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**Oklahoma Municipal Retirement Fund**

**ANALYSIS OF DEMOGRAPHIC EXPERIENCE**  
through Calendar Year 2021

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November 18, 2022

Prepared by

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# Actuarial Terms and Concepts

## Credibility

- Volume of data
- Frequency of event
- Recentness of data
- Market cycles
- Treatment of unusual data

## Exposure

- Actively employed participants
- Annuitants in pay status
- Participant "Life Years"

# Overview

## Credible Demographic Experience

- Termination
- Retirement
- Pay Increase

## Relative Demographic Experience

- Annuitant Mortality

## Other Demographic Experience (not reviewed)

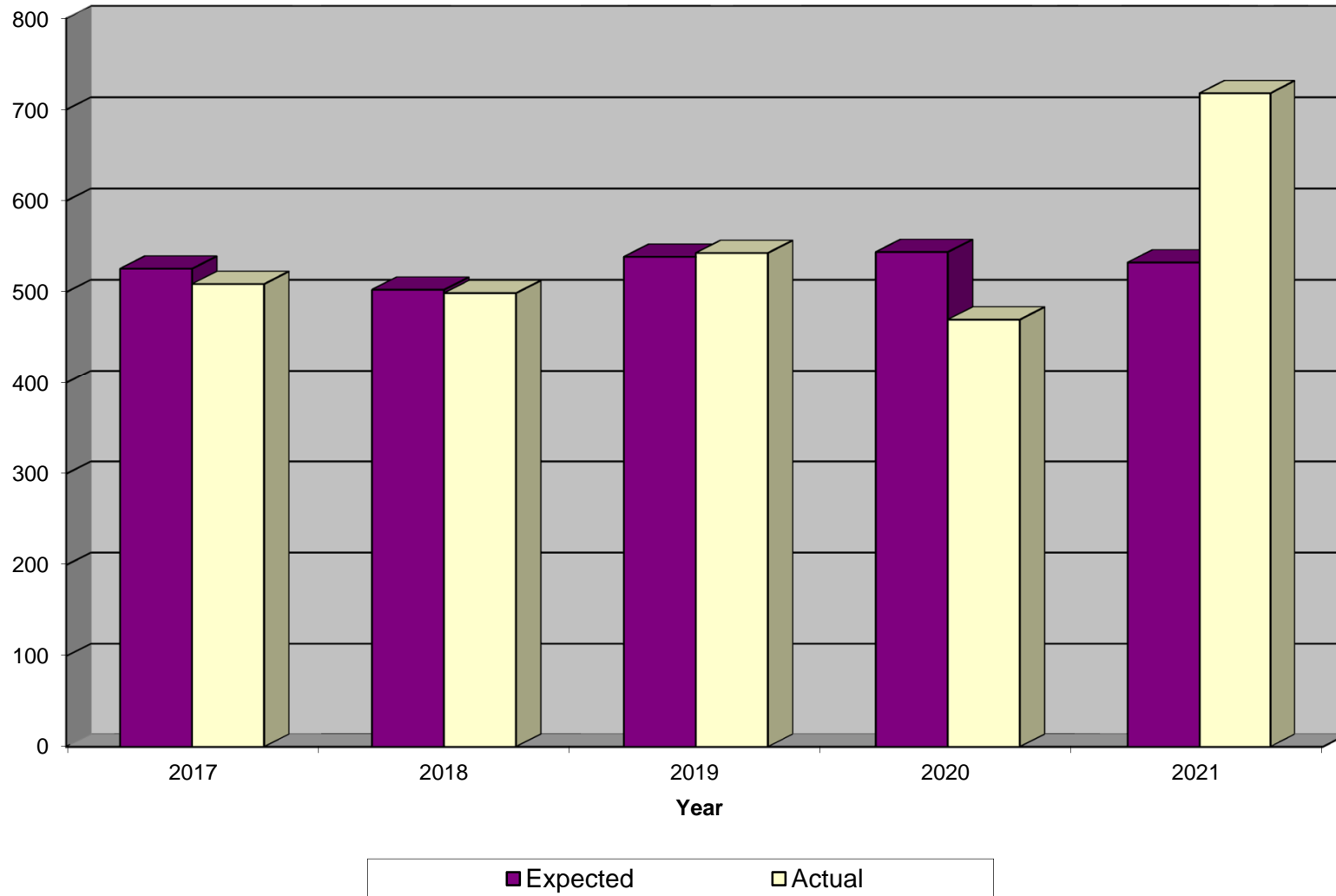
- Active Participant Mortality
- Deferred Terminee Mortality
- Disablement

# **Termination Experience**

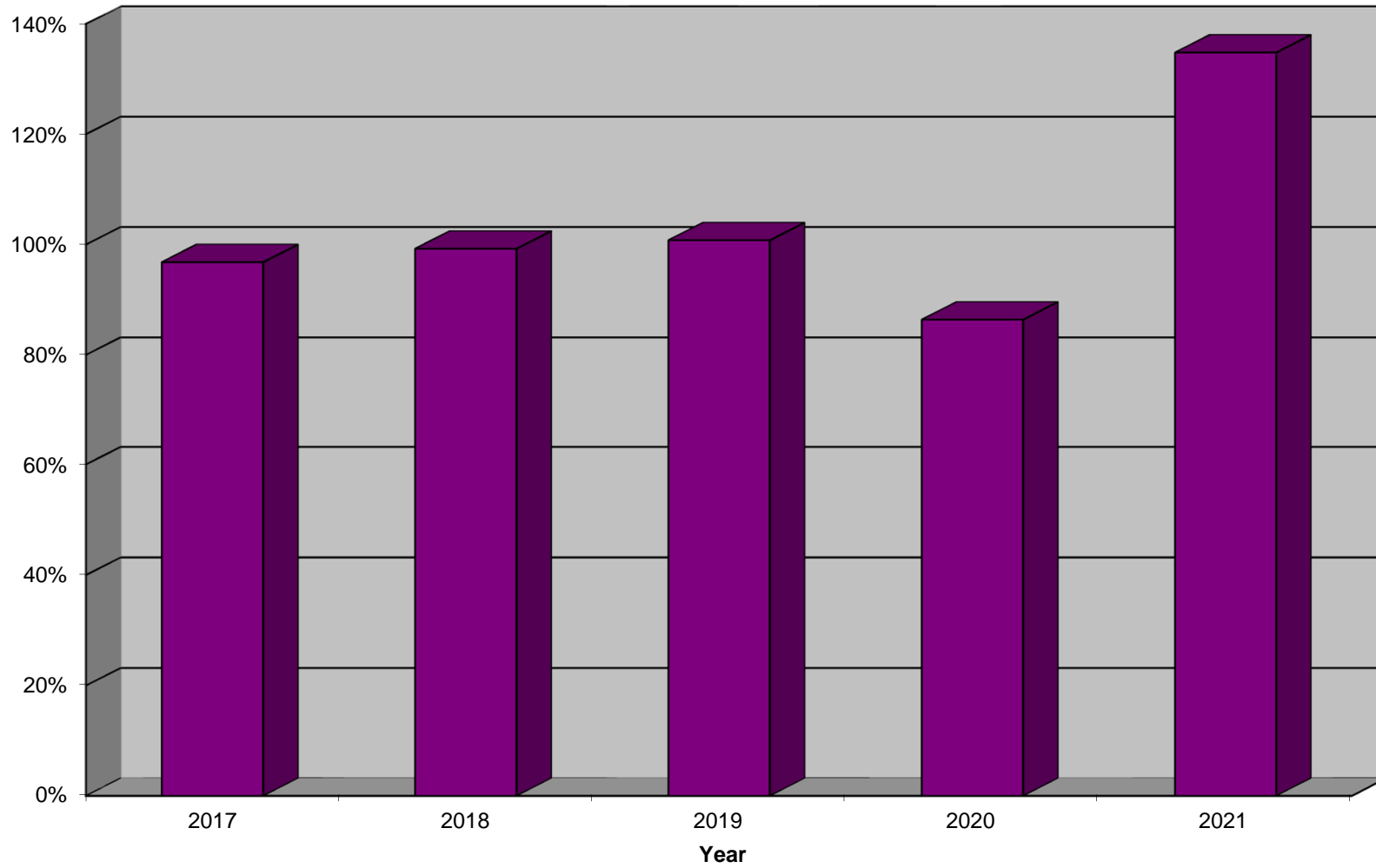
2017-2021

15,493 Participant Life Years

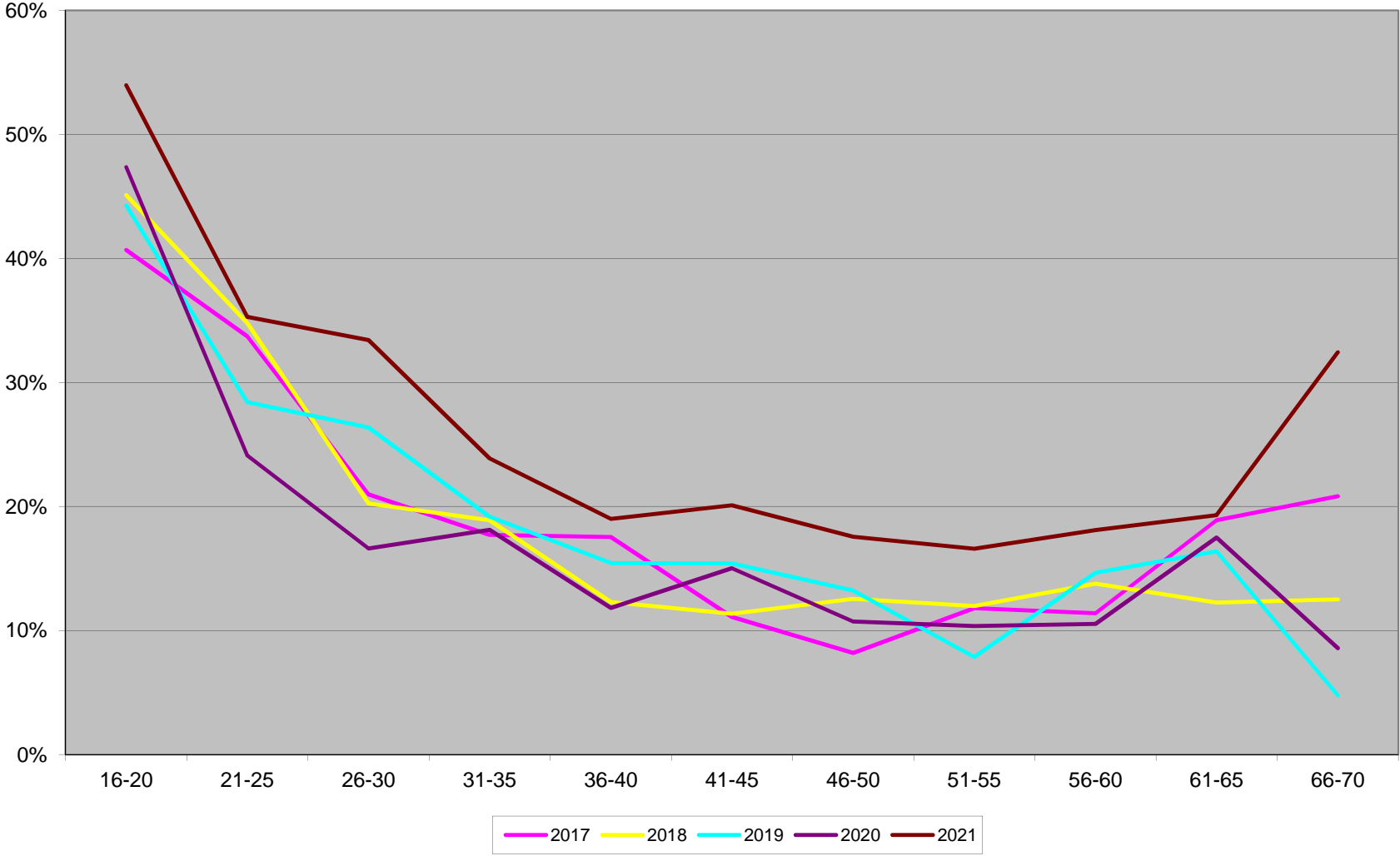
### Actual Versus Expected Terminations



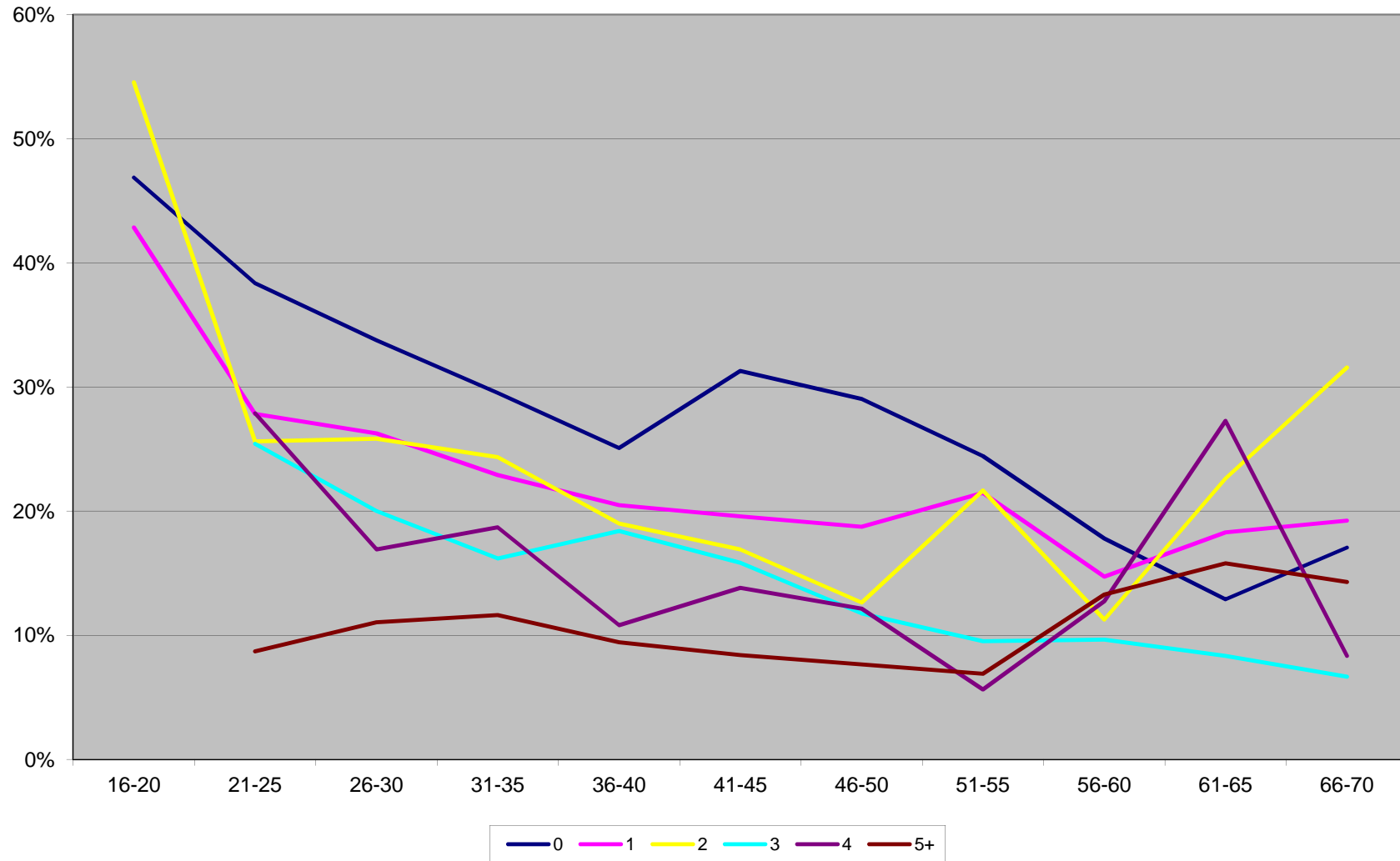
### Ratio of Actual Versus Expected Terminations



### Termination Rates by Age

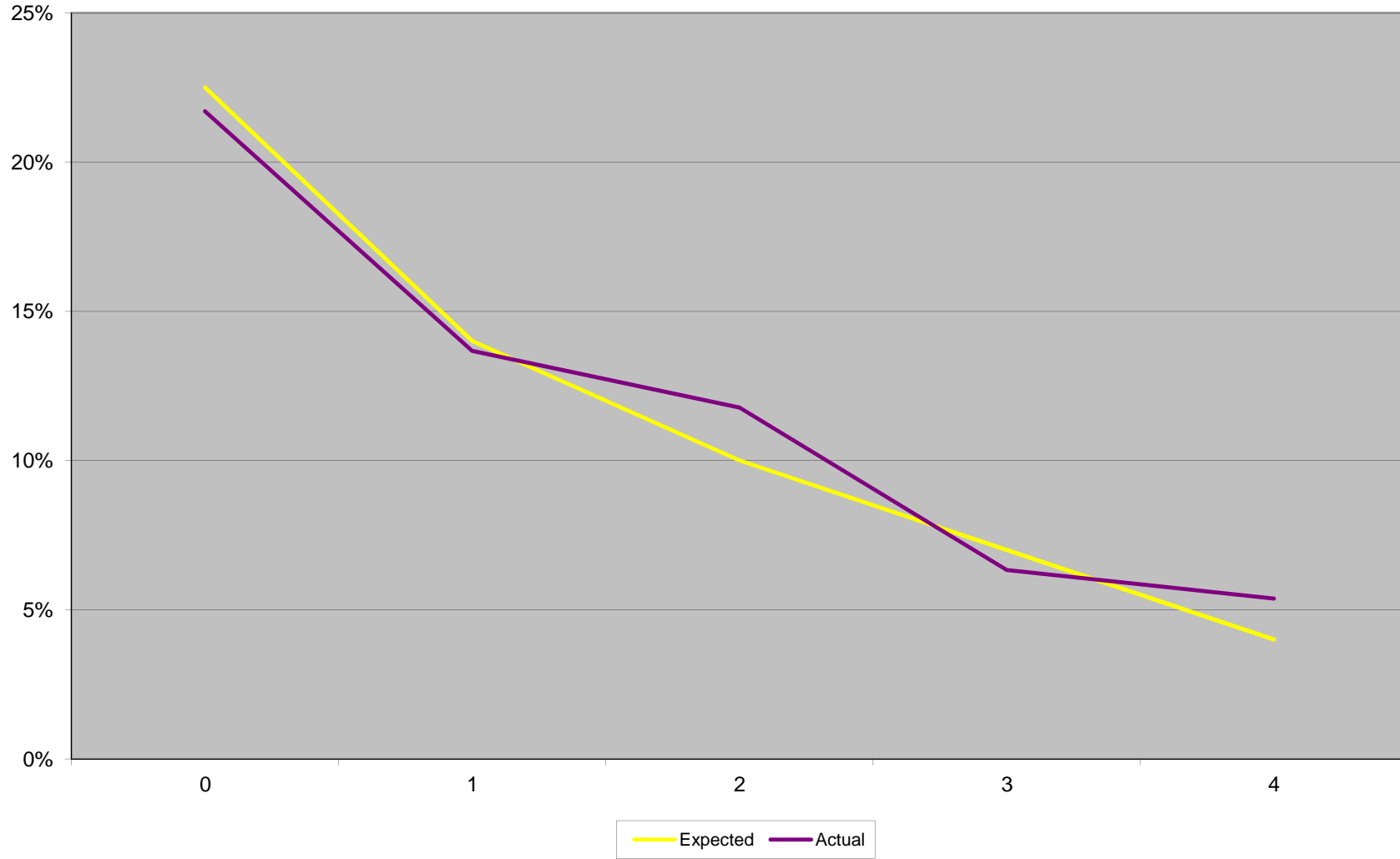


### Termination Rates by Age and Service

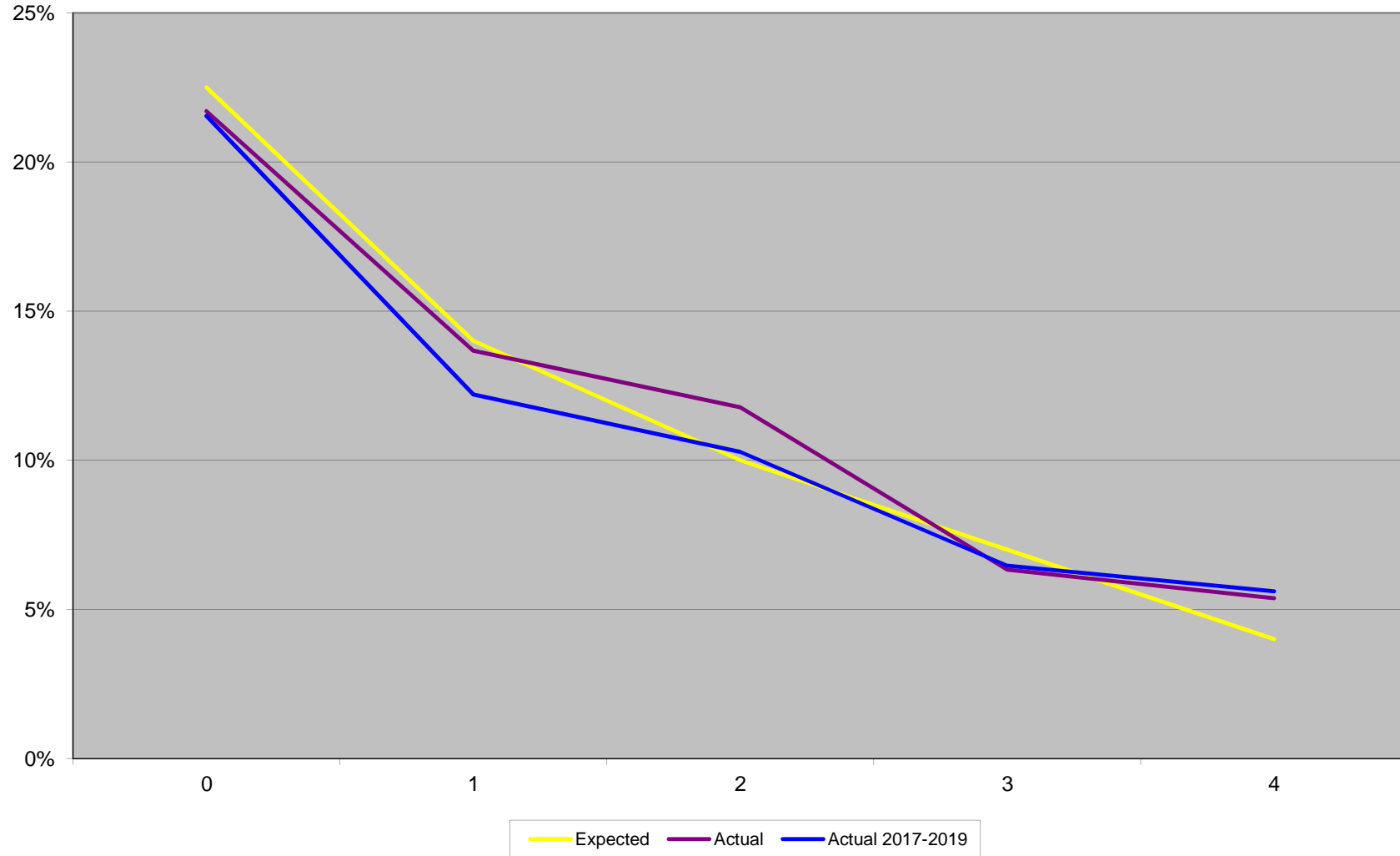




### Incremental Termination Rates by Completed Years of Service



### Incremental Termination Rates by Completed Years of Service



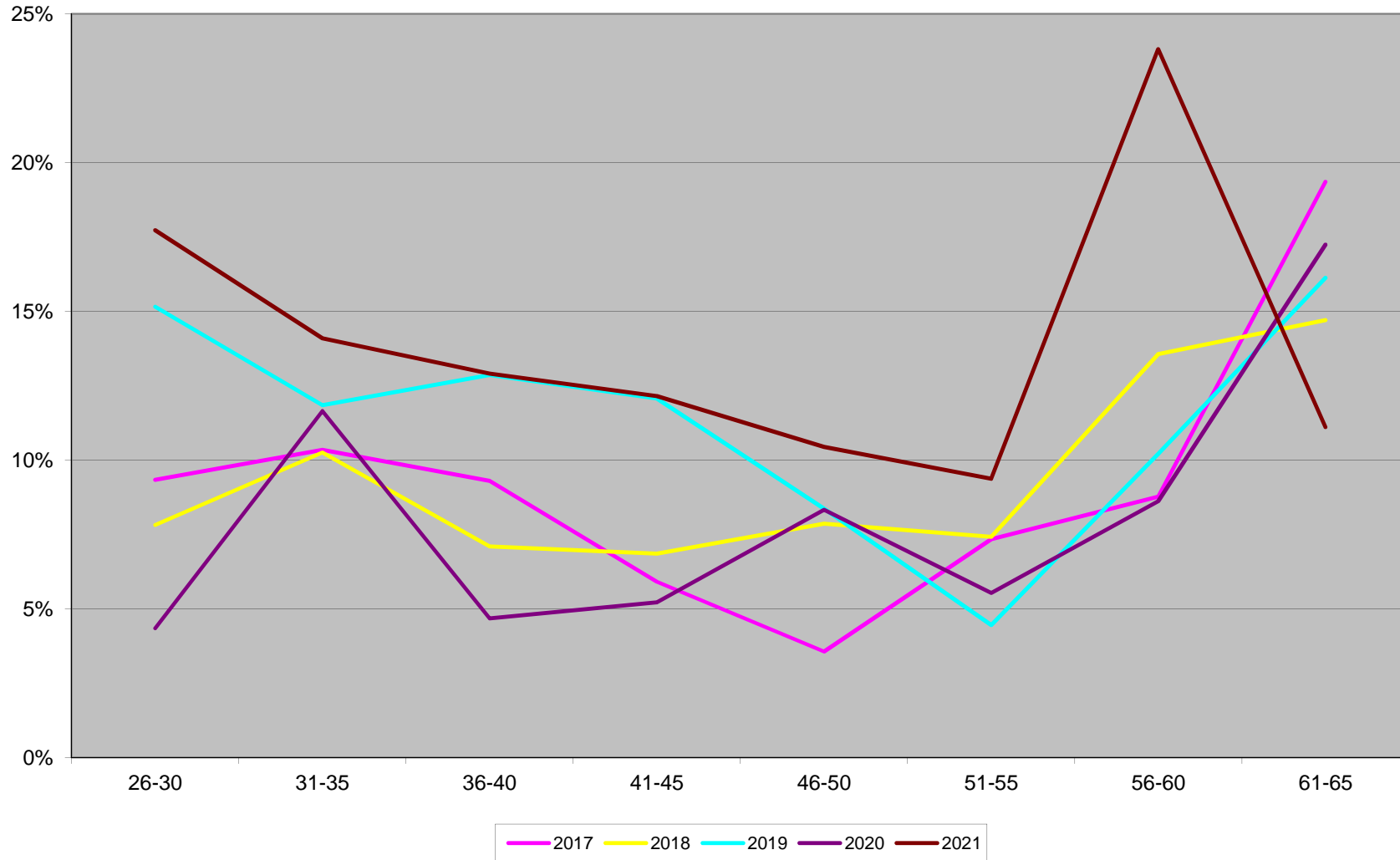
# Termination Experience Recommendations

Level service increment (independent of age)

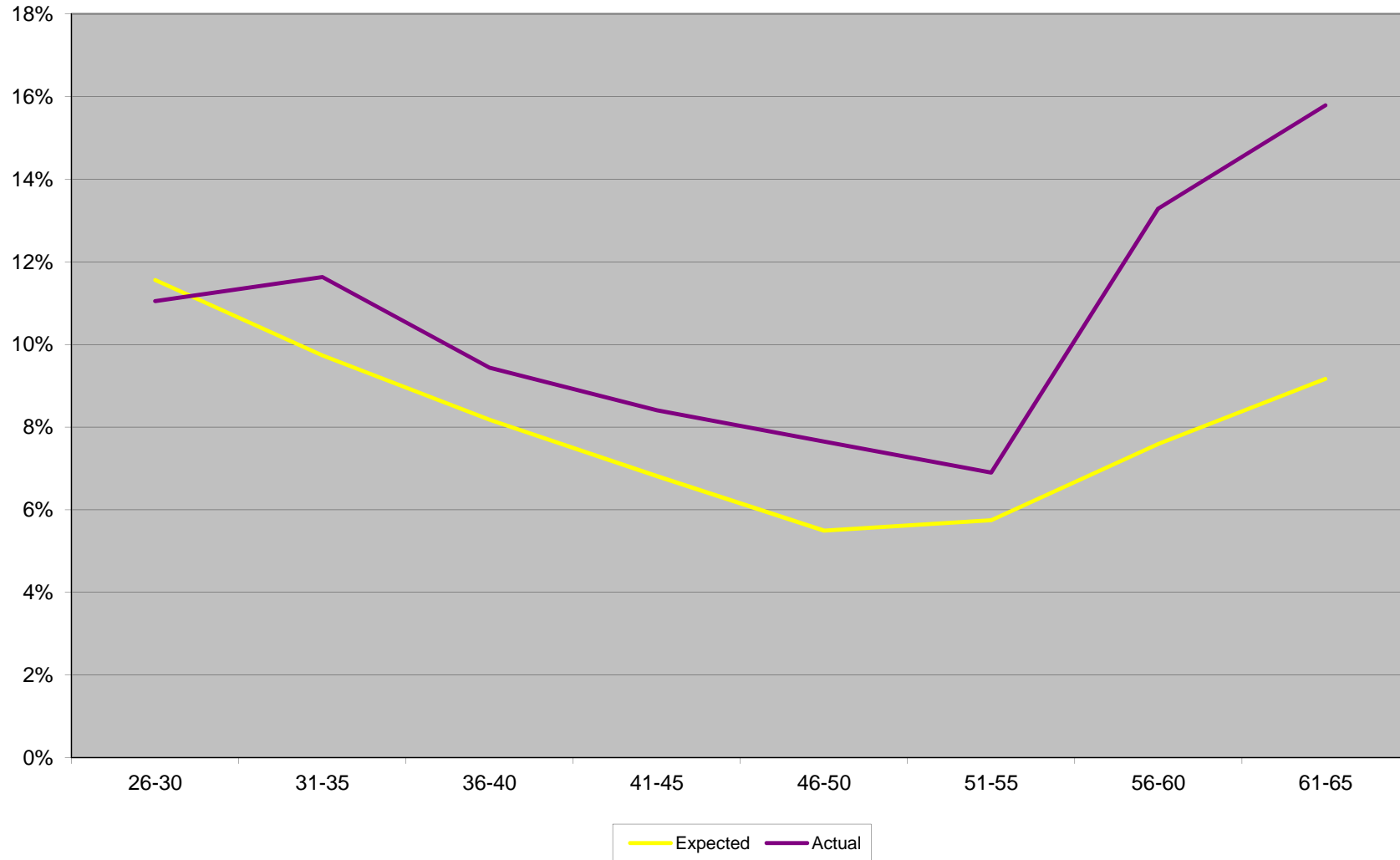
No changes to incremental service rates

	0	1	2	3	4
Assumption	22.5%	14.0%	10.0%	7.0%	4.0%
2007-2011 experience	22.4%	14.3%	9.3%	6.1%	5.4%
2012-2016 experience	22.4%	14.1%	11.0%	9.8%	4.4%
2017-2021 experience	21.7%	13.7%	11.8%	6.3%	5.4%
2017-2019 experience	21.5%	12.2%	10.3%	6.5%	5.6%
Recommendation	22.5%	14.0%	10.0%	7.0%	4.0%

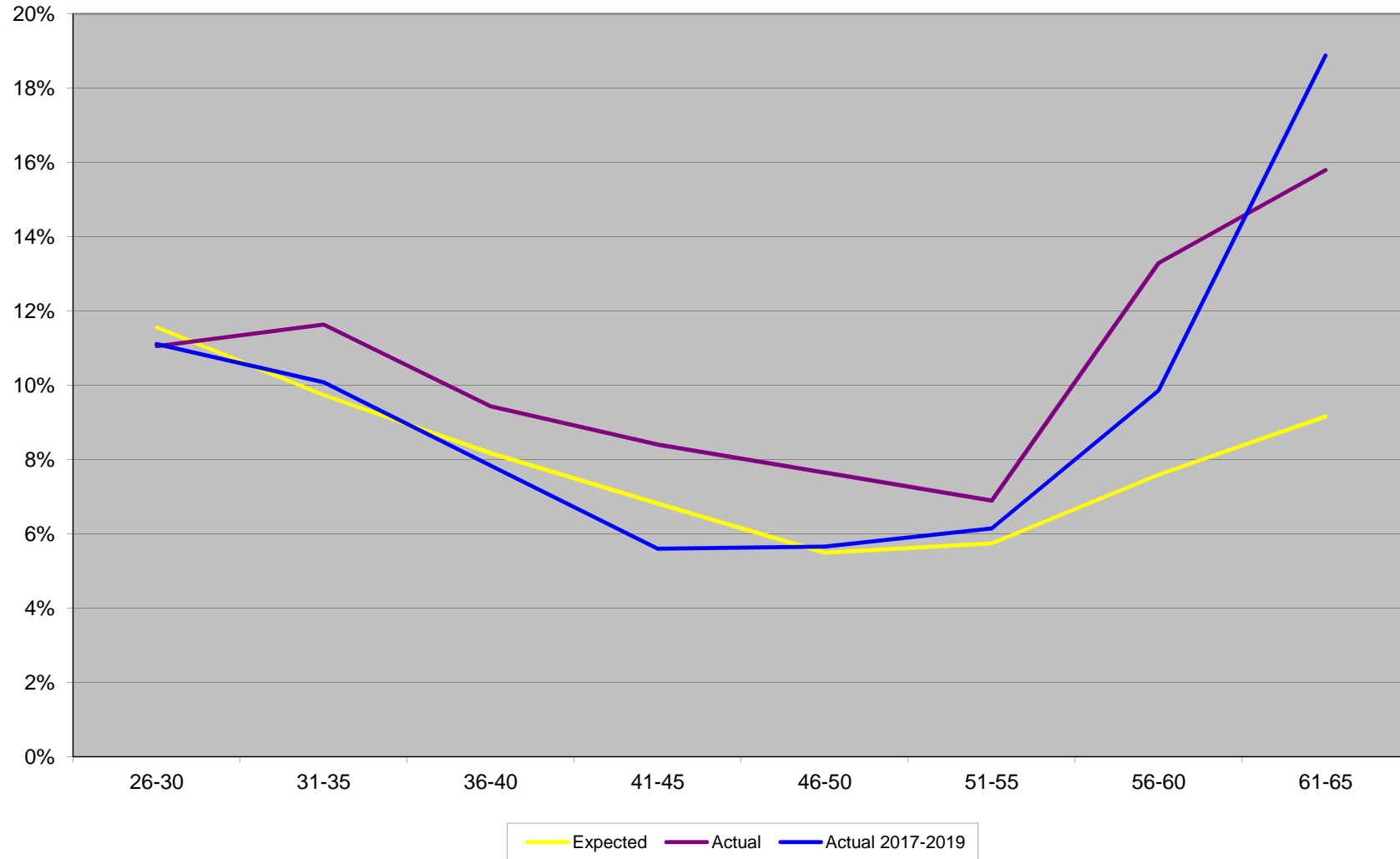
### Termination Rates by Age, 5+ Years of Service



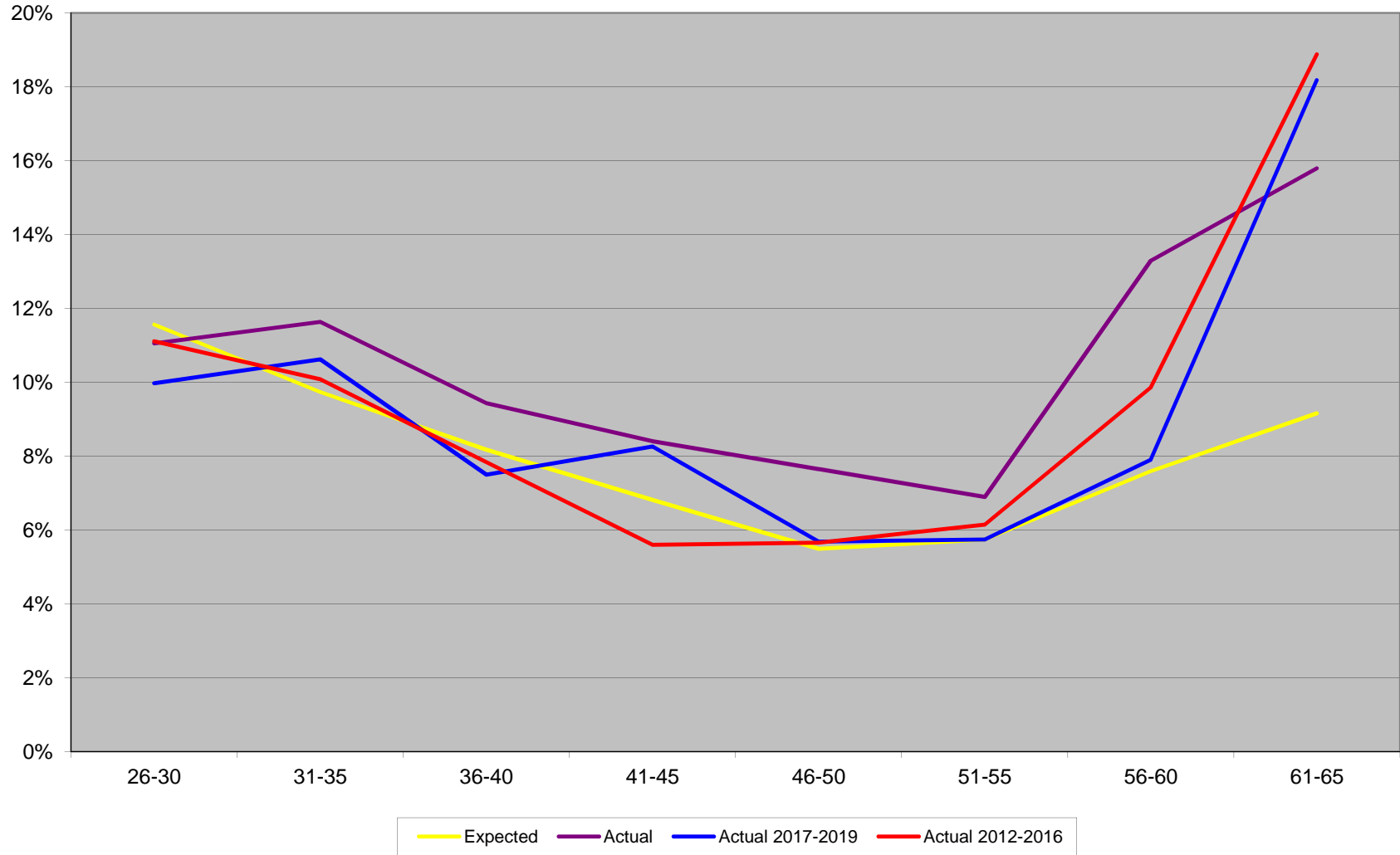
### Actual Versus Expected Termination Rates by Age, 5+ Years of Service



### Actual Versus Expected Termination Rates by Age, 5+ Years of Service



### Actual Versus Expected Termination Rates by Age, 5+ Years of Service



# Termination Experience Recommendations

Maintain adopt asymmetric U-shape of ultimate rates

Increase age 65 bend point from 10% to 15%

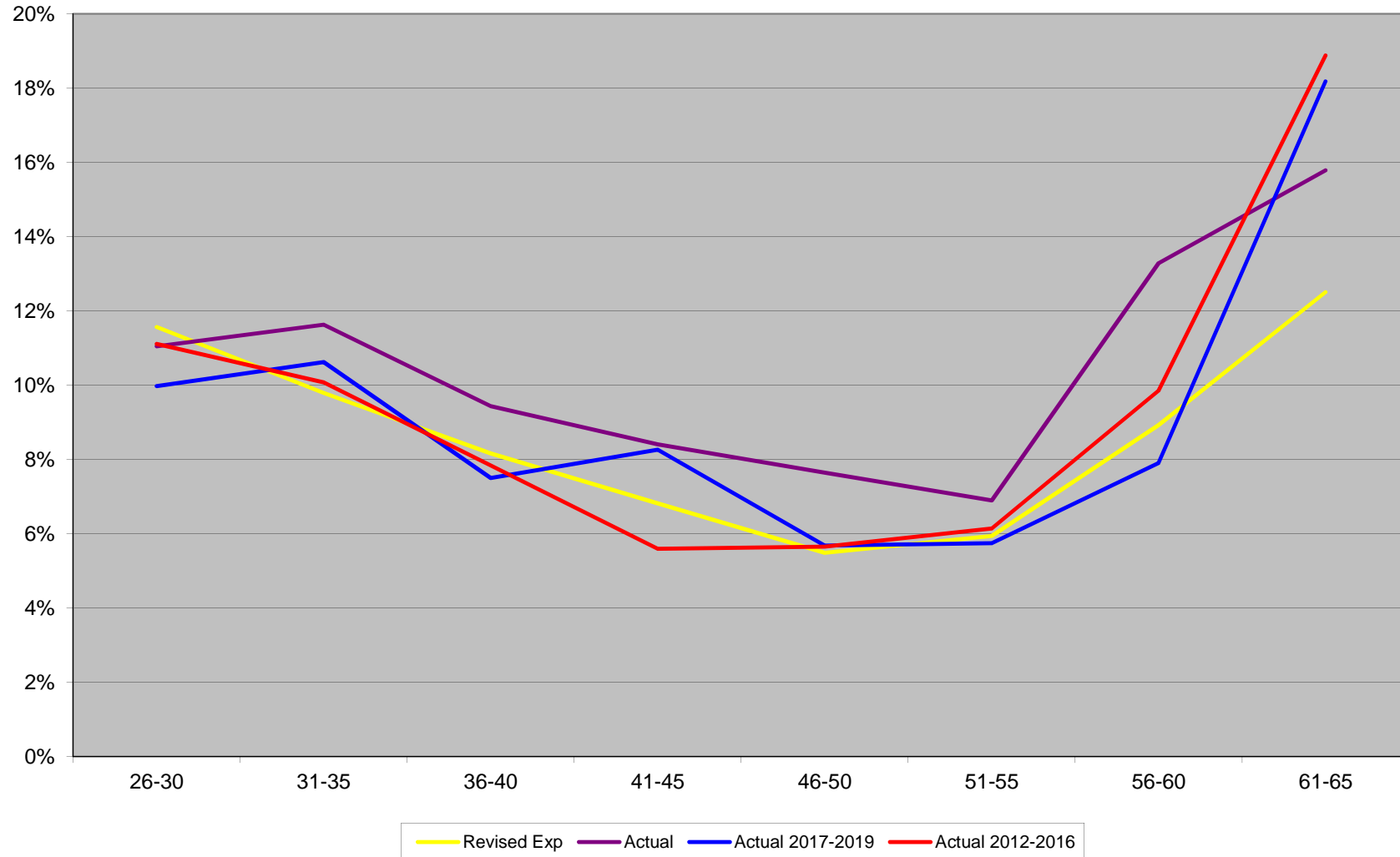
Rates geometrically progress over 15-year intervals

- from 15% at age 20 to 9% at age 35
- from 9% at age 35 to 5% at age 50
- from 5% at age 50 to **15%** at age 65

Ultimate rate levels out at **15%** for ages 65 and above



### Actual Versus Revised Termination Rates by Age, 5+ Years of Service

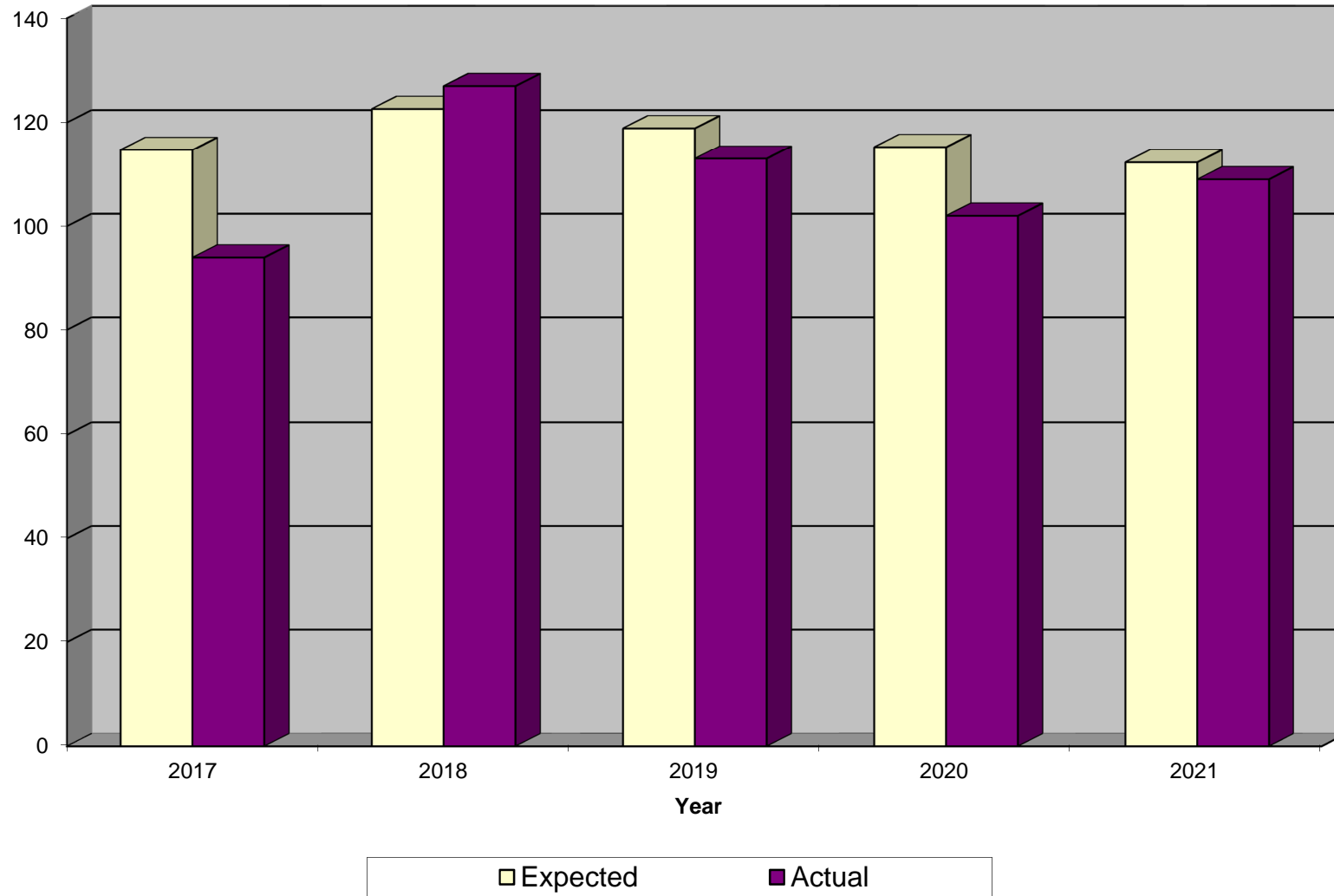


# **Retirement Experience**

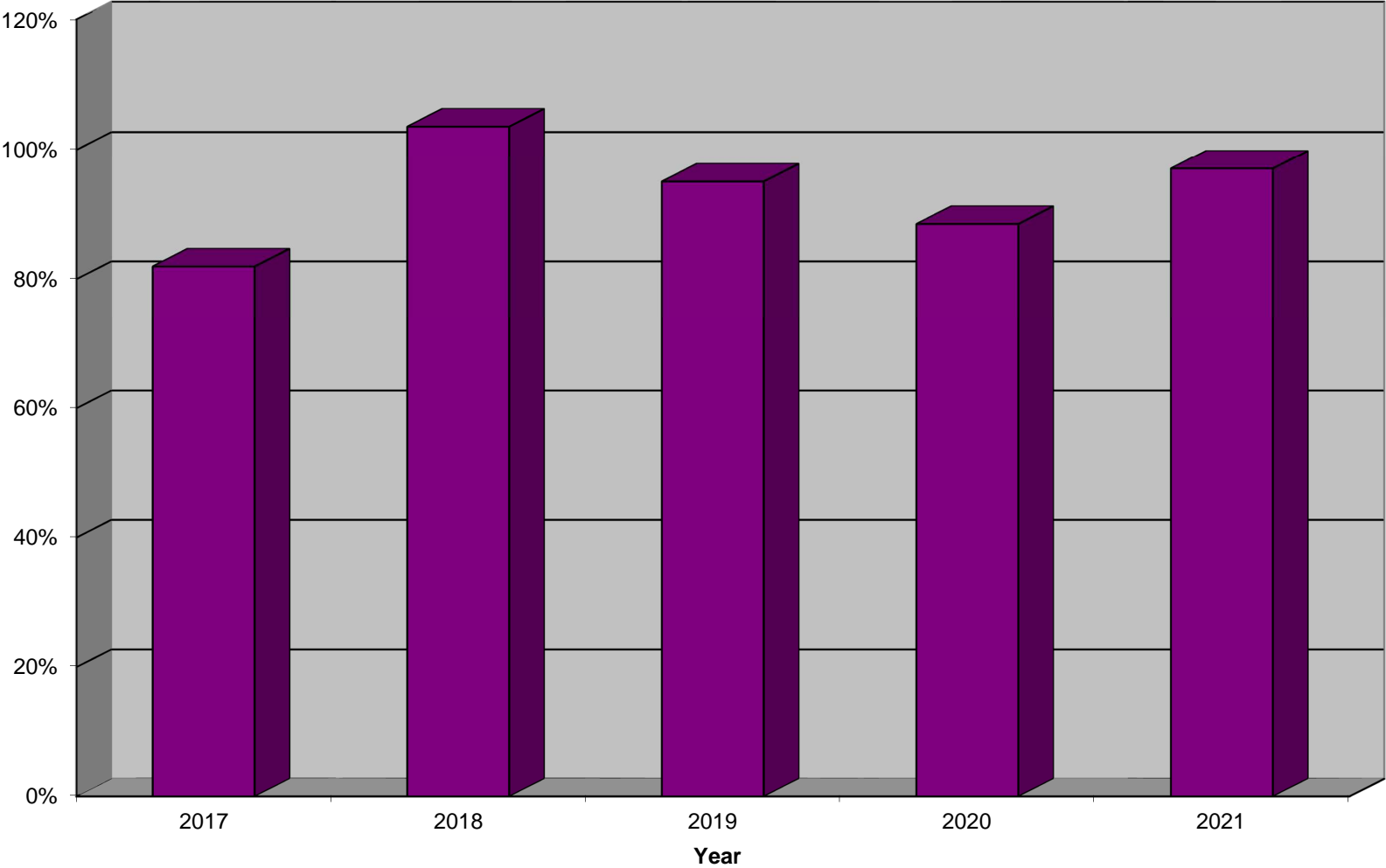
2017-2021

3,925 Participant Life Years

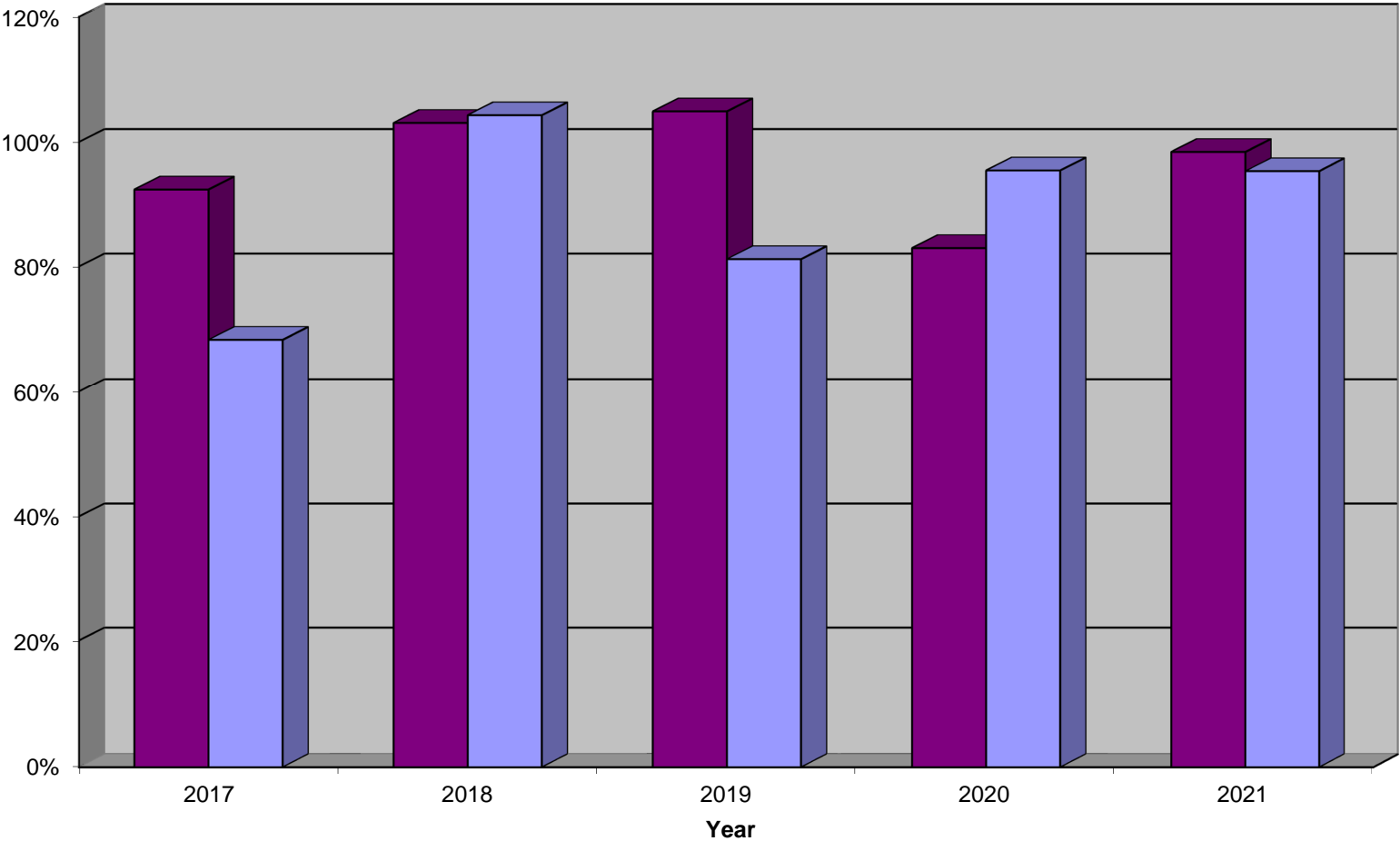
### Actual Versus Expected Retirements



**Ratio of Actual Versus Expected Retirements**

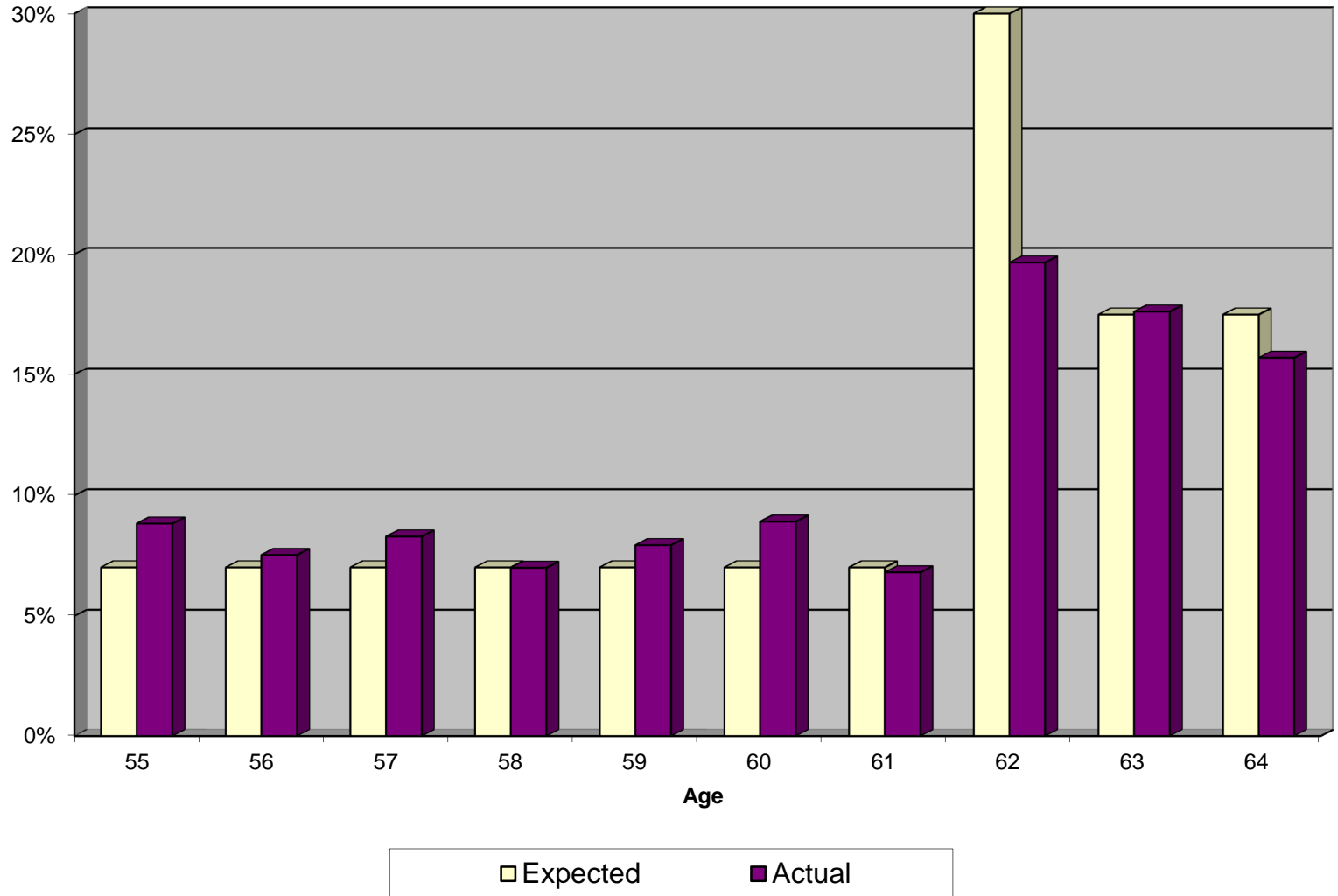


**Ratio of Actual Versus Expected Retirements**

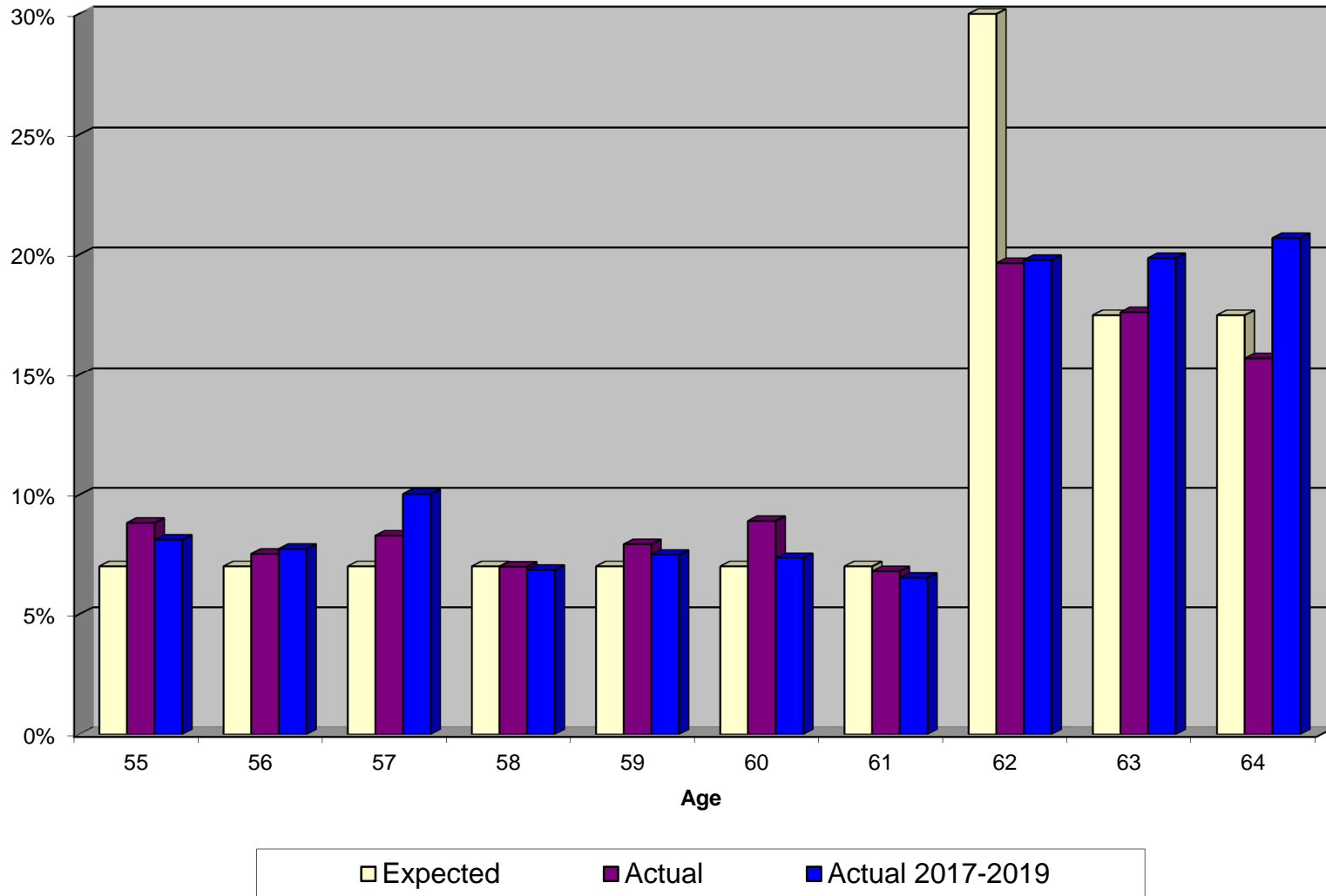


■ Early retirement    ■ Unreduced retirement

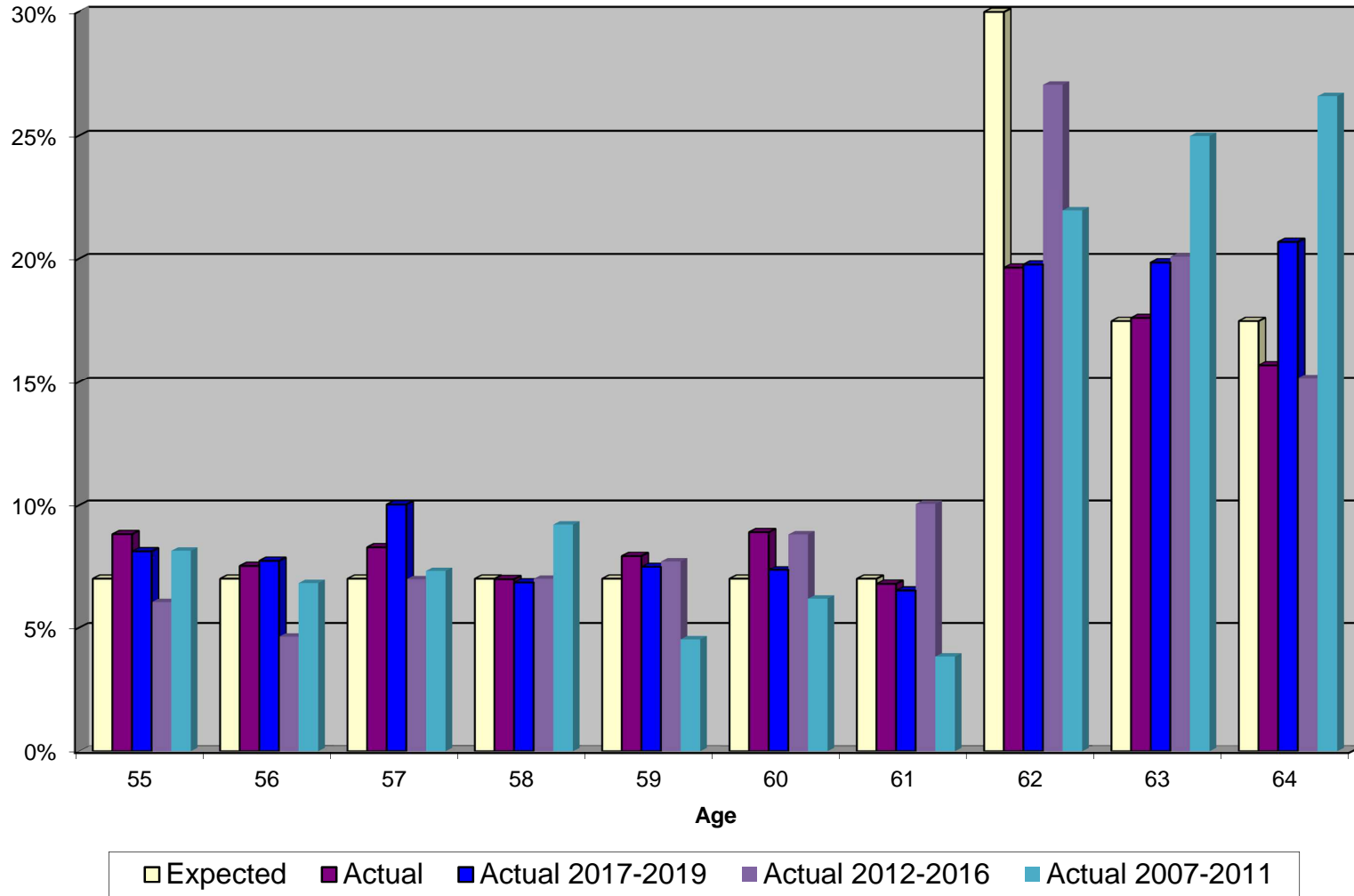
### Early (Reduced) Retirement Rates by Age



### Early (Reduced) Retirement Rates by Age



### Early (Reduced) Retirement Rates by Age



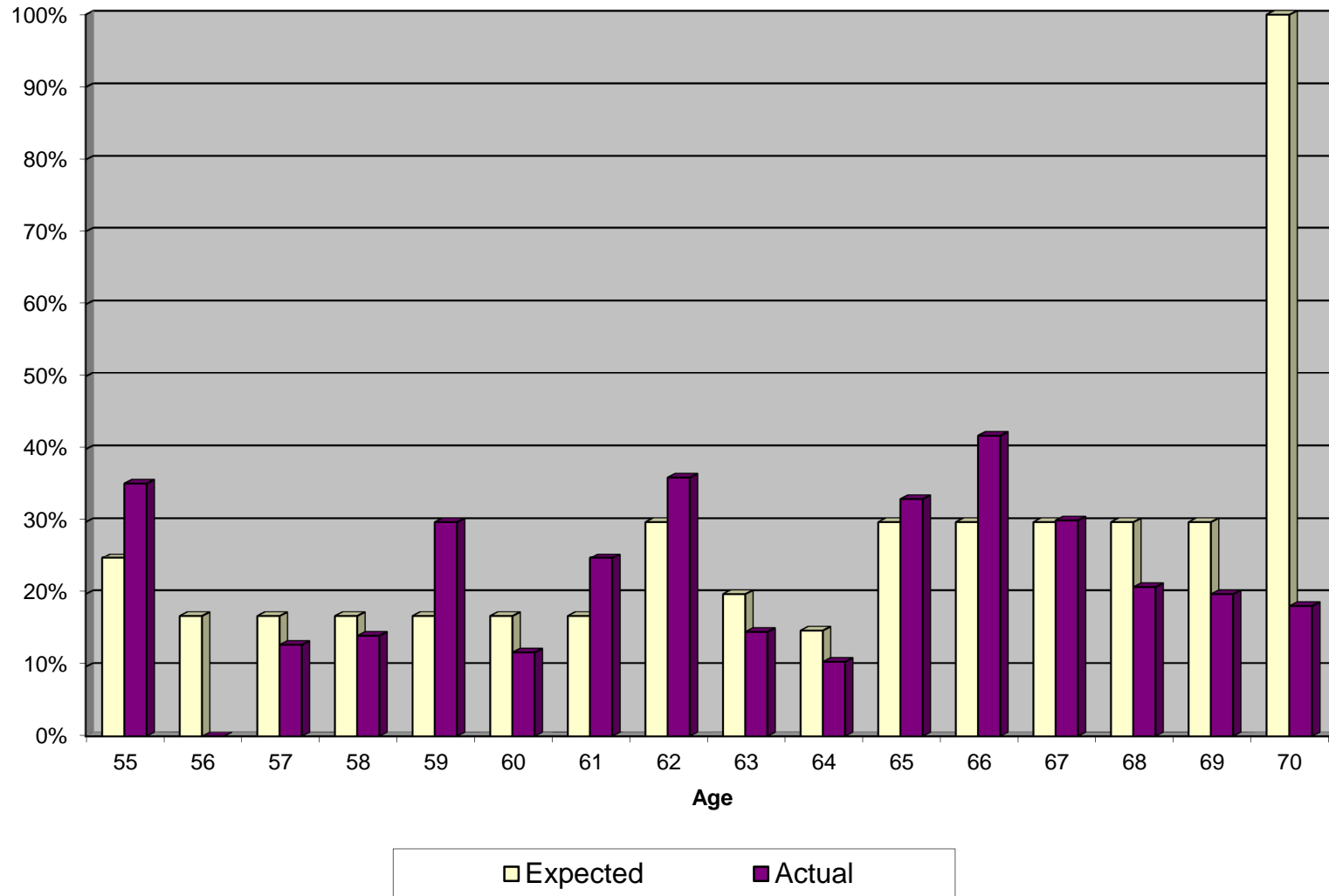


# Early Retirement Experience

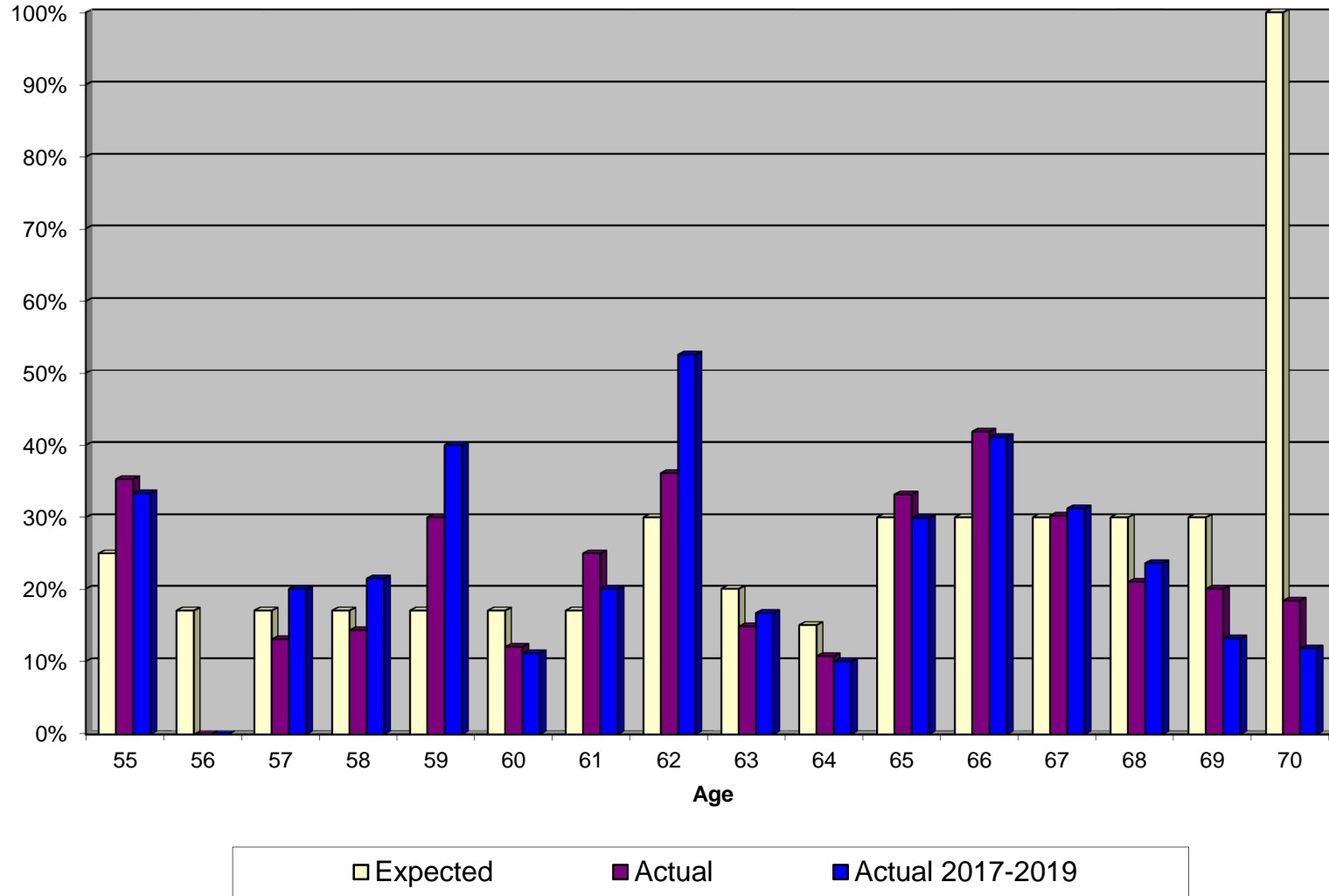
## Possible revisions

	Current	Revised
55	7.0%	7.0%
56	7.0%	7.0%
57	7.0%	7.0%
58	7.0%	7.0%
59	7.0%	7.0%
60	7.0%	7.0%
61	7.0%	7.0%
62	30.0%	<b>20.0%</b>
63	17.5%	<b>20.0%</b>
64	17.5%	<b>20.0%</b>

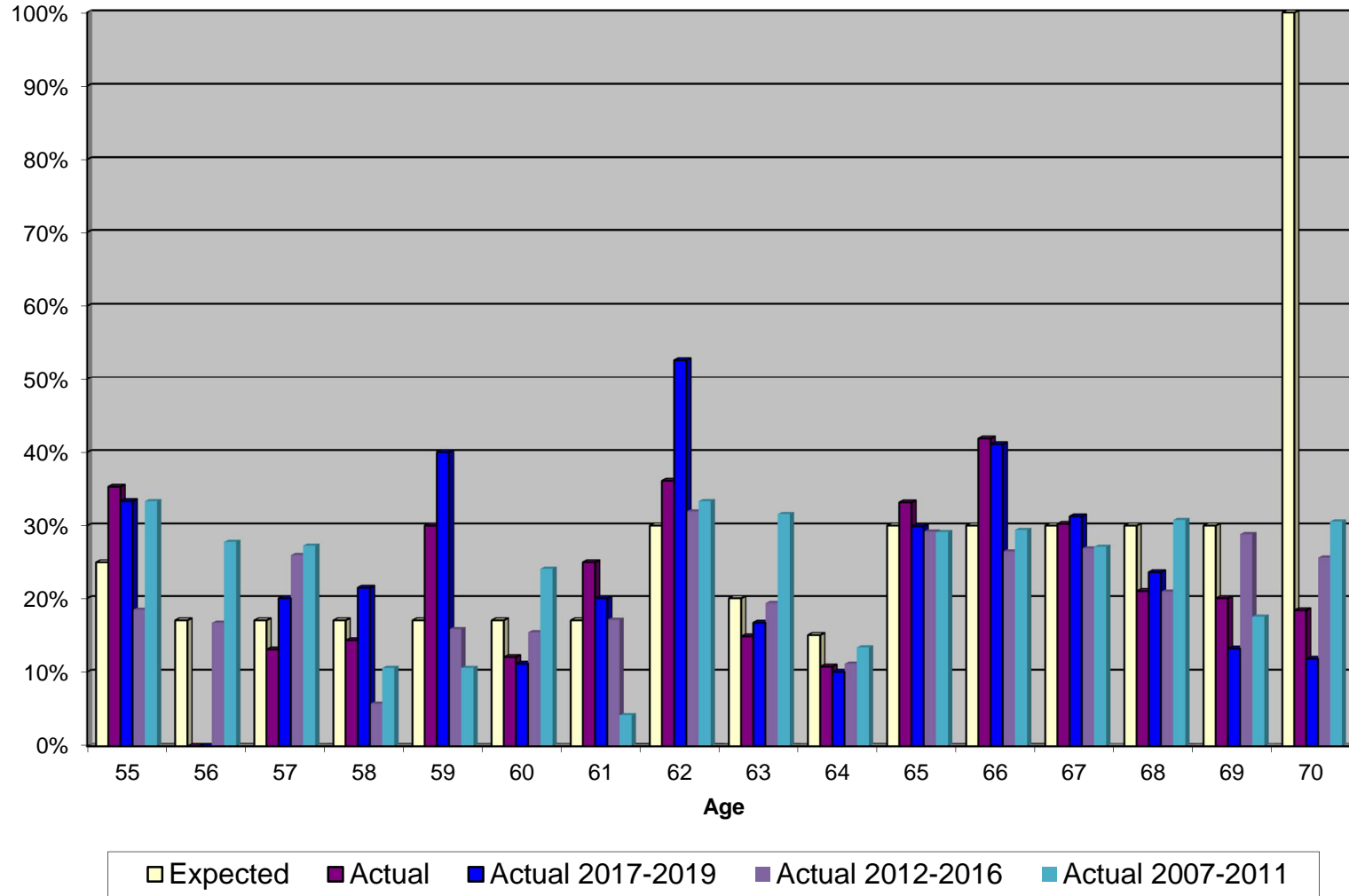
### Unreduced Retirement Rates by Age



### Unreduced Retirement Rates by Age



### Unreduced Retirement Rates by Age



# Unreduced Retirement Experience

## Possible revisions

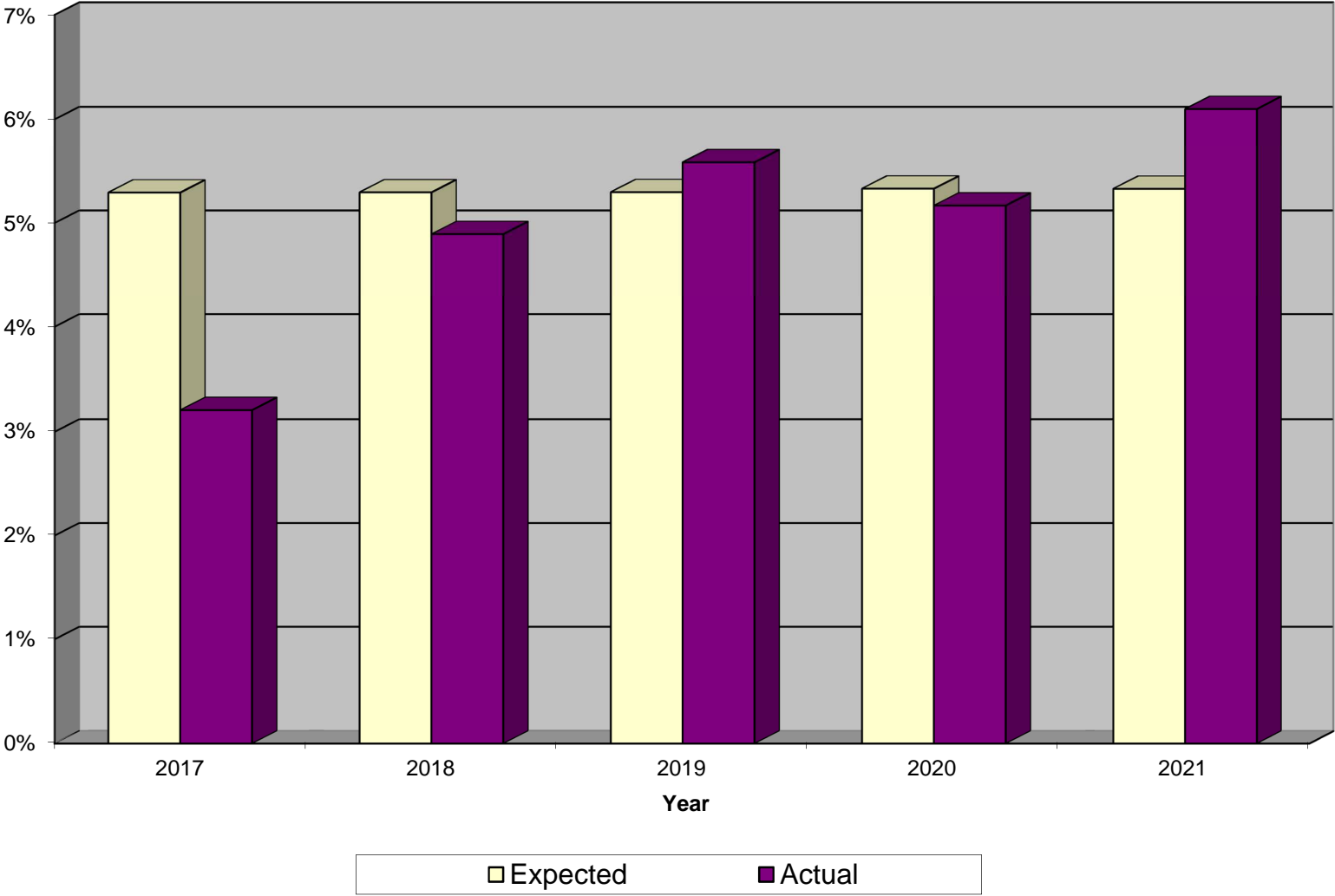
	Current	Revised
55	25%	<b>35%</b>
56	17%	<b>15%</b>
57	17%	<b>15%</b>
58	17%	<b>15%</b>
59	17%	<b>15%</b>
60	17%	<b>15%</b>
61	17%	<b>15%</b>
62	30%	<b>35%</b>
63	20%	<b>15%</b>
64	15%	15%
65	30%	30%
66	30%	30%
67	30%	30%
68	30%	30%
69	30%	30%
70	100%	100%

# **Pay Increase Experience**

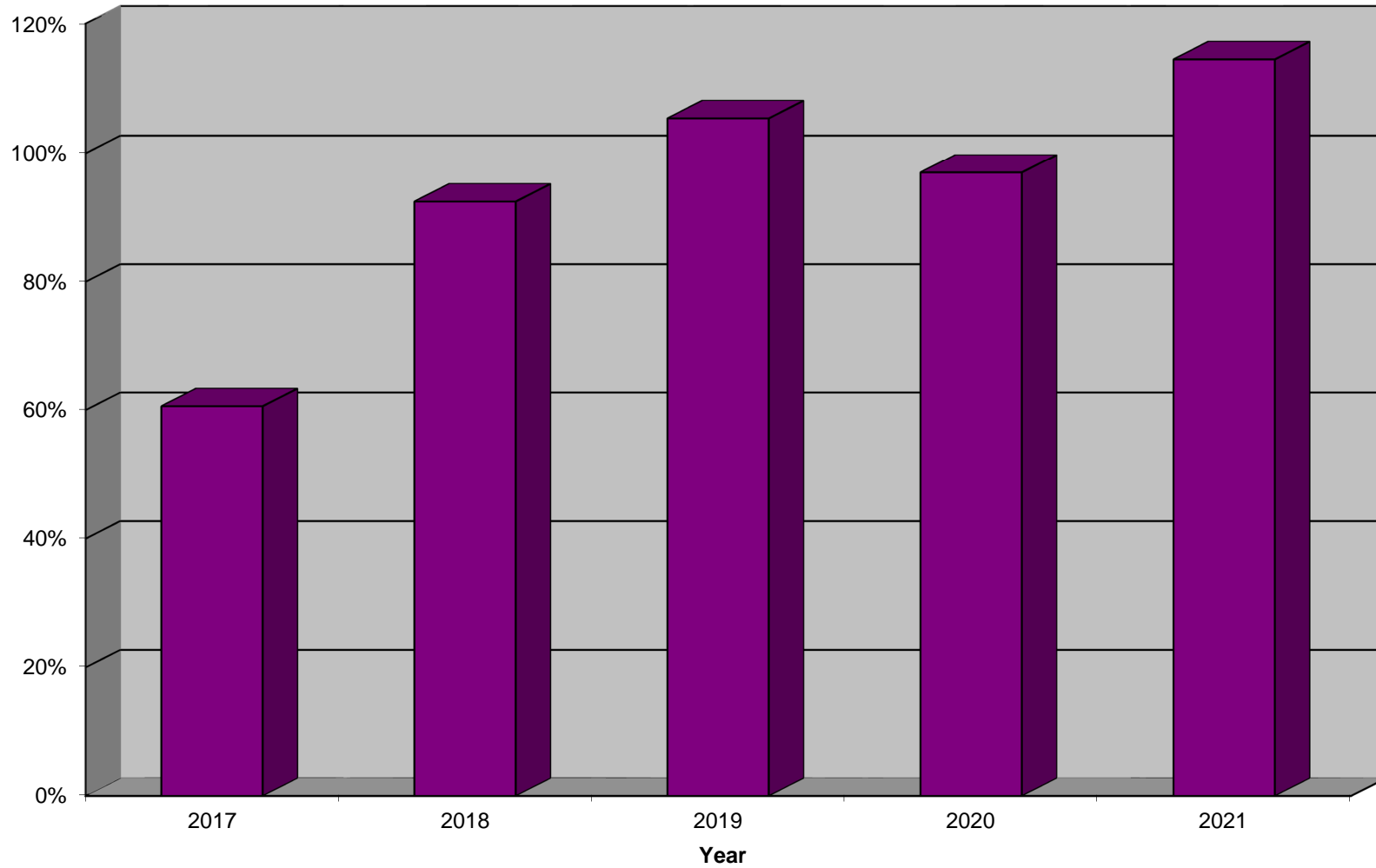
2016-2021

13,289 Participant Life Years

**Actual Versus Expected Pay Increases**

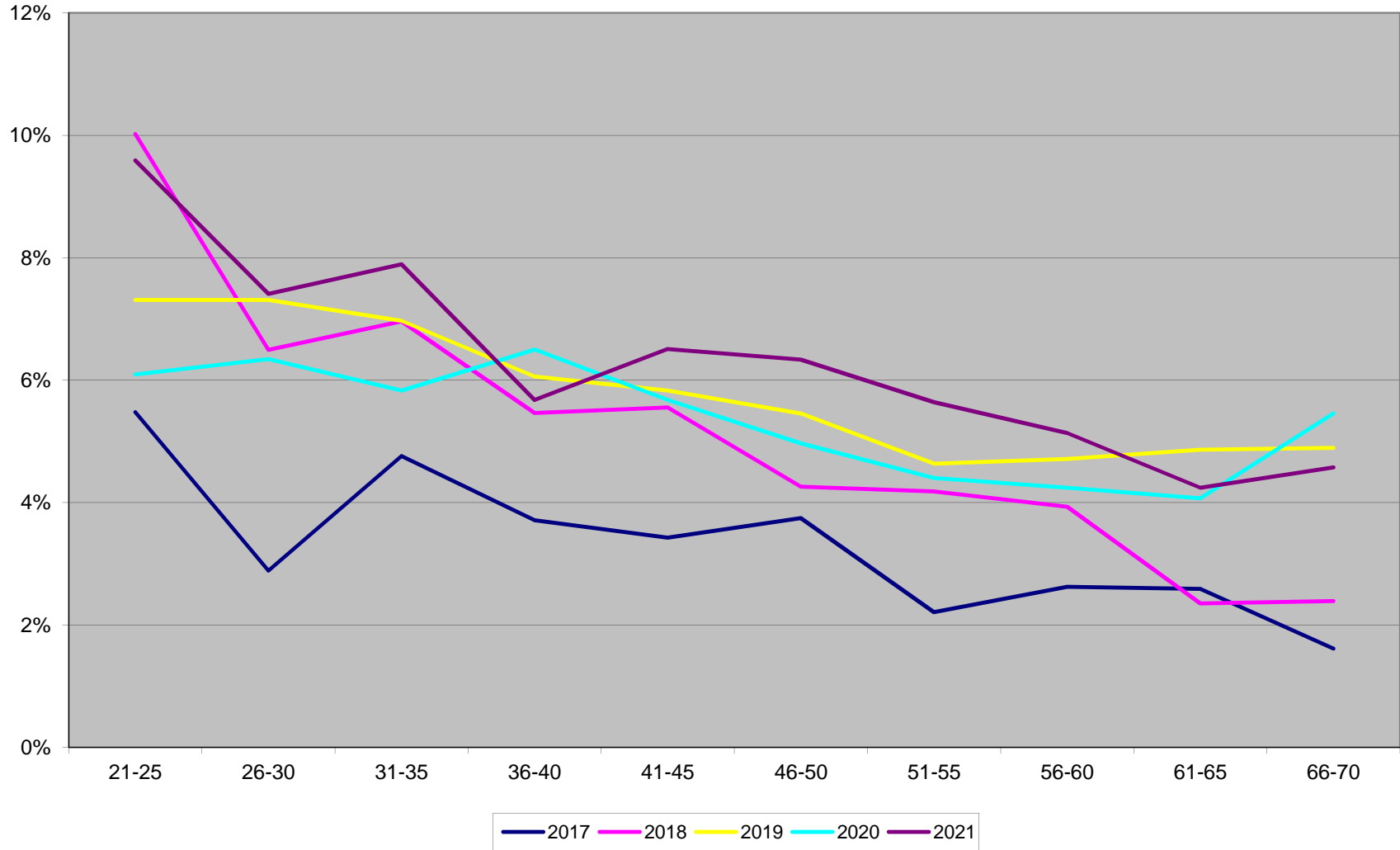


### Ratio of Actual Versus Expected Pay Increases

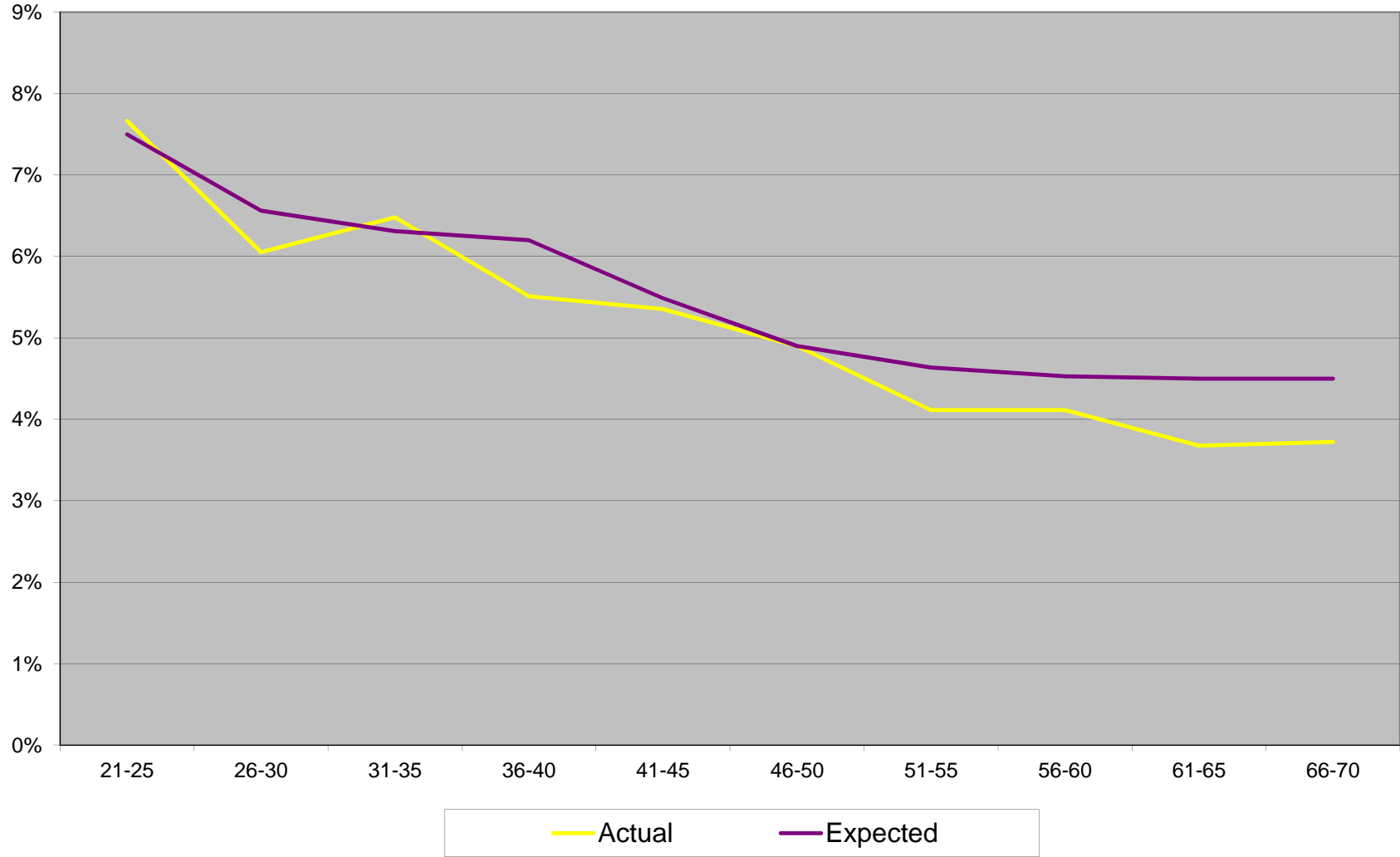




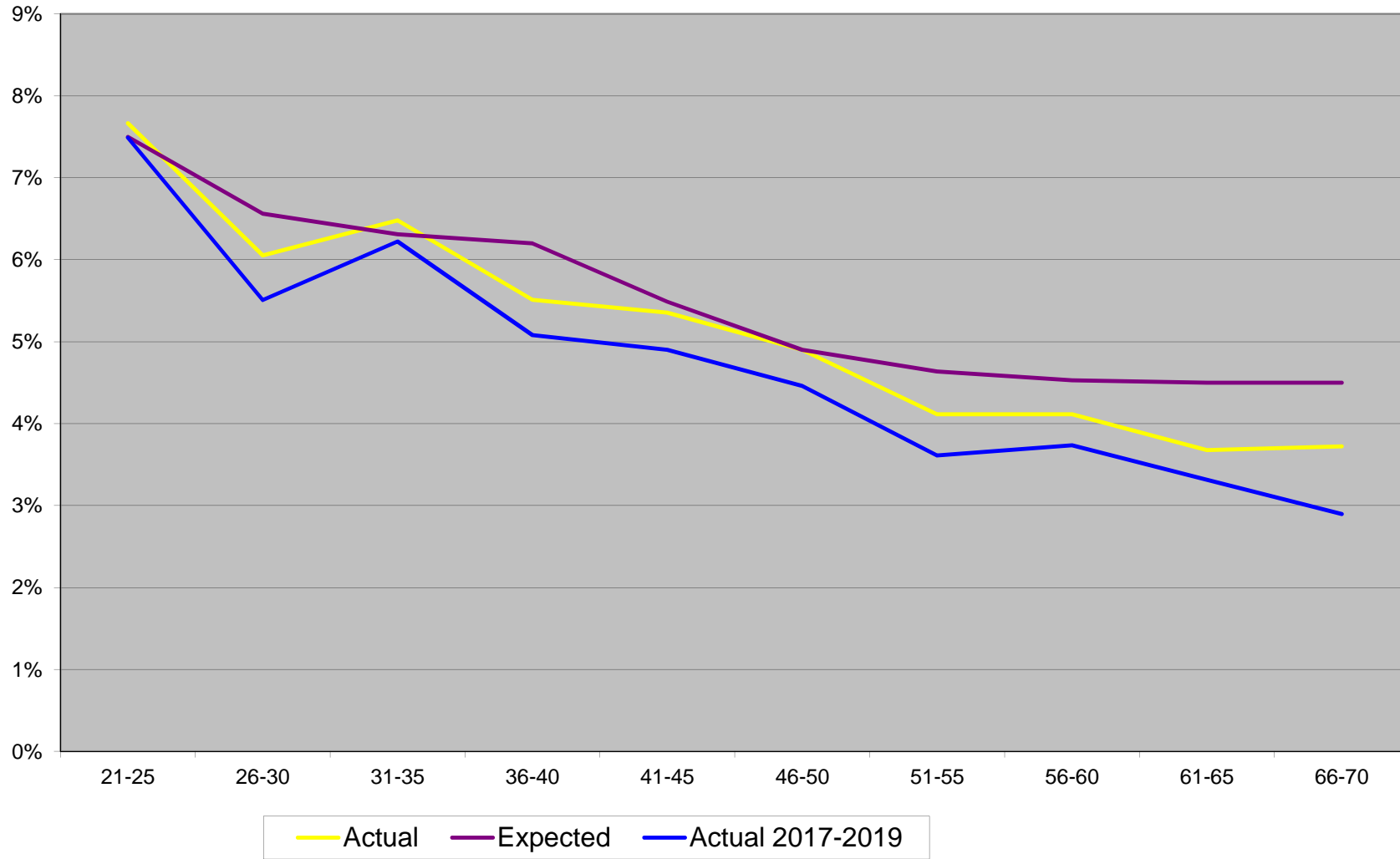
### Year by Year Pay Increases by Age



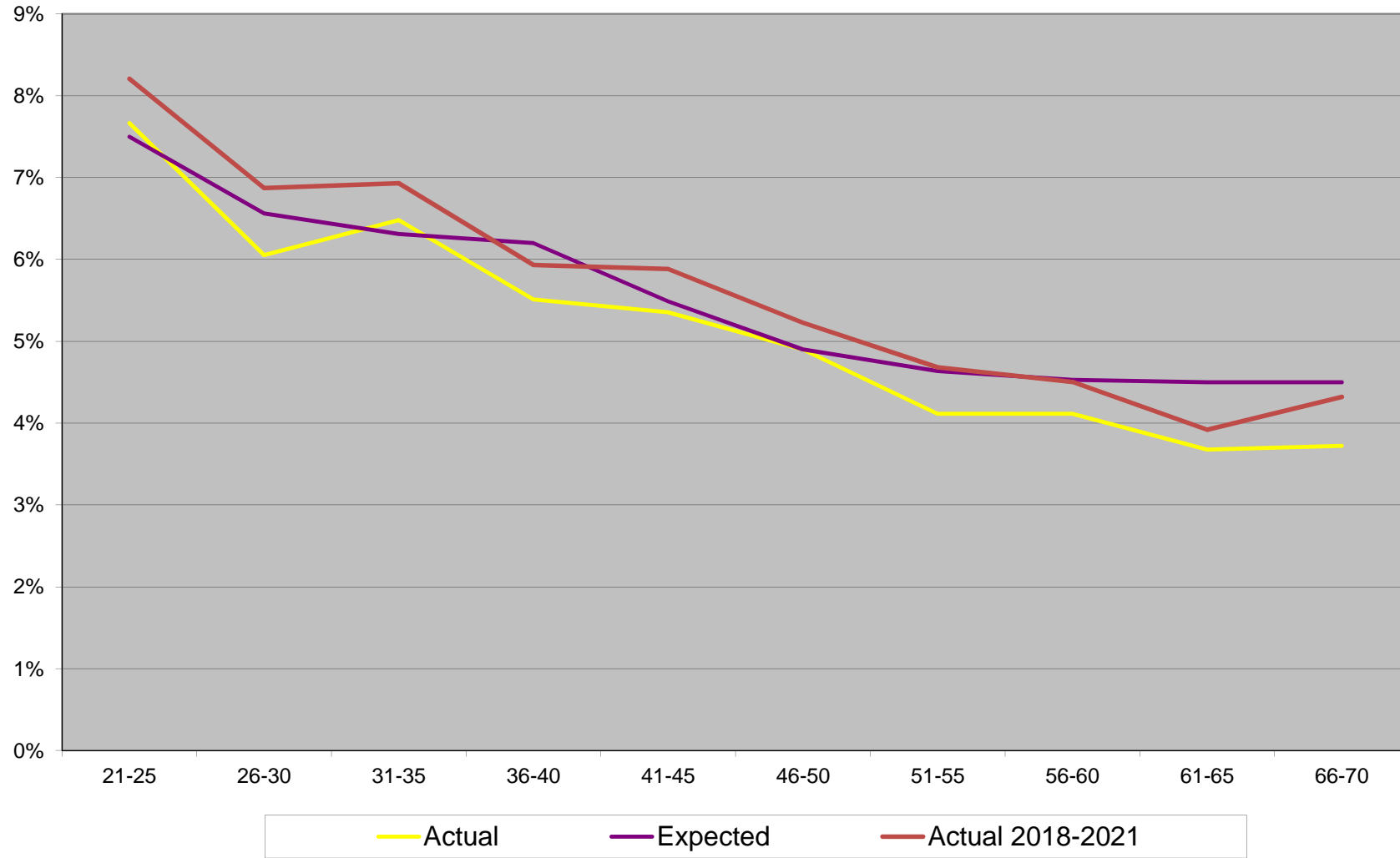
### Average Pay Increases by Age



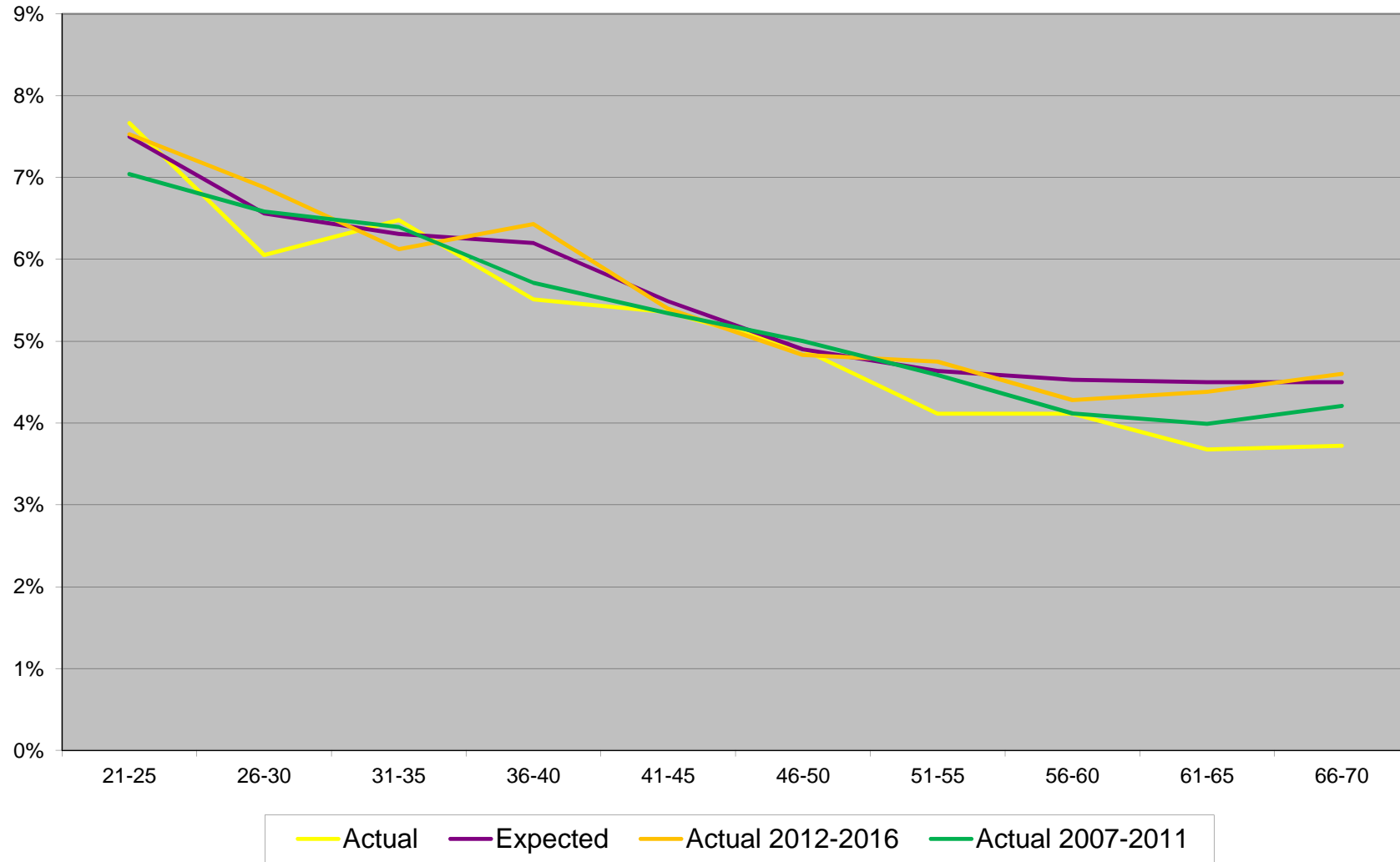
### Average Pay Increases by Age



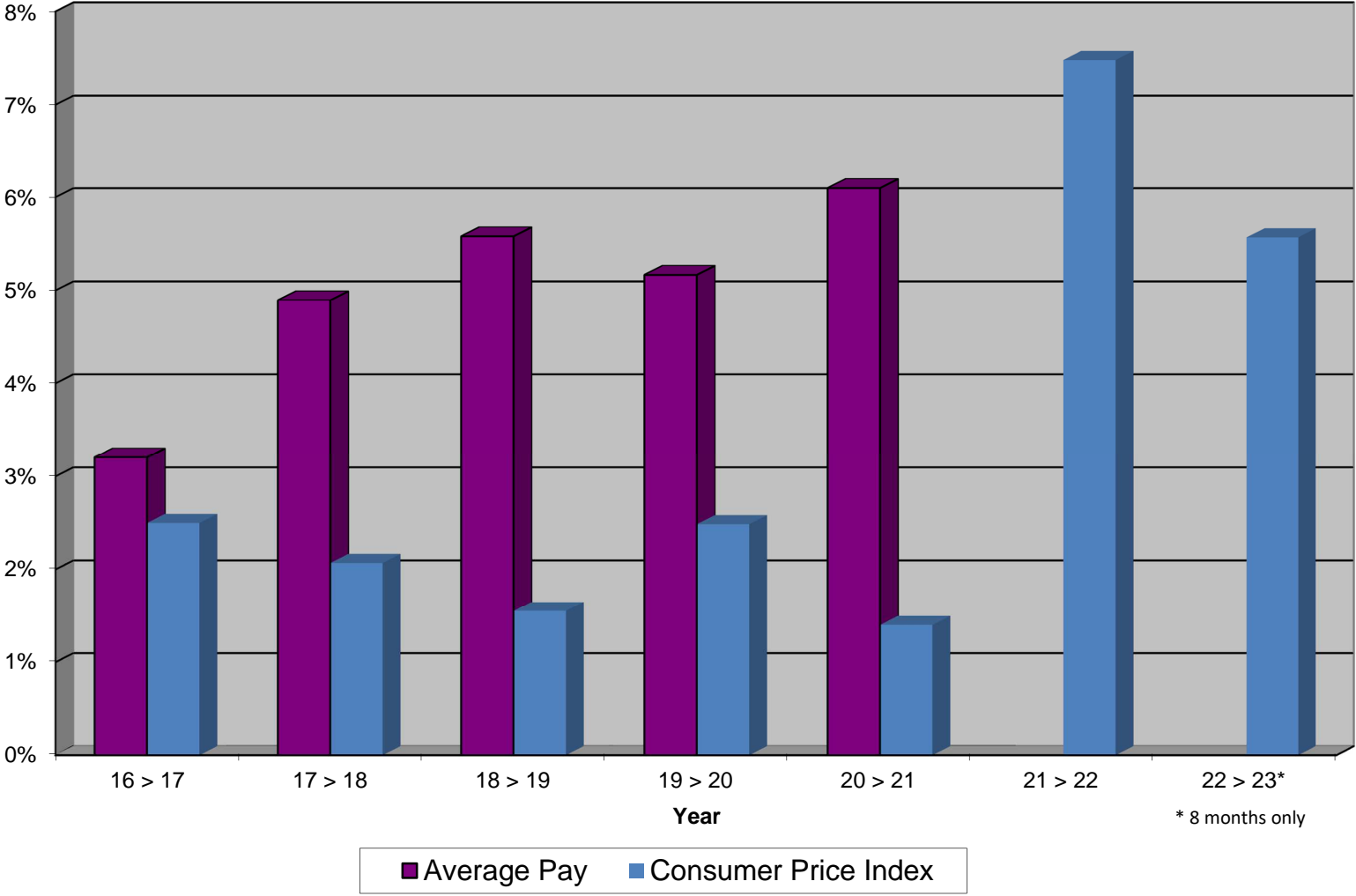
### Average Pay Increases by Age



### Average Pay Increases by Age



### Pay Increases Versus Inflation



# Pay Increase Experience Recommendations

Maintain shape of pay increase curve

Parallel shift to reflect future expectations

- inflation will come under control
- probably will not return to historically low levels
- increase all ages 0.5%

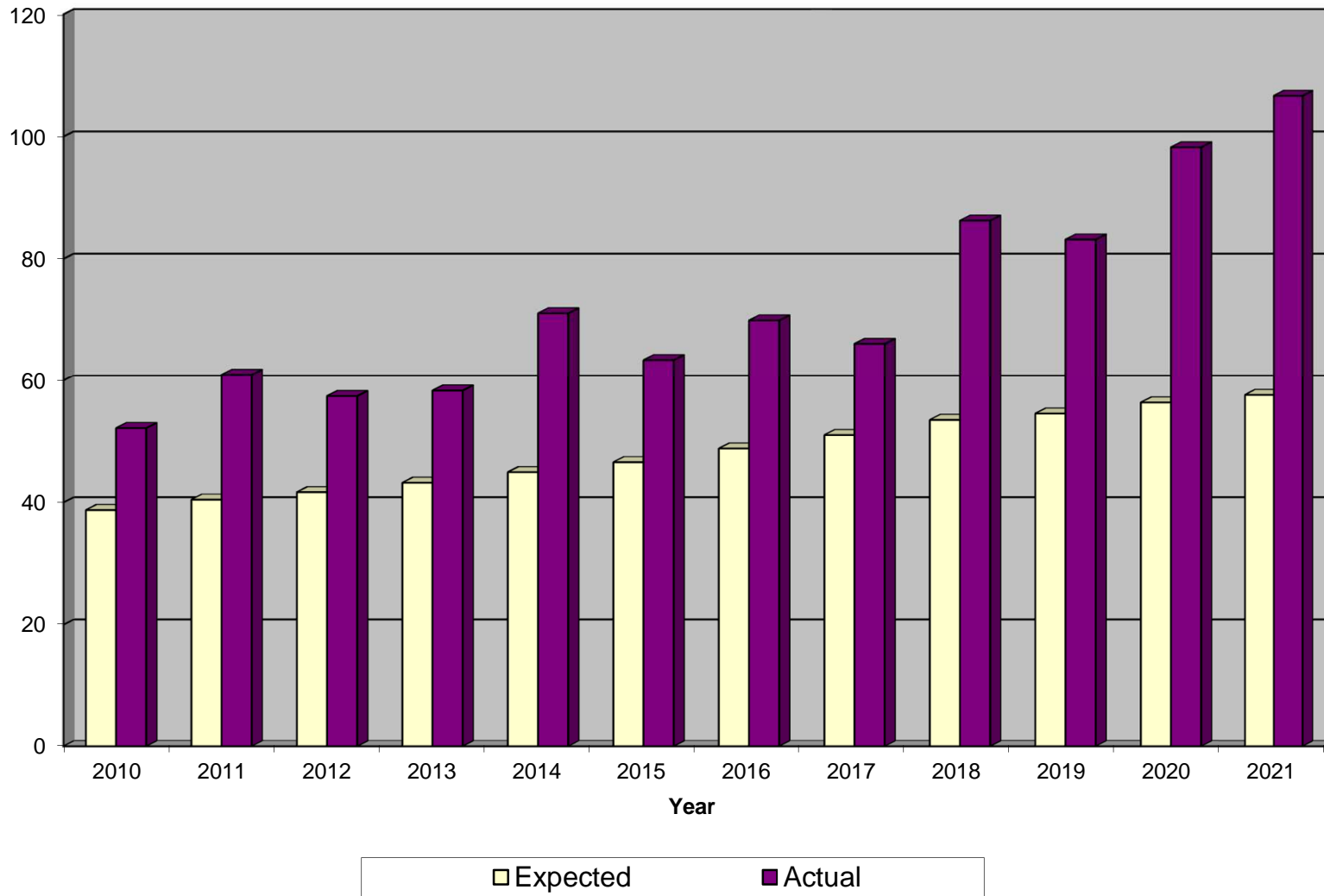
# **Annuitant Mortality Experience**

2010-2021

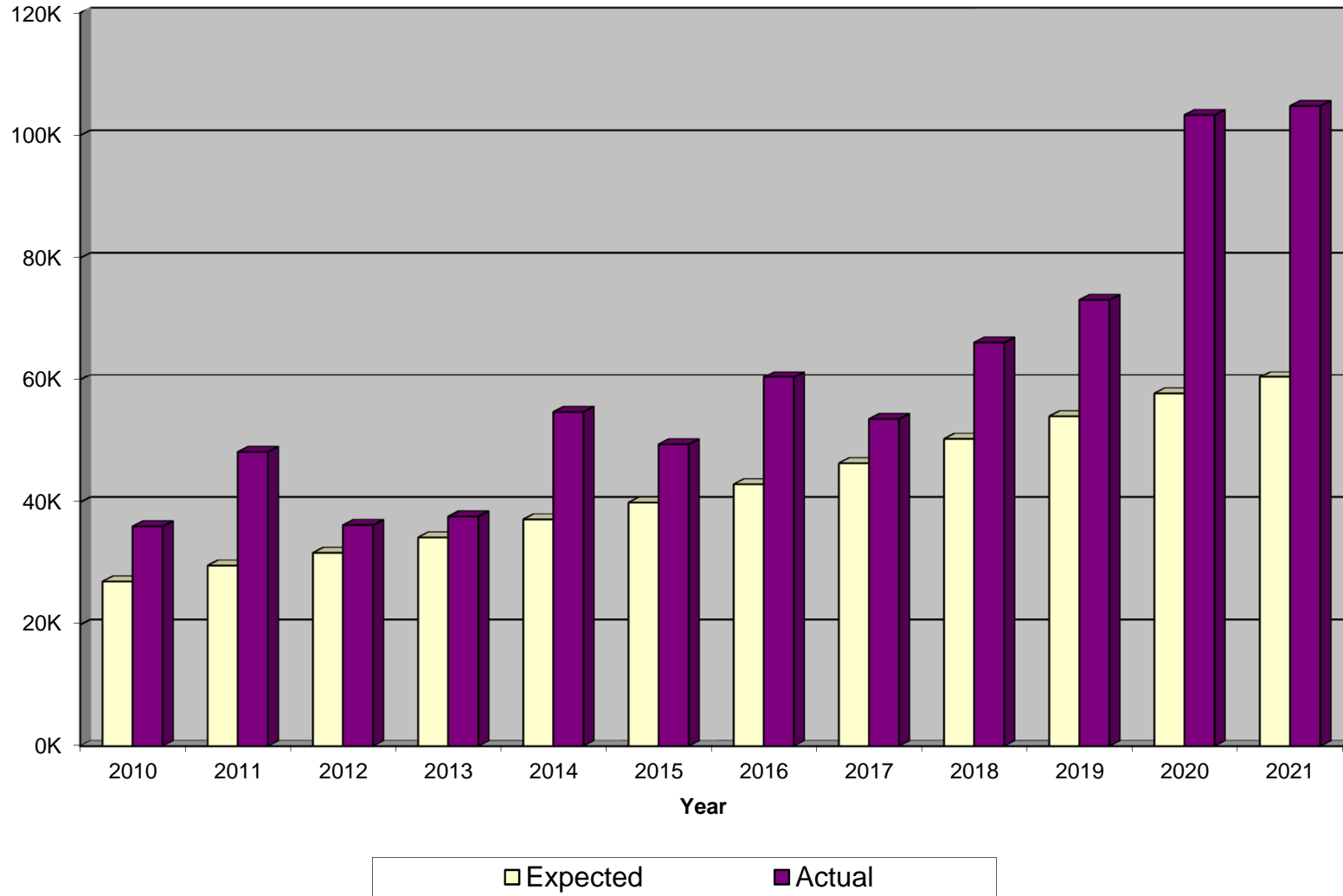
21,832 Participant Life Years



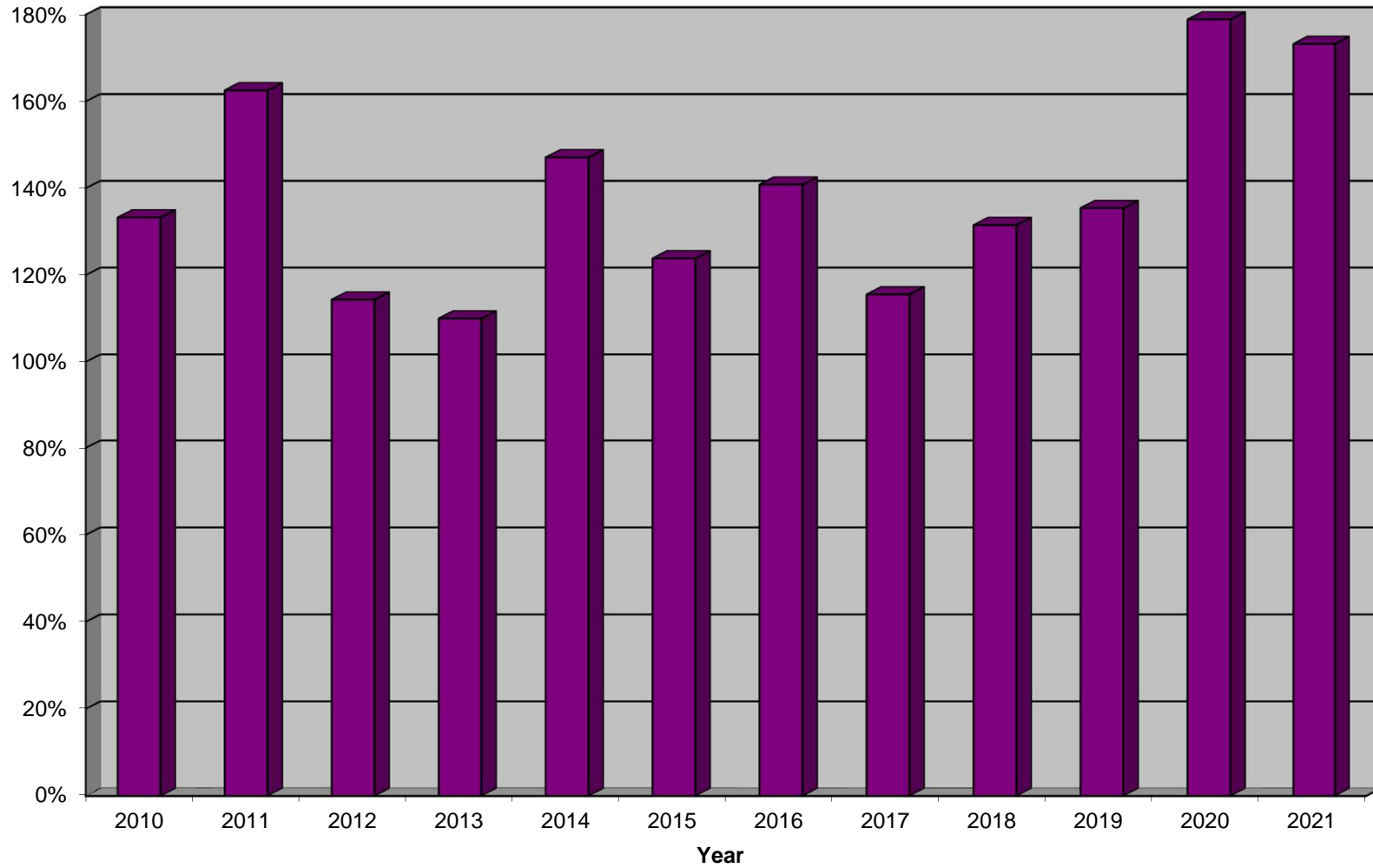
### Actual Versus Expected Deaths (Participant Count)



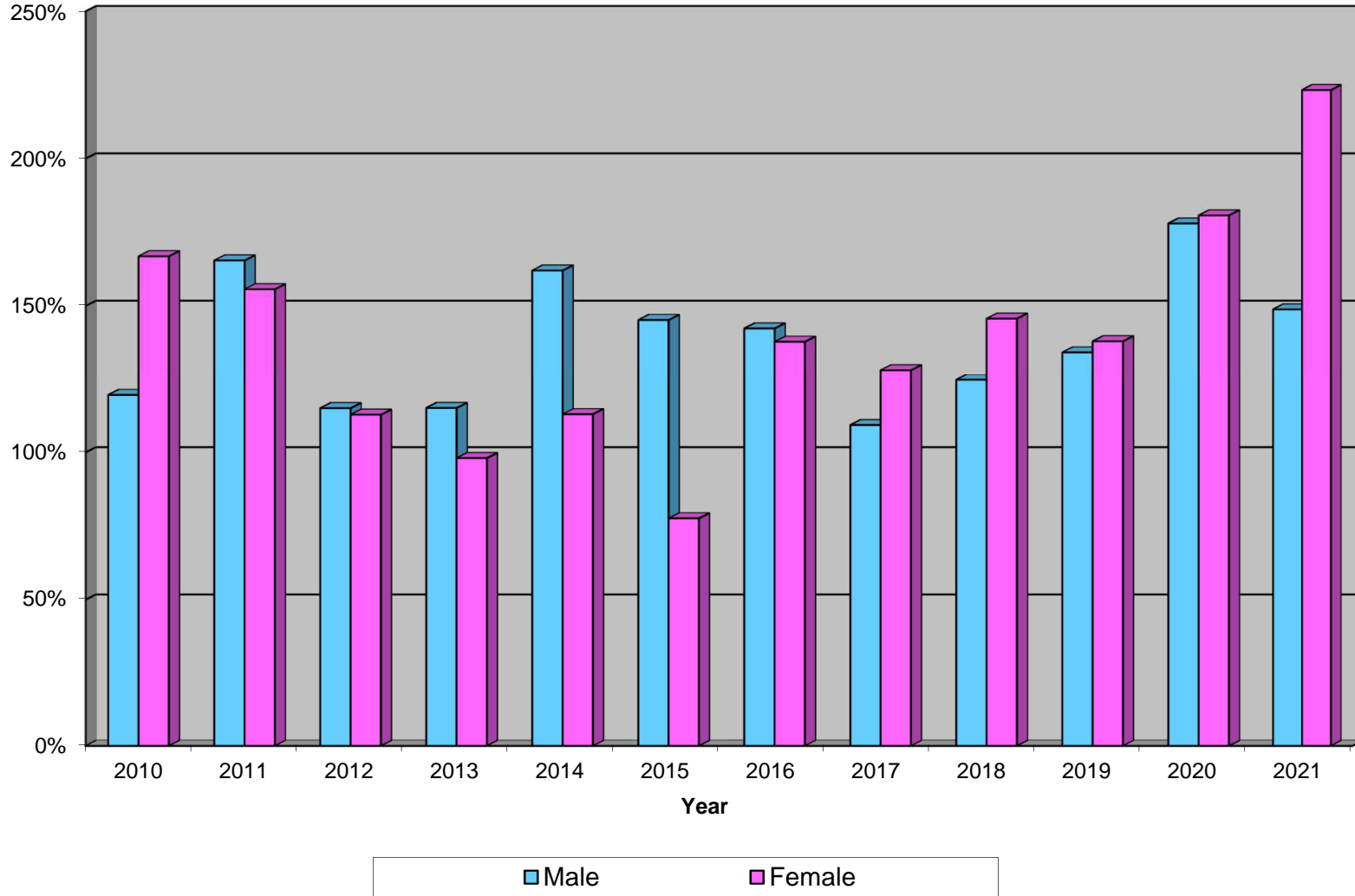
### Actual Versus Expected Deaths (Annuity Amount)



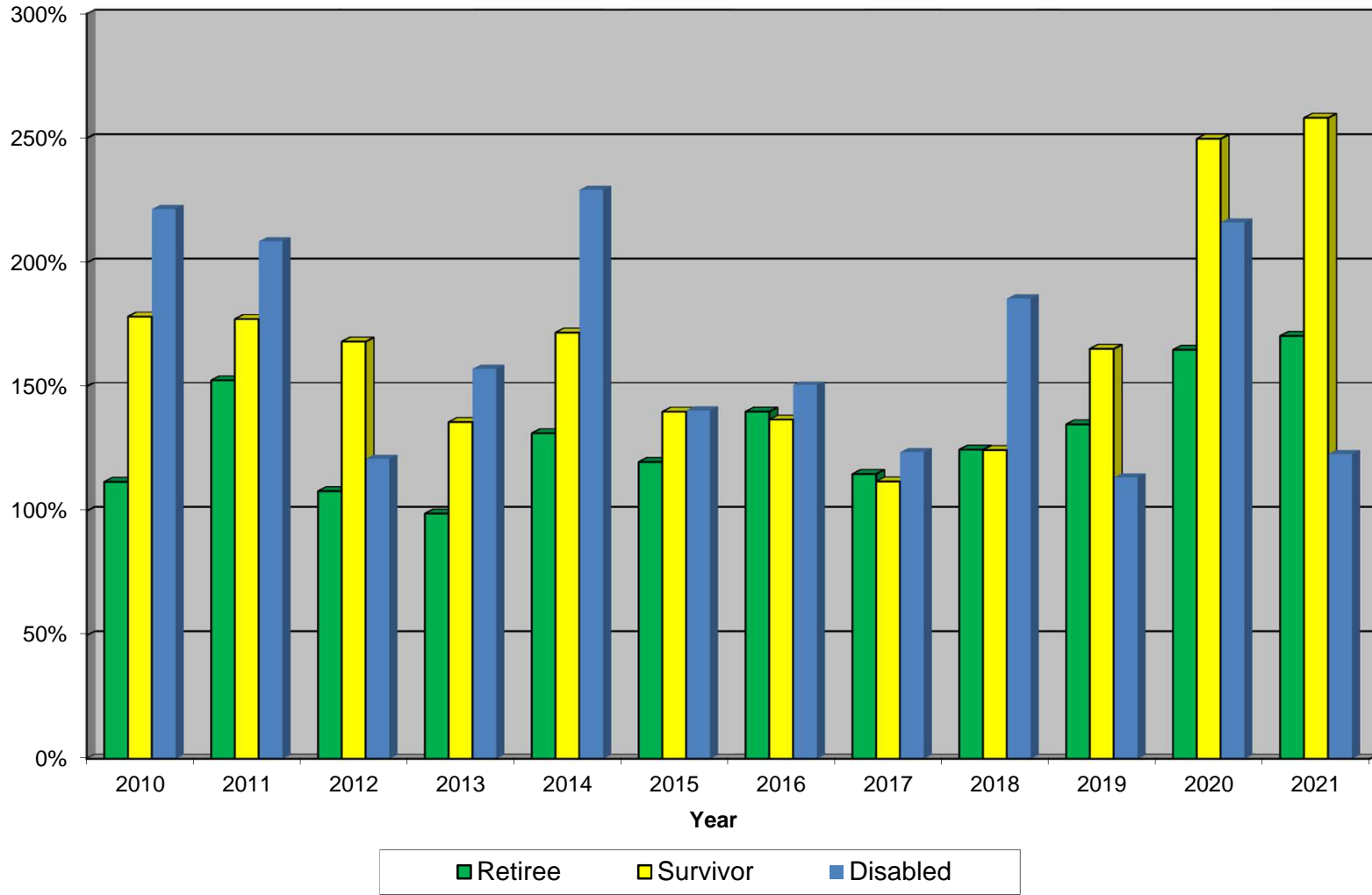
### Ratio of Actual Versus Expected Deaths (Annuity Amount)



### Ratio of Actual Versus Expected Deaths (Annuity Amount)



### Ratio of Actual Versus Expected Deaths (Annuity Amount)



# Mortality Experience versus assumed rates

	2010 - 2021	2010 - 2019	2020 - 2021
All payees	141%	131%	176%
Male	140%	133%	163%
Female	145%	127%	202%
Retiree	135%	124%	168%
Survivor	173%	147%	254%
Disabled	164%	163%	169%

# Disabled Life Mortality

Mortality varies greatly with severity of disability

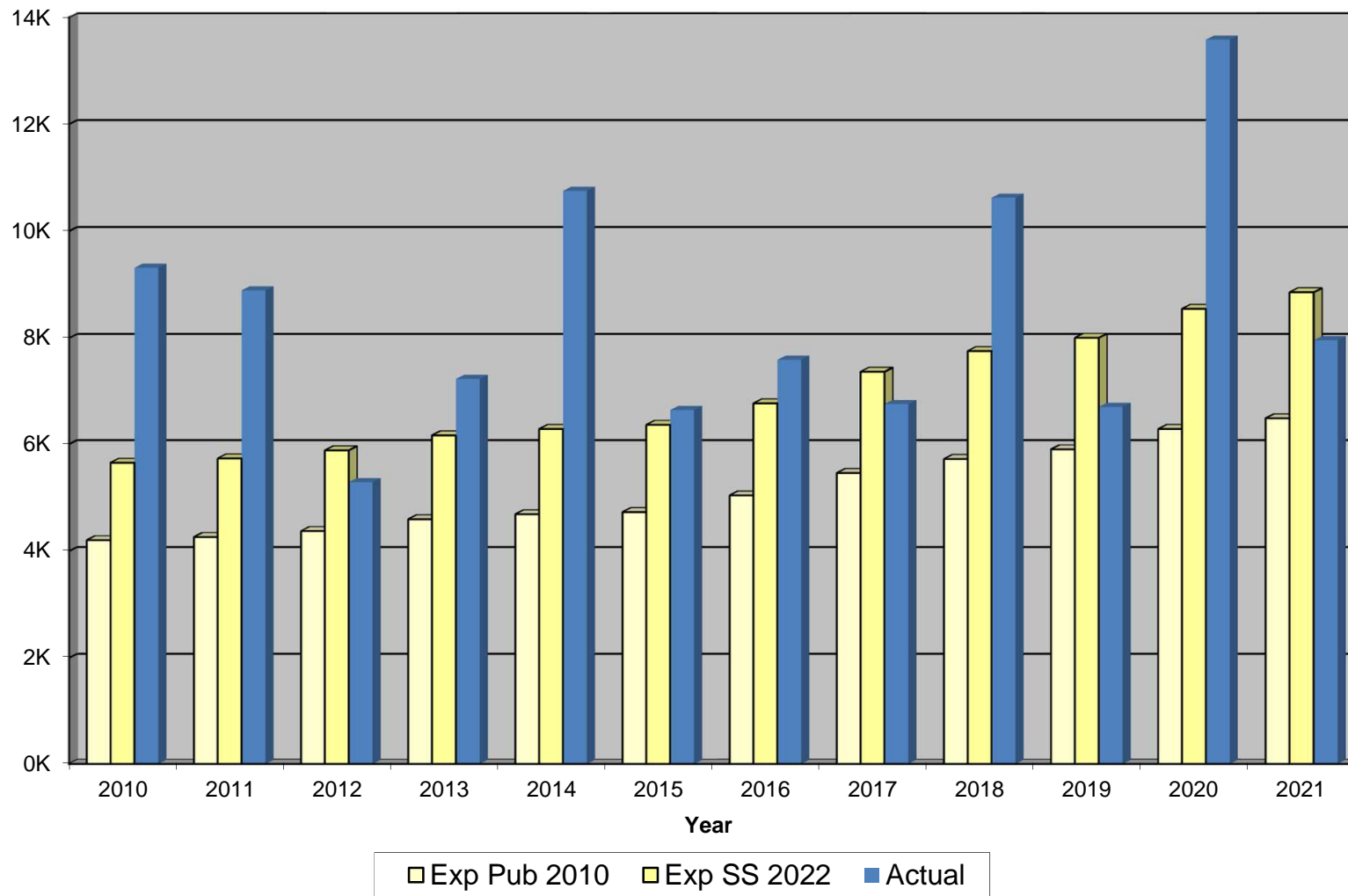
Plan experience will vary due to differences in:

- definition of disability (your job vs any job)
- diligence of administration
- elapsed time since disablement

OkMRF plan definition probably stricter than Pub-2010 universe

Social security ultimate rates (disabled 10 or more years) may be better proxy for OkMRF plans

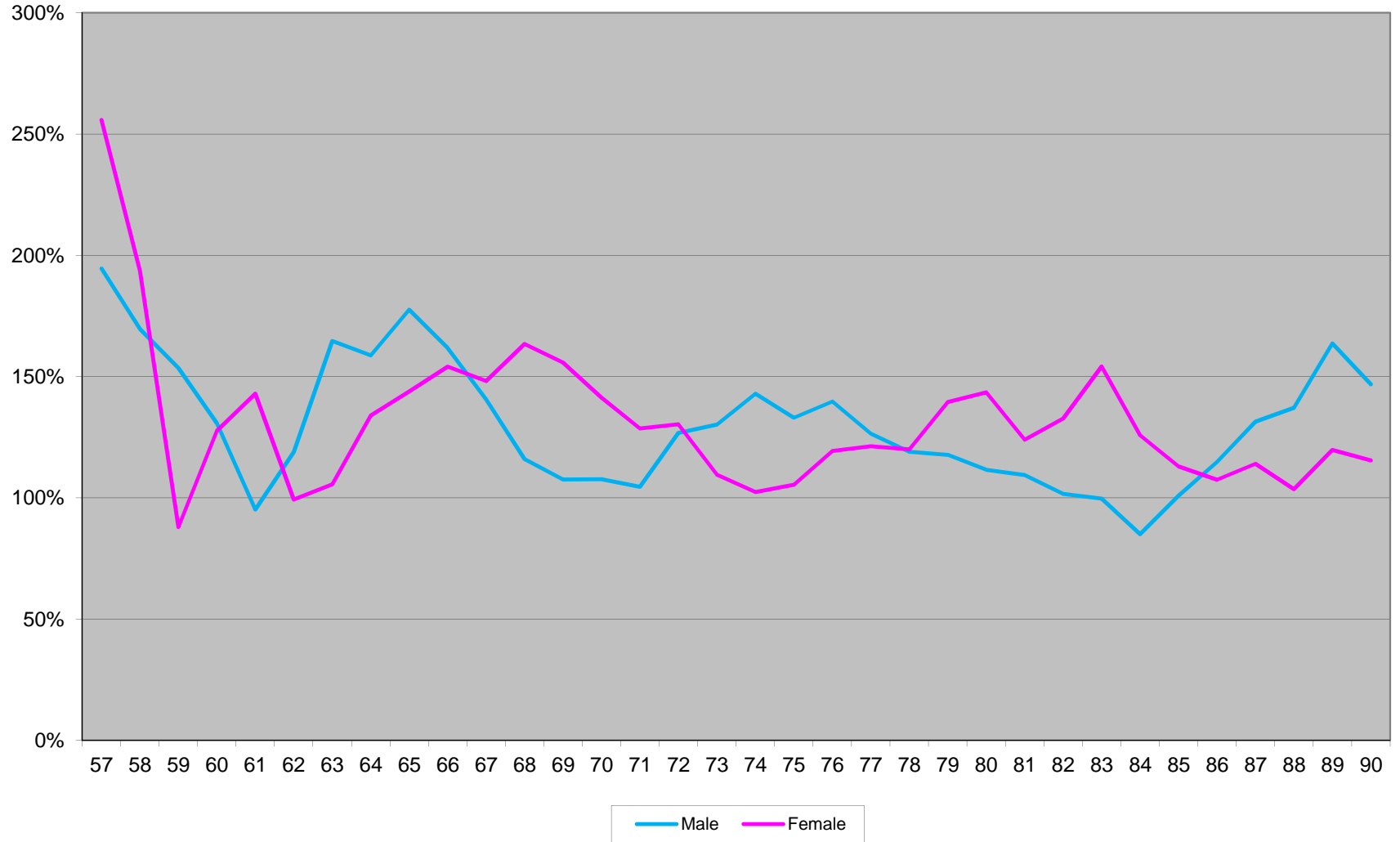
### Actual Versus Expected Deaths Among Disabled Participants (Annuity Amount)





### Ratio of Actual Versus Expected Deaths, 5-Year Central Averages, 2010-2019

#### Retirees and Survivors



# **Mortality Experience Recommendations**

Increase healthy life mortality 20% at all ages

Adopt the ultimate disabled life mortality rates from the 2022 OASDI [Social Security] Trustees report

## Mortality Experience versus revised assumptions

	2010 - 2021	2010 - 2019	2020 - 2021
All payees	116%	108%	145%
Male	114%	109%	133%
Female	120%	105%	168%
Retiree	112%	104%	140%
Survivor	144%	122%	212%
Disabled	122%	121%	124%

# Other Considerations

## Active Participant Mortality

no credible data

## Economic Assumptions

- Inflation  
effect of 3% annual cap
- Investment return  
significant change to market outlook

# Cost Impact of Recommended Changes

*Pro forma* Impact on 7/1/2021 Valuation Results

	<b>Nonactive Liability</b>	<b>Active Liability</b>	<b>Normal Cost</b>
Termination	0.00%	-0.16%	-1.19%
Retirement	0.00%	0.11%	0.19%
Pay Increase	0.00%	2.26%	5.06%
Mortality	-4.42%	-3.27%	-2.76%
<b>Cumulative</b>	<b>-4.42%</b>	<b>-1.15%</b>	<b>1.07%</b>

## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Adair	-4.7%	-2.6%	-3.4%	-3.5%	-0.74%	0.00%	-0.74%
Altus	-4.2%	-0.8%	-2.8%	+2.0%	-0.84%	0.00%	-0.84%
Alva	-3.9%	-2.8%	-3.2%	+0.6%	-0.75%	0.00%	-0.75%
Antlers	-2.9%	-1.6%	-2.4%	-0.2%	-0.28%	0.00%	-0.28%
Ardmore	-4.2%	-1.4%	-2.6%	+0.6%	-0.79%	0.00%	-0.79%
Bartlesville	-3.4%	-4.7%	-4.0%	0.0%	-2.47%	0.00%	-2.47%
Bethany	-4.9%	-1.5%	-3.6%	+0.4%	-2.29%	0.00%	-2.29%
Bethany/Warr Acres	-3.4%	-1.1%	-2.4%	+5.4%	-1.40%	0.00%	-1.40%
Billings	-3.8%	-4.9%	-3.8%	-2.2%	0.00%	0.00%	0.00%
Binger	-3.4%	-2.8%	-3.2%	-5.7%	-0.74%	0.00%	-0.74%
Blackwell	-4.2%	-0.6%	-2.6%	+1.2%	-0.36%	0.00%	-0.36%
Blair	-3.4%	-1.7%	-1.8%	+3.3%	-0.33%	0.00%	-0.33%
Boise City	-4.8%	-2.1%	-3.8%	-2.3%	-1.21%	0.00%	-1.21%
Bokchito	-12.9%	-0.5%	-4.6%	-0.8%	-0.34%	0.00%	-0.34%
Bristow	-5.7%	-1.0%	-4.0%	-2.1%	-1.57%	0.00%	-1.57%
Broken Bow	-3.5%	-1.4%	-2.1%	-0.0%	-0.58%	0.00%	-0.58%
Buffalo	-5.3%	-1.3%	-3.4%	+2.3%	-0.95%	0.00%	-0.95%
Burns Flat	-3.3%	-0.5%	-2.1%	+2.6%	-0.34%	0.00%	-0.34%
Calera	-3.6%	-1.0%	-2.1%	+0.8%	-0.30%	0.00%	-0.30%
Central Oklahoma MCD	-5.0%	-3.4%	-3.9%	-0.4%	-1.91%	0.00%	-1.91%
Chandler	-4.2%	-2.3%	-2.4%	+1.2%	-0.47%	0.00%	-0.47%
Checotah	-4.2%	-0.7%	-1.9%	+1.6%	-0.25%	0.00%	-0.25%
Cherokee & CDA	-4.6%	+0.4%	-2.3%	+1.0%	-0.16%	0.00%	-0.16%
Chickasha	-5.3%	-2.0%	-4.5%	-1.4%	-3.36%	0.00%	-3.36%
Claremore	-4.8%	-0.5%	-2.6%	+2.0%	-0.54%	0.00%	-0.54%

## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Cleo Springs	-6.5%	+0.9%	-6.1%	+1.5%	-4.06%	0.00%	-4.06%
Cleveland	-4.9%	-1.3%	-4.1%	-0.1%	-2.87%	0.00%	-2.87%
Clinton	-5.3%	-1.7%	-3.9%	-0.5%	-2.12%	0.00%	-2.12%
Collinsville	-5.0%	-1.1%	-2.2%	-0.3%	-0.48%	0.00%	-0.48%
Copan	-5.9%	-1.8%	-3.5%	+0.1%	-0.23%	0.00%	-0.23%
Cordell	-5.5%	-2.9%	-4.4%	+0.1%	-2.51%	0.00%	-2.51%
Cushing	-3.8%	-0.8%	-2.8%	+1.3%	-1.20%	0.00%	-1.20%
Davis	-4.6%	-1.9%	-3.0%	+0.7%	-0.60%	0.00%	-0.60%
Del City	-4.4%	-0.7%	-2.9%	+1.6%	-1.64%	0.00%	-1.64%
Dewey	-4.4%	-0.7%	-1.6%	+2.3%	-0.41%	0.00%	-0.41%
Drumright	-4.1%	-0.8%	-3.2%	+1.5%	-1.25%	0.00%	-1.25%
Durant	-4.9%	-1.4%	-3.6%	+0.7%	-1.24%	0.00%	-1.24%
El Reno	-4.7%	-0.3%	-1.7%	+2.1%	-0.17%	0.00%	-0.17%
Eufaula	-4.1%	-1.5%	-3.0%	+2.0%	-0.36%	0.00%	-0.36%
Fort Cobb	-3.2%	-10.1%	-3.8%	-1.6%	-0.93%	0.00%	-0.93%
Foss Reservoir Public Works	-3.9%	-0.5%	-1.7%	+5.9%	-0.15%	0.00%	-0.15%
Frederick	-3.6%	-1.2%	-2.5%	+0.9%	-1.11%	0.00%	-1.11%
Garber	-3.4%	-1.0%	-1.1%	-6.4%	-0.71%	0.00%	-0.71%
Geary	-5.3%	-0.5%	-2.7%	+2.0%	-0.34%	-0.00%	-0.35%
Goodwell	-4.1%	+0.3%	-3.6%	-1.7%	0.00%	0.00%	0.00%
Gore and Gore PWA	-3.9%	+0.2%	-1.3%	+1.0%	-0.06%	0.00%	-0.06%
Granite	-4.2%	-2.9%	-3.7%	-2.9%	-2.50%	0.00%	-2.50%
Guthrie	-3.2%	-0.5%	-1.5%	+1.1%	-0.30%	0.00%	-0.30%
Harrah	-2.4%	-1.0%	-1.8%	+1.1%	-0.63%	0.00%	-0.63%
Healdton	-3.7%	-0.9%	-2.1%	+1.4%	-0.57%	0.00%	-0.57%

## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Henryetta	-3.4%	-0.8%	-1.6%	+1.7%	-0.35%	0.00%	-0.35%
Hooker	-5.9%	-0.2%	-3.3%	+2.7%	-1.00%	0.00%	-1.00%
Hulbert	-3.5%	+0.4%	-1.4%	+4.5%	0.00%	0.00%	0.00%
Hydro	-3.7%	+2.3%	-2.4%	+2.2%	-0.27%	0.00%	-0.27%
Kansas	-3.7%	+0.6%	-1.7%	+3.9%	+0.01%	0.00%	+0.01%
Kiefer	-4.1%	+0.1%	-0.6%	+1.7%	+0.07%	0.00%	+0.07%
Kingston	-5.3%	-1.0%	-3.7%	+0.0%	-0.51%	0.00%	-0.51%
Krebs & Krebs Utility Auth.	-4.3%	-1.2%	-1.8%	+0.4%	-0.11%	0.00%	-0.11%
Laverne	-4.1%	+1.7%	-2.1%	+3.0%	-0.32%	0.00%	-0.32%
Lindsay	-5.5%	-1.0%	-3.6%	-0.0%	-0.78%	0.00%	-0.78%
Madill	-6.1%	-1.9%	-2.9%	+1.2%	-0.71%	0.00%	-0.71%
Mannford	-5.9%	-0.8%	-3.2%	+2.3%	-0.79%	0.00%	-0.79%
Marietta	-6.0%	+0.2%	-2.7%	+5.5%	+0.04%	0.00%	+0.04%
Marietta PWA	-6.1%	+0.3%	-2.7%	+1.8%	-0.69%	0.00%	-0.69%
McCloud	-7.3%	-0.8%	-3.6%	+0.2%	-0.29%	0.00%	-0.29%
Medford	-4.7%	-1.3%	-2.7%	+3.9%	-1.63%	0.00%	-1.63%
Meeker	-3.4%	-0.9%	-2.7%	-1.3%	-0.58%	0.00%	-0.58%
Miami	-3.9%	-0.1%	-2.4%	+1.7%	-0.49%	0.00%	-0.49%
Mooreland	-3.1%	+3.1%	-1.8%	+1.5%	-0.38%	0.00%	-0.38%
Mountain Park MCD	-3.0%	-1.6%	-2.7%	-1.2%	-1.76%	0.00%	-1.76%
Muldrow	-5.1%	+0.9%	-2.7%	+1.9%	-0.52%	0.00%	-0.52%
Mustang	-3.2%	-1.0%	-2.0%	-0.3%	-0.66%	0.00%	-0.66%
Nichols Hills	-4.5%	-1.9%	-3.4%	+1.3%	-0.82%	0.00%	-0.82%
Noble	-5.7%	-1.6%	-2.8%	+2.3%	-0.46%	0.00%	-0.46%
Nowata	-3.7%	-0.3%	-1.6%	+0.8%	-0.18%	0.00%	-0.18%



## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Oilton	-8.8%	-0.0%	-4.4%	+3.0%	-0.37%	0.00%	-0.37%
Okeene	-3.5%	-0.5%	-2.5%	+0.8%	-0.64%	0.00%	-0.64%
Okemah	-4.0%	-1.2%	-1.9%	+0.8%	-0.26%	0.00%	-0.26%
Oklahoma Municipal League	-5.1%	-2.2%	-4.1%	-1.0%	-2.71%	0.00%	-2.71%
OkMRF Staff	-3.4%	-1.0%	-1.3%	+1.8%	-0.14%	0.00%	-0.14%
Okmulgee	-5.9%	-1.9%	-3.6%	+0.8%	-1.67%	0.00%	-1.67%
Owasso	-3.8%	-0.6%	-1.5%	+1.4%	-0.23%	0.00%	-0.23%
Pawnee	-3.1%	-0.4%	-1.8%	-0.1%	-0.44%	0.00%	-0.44%
Perkins	-5.0%	+0.3%	-2.6%	-0.1%	-0.56%	0.00%	-0.56%
Perry	-4.3%	+0.6%	-1.0%	+3.4%	+0.14%	0.00%	+0.14%
Piedmont	-3.3%	+2.2%	+0.4%	+1.3%	+0.10%	0.00%	+0.10%
Pond Creek	-4.4%	+0.4%	-2.4%	+3.5%	-0.76%	0.00%	-0.76%
Porum	-3.7%	-0.2%	-1.5%	+3.6%	+0.02%	0.00%	+0.02%
Poteau	-3.9%	-1.2%	-2.7%	+2.9%	-1.10%	0.00%	-1.10%
Ratliff City	-3.6%	+0.3%	-1.2%	+2.0%	-0.01%	0.00%	-0.01%
Ringling	-9.6%	-2.0%	-4.9%	-1.1%	-0.65%	0.00%	-0.65%
Roland	-4.2%	-0.9%	-1.6%	+2.0%	-0.05%	0.00%	-0.05%
Sallisaw	-4.0%	-1.1%	-2.3%	+3.0%	-0.57%	0.00%	-0.57%
Seiling	-4.7%	-1.1%	-1.7%	+3.9%	0.00%	0.00%	0.00%
Shawnee	-4.4%	+0.0%	-3.9%	+2.8%	-11.72%	0.00%	-11.72%
Skiatook	-4.6%	-1.0%	-1.8%	-0.8%	-0.26%	0.00%	-0.26%
Spencer	-4.0%	+2.2%	-1.5%	+5.4%	+0.40%	0.00%	+0.40%
Spiro	-4.7%	-2.6%	-3.8%	-0.1%	-0.89%	0.00%	-0.89%
Stilwell	-4.8%	+0.6%	-2.8%	+3.1%	-0.60%	0.00%	-0.60%
Stratford	-3.0%	+0.7%	-0.8%	+0.8%	0.00%	0.00%	0.00%

## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Stroud	-5.1%	-0.5%	-2.5%	+0.8%	-0.60%	0.00%	-0.60%
Sulphur	-3.5%	-0.7%	-2.2%	+0.9%	-0.93%	0.00%	-0.93%
Talihina & TPWA	-3.9%	-1.0%	-1.6%	+3.0%	-0.14%	0.00%	-0.14%
Thomas	-5.2%	-1.0%	-3.1%	+2.7%	-1.13%	0.00%	-1.13%
Tipton	-2.2%	-2.7%	-2.6%	+2.3%	-0.38%	0.00%	-0.38%
Tishomingo	-5.2%	-1.3%	-2.2%	+0.6%	-0.20%	0.00%	-0.20%
Tonkawa	-5.1%	+0.7%	-2.6%	+2.0%	-0.52%	0.00%	-0.52%
Valliant	0.0%	-1.2%	-1.2%	-0.8%	-0.12%	0.00%	-0.12%
Velma	-3.1%	+4.5%	-1.3%	+2.0%	-0.00%	0.00%	-0.00%
Vian	-4.3%	-1.3%	-1.7%	-0.6%	-0.18%	0.00%	-0.18%
Vinita	-5.8%	-2.6%	-4.7%	+0.3%	-2.80%	0.00%	-2.80%
Wakita	-5.0%	-1.1%	-4.4%	-0.5%	0.00%	0.00%	0.00%
Warr Acres	-3.9%	-1.4%	-2.7%	+1.3%	-1.26%	0.00%	-1.26%
Watonga	-5.0%	-1.8%	-3.4%	-0.7%	-1.39%	0.00%	-1.39%
Waukomis	-3.4%	+0.3%	-1.6%	+2.6%	+0.12%	0.00%	+0.12%
Waurika	-3.7%	+0.1%	-2.3%	+1.2%	-0.71%	0.00%	-0.71%
Weatherford	-4.4%	-0.7%	-2.4%	+0.4%	-0.48%	0.00%	-0.48%
Webbers Falls	-5.2%	-1.1%	-2.2%	+1.4%	-0.02%	0.00%	-0.02%
Wellston	-6.4%	-1.4%	-4.5%	+1.5%	-0.54%	0.00%	-0.54%
Westville Utility Authority	-3.7%	+2.0%	+0.2%	+3.2%	+0.44%	0.00%	+0.44%
Wetumka	-4.7%	-1.2%	-3.8%	-0.6%	-1.28%	0.00%	-1.28%
Wilburton	-4.4%	-0.0%	-0.5%	+1.9%	+0.03%	0.00%	+0.03%
Yale	-5.1%	-0.4%	-3.0%	-0.7%	-0.88%	0.00%	-0.88%
Yukon	-4.1%	-0.7%	-2.1%	+1.7%	-1.09%	0.00%	-1.09%

## Pro forma Impact on 7/1/2021 Valuation and 2022-23 Contribution Rates

City	Liability			Normal Cost	Change in Contribution Rate		
	Nonactive	Active	Total		Muni	Employee	Total
Braman	-8.7%	0.0%	-8.7%				(2,335)
Chouteau	-6.0%		-6.0%				0
Guymon	-3.7%	-3.6%	-3.7%				0
Muskogee	-13.6%		-13.6%				0
Newkirk	-4.0%	-4.2%	-4.0%				(9,960)
Norman	-10.6%		-10.6%				(31)
Tecumseh	-8.6%		-6.7%				0
<b>Total</b>	<b>-4.4%</b>	<b>-1.2%</b>	<b>-2.9%</b>	<b>+1.1%</b>			<b>-0.92%</b>