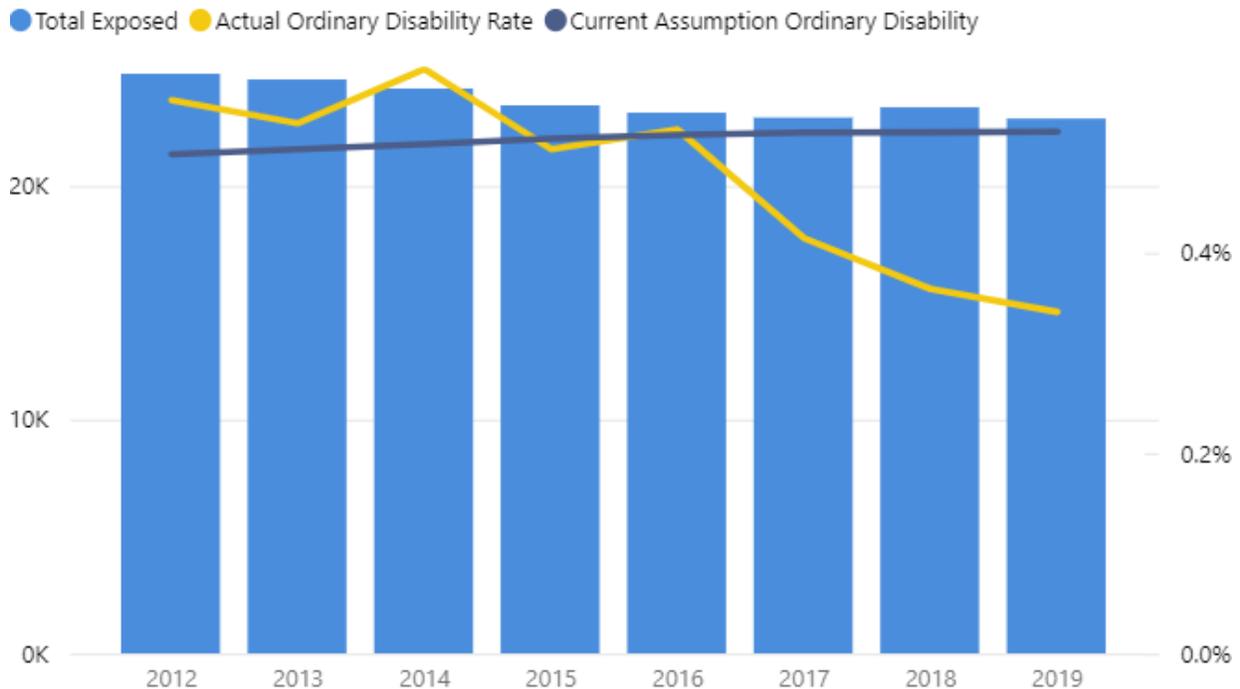
The following tables show the experience of ordinary disability retirement of TBTA and Transit members for all plans, by year, for the age range 30 to 69 and service range 10 to 39, through 2021.

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	137	123.6	24,795	0.5525%	0.4983%	▲ 1.11
2013	130	123.6	24,554	0.5294%	0.5033%	● 1.05
2014	141	122.9	24,164	0.5835%	0.5084%	▲ 1.15
2015	118	120.5	23,445	0.5033%	0.5141%	● 0.98
2016	121	119.8	23,132	0.5231%	0.5178%	● 1.01
2017	95	119.2	22,922	0.4144%	0.5199%	▲ 0.80
2018	85	121.5	23,362	0.3638%	0.5202%	▲ 0.70
2019	78	119.2	22,880	0.3409%	0.5209%	▲ 0.65
2020	32	110.2	20,935	0.1529%	0.5262%	◆ 0.29
2021	14	103.5	19,643	0.0713%	0.5267%	◆ 0.14
Total	951	1,183.8	229,832	0.4138%	0.5151%	▲ 0.80

The following tables show the experience of ordinary disability retirement of TBTA and Transit members for all plans, for the age range 30 to 69 and service range 10 to 39 years, during 2012 - 2019.

Plan Year	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
2012	137	123.6	24,795	0.5525%	0.4983%	▲ 1.11
2013	130	123.6	24,554	0.5294%	0.5033%	● 1.05
2014	141	122.9	24,164	0.5835%	0.5084%	▲ 1.15
2015	118	120.5	23,445	0.5033%	0.5141%	● 0.98
2016	121	119.8	23,132	0.5231%	0.5178%	● 1.01
2017	95	119.2	22,922	0.4144%	0.5199%	▲ 0.80
2018	85	121.5	23,362	0.3638%	0.5202%	▲ 0.70
2019	78	119.2	22,880	0.3409%	0.5209%	▲ 0.65
Total	905	970.2	189,254	0.4782%	0.5126%	● 0.93

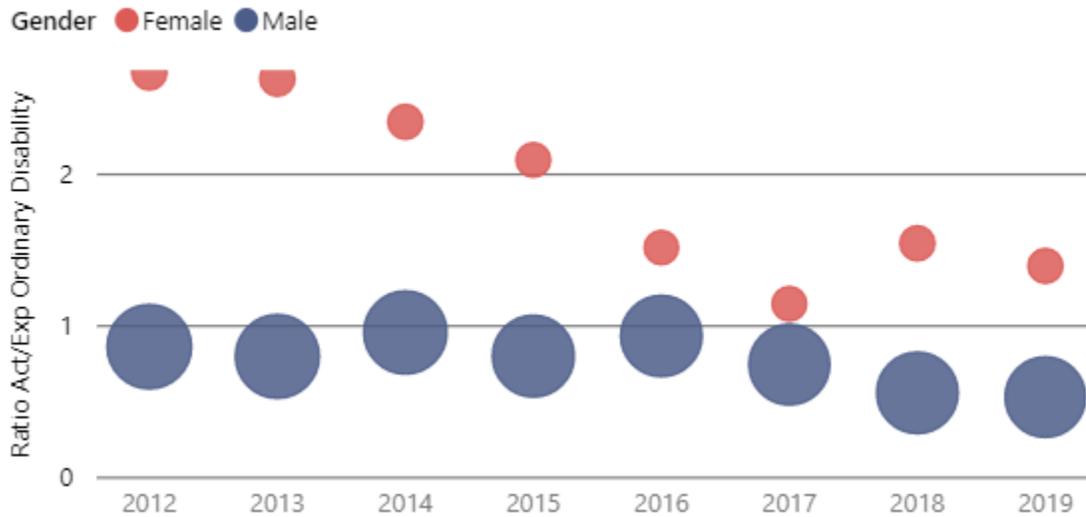
Exposure Distribution w/ Ordinary Disability Rate - Actual and Expected; by Year



Specific observations:

- Based on the current assumptions, the actual rate of disability retirements was less than expected (A/E ratio of 0.93) from 2012 - 2019.
- While the assumption does not distinguish rates of disability by gender, rates of disability were significantly higher for female members than male members as shown in the following bubble chart.

Actual vs. Expected - Ordinary Disability Rate w/ Exposure Bubbles; by Year

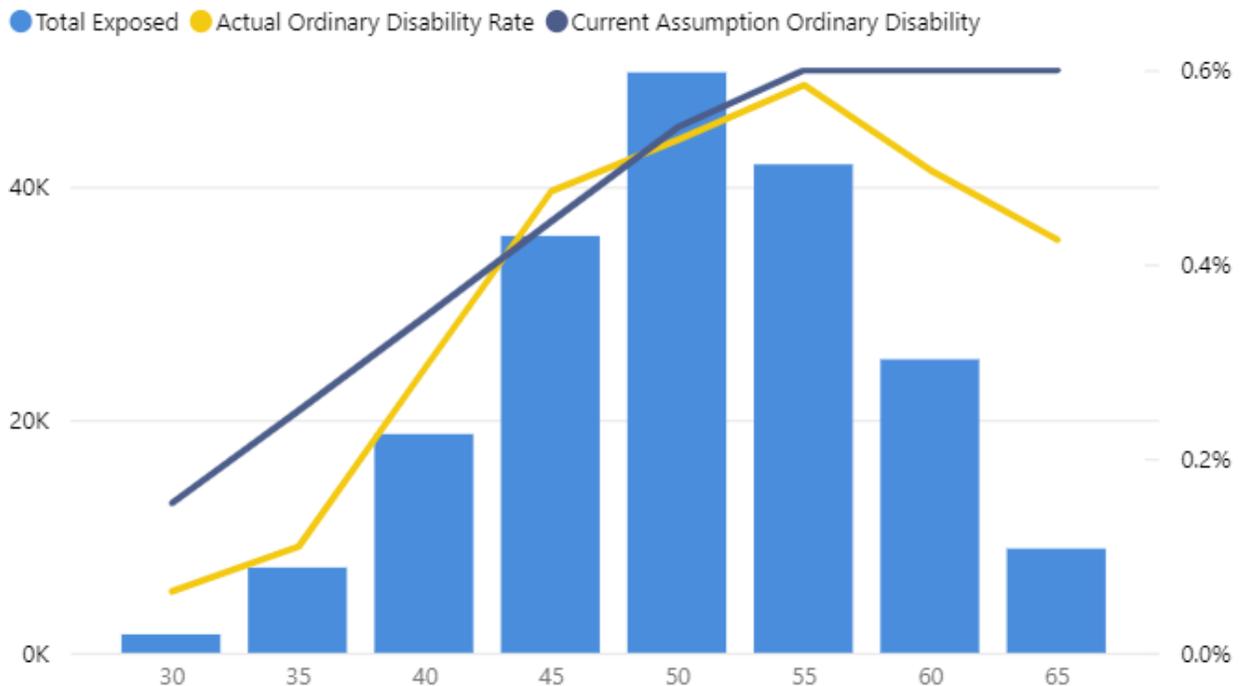


The following tables show the experience of ordinary disability retirement of TBTA and Transit members for all plans, by age, for the age range 30 to 69 and service range 10 to 39 years, during 2012 - 2019.

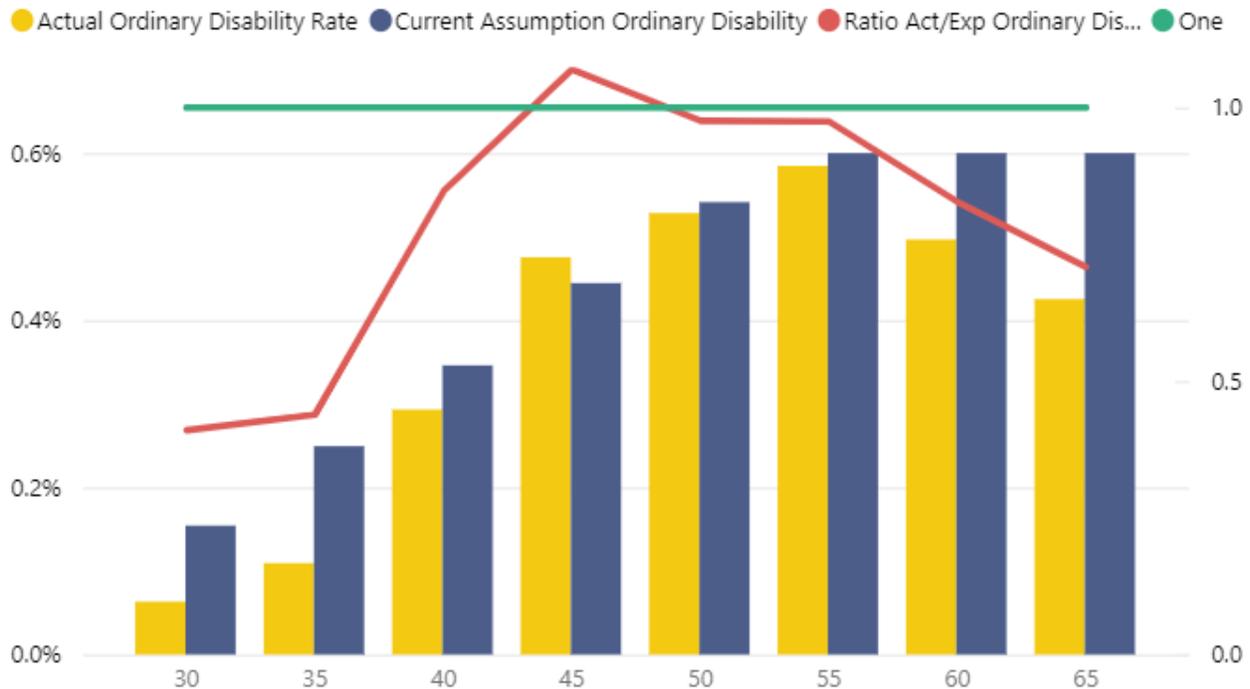
Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
30	0	0.1	148	0.0000%	0.1000%	0.00
31	0	0.2	179	0.0000%	0.1200%	0.00
32	0	0.4	264	0.0000%	0.1400%	0.00
33	1	0.6	391	0.2558%	0.1600%	1.60
34	0	1.1	601	0.0000%	0.1800%	0.00
35	0	1.7	832	0.0000%	0.2000%	0.00
36	0	2.4	1,097	0.0000%	0.2200%	0.00
37	2	3.4	1,428	0.1401%	0.2400%	0.58
38	2	4.6	1,780	0.1124%	0.2600%	0.43
39	4	6.1	2,183	0.1832%	0.2800%	0.65
40	10	8.0	2,658	0.3762%	0.3000%	1.25
41	12	10.2	3,187	0.3765%	0.3200%	1.18
42	13	12.7	3,747	0.3469%	0.3400%	1.02
43	9	15.5	4,303	0.2092%	0.3600%	0.58
44	11	18.5	4,874	0.2257%	0.3800%	0.59
45	25	22.3	5,570	0.4488%	0.4000%	1.12
46	36	26.9	6,393	0.5631%	0.4200%	1.34
47	20	31.5	7,156	0.2795%	0.4400%	0.64
48	45	36.8	7,998	0.5626%	0.4600%	1.22
49	44	41.5	8,650	0.5087%	0.4800%	1.06
50	50	46.3	9,258	0.5401%	0.5000%	1.08

51	53	50.1	9,626	0.5506%	0.5200%	●	1.06
52	63	54.5	10,092	0.6243%	0.5400%	▲	1.16
53	50	58.0	10,349	0.4831%	0.5600%	▲	0.86
54	47	60.7	10,468	0.4490%	0.5800%	▲	0.77
55	41	59.9	9,987	0.4105%	0.6000%	▲	0.68
56	43	53.0	8,825	0.4873%	0.6000%	▲	0.81
57	48	49.3	8,224	0.5837%	0.6000%	●	0.97
58	71	46.4	7,736	0.9178%	0.6000%	◆	1.53
59	42	42.8	7,138	0.5884%	0.6000%	●	0.98
60	40	39.6	6,592	0.6068%	0.6000%	●	1.01
61	30	36.3	6,044	0.4964%	0.6000%	▲	0.83
62	29	31.3	5,218	0.5558%	0.6000%	●	0.93
63	15	23.9	3,987	0.3762%	0.6000%	▲	0.63
64	11	20.0	3,335	0.3298%	0.6000%	▲	0.55
65	15	16.8	2,792	0.5372%	0.6000%	▲	0.90
66	10	13.6	2,259	0.4427%	0.6000%	▲	0.74
67	4	10.0	1,669	0.2397%	0.6000%	◆	0.40
68	6	7.5	1,246	0.4815%	0.6000%	▲	0.80
69	3	5.8	970	0.3093%	0.6000%	▲	0.52
Total	905	970.2	189,254	0.4782%	0.5126%	●	0.93

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



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



Specific observations:

- The number of actual disabilities is influenced by whether the member has accrued 20 years of service or not for the Basic Plan Group or 25 years of service for the Special Plan Group. This finding is consistent with the fact that the disability benefit is smaller than the member’s accrued benefit with 20 or more years of service for the Basic Plan Group.
- This issue was pronounced in the rates experienced for ages 62 and older. For members with at least 20 years of service, there were only 4 ordinary disability retirements but 68 expected.
 - For Transit, for the age range 55 to 61 with at least 25 years of service, there were 36 ordinary disability retirements but 127 expected (A/E ratio of 0.28).
- For members with less than 20 years of service, 62 years old and older, there were 89 ordinary disability retirements compared to 61 expected (A/E ratio of 1.45).
- While the rates of disability vary by gender, the overall observations compared to expectations are consistent by gender and thus, the following tables are shown on a combined basis.

Age 62 and older

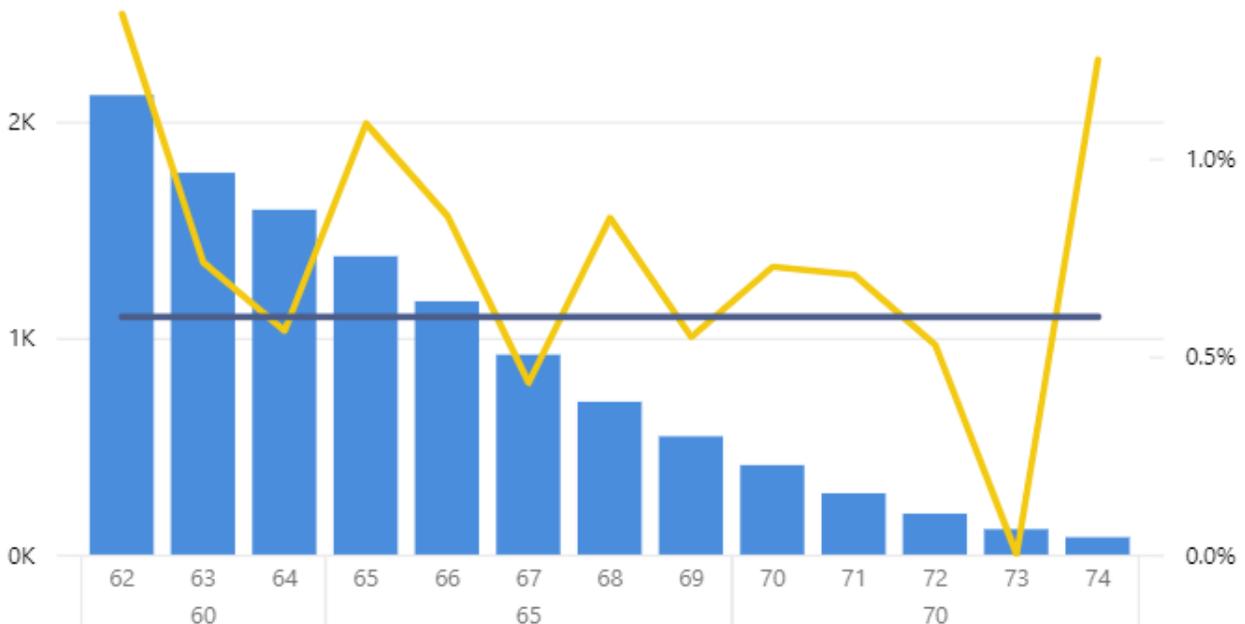
The following charts show the experience of members aged 62 and older with less than 20 years of service.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
62	29	12.7	2,122	1.3666%	0.6000%	2.28
63	13	10.6	1,764	0.7370%	0.6000%	1.23
64	9	9.6	1,593	0.5650%	0.6000%	0.94
65	15	8.3	1,378	1.0885%	0.6000%	1.81
66	10	7.0	1,170	0.8547%	0.6000%	1.42
67	4	5.5	923	0.4334%	0.6000%	0.72
68	6	4.2	706	0.8499%	0.6000%	1.42
69	3	3.3	546	0.5495%	0.6000%	0.92
70	3	2.5	413	0.7264%	0.6000%	1.21
71	2	1.7	283	0.7067%	0.6000%	1.18
72	1	1.1	189	0.5291%	0.6000%	0.88
73	0	0.7	117	0.0000%	0.6000%	0.00
74	1	0.5	80	1.2500%	0.6000%	2.08
Total	96	67.7	11,284	0.8508%	0.6000%	1.42

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



● Total Exposed ● Actual Ordinary Disability Rate ● Current Assumption Ordinary Disability

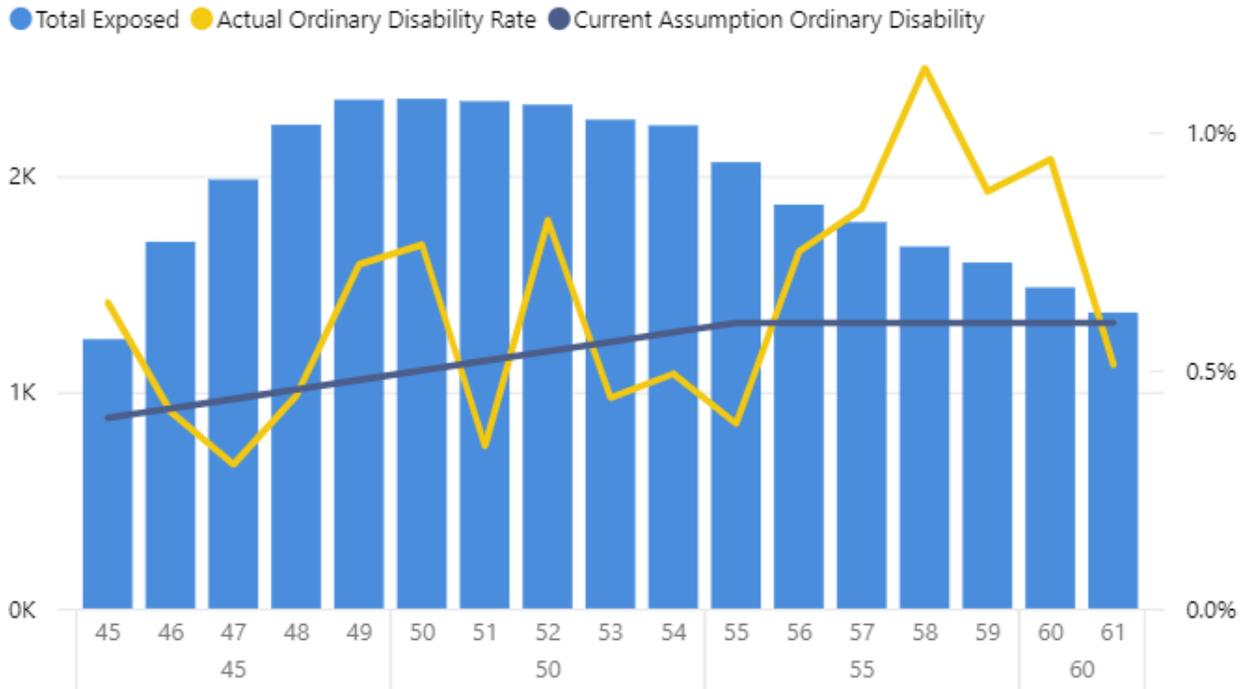


Service Greater than 20 Years and Less than Age 62

The following tables display the experience for TBTA and Transit members for the age range 45 to 61 and service range 20 to 24 years.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
45	8	5.0	1,245	0.6426%	0.4000%	◆ 1.61
46	7	7.1	1,695	0.4130%	0.4200%	● 0.98
47	6	8.7	1,983	0.3026%	0.4400%	▲ 0.69
48	10	10.3	2,236	0.4472%	0.4600%	● 0.97
49	17	11.3	2,352	0.7228%	0.4800%	◆ 1.51
50	18	11.8	2,356	0.7640%	0.5000%	◆ 1.53
51	8	12.2	2,345	0.3412%	0.5200%	▲ 0.66
52	19	12.6	2,329	0.8158%	0.5400%	◆ 1.51
53	10	12.7	2,260	0.4425%	0.5600%	▲ 0.79
54	11	13.0	2,233	0.4926%	0.5800%	▲ 0.85
55	8	12.4	2,063	0.3878%	0.6000%	▲ 0.65
56	14	11.2	1,867	0.7499%	0.6000%	▲ 1.25
57	15	10.7	1,786	0.8399%	0.6000%	▲ 1.40
58	19	10.0	1,673	1.1357%	0.6000%	◆ 1.89
59	14	9.6	1,599	0.8755%	0.6000%	▲ 1.46
60	14	8.9	1,484	0.9434%	0.6000%	◆ 1.57
61	7	8.2	1,368	0.5117%	0.6000%	▲ 0.85
Total	205	175.6	32,874	0.6236%	0.5342%	▲ 1.17

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



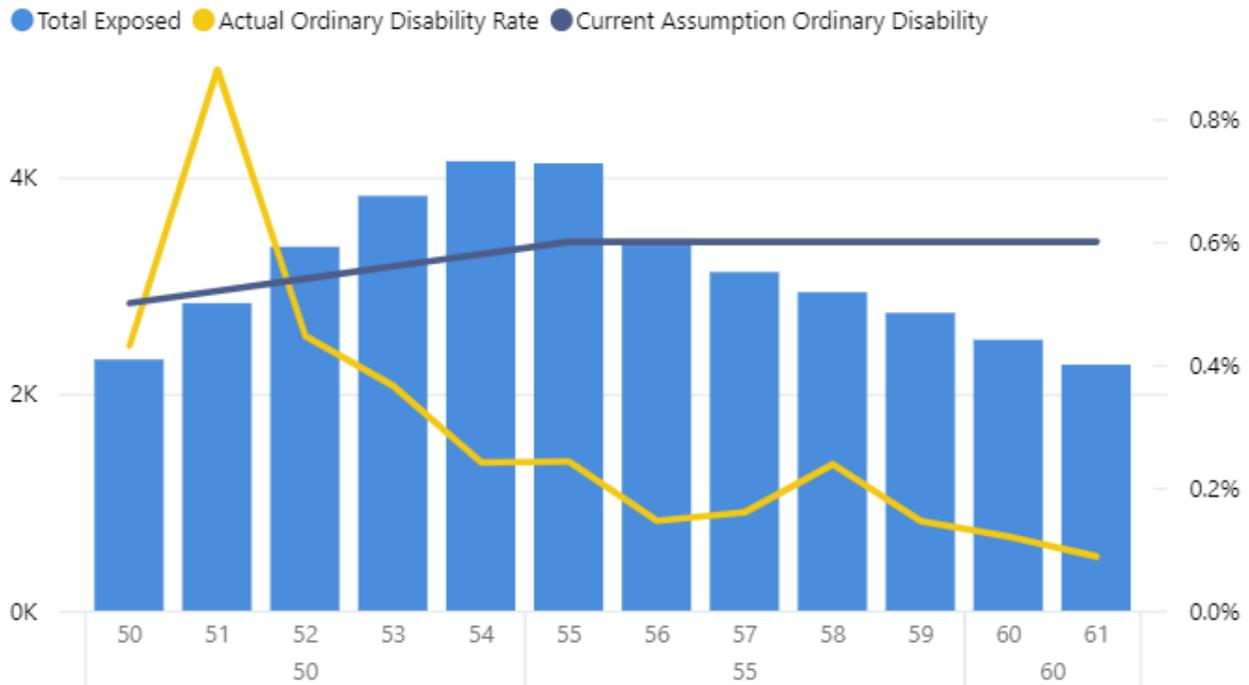
Specific observations:

- For the service range 20 to 24 years at these ages, the number of actual ordinary disability retirements is greater than expected (A/E ratio of 1.17).
 - For female members, the A/E ratio is 2.41 and for male members, it is 0.93.
- The actual rate of ordinary disability retirements increases as age increases since unreduced retirement is not reached until age 62 for these members.

The following tables display the experience for Transit members for the age range 50 to 61 and service range 25 to 39 years.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
50	10	11.6	2,318	0.4314%	0.5000%	▲ 0.86
51	25	14.8	2,837	0.8812%	0.5200%	◆ 1.69
52	15	18.1	3,358	0.4467%	0.5400%	▲ 0.83
53	14	21.4	3,829	0.3656%	0.5600%	▲ 0.65
54	10	24.1	4,148	0.2411%	0.5800%	◆ 0.42
55	10	24.8	4,129	0.2422%	0.6000%	◆ 0.40
56	5	20.6	3,426	0.1459%	0.6000%	◆ 0.24
57	5	18.7	3,125	0.1600%	0.6000%	◆ 0.27
58	7	17.6	2,939	0.2382%	0.6000%	◆ 0.40
59	4	16.5	2,748	0.1456%	0.6000%	◆ 0.24
60	3	15.0	2,500	0.1200%	0.6000%	◆ 0.20
61	2	13.6	2,270	0.0881%	0.6000%	◆ 0.15
Total	110	216.8	37,627	0.2923%	0.5762%	▲ 0.51

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



Specific observations:

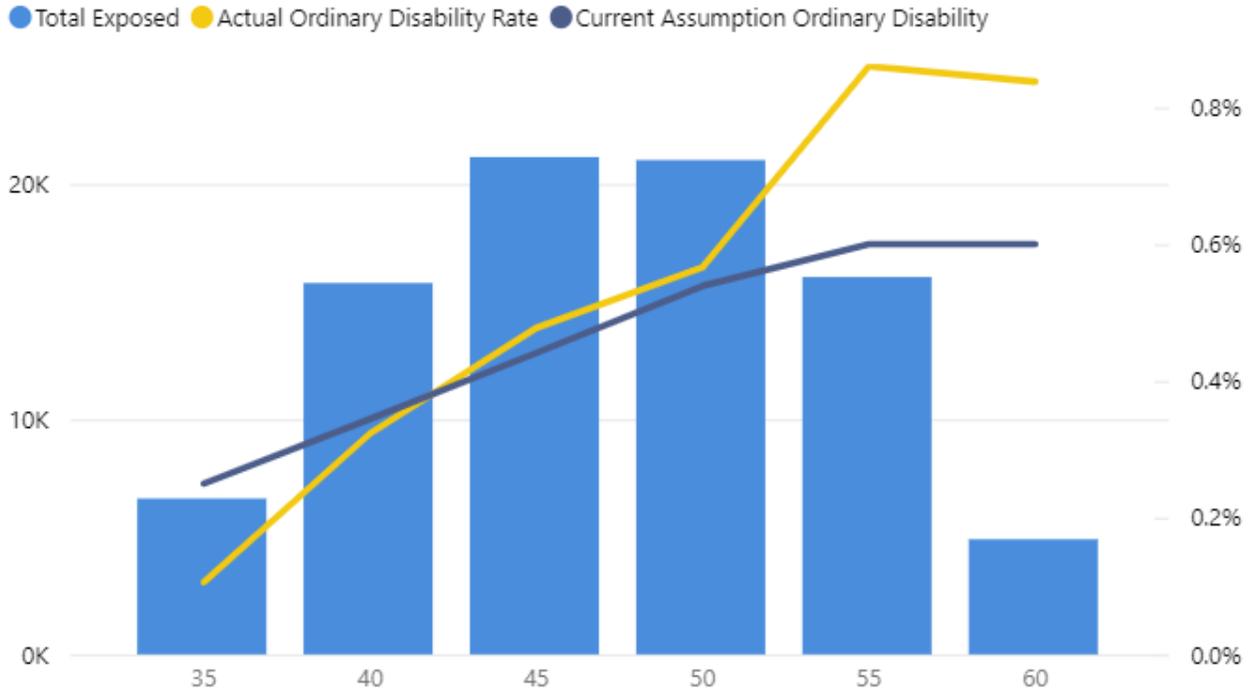
- For the service range 25 to 39 years at these ages, the number of actual ordinary disability retirements is much less than expected (A/E ratio of 0.51).
 - For female members, the A/E ratio is 1.38 and for male members, it is 0.38.
- At this service range, the actual rate of ordinary disability retirements sharply decreases at age 55 once members are eligible for unreduced retirement.
 - For the age range 50 to 54, the A/E ratio is 0.82 (1.63 for females; 0.69 for males)
 - For the age range 55 to 61, the A/E ratio is 0.28 (1.18 for females; 0.16 for males)

Service Less than 20 Years and Under Age 62

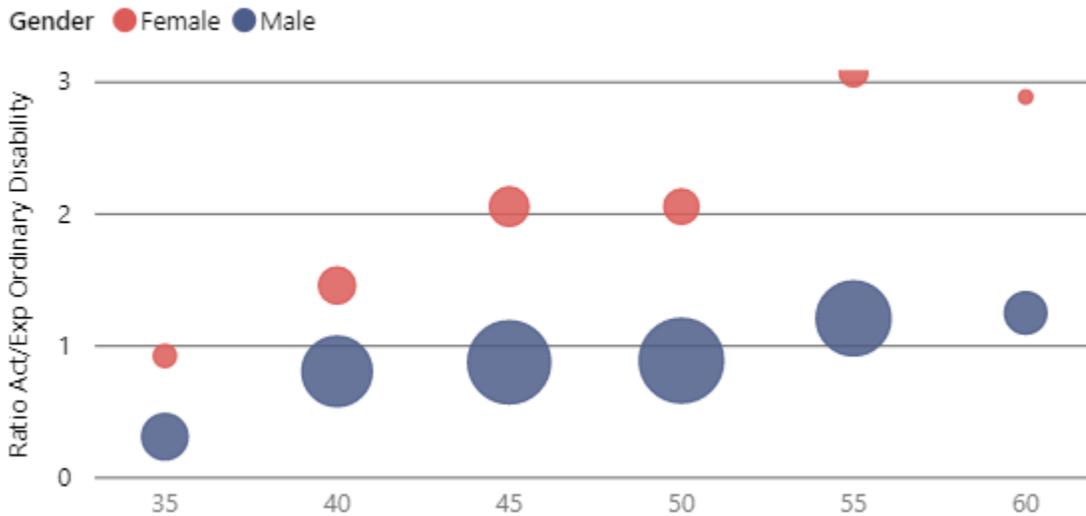
The following tables display the results by age of Transit members with less than 20 years of service, and younger than age 62. Since there was no credible experience for TBTA members, these members were excluded although experience up to age 50 is similar as noted below for Transit up to age 61.

Age	Actual Ordinary Disabilities	Expected Ordinary Disabilities	Total Exposed	Actual Ordinary Disability Rate	Current Assumption Ordinary Disability	Ratio Act/Exp Ordinary Disability
35	0	1.5	740	0.0000%	0.2000%	0.00
36	0	2.2	985	0.0000%	0.2200%	0.00
37	1	3.1	1,295	0.0772%	0.2400%	0.32
38	2	4.2	1,613	0.1240%	0.2600%	0.48
39	4	5.6	1,993	0.2007%	0.2800%	0.72
40	9	7.3	2,417	0.3724%	0.3000%	1.24
41	12	9.1	2,845	0.4218%	0.3200%	1.32
42	12	11.0	3,233	0.3712%	0.3400%	1.09
43	8	12.7	3,540	0.2260%	0.3600%	0.63
44	10	14.3	3,753	0.2665%	0.3800%	0.70
45	16	15.8	3,961	0.4039%	0.4000%	1.01
46	26	17.4	4,138	0.6283%	0.4200%	1.50
47	13	18.7	4,255	0.3055%	0.4400%	0.69
48	32	20.2	4,390	0.7289%	0.4600%	1.58
49	14	21.1	4,398	0.3183%	0.4800%	0.66
50	21	22.0	4,408	0.4764%	0.5000%	0.95
51	20	22.3	4,297	0.4654%	0.5200%	0.90
52	28	23.0	4,259	0.6574%	0.5400%	1.22
53	24	23.0	4,110	0.5839%	0.5600%	1.04
54	26	22.9	3,941	0.6597%	0.5800%	1.14
55	21	22.0	3,661	0.5736%	0.6000%	0.96
56	22	20.5	3,416	0.6440%	0.6000%	1.07
57	28	19.3	3,214	0.8712%	0.6000%	1.45
58	45	18.2	3,040	1.4803%	0.6000%	2.47
59	22	16.3	2,712	0.8112%	0.6000%	1.35
60	22	15.3	2,542	0.8655%	0.6000%	1.44
61	19	14.1	2,353	0.8075%	0.6000%	1.35
Total	457	403.0	85,509	0.5344%	0.4713%	1.13

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



Actual vs. Expected - Ordinary Disability Rate w/ Exposure Bubbles; by Age



Specific observations:

- Overall, for these ages, the number of actual ordinary disability retirements is more than expected (A/E ratio of 1.13) but varies by gender (A/E ratio of 2.11 for females; 0.95 for males).

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. Consequently, consideration should be given to varying the rates of disability to take into account these two variables. Also, rates of disability vary by gender with female members exhibiting higher rates than male members.

Accidental Disability

As noted in the ordinary disability section, 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. Due to the small volume of data, there can be much variation from year to year. We do note that there were no recorded accidental disability retirements during 2021.

The following tables show the experience results of accidental disability retirements, for all the plans, by year, for the age range 20 to 79, service range 0 to 39 years.

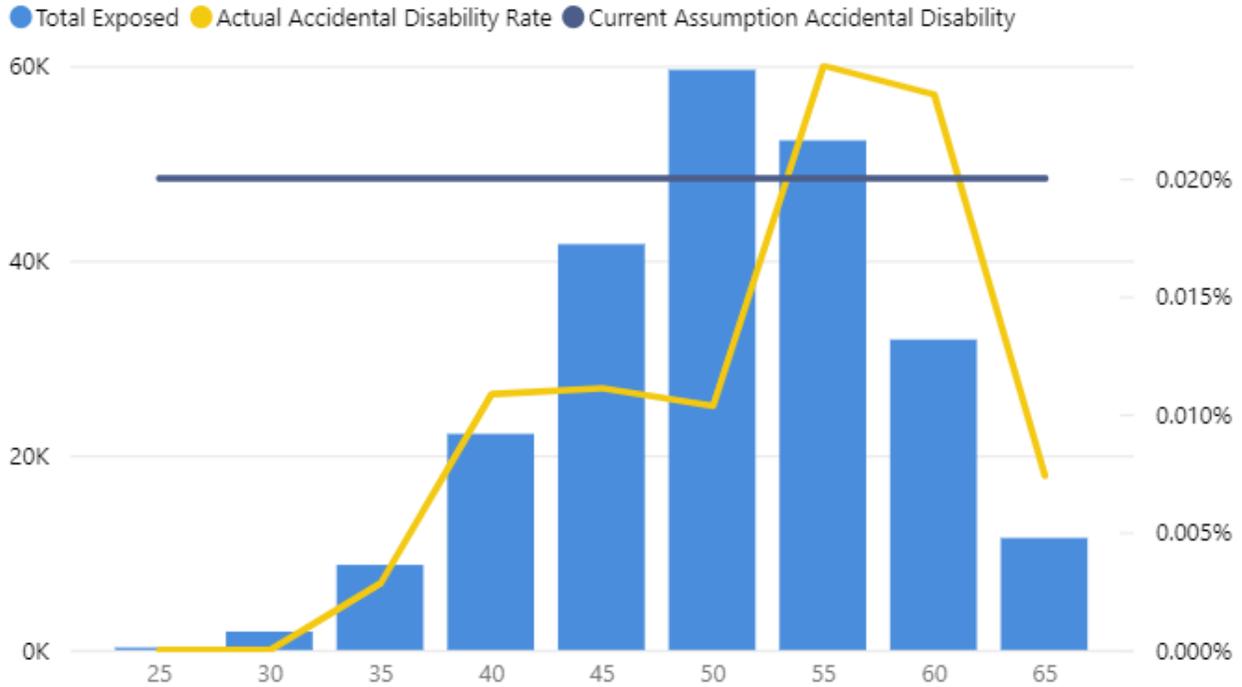
Plan Year	Actual Accidental Disabilities	Expected Accidental Disabilities	Total Exposed	Actual Accidental Disability Rate	Current Assumption Accidental Disability	Ratio Act/Exp Accidental Disability
2012	6	7.2	36,026	0.0167%	0.0200%	▲ 0.83
2013	8	7.2	35,881	0.0223%	0.0200%	▲ 1.11
2014	6	7.3	36,350	0.0165%	0.0200%	▲ 0.83
2015	1	7.4	37,155	0.0027%	0.0200%	◆ 0.13
2016	4	7.6	37,805	0.0106%	0.0200%	▲ 0.53
2017	5	7.7	38,271	0.0131%	0.0200%	▲ 0.65
2018	6	7.8	39,115	0.0153%	0.0200%	▲ 0.77
2019	6	8.1	40,325	0.0149%	0.0200%	▲ 0.74
2020	5	7.9	39,608	0.0126%	0.0200%	▲ 0.63
2021	0	7.7	38,379	0.0000%	0.0200%	◆ 0.00
Total	47	75.8	378,915	0.0124%	0.0200%	▲ 0.62

Specific observations:

- The number of accidental disability retirements was less than expected each year, except for 2013.
- Similar to the ordinary disability assumption, the accidental disability assumption is unisex. However, unlike the ordinary disability retirement experience, the rate of accidental retirements did not vary significantly by males and females.
- The current assumption does not vary by age. However, the experience indicates greater rates as age increases until normal retirement age.

The following tables display the experience by age for an age range of 25 to 69 and a service range 0 to 39 years during the period 2012 - 2019.

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



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 did not publish a MP-2022 scale.

In this study the base table 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. This method links mortality rates across the years and, consequently, allows mortality comparisons from one year to another.

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 purpose of this analysis is to share our observations about the experience during the study period. In subsequent analyses, we will recommend changes to mortality assumptions as appropriate.

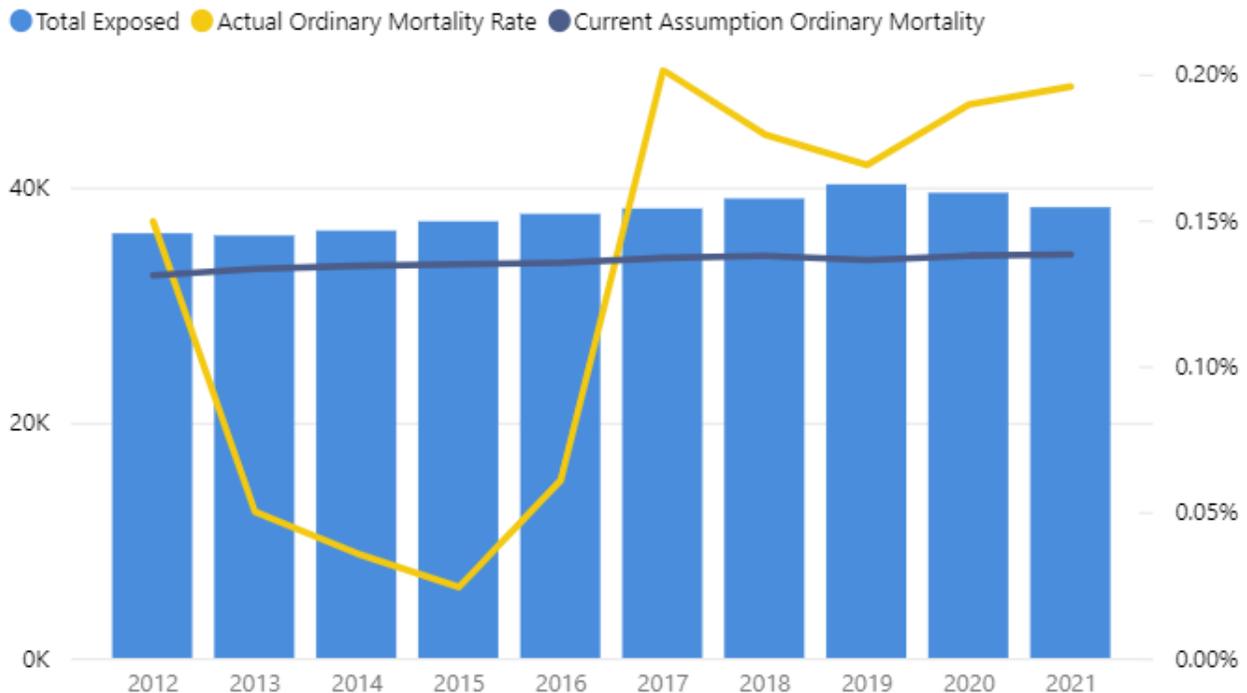
Please note that the charts by age are based on 5-year brackets. For example, the age bracket 45 should be interpreted as the interval 45 – 49.

Ordinary Death

The following charts show the experience of ordinary death by year, for males and females combined, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

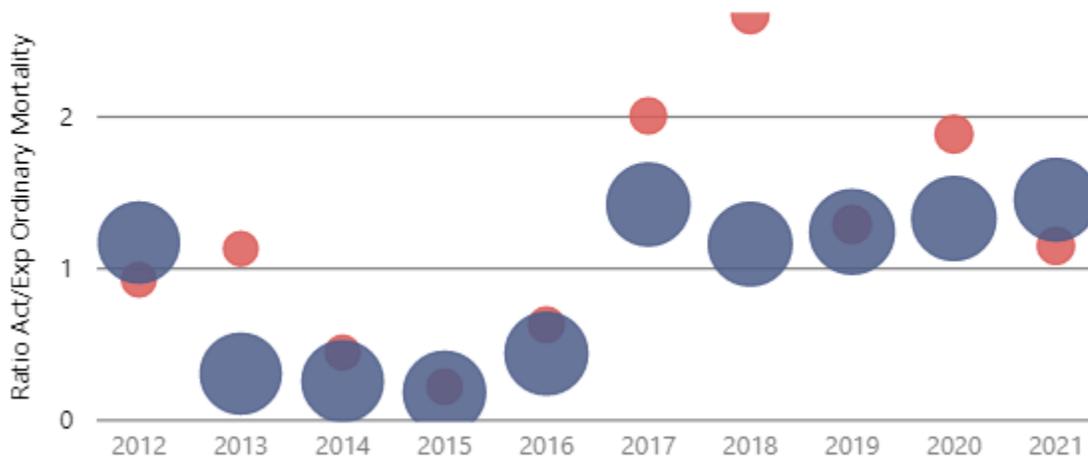
Plan Year	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
2012	54	47.3	36,100	0.1496%	0.1311%	▲ 1.14
2013	18	47.9	35,912	0.0501%	0.1333%	◆ 0.38
2014	13	48.8	36,330	0.0358%	0.1343%	◆ 0.27
2015	9	50.1	37,120	0.0242%	0.1349%	◆ 0.18
2016	23	51.1	37,756	0.0609%	0.1354%	◆ 0.45
2017	77	52.4	38,214	0.2015%	0.1370%	▲ 1.47
2018	70	53.8	39,061	0.1792%	0.1378%	▲ 1.30
2019	68	54.9	40,267	0.1689%	0.1363%	▲ 1.24
2020	75	54.5	39,547	0.1896%	0.1378%	▲ 1.38
2021	75	53.0	38,312	0.1958%	0.1382%	▲ 1.42
Total	482	513.7	378,619	0.1273%	0.1357%	● 0.94

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



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

Gender ● Female ● Male



Specific observations:

- The same assumption is used for TBTA and Transit members as General employees.
- Actual deaths were slightly less than expected during the study period (A/E ratio of 0.94 versus 1.05 for General).
- During 2020 - 2021, actual deaths were greater than expected (A/E ratio of 1.40), although this is consistent with the experience during 2017 – 2019 (A/E ratio of 1.33).
- Actual number of ordinary deaths during 2014 – 2016 were much less than other years (A/E ratio of 0.30). We don't know what generated these anomalous results; one potential cause is problems with the data. In the prior experience study report, there was no mention that mortality data may be unreliable, and this issue will be reviewed further with OA.
- Actual rates of death among males (A/E ratio of 0.90) were less than expected whereas it was more than expected for females (1.26).

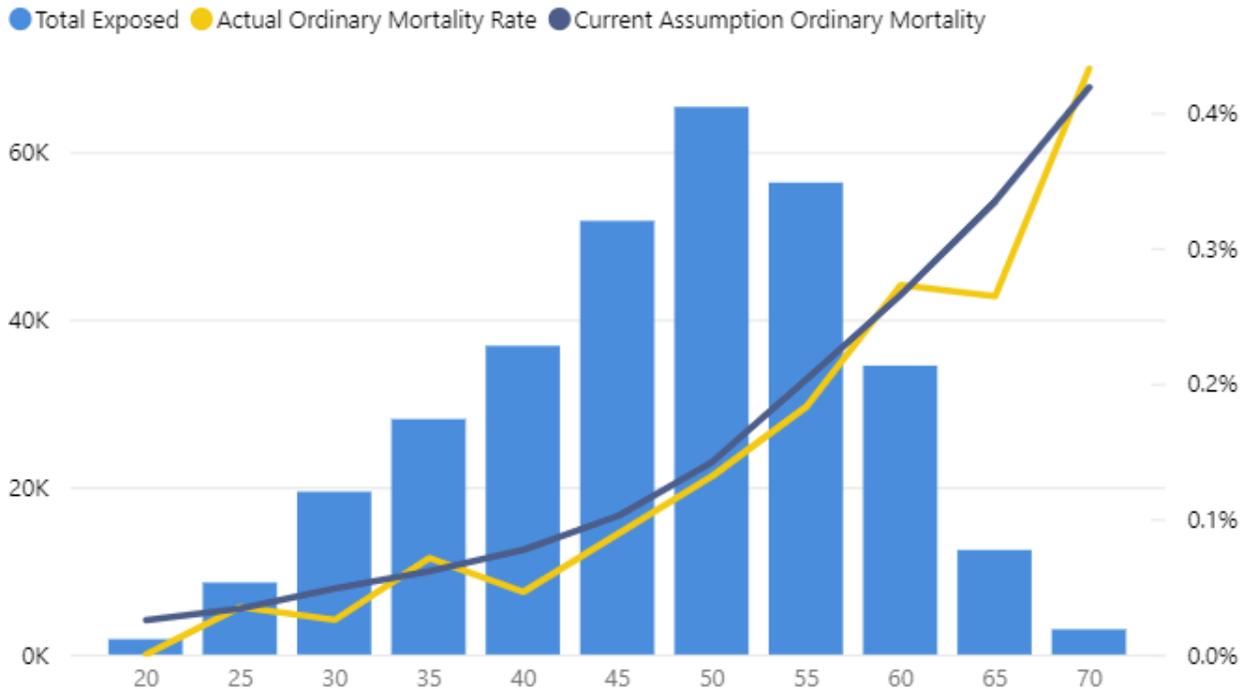
Due to the offsetting effects from 2014 – 2016 and 2020 – 2021, we have included all years in the following analysis despite the Covid pandemic.

Males

The following tables show the experience of ordinary death by age, for males, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

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	0.5	1,827	0.0000%	0.0253%	0.00
25	3	2.9	8,580	0.0350%	0.0339%	1.03
30	5	9.5	19,436	0.0257%	0.0488%	0.53
35	20	17.3	28,097	0.0712%	0.0615%	1.16
40	17	28.5	36,845	0.0461%	0.0772%	0.60
45	46	52.9	51,762	0.0889%	0.1022%	0.87
50	86	92.8	65,356	0.1316%	0.1420%	0.93
55	103	114.4	56,335	0.1828%	0.2030%	0.90
60	94	91.5	34,482	0.2726%	0.2655%	1.03
65	33	41.7	12,476	0.2645%	0.3345%	0.79
70	13	12.6	3,003	0.4329%	0.4187%	1.03
Total	420	464.5	318,199	0.1320%	0.1460%	0.90

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



Since the assumption is used for General employees as is used for TBTA and Transit, the following tables show the combined experience of these groups of ordinary death by age, for males, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	1	2.4	9,576	0.0104%	0.0252%	0.41
25	12	14.5	43,921	0.0273%	0.0330%	0.83
30	25	34.5	71,894	0.0348%	0.0480%	0.72
35	46	52.7	86,080	0.0534%	0.0612%	0.87
40	79	77.8	100,922	0.0783%	0.0771%	1.02
45	129	134.1	131,282	0.0983%	0.1021%	0.96
50	214	231.1	162,679	0.1315%	0.1421%	0.93
55	316	313.4	153,729	0.2056%	0.2039%	1.01
60	292	273.4	102,976	0.2836%	0.2655%	1.07
65	127	129.5	38,631	0.3288%	0.3353%	0.98
70	63	45.4	10,760	0.5855%	0.4219%	1.39
Total	1,304	1,308.8	912,450	0.1429%	0.1434%	1.00

Specific observations:

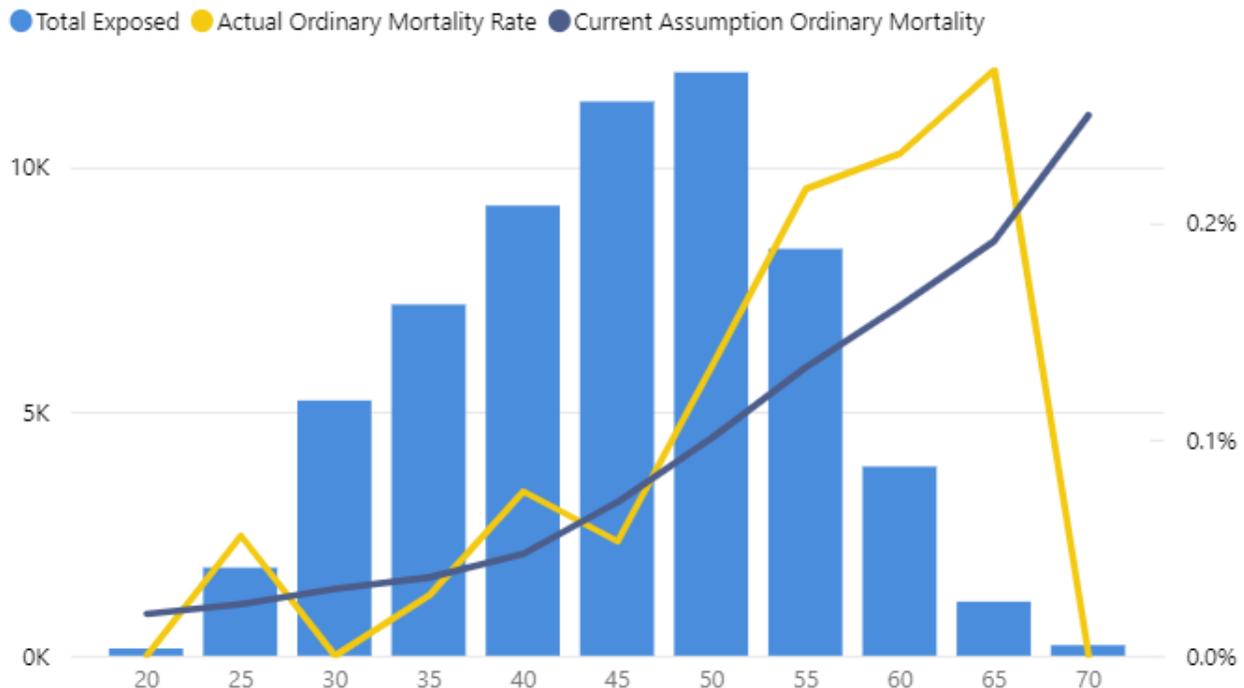
- On a combined basis for General, actual deaths nearly equaled that expected by the assumption (A/E ratio of 1.00) during the study period.

Females

The following tables show the experience of ordinary death by age, for females, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

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	0.0	147	0.0000%	0.0193%	0.00
25	1	0.4	1,803	0.0555%	0.0239%	2.32
30	0	1.6	5,229	0.0000%	0.0310%	0.00
35	2	2.6	7,193	0.0278%	0.0362%	0.77
40	7	4.3	9,219	0.0759%	0.0471%	1.61
45	6	8.1	11,350	0.0529%	0.0711%	0.74
50	16	12.0	11,949	0.1339%	0.1007%	1.33
55	18	11.1	8,334	0.2160%	0.1334%	1.62
60	9	6.3	3,874	0.2323%	0.1619%	1.43
65	3	2.1	1,107	0.2710%	0.1919%	1.41
70	0	0.5	215	0.0000%	0.2501%	0.00
Total	62	49.2	60,420	0.1026%	0.0814%	1.26

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



Since the assumption is used for General employees as is used for TBTA and Transit, the following tables show the combined experience of these groups of ordinary death by age, for males, for the age range (20 to 74) and service range (0 to 39 years), during the period 2012 – 2021.

Age (bins)	Actual Ordinary Deaths	Expected Ordinary Deaths	Total Exposed	Actual Ordinary Mortality Rate	Current Assumption Ordinary Mortality	Ratio Act/Exp Ordinary Mortality
20	1	0.9	4,909	0.0204%	0.0192%	● 1.06
25	4	9.5	41,100	0.0097%	0.0231%	◆ 0.42
30	9	22.6	74,970	0.0120%	0.0301%	◆ 0.40
35	33	31.6	88,088	0.0375%	0.0358%	● 1.05
40	44	45.5	96,871	0.0454%	0.0469%	● 0.97
45	82	81.6	114,916	0.0714%	0.0710%	● 1.00
50	142	137.6	135,712	0.1046%	0.1014%	● 1.03
55	171	176.1	130,912	0.1306%	0.1345%	● 0.97
60	158	141.1	86,867	0.1819%	0.1624%	▲ 1.12
65	91	58.4	30,316	0.3002%	0.1926%	◆ 1.56
70	34	20.0	7,811	0.4353%	0.2556%	◆ 1.70
Total	769	724.8	812,472	0.0946%	0.0892%	● 1.06

Specific observations:

- On a combined basis for General, actual deaths were slightly greater than expected (A/E ratio of 1.06) during the study period.

Accidental Death

The accidental death rate assumption is a constant percentage that does not vary by gender nor age and is not subject to mortality improvements. During the Covid pandemic, there were deaths characterized as accidental deaths. The following table shows the experience of accidental death by year.

Plan Year	Actual Accidental Deaths	Expected Accidental Deaths	Total Exposed	Actual Accidental Mortality Rate	Current Assumption Accidental Mortality	Ratio Act/Exp Accidental Mortality
2012	0	2.2	36,207	0.0000%	0.0060%	0.00
2013	1	2.2	36,022	0.0028%	0.0060%	0.46
2014	0	2.2	36,461	0.0000%	0.0060%	0.00
2015	0	2.2	37,236	0.0000%	0.0060%	0.00
2016	0	2.3	37,868	0.0000%	0.0060%	0.00
2017	0	2.3	38,316	0.0000%	0.0060%	0.00
2018	1	2.3	39,151	0.0026%	0.0060%	0.43
2019	2	2.4	40,361	0.0050%	0.0060%	0.83
2020	82	2.4	39,663	0.2067%	0.0060%	34.46
2021	20	2.3	38,443	0.0520%	0.0060%	8.67
Total	106	22.8	379,728	0.0279%	0.0060%	4.65

Specific observations:

- Excluding 2020 – 2021, there were only four accidental deaths during the study period versus 18 expected.

Section I(E) – Postretirement Mortality of New York City Employees’ Retirement System (NYCERS)

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. Vested members prior to commencement are included in the MEST but are essentially excluded in the analysis below.

Analogous to the pre-retirement death assumption, the mortality assumption involves 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 same mortality improvement scale applies to the post-retirement mortality base table that applies to the pre-retirement death base table. In this study the base table corresponds to the year 2012.

Many mortality studies have found that greater 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. For NYCERS, the adjustment factors vary by group. The adjustment factors used by the OA are:

Post-Retirement Mortality Adjustment Factor To Convert from Headcount-Weighted to Amount-Weighted						
	Service Retiree		Disabled Retiree		Contingent Beneficiary	
	Males		Females	Males	Females	
General	0.890		0.951	0.962		0.890, 0.951
Correction	0.890		0.873	0.835		0.890, 0.951
Sanitation	0.940		0.922	1.000		0.890, 0.951
TBTA/Transit	0.950	1.098	1.010		0.900	0.890, 0.951
Housing Police/ Transit Police	0.910	0.910	0.876		0.876	0.890, 0.951

We examined the implications of using both types of weights in the post-retirement mortality analysis. Pure mortality is the same as post-retirement mortality weighted by headcounts; pure mortality multiplied by the adjustment factor is post-retirement mortality weighted by benefit amount. The benefit amount weighting approach was not applied to the experience prior to 2015 because the historical database did not contain benefit amounts prior to 2015.

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 Covid that occurred in 2020 – 2022. The purpose of this analysis is to share our observations about the experience during the study period. In subsequent analyses, we will recommend changes to mortality assumptions as appropriate.

The charts by age are based on 5-year age brackets. For example, the age bracket 45 should be interpreted as the interval 45-49.

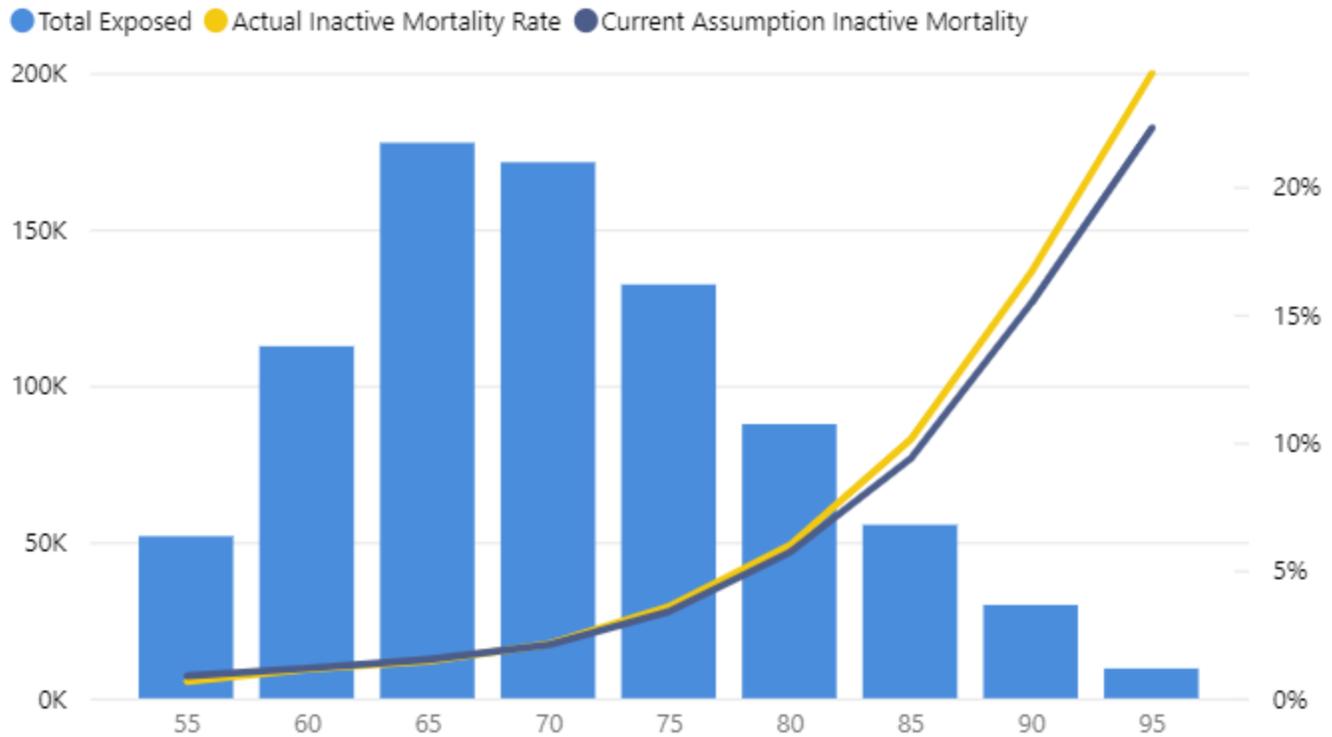
Postretirement Mortality – Service Retirees

The following charts show postretirement mortality experience on a headcount-weighted basis, by year and by age, for males and females combined, for the age range (55 to 99) during the period 2015 – 2021.

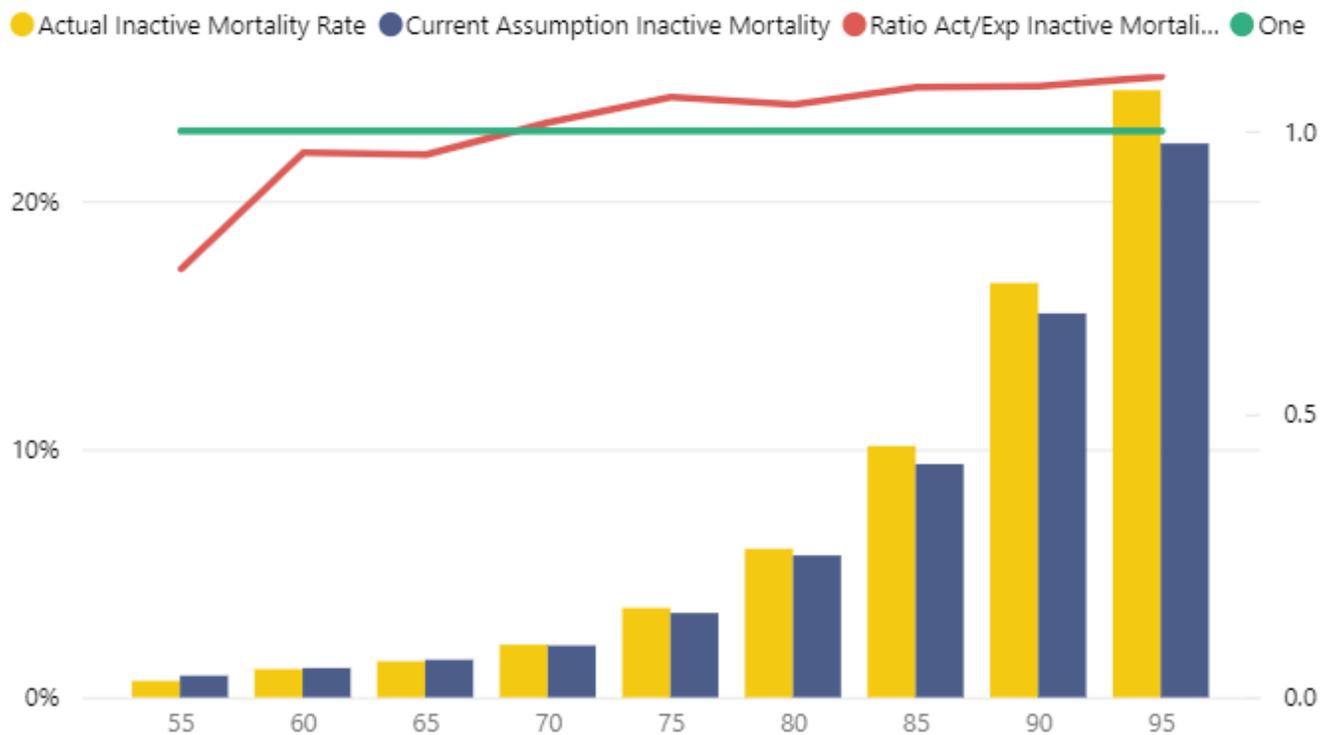
Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	4,053	4,039.6	109,656	3.6961%	3.6839%	1.00
2016	3,882	4,072.3	111,932	3.4682%	3.6382%	0.95
2017	4,223	4,157.9	115,091	3.6693%	3.6127%	1.02
2018	4,207	4,211.3	117,876	3.5690%	3.5727%	1.00
2019	4,645	4,290.4	121,737	3.8156%	3.5243%	1.08
2020	4,994	4,350.5	125,041	3.9939%	3.4792%	1.15
2021	4,752	4,360.9	127,020	3.7411%	3.4333%	1.09
Total	30,756	29,482.9	828,353	3.7129%	3.5592%	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
55	342	452.1	51,832	0.6598%	0.8722%	0.76
60	1,278	1,327.9	112,575	1.1352%	1.1796%	0.96
65	2,579	2,687.0	177,652	1.4517%	1.5125%	0.96
70	3,629	3,571.8	171,410	2.1171%	2.0837%	1.02
75	4,759	4,486.3	132,335	3.5962%	3.3901%	1.06
80	5,242	5,003.8	87,672	5.9791%	5.7075%	1.05
85	5,615	5,211.3	55,485	10.1199%	9.3923%	1.08
90	4,982	4,617.0	29,862	16.6834%	15.4612%	1.08
95	2,330	2,125.7	9,530	24.4491%	22.3053%	1.10
Total	30,756	29,482.9	828,353	3.7129%	3.5592%	1.04

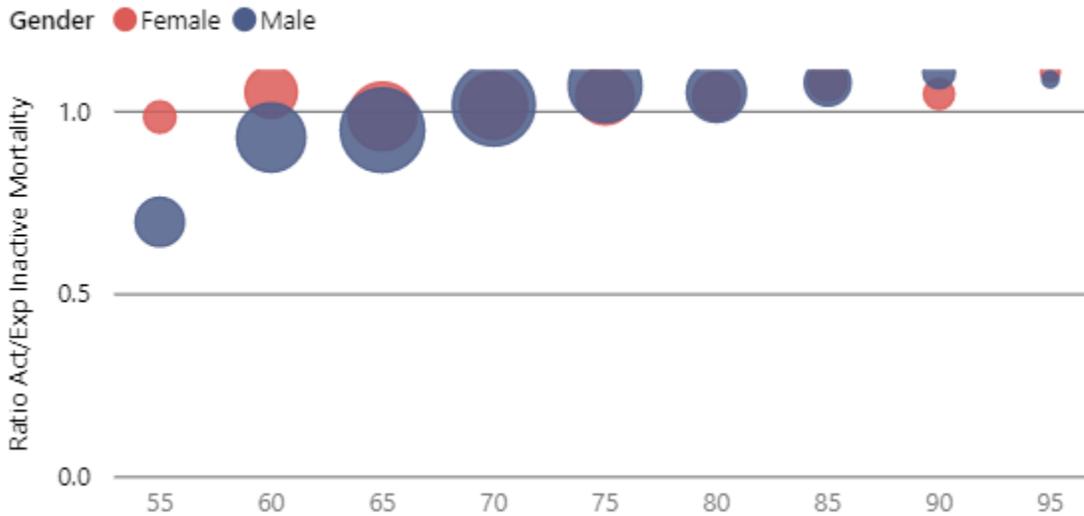
Exposure Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age



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



Actual vs. Expected - Inactive Mortality Rate w/ Exposure Bubbles; by Age

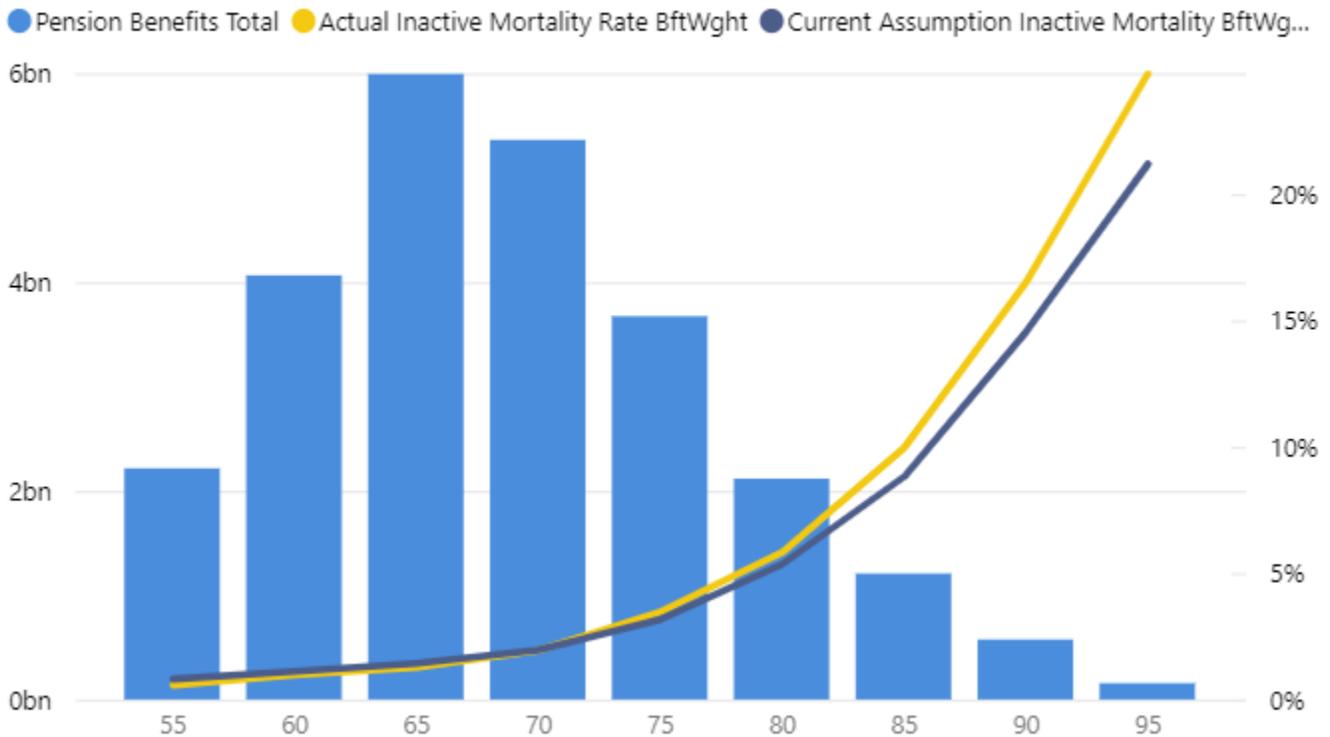


The following charts show postretirement mortality experience, on an amount-weighted basis by year and by age, for males and females combined, for the age range (55 to 99) during the period 2015 – 2021.

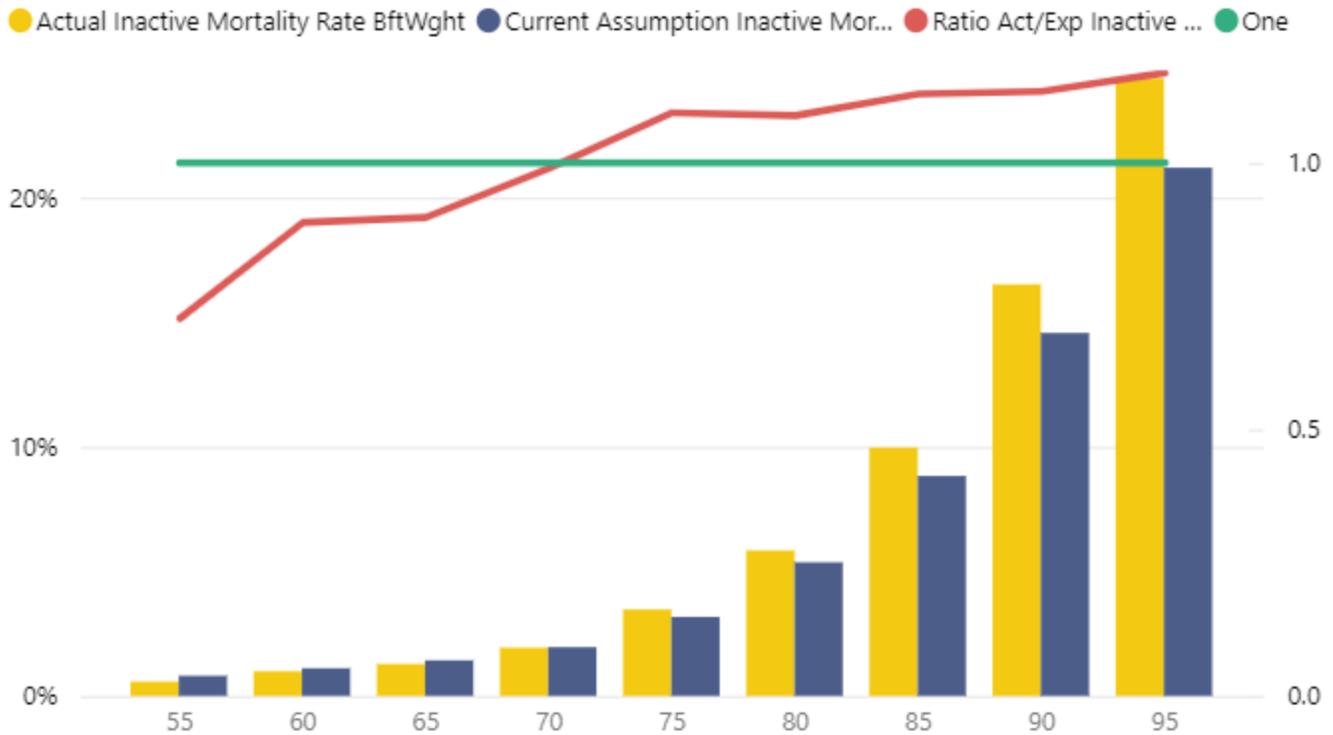
Plan Year	Actual Inactive Benefits Released	Expected Inactive Benefits Released	Pension Benefits Total	Actual Inactive Mortality Rate BftWght	Current Assumption Inactive Mortality BftWght	Ratio Act/Exp Inactive Mortality BftWght
2015	93,777K	93,715K	3,207,313K	2.9238%	2.9219%	1.00
2016	93,828K	97,109K	3,320,994K	2.8253%	2.9241%	0.97
2017	103,975K	101,292K	3,472,916K	2.9939%	2.9166%	1.03
2018	105,900K	105,867K	3,653,208K	2.8988%	2.8979%	1.00
2019	103,548K	97,846K	3,675,800K	2.8170%	2.6619%	1.06
2020	120,287K	103,072K	3,919,725K	3.0688%	2.6296%	1.17
2021	116,573K	107,311K	4,111,654K	2.8352%	2.6099%	1.09
Total	737,889K	706,212K	25,361,610K	2.9095%	2.7846%	1.04

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	12,644K	17,864K	2,214,744K	0.5709%	0.8066%	▲ 0.71
60	40,055K	45,062K	4,063,930K	0.9856%	1.1088%	▲ 0.89
65	76,756K	85,387K	5,993,750K	1.2806%	1.4246%	▲ 0.90
70	103,791K	104,870K	5,362,311K	1.9356%	1.9557%	● 0.99
75	127,339K	116,357K	3,672,576K	3.4673%	3.1683%	● 1.09
80	123,444K	113,308K	2,116,306K	5.8330%	5.3540%	● 1.09
85	120,259K	106,543K	1,207,050K	9.9631%	8.8267%	▲ 1.13
90	94,898K	83,707K	574,717K	16.5120%	14.5649%	▲ 1.13
95	38,704K	33,114K	156,227K	24.7740%	21.1963%	▲ 1.17
Total	737,889K	706,212K	25,361,610K	2.9095%	2.7846%	● 1.04

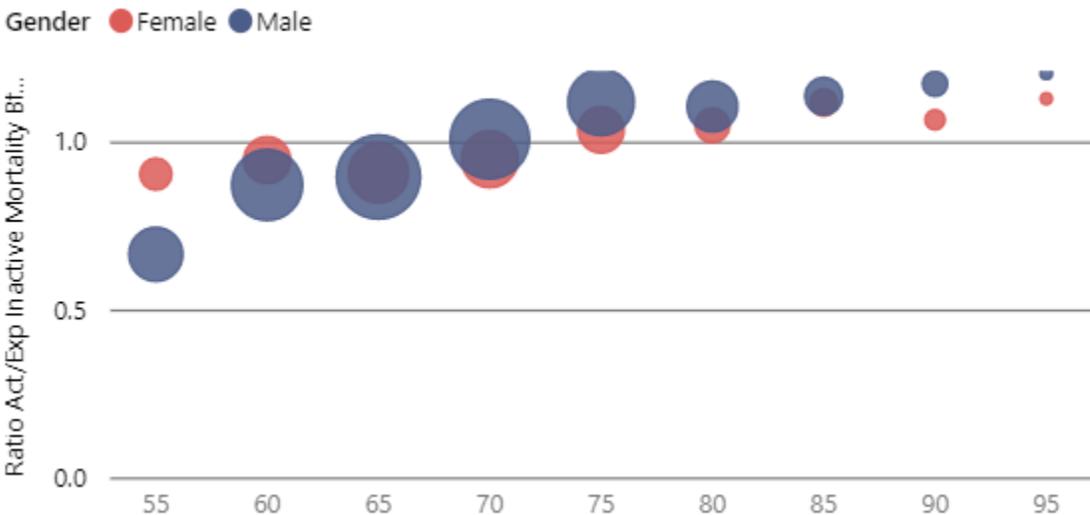
Pension Benefit Distribution w/ Inactive Mortality Rate - Actual and Expected; by Age 



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



Actual vs. Expected - Inactive Mortality Rate w/ Benefit Bubbles; by Age



Specific observations:

- From 2015 – 2021, the actual number of deaths was higher than expected on a headcount basis (A/E ratio of 1.04) and a benefit basis (A/E ratio of 1.04).

- During 2020 – 2021, the actual experience was greater than in previous years (A/E ratio of 1.13 on a benefits basis).
- For ages 75 to 99, actual deaths exceeded expectations (A/E ratio of 1.11 on a benefits basis).
- For ages 55 to 74, actual deaths were smaller than expected (A/E ratio of 0.92 on a benefits basis).
- For males, the rate of mortality on an amount-weighted basis was 78.7% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 77.8%. The assumed percentage varies between 89% and 95% depending on the NYCERS group. The actual weighting of benefits will result in a difference from the assumed percentage.
- For females, the rate of mortality on an amount-weighted basis was 75.2% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 76.8%. The assumed percentage varies between 87% and 110% depending on the NYCERS group. The actual weighting of benefits will result in a difference from the assumed percentage.
- The mortality rates for members retiring from active service are lower than the mortality rates for members commencing a pension benefit from vested status.

The following chart shows the postretirement mortality experience of members retiring from active service excluding members retiring from a vested terminated status, on an amount-weighted basis, by age, for males and females combined, for the age range (55 to 99), in the period 2015 – 2021.

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	12,200K	17,461K	2,164,483K	0.5637%	0.8067%	▲ 0.70
60	38,089K	43,576K	3,926,515K	0.9700%	1.1098%	▲ 0.87
65	73,674K	82,770K	5,799,661K	1.2703%	1.4272%	▲ 0.89
70	100,858K	102,449K	5,239,663K	1.9249%	1.9553%	● 0.98
75	123,572K	113,381K	3,582,059K	3.4498%	3.1652%	● 1.09
80	120,920K	110,705K	2,067,713K	5.8480%	5.3540%	● 1.09
85	118,332K	104,926K	1,187,339K	9.9661%	8.8371%	▲ 1.13
90	94,256K	83,040K	569,887K	16.5394%	14.5713%	▲ 1.14
95	38,422K	32,905K	155,185K	24.7588%	21.2035%	▲ 1.17
Total	720,323K	691,213K	24,692,505K	2.9172%	2.7993%	● 1.04

The following chart shows the postretirement mortality experience of members commencing retirement from a vested terminated status on an amount-weighted basis, by age, for males and females combined, for the age range (55 to 99), during the period 2015 – 2021.

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	443K	403K	50,261K	0.8817%	0.8013%	▲ 1.10
60	1,966K	1,487K	137,415K	1.4307%	1.0819%	▲ 1.32
65	3,082K	2,616K	194,088K	1.5879%	1.3481%	▲ 1.18
70	2,933K	2,421K	122,649K	2.3916%	1.9742%	▲ 1.21
75	3,767K	2,976K	90,517K	4.1615%	3.2882%	▲ 1.27
80	2,524K	2,603K	48,593K	5.1943%	5.3559%	● 0.97
85	1,928K	1,617K	19,711K	9.7799%	8.2032%	▲ 1.19
90	642K	667K	4,830K	13.2884%	13.8013%	● 0.96
95	282K	210K	1,042K	27.0304%	20.1276%	▲ 1.34
Total	17,566K	14,999K	669,105K	2.6253%	2.2417%	▲ 1.17

Specific observations:

- Although there is not enough mortality experience of members commencing to receive retirement benefits from vested status to be fully credible, it is interesting that this group exhibits greater mortality experience versus members retiring from active service.

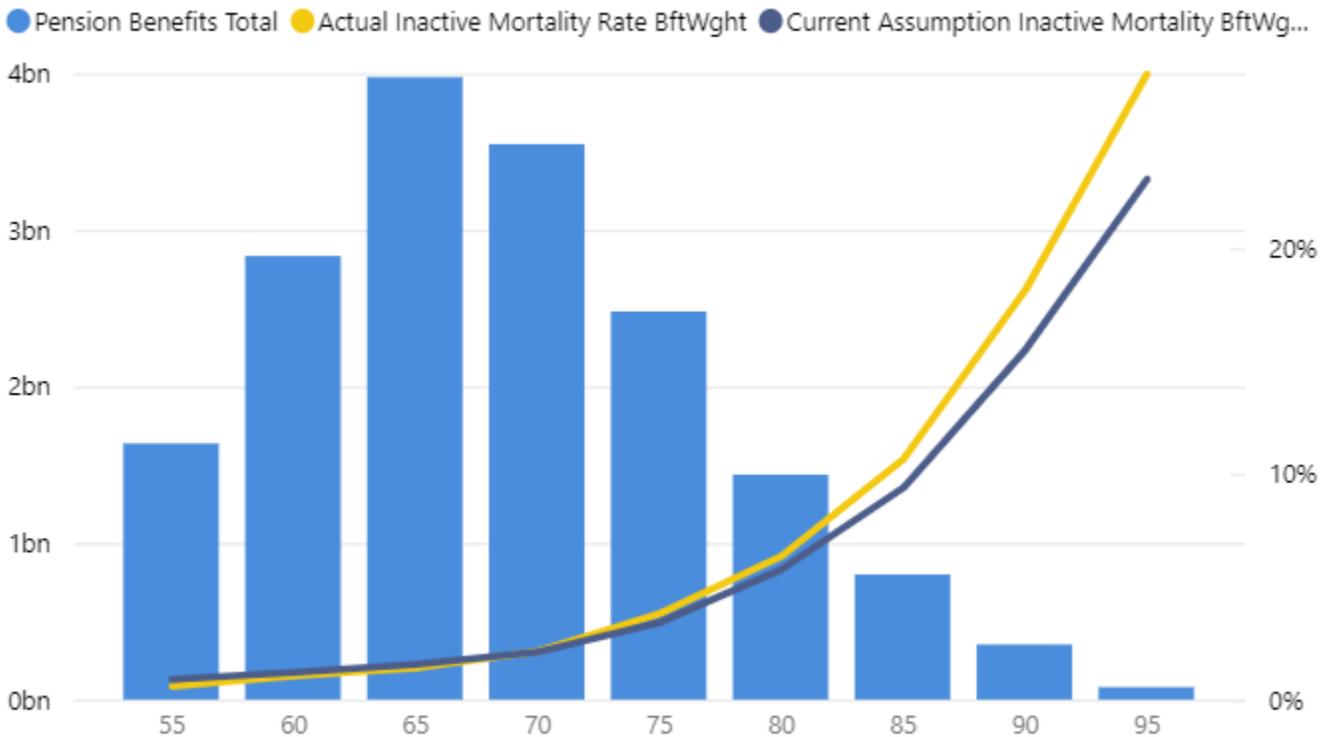
While the overall rates of mortality for 2020 and 2021 are somewhat greater than prior years, we included the experience of these years in the analysis. The A/E ratio on a benefits basis decreases from 1.04 to 1.01 when these two years are excluded. Since amount-weighted mortality rates are not available prior to 2015, the following analysis contains the entire study period from 2015 – 2021.

Service Retirees - Males

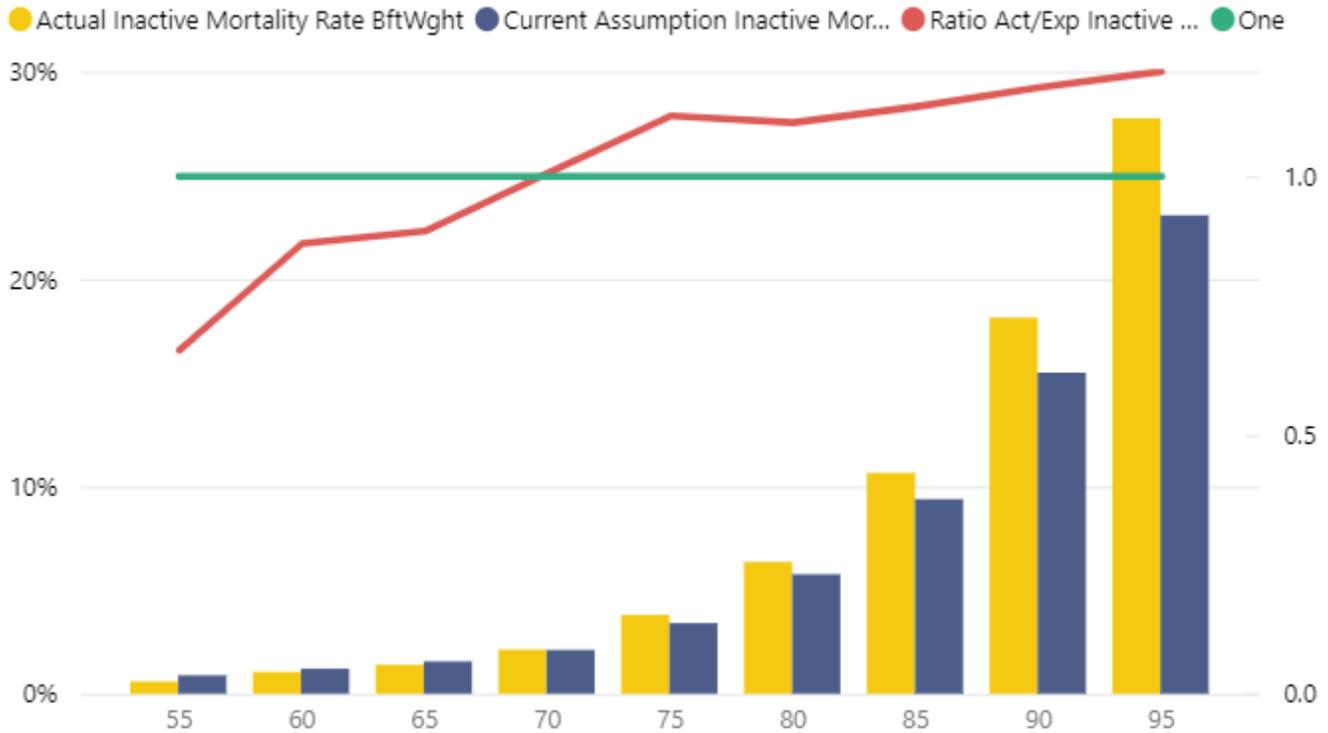
The following charts show postretirement mortality experience on an amount-weighted basis by age, for males, for the age range (55 to 99) in the period 2015 – 2021.

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	9,675K	14,575K	1,635,362K	0.5916%	0.8913%	0.66
60	29,782K	34,185K	2,833,217K	1.0512%	1.2066%	0.87
65	55,402K	61,831K	3,975,183K	1.3937%	1.5554%	0.90
70	75,454K	74,951K	3,547,757K	2.1268%	2.1126%	1.01
75	94,305K	84,416K	2,479,129K	3.8040%	3.4051%	1.12
80	91,340K	82,665K	1,436,327K	6.3593%	5.7553%	1.10
85	85,029K	74,961K	798,709K	10.6459%	9.3852%	1.13
90	63,678K	54,376K	351,121K	18.1355%	15.4864%	1.17
95	21,963K	18,263K	79,158K	27.7452%	23.0718%	1.20
Total	526,628K	500,223K	17,135,962K	3.0732%	2.9191%	1.05

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



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



Specific observations:

- From 2015 - 2021, the actual number of male deaths was greater than expected on a headcount basis (A/E ratio of 1.04) and a benefit basis (A/E ratio of 1.05).
 - Excluding 2020 – 2021, A/E ratios were 1.00 and 1.01, respectively.
- For ages 75 to 99, actual deaths exceeded expectations (A/E ratio of 1.13 on a benefits basis).
- For ages 55 to 74, the number of actual deaths was smaller than expected (A/E ratio of 0.92 on a benefits basis).

The following chart shows the A/E ratios on a headcount-weighted and amount-weighted basis for each of the groups.

Postretirement Mortality Experience A/E Ratios Service Retiree Males		
	Headcount-Weighted	Amount-Weighted
General	1.05	1.07
Correction	0.96	0.98
Sanitation	1.02	1.00
TBTA and Transit	1.05	1.04
Housing Police / Transit Police	1.06	1.12

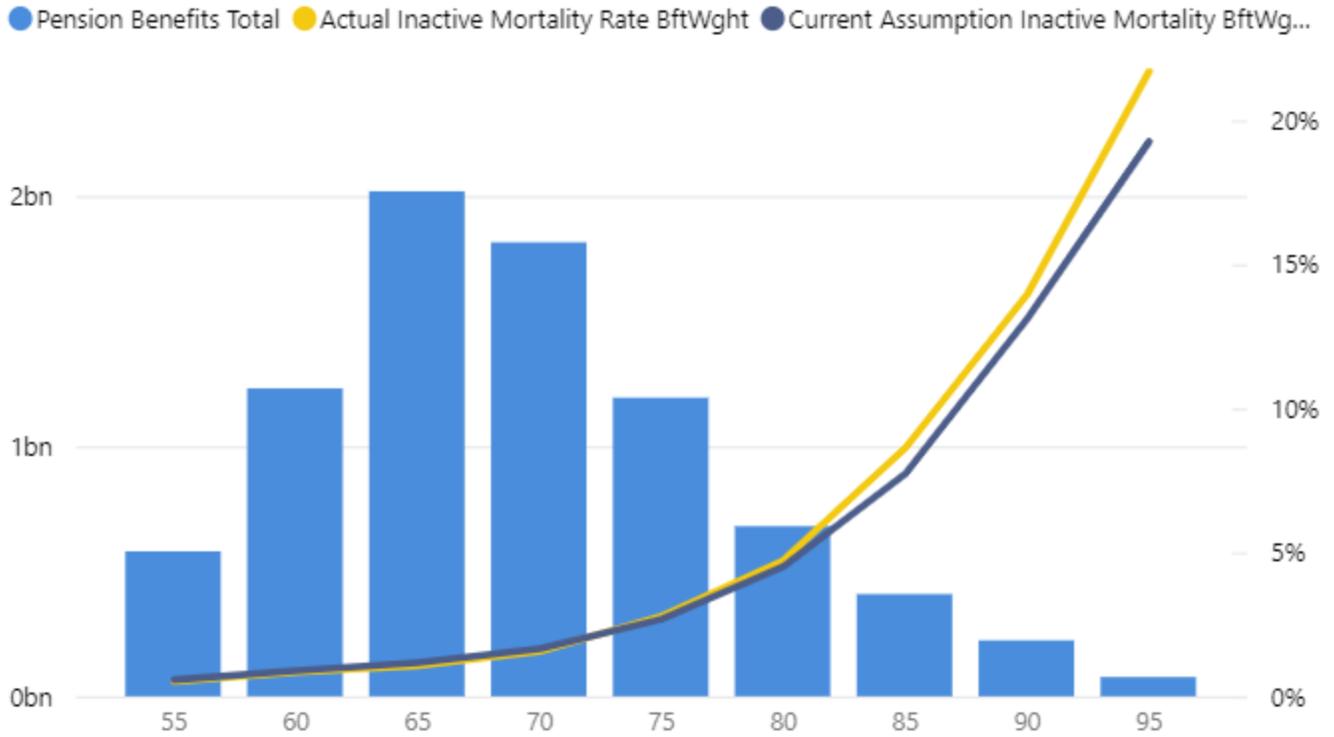
Mortality rates among male service retirees are highest among General and Housing Police / Transit Police retirees and lowest among Correction officers.

Service Retirees - Females

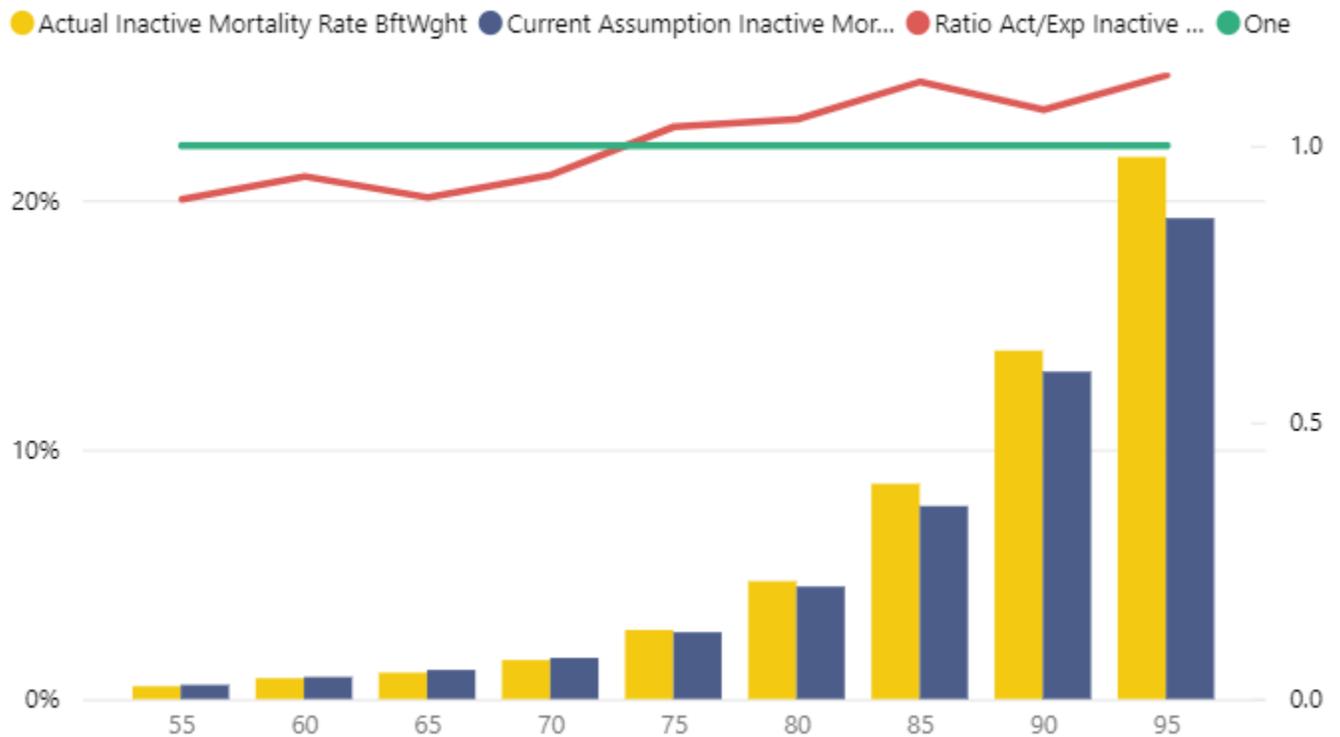
The following charts show postretirement mortality on an amount-weighted basis by age, for females, for the age range (55 to 99) during the period 2015 – 2021.

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	2,969K	3,289K	579,382K	0.5124%	0.5676%	0.90
60	10,273K	10,877K	1,230,712K	0.8347%	0.8838%	0.94
65	21,354K	23,556K	2,018,567K	1.0579%	1.1669%	0.91
70	28,337K	29,919K	1,814,555K	1.5616%	1.6489%	0.95
75	33,034K	31,941K	1,193,446K	2.7680%	2.6764%	1.03
80	32,104K	30,643K	679,979K	4.7213%	4.5065%	1.05
85	35,230K	31,582K	408,341K	8.6276%	7.7343%	1.12
90	31,220K	29,331K	223,596K	13.9627%	13.1177%	1.06
95	16,741K	14,851K	77,069K	21.7222%	19.2700%	1.13
Total	211,261K	205,989K	8,225,647K	2.5683%	2.5042%	1.03

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



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



Specific observations:

- From 2015 - 2021, the actual number of female deaths greater than expected on a headcount basis (A/E ratio of 1.05) and a benefit basis (A/E ratio of 1.03).
 - Excluding 2020 – 2021, A/E ratios were 1.03 and 1.00, respectively.
- For ages 75 to 99, actual deaths exceeded expectations (A/E ratio of 1.07 on a benefits basis).
- For ages 55 to 74, the number of actual deaths was smaller than expected (A/E ratio of 0.93 on a benefits basis).

The following chart shows the A/E ratios on a headcount-weighted and amount-weighted basis for each of the groups.

Postretirement Mortality Experience A/E Ratios Service Retiree Females		
	Headcount-Weighted	Amount-Weighted
General	1.04	1.02
Correction	0.94	1.07
Sanitation	N/A	N/A
TBTA and Transit	1.23	1.08
Housing Police / Transit Police	N/A	N/A

Mortality rates among female service retirees are highest among TBTA and Transit retirees. Due to the very limited amount of experience, Sanitation and Housing Police / Transit Police were excluded.

Postretirement Mortality – Disability Retirees

The following charts show postretirement mortality on a headcount-weighted basis and an amount-weighted basis by year, for males and females combined, for the age range 45 to 94, during the period 2015 – 2021.

Plan Year	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
2015	469	471.0	14,265	3.2878%	3.3015%	1.00
2016	509	481.9	14,400	3.5347%	3.3465%	1.06
2017	501	491.1	14,490	3.4576%	3.3890%	1.02
2018	507	499.2	14,519	3.4920%	3.4382%	1.02
2019	549	509.5	14,543	3.7750%	3.5036%	1.08
2020	595	512.8	14,469	4.1122%	3.5440%	1.16
2021	577	505.6	14,115	4.0878%	3.5821%	1.14
Total	3,707	3,471.0	100,801	3.6775%	3.4434%	1.07

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	8,824K	9,271K	315,543K	2.7963%	2.9382%	0.95
2016	9,777K	9,680K	325,409K	3.0045%	2.9746%	1.01
2017	10,415K	10,001K	333,552K	3.1224%	2.9983%	1.04
2018	10,360K	10,416K	343,765K	3.0138%	3.0301%	0.99
2019	9,500K	9,107K	315,047K	3.0155%	2.8905%	1.04
2020	10,489K	9,456K	325,570K	3.2218%	2.9043%	1.11
2021	10,269K	9,532K	326,522K	3.1450%	2.9193%	1.08
Total	69,634K	67,463K	2,285,408K	3.0469%	2.9519%	1.03

Specific observations:

- From 2015 - 2021, the actual number of deaths was greater than expected on a headcount basis (A/E ratio of 1.07) and a benefit basis (A/E ratio of 1.03).
- During 2020 – 2021, the actual experience was higher than previous years (A/E ratio of 1.15 on a headcount basis and 1.09 on a benefits basis).
- For males, the rate of mortality on an amount-weighted basis was 81.4% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 84.1%. The assumed percentage varies between 84% and 101% depending on the NYCERS group. The actual weighting of benefits will result in a difference from the assumed percentage.

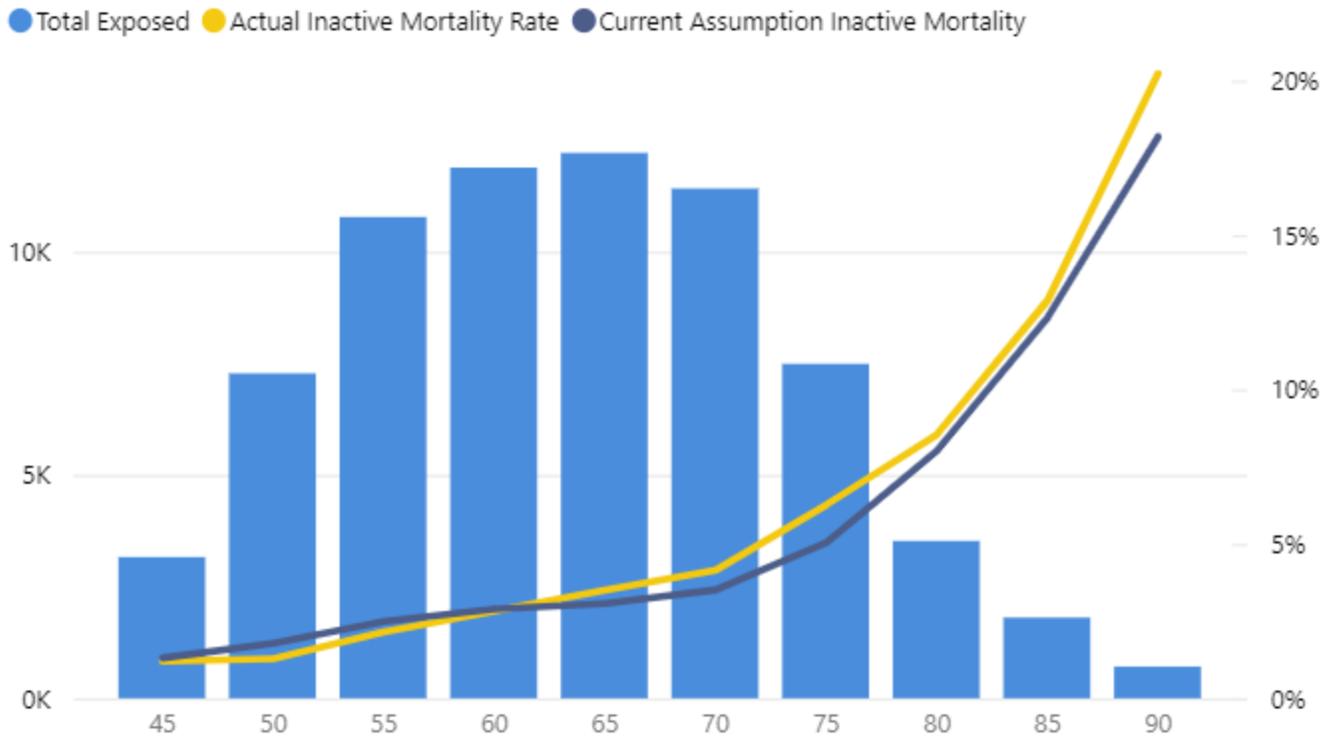
- For females, the rate of mortality on an amount-weighted basis was 83.5% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 87.0%. The assumed percentage varies between 77% and 100% depending on the NYCERS group. The actual weighting of benefits will result in a difference from the assumed percentage.

Disabled Retirees - Males

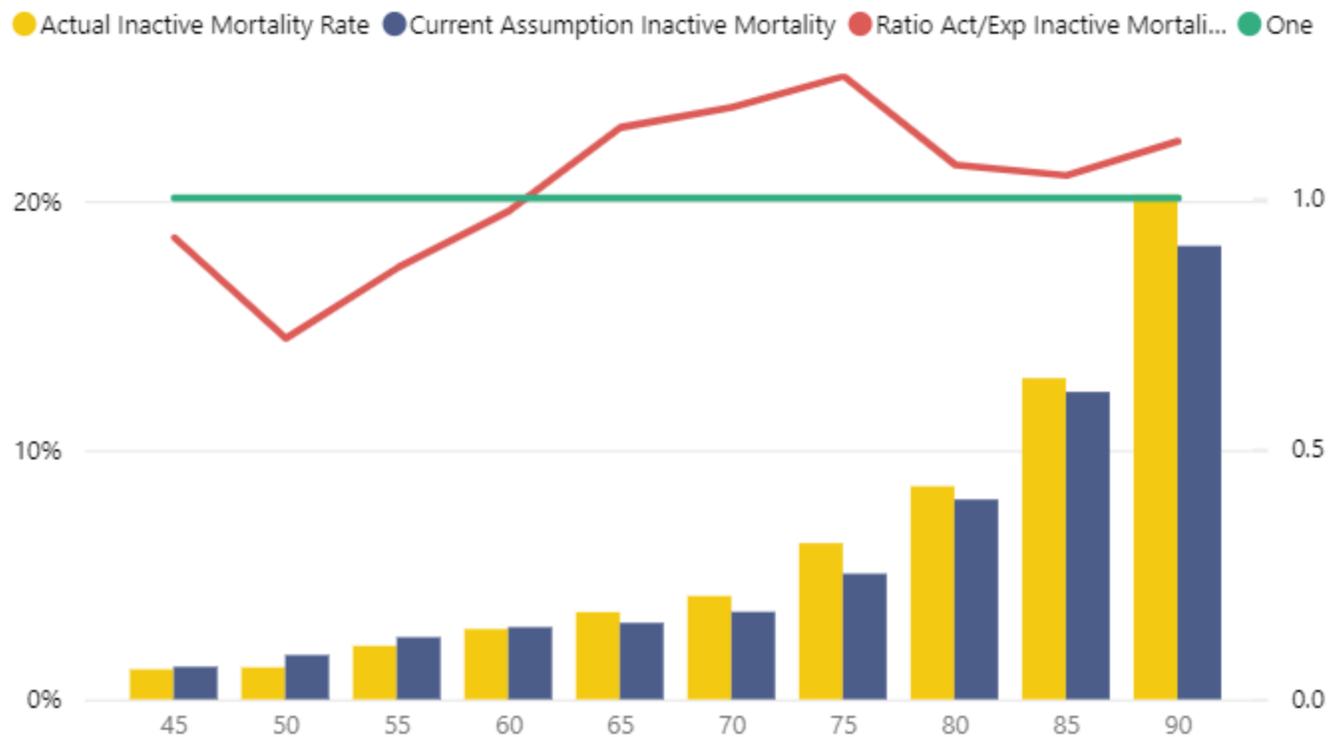
The following charts show postretirement mortality experience on a headcount-weighted basis by age, for males, for the age range 45 to 94 during the period 2015 – 2021.

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
45	38	41.3	3,161	1.2022%	1.3052%	0.92
50	93	129.1	7,273	1.2787%	1.7753%	0.72
55	231	268.3	10,773	2.1442%	2.4905%	0.86
60	335	343.9	11,880	2.8199%	2.8950%	0.97
65	427	374.3	12,209	3.4974%	3.0658%	1.14
70	473	400.6	11,411	4.1451%	3.5105%	1.18
75	469	377.3	7,486	6.2650%	5.0405%	1.24
80	301	282.4	3,522	8.5463%	8.0177%	1.07
85	233	223.0	1,808	12.8872%	12.3343%	1.04
90	144	129.4	711	20.2532%	18.1945%	1.11
Total	2,744	2,569.6	70,234	3.9069%	3.6586%	1.07

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



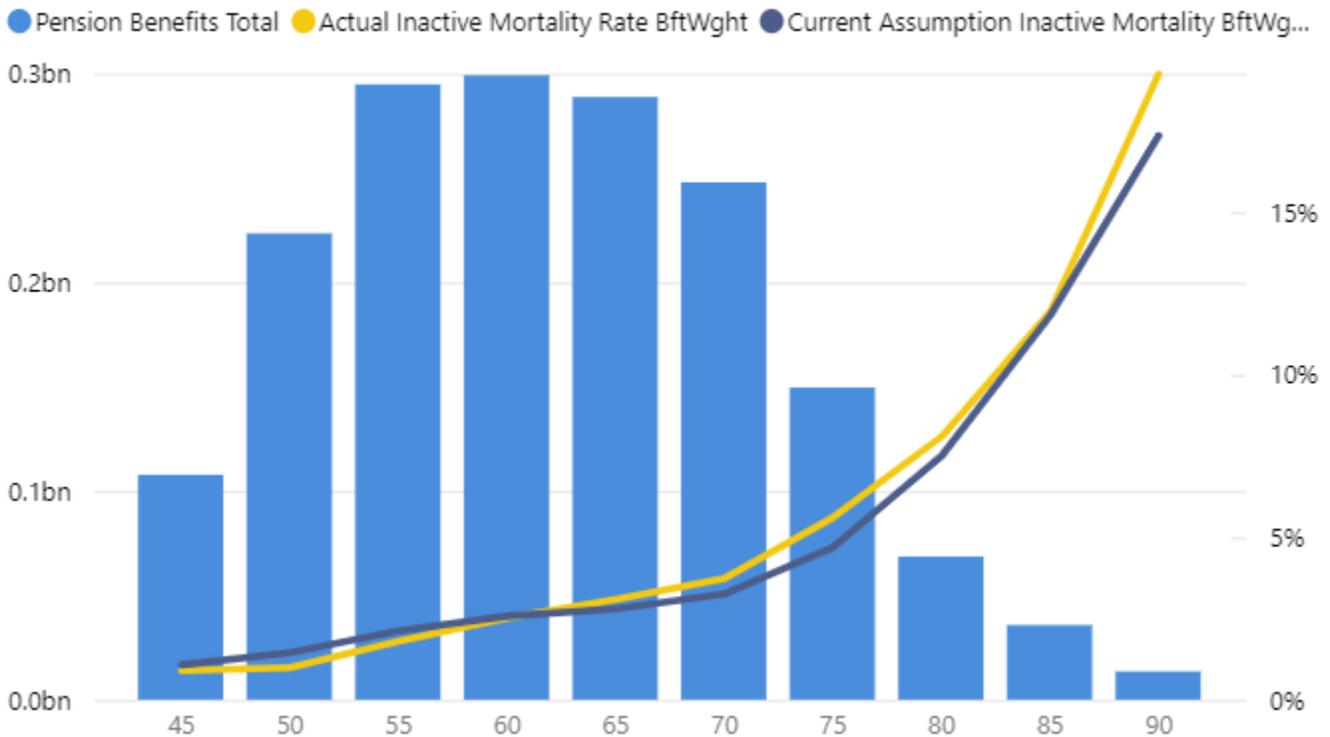
Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



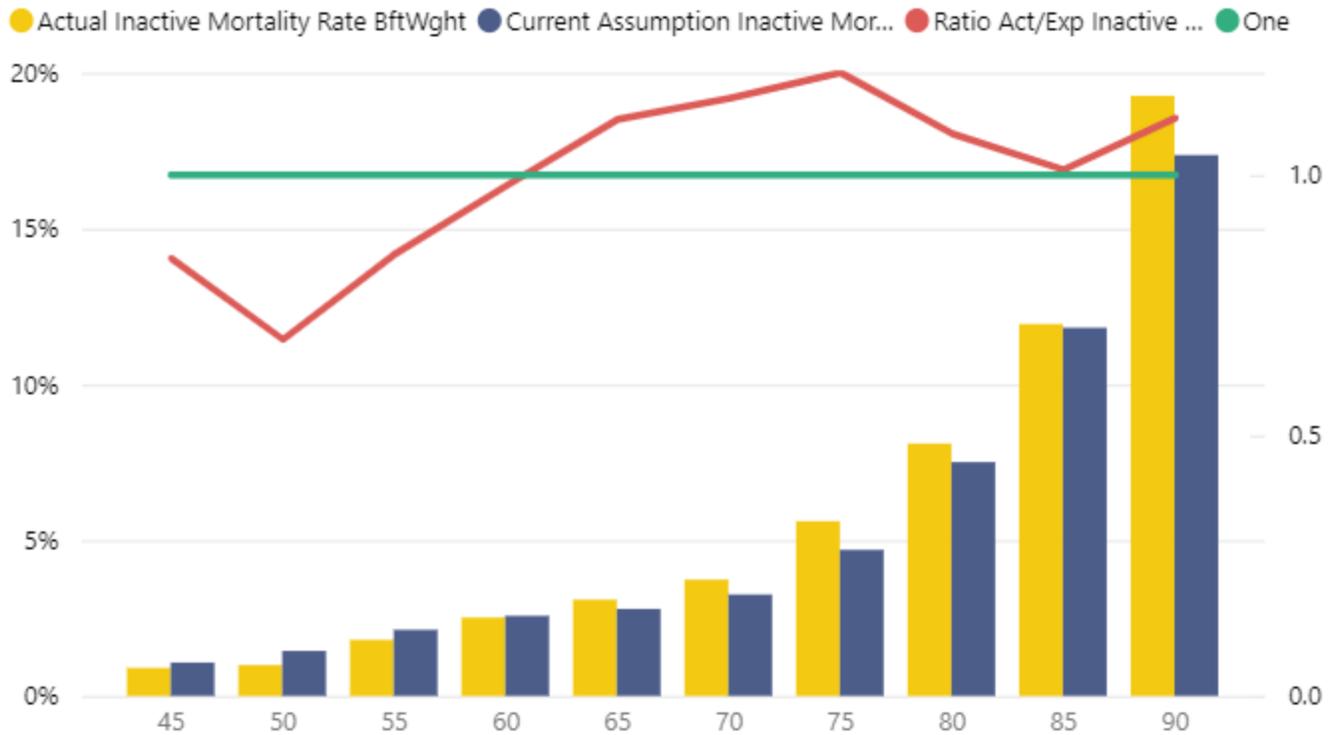
The following charts show postretirement mortality experience on an amount-weighted basis, by age, for males, for the age range 45 to 94, during the period 2015 – 2021.

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
45	968K	1,153K	107,752K	0.8984%	1.0703%	0.84
50	2,209K	3,227K	223,425K	0.9887%	1.4444%	0.68
55	5,305K	6,258K	294,793K	1.7996%	2.1229%	0.85
60	7,529K	7,691K	299,169K	2.5165%	2.5708%	0.98
65	8,921K	8,062K	288,772K	3.0892%	2.7917%	1.11
70	9,253K	8,067K	247,896K	3.7325%	3.2542%	1.15
75	8,386K	7,010K	149,545K	5.6074%	4.6877%	1.20
80	5,559K	5,150K	68,628K	8.0997%	7.5044%	1.08
85	4,267K	4,225K	35,747K	11.9356%	11.8182%	1.01
90	2,612K	2,354K	13,559K	19.2623%	17.3604%	1.11
Total	55,007K	53,197K	1,729,288K	3.1809%	3.0763%	1.03

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



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



Specific observations:

- From 2015 - 2021, the actual number of deaths was greater than expected on a headcount basis (A/E ratio of 1.07) and a benefit basis (A/E ratio of 1.03).
- Experience during 2020 – 2021 was greater than prior years (A/E ratio of 1.17 on a headcount basis and A/E ratio of 1.11 on a benefits basis).
 - Excluding 2020 – 2021, A/E ratios were 1.03 and 1.00, respectively.

The following chart shows the A/E ratios on a headcount-weighted and amount-weighted basis for each of the groups.

Postretirement Mortality Experience A/E Ratios Disabled Retiree Males		
	Headcount-Weighted	Amount-Weighted
General	1.07	1.03
Correction	0.92	0.96
Sanitation	1.05	0.97
TBTA and Transit	1.12	1.10
Housing Police / Transit Police	1.11	1.16

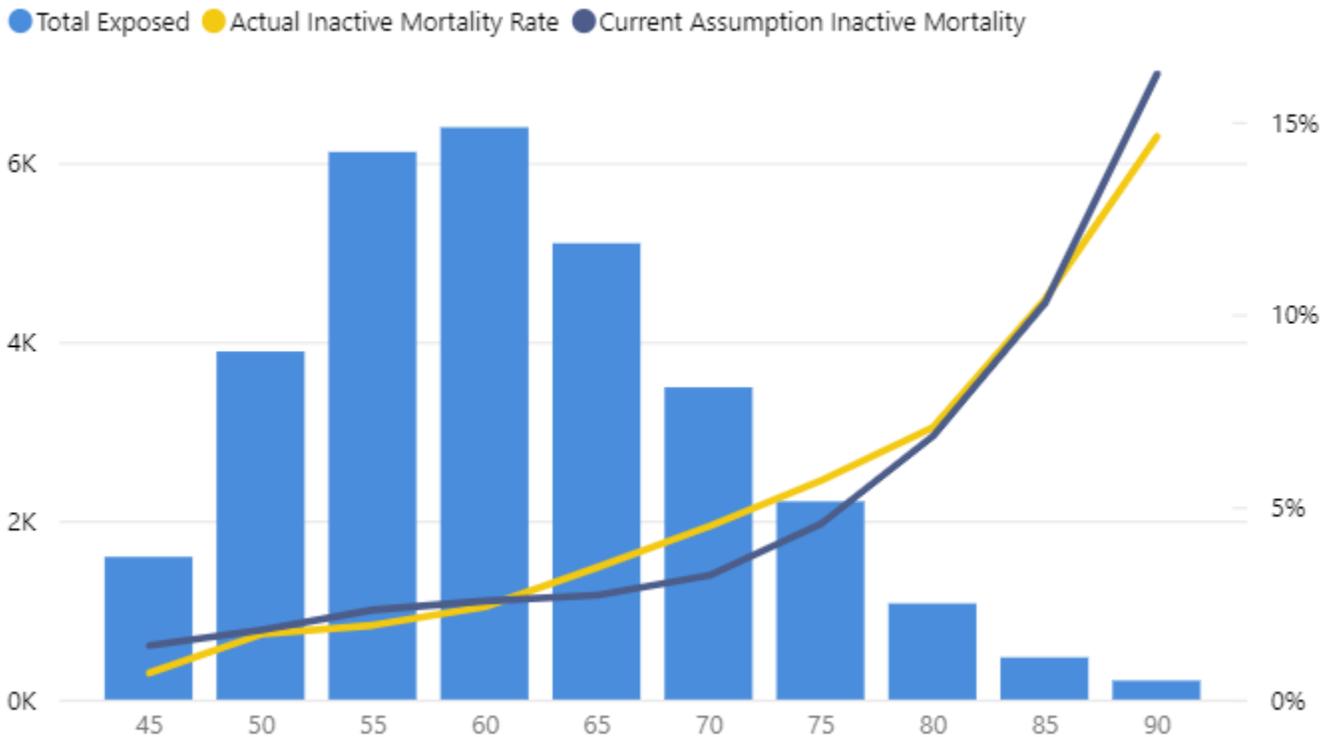
Mortality rates among male disabled retirees are highest among TBTA and Transit retirees along with Housing Police / Transit Police and lowest among Correction officers.

Disabled Retirees - Females

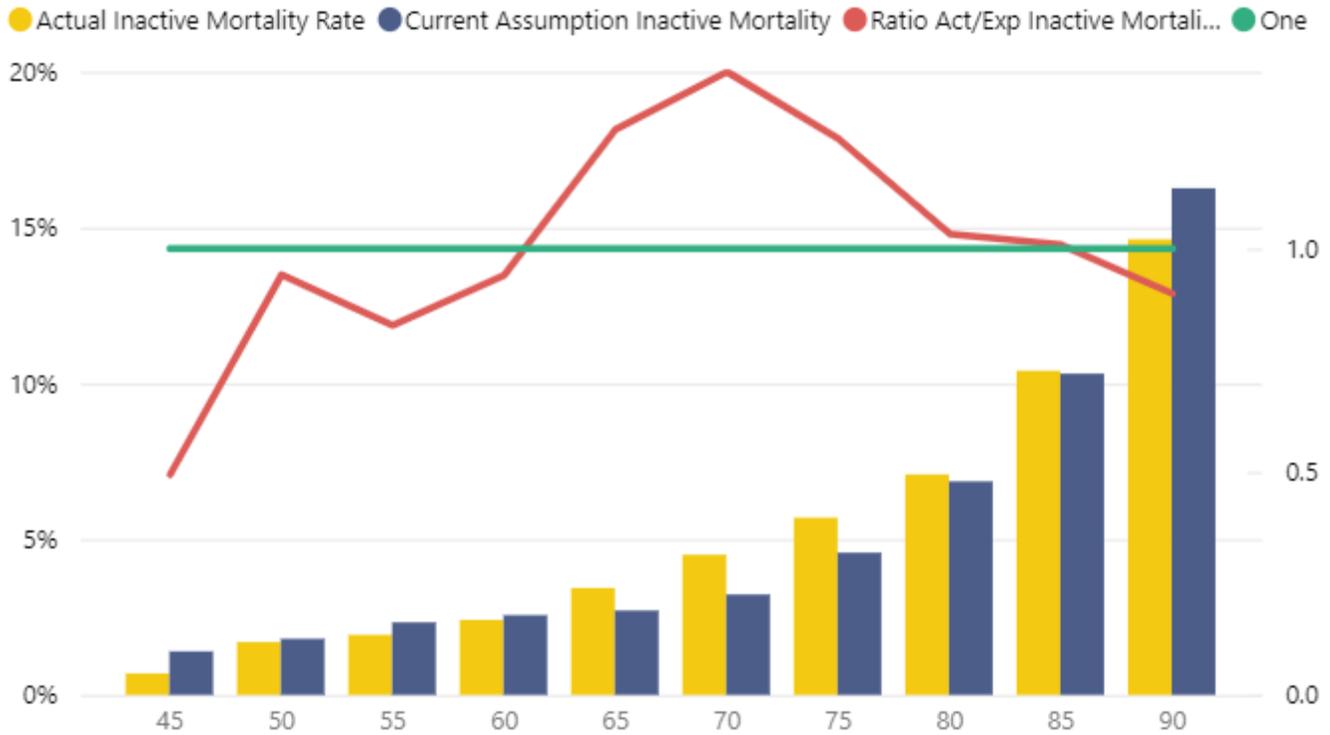
The following charts show postretirement mortality experience on a headcount-weighted basis by age, for females, for the age range 45 to 94 during the period 2015 – 2021.

Age (bins)	Actual Inactive Deaths	Expected Inactive Deaths	Total Exposed	Actual Inactive Mortality Rate	Current Assumption Inactive Mortality	Ratio Act/Exp Inactive Mortality
45	11	22.1	1,595	0.6897%	1.3874%	0.50
50	66	69.1	3,891	1.6962%	1.7756%	0.96
55	118	140.4	6,122	1.9275%	2.2935%	0.84
60	154	162.3	6,396	2.4078%	2.5378%	0.95
65	175	137.8	5,101	3.4307%	2.7022%	1.27
70	157	112.2	3,490	4.4986%	3.2142%	1.40
75	126	100.9	2,215	5.6885%	4.5545%	1.25
80	76	73.6	1,074	7.0764%	6.8492%	1.03
85	49	48.6	471	10.4034%	10.3114%	1.01
90	31	34.5	212	14.6226%	16.2633%	0.90
Total	963	901.4	30,567	3.1505%	2.9491%	1.07

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



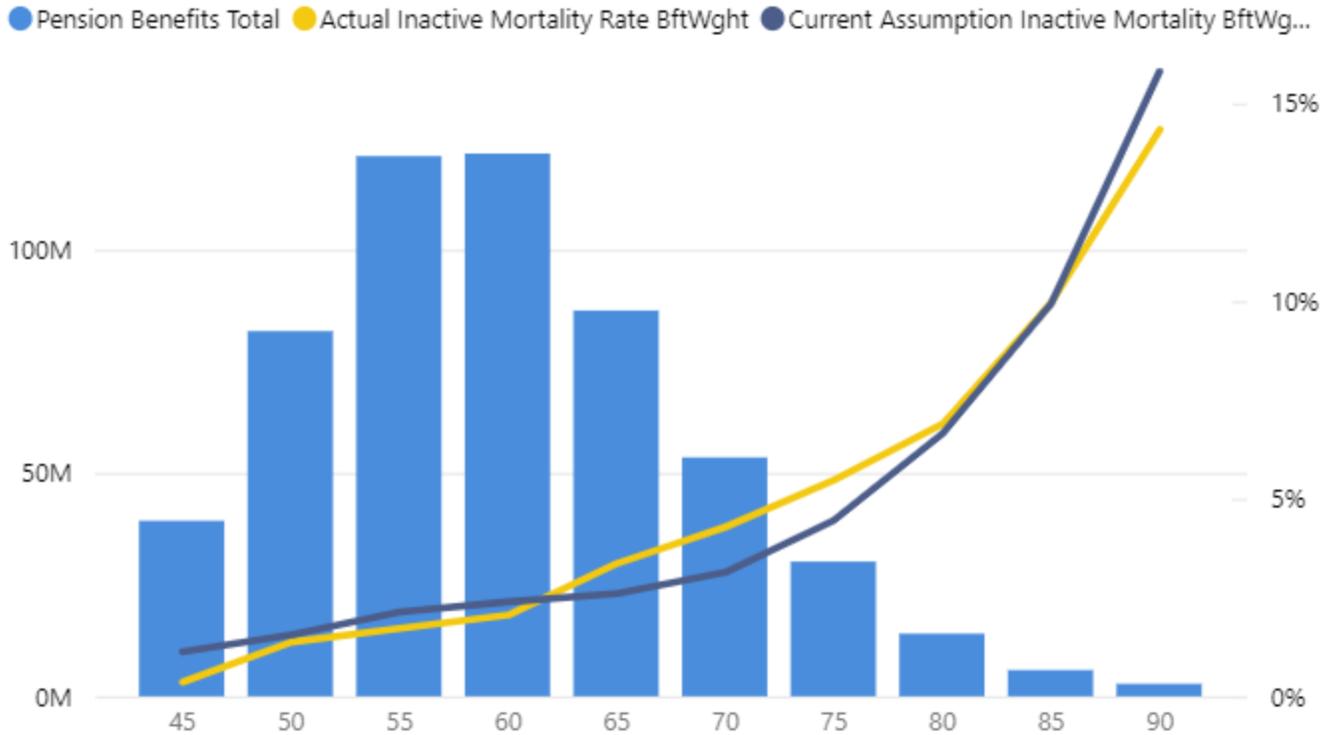
Inactive Mortality Rate - Actual, Expected, and Ratio; by Age



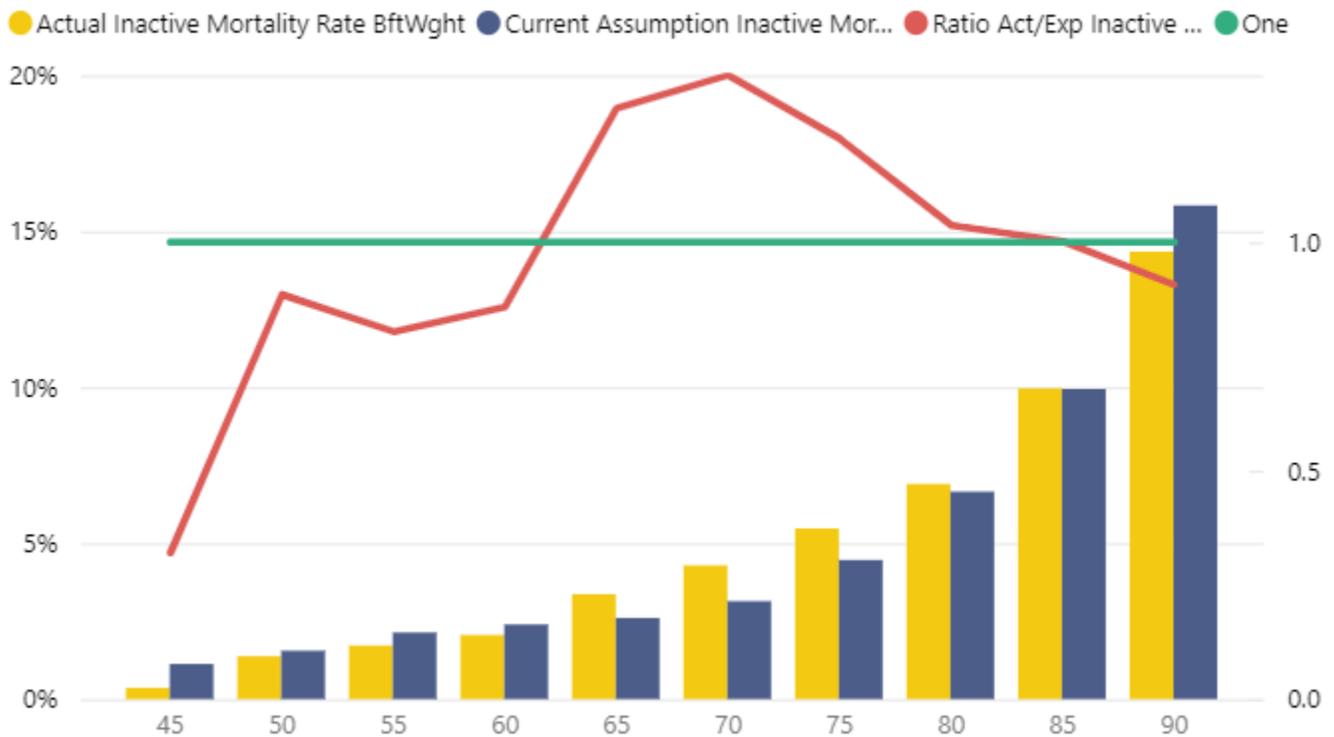
The following charts show postretirement mortality experience on an amount-weighted basis, by age, for females, for the age range 45 to 94, during the period 2015 – 2021.

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
45	141K	437K	39,291K	0.3601%	1.1133%	0.32
50	1,122K	1,237K	81,744K	1.3727%	1.5137%	0.91
55	2,074K	2,518K	120,920K	1.7154%	2.0827%	0.82
60	2,494K	2,872K	121,497K	2.0529%	2.3637%	0.87
65	2,902K	2,238K	86,355K	3.3611%	2.5919%	1.30
70	2,290K	1,667K	53,470K	4.2836%	3.1175%	1.37
75	1,649K	1,337K	30,150K	5.4699%	4.4349%	1.23
80	967K	932K	14,027K	6.8945%	6.6443%	1.04
85	585K	584K	5,871K	9.9596%	9.9404%	1.00
90	401K	442K	2,795K	14.3470%	15.8254%	0.91
Total	14,627K	14,265K	556,120K	2.6302%	2.5651%	1.03

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



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



Specific observations:

- The mortality experience of disabled female members is not fully credible.
- From 2015 - 2021, the actual number of deaths was greater than expected on both a headcount basis (A/E ratio of 1.07) and a benefit basis (A/E ratio of 1.03).
- Experience during 2020 – 2021 was greater than prior years (A/E ratio of 1.11 on a headcount basis and A/E ratio of 1.03 on a benefits basis).
 - Excluding 2020 – 2021, A/E ratios were 1.05 and 1.02, respectively.

The following chart shows the A/E ratios on a headcount-weighted and amount-weighted basis for each of the groups.

Postretirement Mortality Experience A/E Ratios Disabled Retiree Females		
	Headcount-Weighted	Amount-Weighted
General	1.11	1.06
Correction	0.97	0.98
Sanitation	N/A	N/A
TBTA and Transit	0.81	0.83
Housing Police / Transit Police	N/A	N/A

Mortality rates among female service retirees are highest among General retirees. Experience was limited for Correction and TBTA / Transit. Due to the very limited amount of experience, Sanitation and Housing Police / Transit Police were excluded.

Postretirement Mortality – Contingent Beneficiaries

The following charts show the postretirement mortality experience on a headcount-weighted basis and amount-weighted basis by year, for males and females combined, for the age range 60 to 104, during the period 2015 – 2021.

Plan Year	Actual Beneficiary Deaths	Expected Beneficiary Deaths	Total Exposed	Actual Beneficiary Mortality Rate	Current Assumption Beneficiary Mortality	Ratio Act/Exp Beneficiary Mortality
2015	855	785.0	12,070	7.0837%	6.5037%	1.09
2016	828	787.1	12,207	6.7830%	6.4479%	1.05
2017	865	783.7	12,287	7.0400%	6.3786%	1.10
2018	953	783.4	12,481	7.6356%	6.2766%	1.22
2019	931	759.2	12,464	7.4695%	6.0911%	1.23
2020	933	747.5	12,527	7.4479%	5.9672%	1.25
2021	1028	733.1	12,797	8.0331%	5.7284%	1.40
Total	6393	5,379.0	86,833	7.3624%	6.1946%	1.19

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	8,810K	7,637K	126,497K	6.9649%	6.0370%	1.15
2016	8,853K	7,828K	131,809K	6.7167%	5.9390%	1.13
2017	9,104K	7,779K	131,924K	6.9011%	5.8965%	1.17
2018	9,848K	7,762K	135,436K	7.2712%	5.7311%	1.27
2019	12,614K	10,047K	202,920K	6.2162%	4.9511%	1.26
2020	12,862K	10,200K	210,285K	6.1167%	4.8508%	1.26
2021	17,750K	10,515K	227,342K	7.8076%	4.6252%	1.69
Total	79,842K	61,768K	1,166,214K	6.8463%	5.2965%	1.29

Specific observations:

- From 2015 - 2021, the actual number of deaths was greater than expected on both a headcount basis (A/E ratio of 1.19) and a benefit basis (A/E ratio of 1.29).
- During 2020 – 2021, the actual experience was higher than previous years (A/E ratio of 1.32 on a headcount basis and 1.48 on a benefits basis).
- For males, the rate of mortality on an amount-weighted basis was 104.7% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 86.3%. The assumed percentage is 89% for all male contingent beneficiaries. The actual weighting of benefits will result in a difference from the assumed percentage.

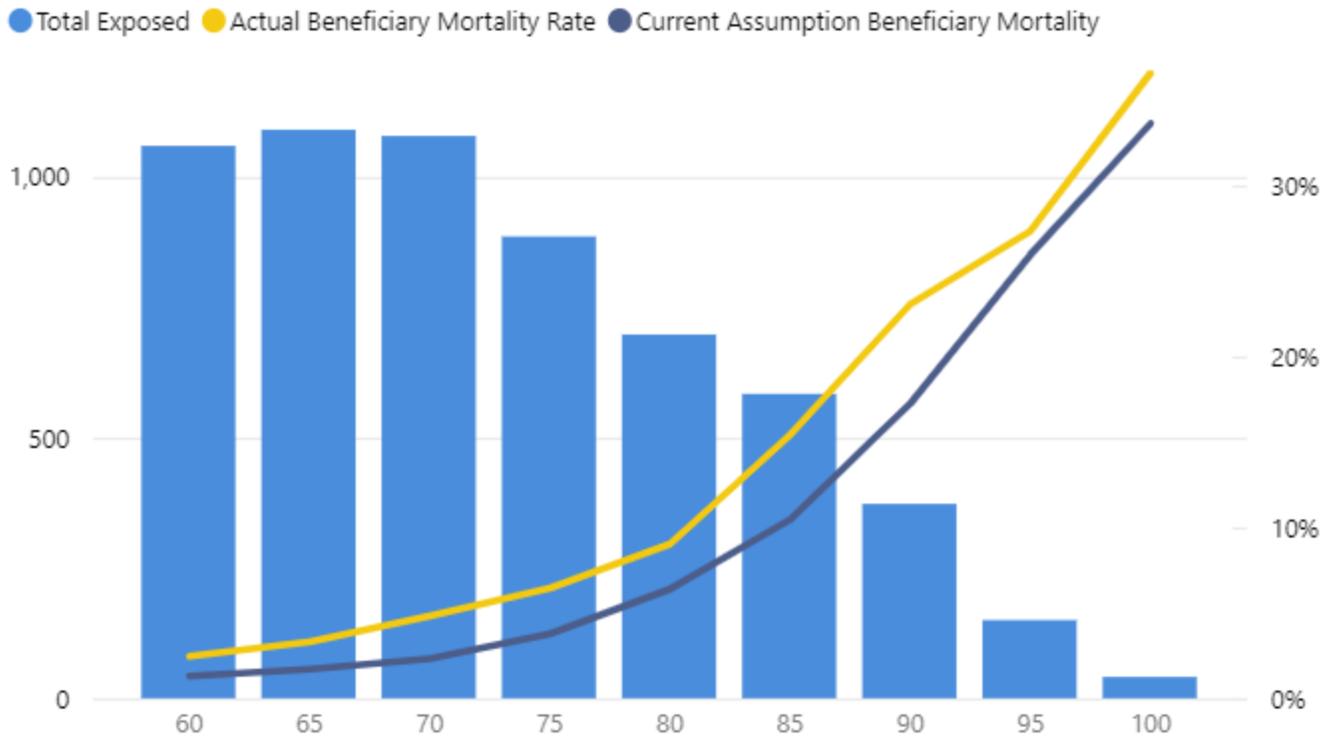
- For females, the rate of mortality on an amount-weighted basis was 92.2% of the rate of mortality on a headcount-weighted basis, versus the ratio on an expected basis of 85.4%. The assumed percentage is 95.1% for all female contingent beneficiaries. The actual weighting of benefits will result in a difference from the assumed percentage.
- The rates of mortality of contingent beneficiaries were nearly double the rates of mortality of service retirees for ages 60 to 99.
- While the volume of data for ages younger than age 60 is small, we do note that the rates of mortality are approximately three times than expected for the age range 30 to 59 during 2015 – 2020; 2021 was excluded as the number of deaths was 10 times than expected on a headcount basis.

Contingent Beneficiaries - Males

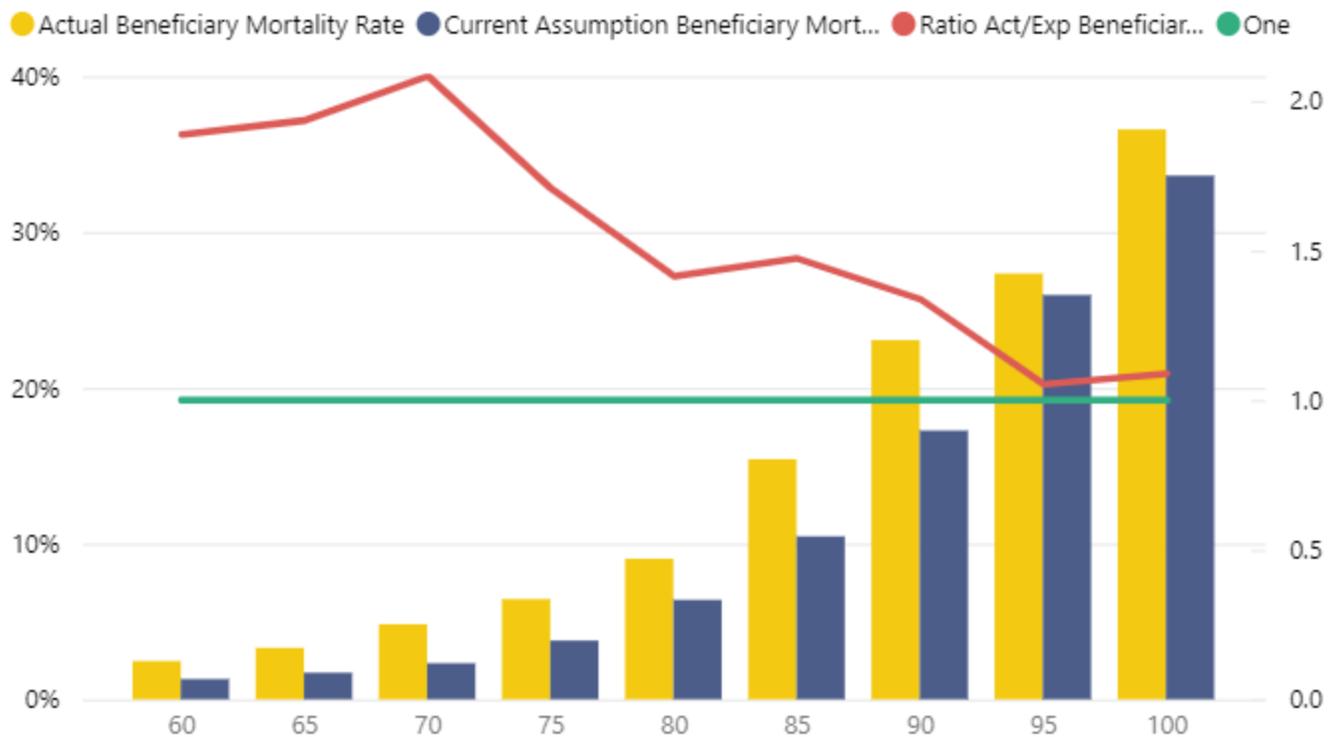
The following charts show postretirement mortality experience on a headcount-weighted basis by age, for males, for the age range 60 to 104, during the period 2015 – 2021.

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	26	13.8	1,060	2.4528%	1.2995%	1.89
65	36	18.6	1,091	3.2997%	1.7058%	1.93
70	52	25.0	1,079	4.8193%	2.3142%	2.08
75	57	33.4	886	6.4334%	3.7691%	1.71
80	63	44.6	698	9.0258%	6.3842%	1.41
85	90	61.1	584	15.4110%	10.4634%	1.47
90	86	64.4	373	23.0563%	17.2524%	1.34
95	41	38.9	150	27.3333%	25.9526%	1.05
100	15	13.8	41	36.5854%	33.6193%	1.09
Total	466	313.5	5,962	7.8162%	5.2580%	1.49

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



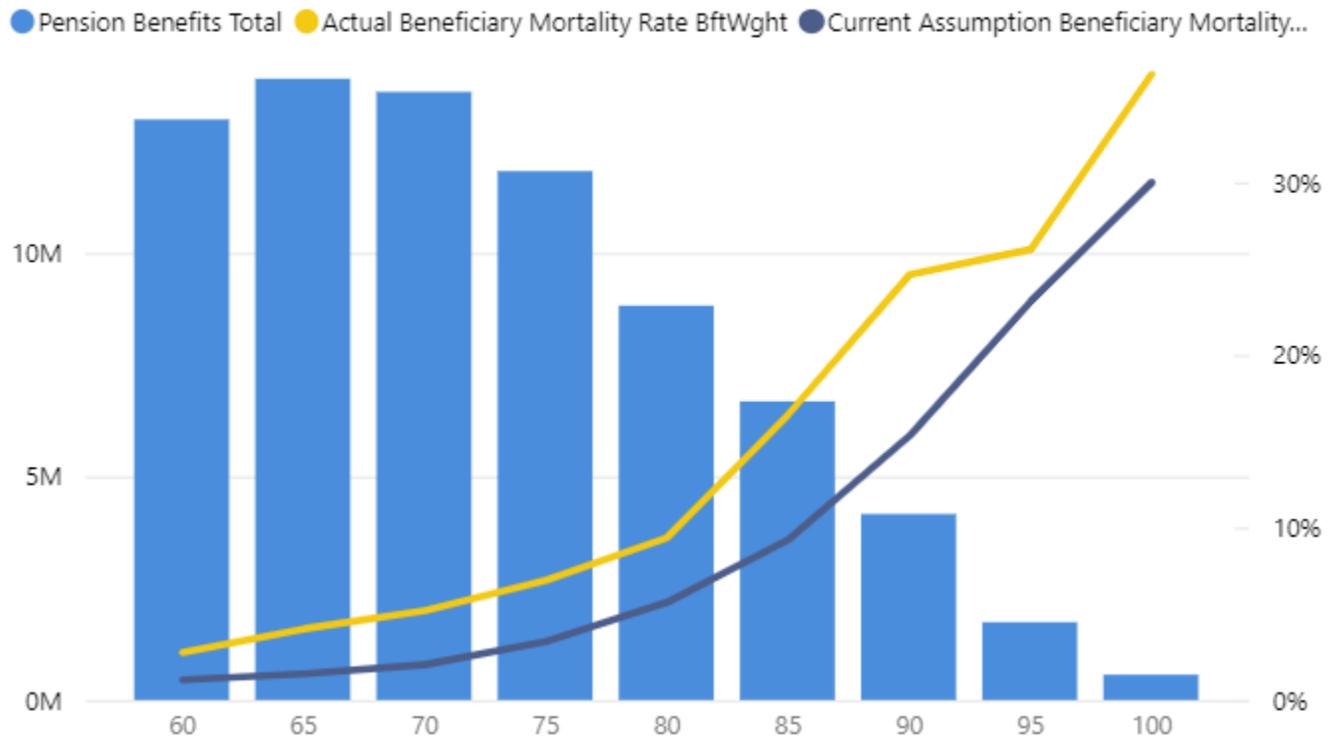
Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



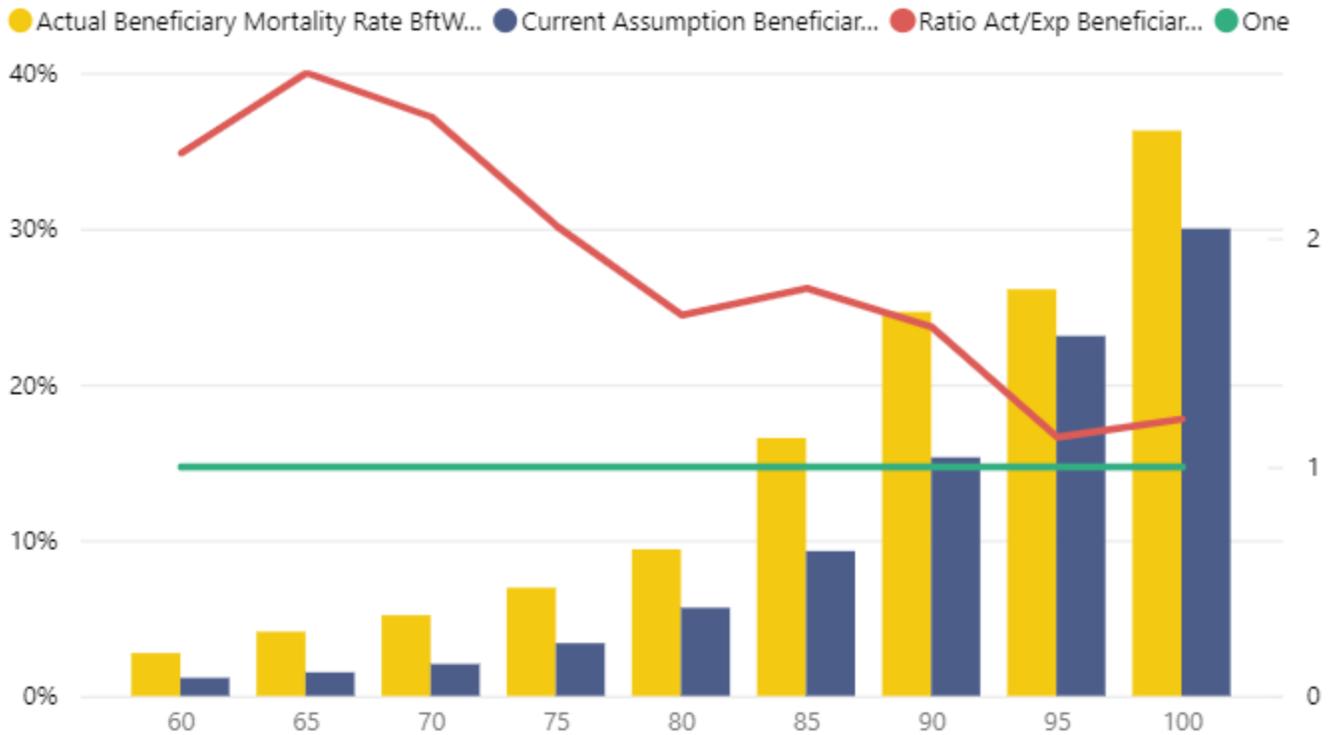
The following charts show postretirement mortality experience on an amount-weighted basis by age, for males, for the age range 60 to 104, during the period 2015 – 2021.

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	357K	151K	12,980K	2.7517%	1.1611%	2.37
65	573K	210K	13,891K	4.1230%	1.5150%	2.72
70	704K	279K	13,596K	5.1807%	2.0488%	2.53
75	821K	400K	11,824K	6.9435%	3.3840%	2.05
80	830K	499K	8,817K	9.4100%	5.6603%	1.66
85	1,105K	621K	6,677K	16.5517%	9.2980%	1.78
90	1,025K	637K	4,159K	24.6522%	15.3119%	1.61
95	454K	402K	1,740K	26.1055%	23.1087%	1.13
100	205K	170K	566K	36.2887%	29.9982%	1.21
Total	6,075K	3,368K	74,250K	8.1817%	4.5365%	1.80

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



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



Specific observations:

- The mortality experience of male contingent beneficiaries is not fully credible.
- From 2015 - 2021, the actual number of deaths was greater than expected on both a headcount basis (A/E ratio of 1.49) and a benefit basis (A/E ratio of 1.80).
- The largest difference between the number of actual and expected deaths occurred during 2020 – 2021 (A/E ratio of 1.90 on a headcount basis and A/E ratio of 2.49 on a benefits basis).
 - If these two years were excluded, the A/E ratios are 1.31 on a headcount basis and 1.42 on a benefits basis.
- Due to limited experience among groups other than General, we do not provide a breakdown of the experience by group. Furthermore, not all beneficiaries are assigned a group code in the data.

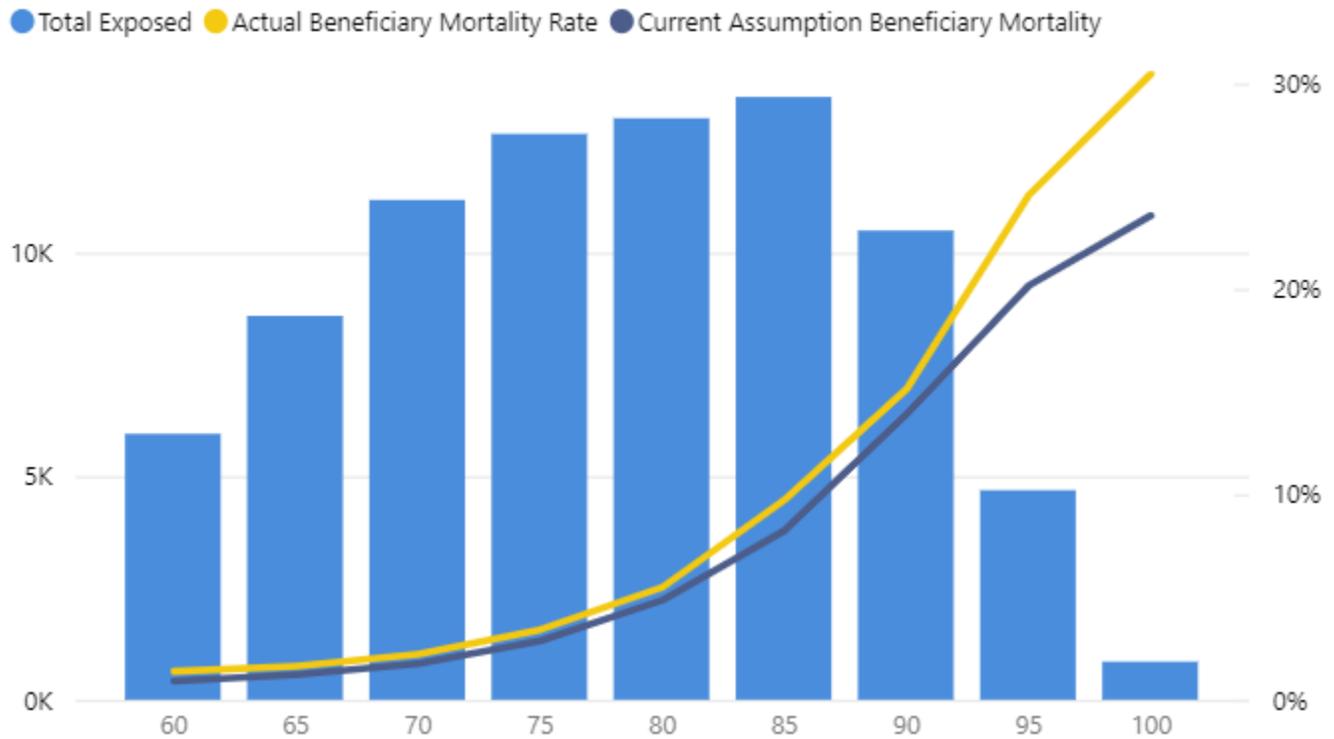
Due to the very limited amount of experience for groups other than General, we did not provide the relative A/E ratios by group.

Contingent Beneficiaries - Females

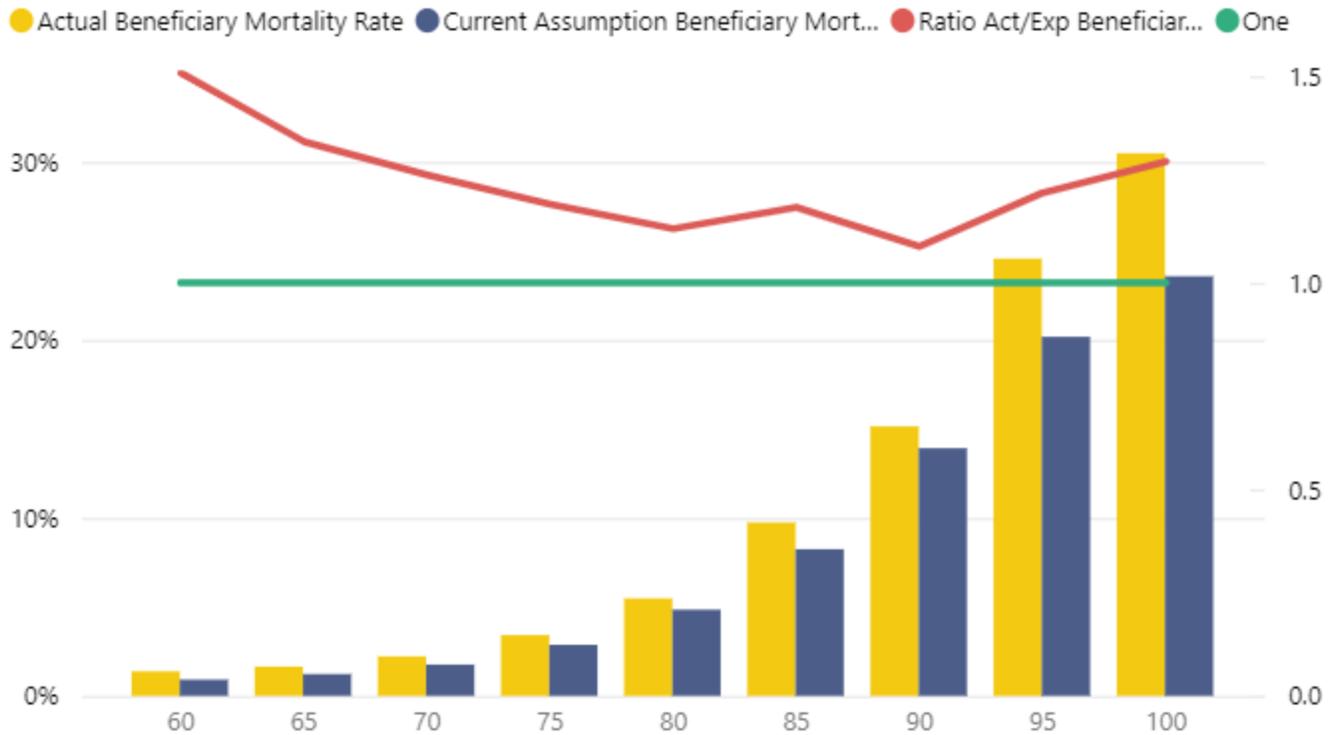
The following charts show postretirement mortality experience on a headcount-weighted basis by age, for females, for the age range 60 to 104, during the period 2015 – 2021.

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	82	54.4	5,947	1.3788%	0.9142%	1.51
65	141	105.1	8,583	1.6428%	1.2248%	1.34
70	248	196.6	11,176	2.2190%	1.7594%	1.26
75	432	363.0	12,653	3.4142%	2.8691%	1.19
80	712	629.8	13,003	5.4757%	4.8438%	1.13
85	1313	1,110.5	13,479	9.7411%	8.2390%	1.18
90	1588	1,459.7	10,491	15.1368%	13.9134%	1.09
95	1151	945.2	4,686	24.5625%	20.1717%	1.22
100	260	201.1	853	30.4807%	23.5713%	1.29
Total	5927	5,065.5	80,871	7.3290%	6.2637%	1.17

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



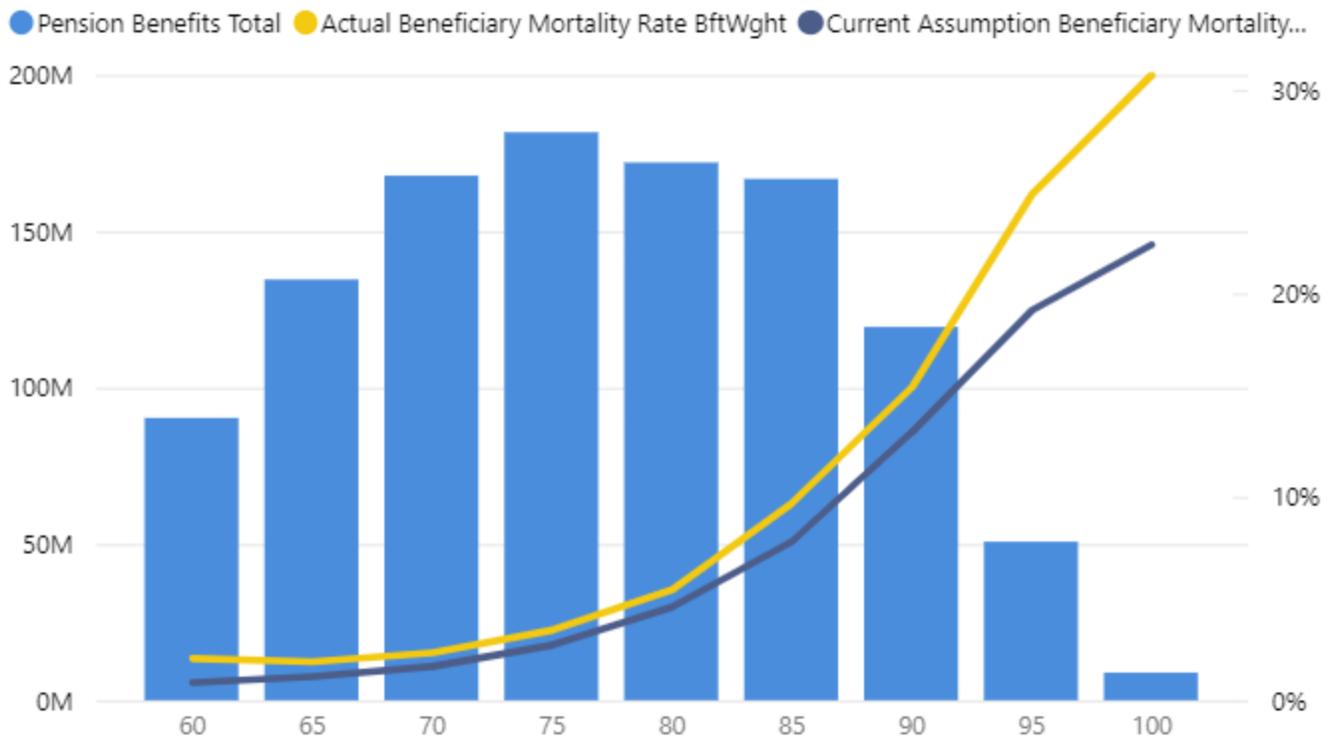
Beneficiary Mortality Rate - Actual, Expected, and Ratio; by Age



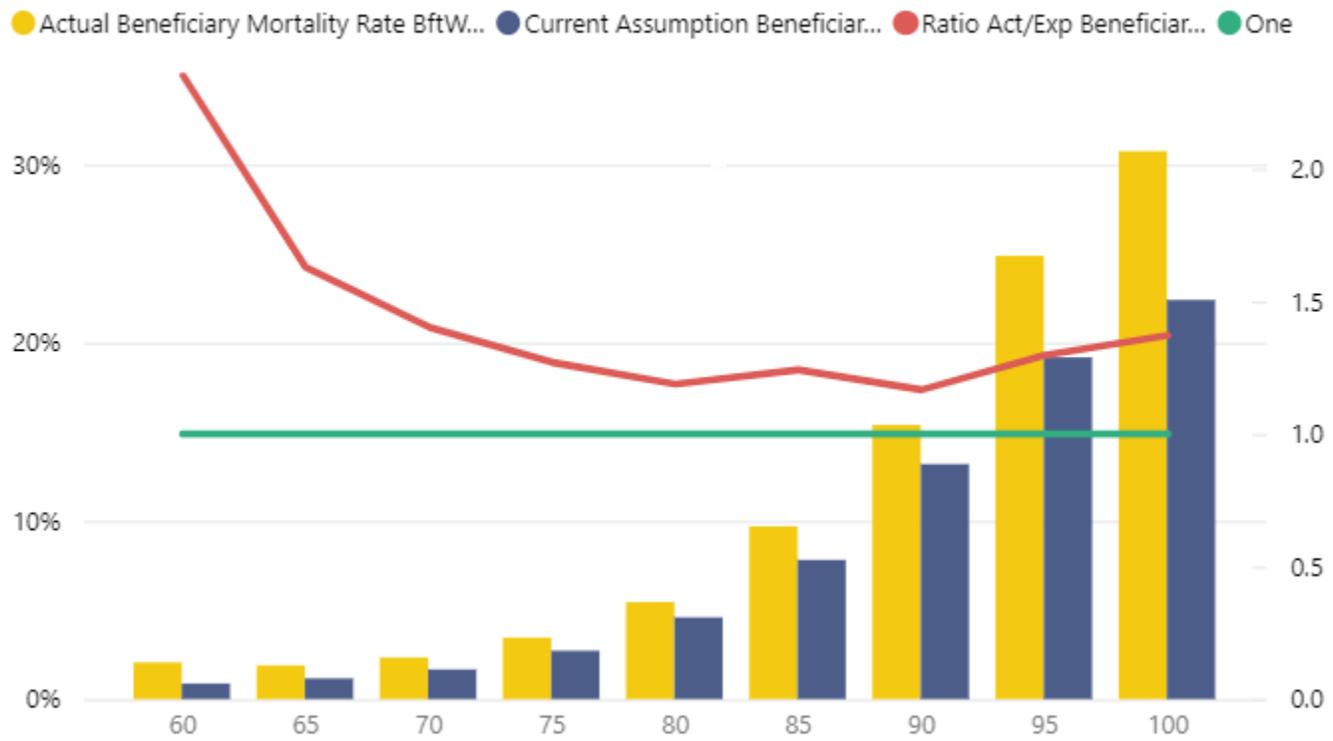
The following charts show postretirement mortality experience on an amount-weighted basis by age, for females, for the age range 60 to 104, during the period 2015 – 2021.

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	1,854K	788K	90,299K	2.0532%	0.8724%	2.35
65	2,538K	1,559K	134,571K	1.8859%	1.1587%	1.63
70	3,913K	2,789K	167,763K	2.3322%	1.6626%	1.40
75	6,255K	4,926K	181,647K	3.4436%	2.7120%	1.27
80	9,358K	7,880K	171,970K	5.4416%	4.5821%	1.19
85	16,161K	13,017K	166,748K	9.6919%	7.8063%	1.24
90	18,357K	15,738K	119,397K	15.3746%	13.1809%	1.17
95	12,608K	9,718K	50,705K	24.8647%	19.1662%	1.30
100	2,724K	1,984K	8,863K	30.7336%	22.3897%	1.37
Total	73,767K	58,400K	1,091,964K	6.7555%	5.3481%	1.26

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



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



Specific observations:

- From 2015 - 2021, the actual number of deaths was greater than expected on both a headcount basis (A/E ratio of 1.17) and a benefit basis (A/E ratio of 1.26).
- The largest difference between the number of actual and expected deaths occurred during 2020 – 2021 (A/E ratio of 1.29 on a headcount basis and A/E ratio of 1.42 on a benefits basis).
 - If these two years were excluded, the A/E ratios are 1.13 on a headcount basis and 1.19 on a benefits basis.

The following chart shows the A/E ratios on a headcount-weighted and amount-weighted basis for each of the groups and excludes beneficiaries that were not assigned a group code in the data.

Postretirement Mortality Experience A/E Ratios Contingent Beneficiary Females		
	Headcount-Weighted	Amount-Weighted
General	1.19	1.26
Correction	1.31	1.56
Sanitation	1.09	1.15
TBTA and Transit	1.16	1.30
Housing Police / Transit Police	N/A	N/A

Due to the very limited amount of experience, Housing Police / Transit Police was excluded.