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IOWA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Actuarial Valuation Report as of June 30, 2018

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October 29, 2018

Investment Board
Iowa Public Employees' Retirement System
7401 Register Drive
Des Moines, IA 50321

Re: June 30, 2018 Actuarial Valuation Report

Dear Investment Board Members:

At your request, we have performed an actuarial valuation of the Iowa Public Employees' Retirement System (IPERS or System) as of June 30, 2018 to measure the assets and liabilities of the System, determine the funded status, and set the Required Contribution Rate based on the results of the valuation and IPERS' Contribution Rate Funding Policy. While not verifying the data at its source, the actuary performed tests for consistency and reasonableness. The major findings of the valuation are contained in this report which reflects the benefit provisions in place on June 30, 2018. There have been no changes to the benefit provisions or actuarial methods since last year's valuation. However, an experience study of the System's demographic assumptions was performed and the results were presented to the Board in June, 2018. At the recommendation of the actuary, the Board adopted a new set of demographic assumptions. The assumption changes, as well as their impact on the current valuation results, are discussed further in the Executive Summary section of the report.

In preparing our report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, System benefit provisions as defined in statute, member census data and financial information. We found this information to be reasonably consistent and comparable with information provided in prior years. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

All costs, liabilities, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the System. The Investment Board has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix C.

This valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable, and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of potential results is not presented herein.

The actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the System and have been made on a basis consistent with our understanding of the System's funding requirements and goals and the plan provisions described in Appendix B of this report. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes. In particular, actuarial computations for purposes of fulfilling financial reporting requirements for the System under Governmental Accounting Standards Board Statements No. 67 and No. 68 will be presented in separate reports.

The consultants who worked on this assignment are pension actuaries with significant public plan experience. In addition, the signing actuaries are independent of the System and the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

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 that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonable based on the actual experience of the System. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We respectfully submit the following report and look forward to discussing it with you.

Patrice Beckham

Brent A. Banister

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Actuary

INTRODUCTION

This report presents the results of the June 30, 2018 actuarial valuation of the Iowa Public Employees' Retirement System (IPERS). The primary purposes of performing the valuation are as follows:

- to determine the Actuarial Contribution Rate (ACR) and the Required Contribution Rate (RCR) for the Regular membership, Sheriffs and Deputies, and the Protection Occupation group (all public safety members other than Sheriffs and Deputies) in accordance with IPERS' Contribution Rate Funding Policy (described in Appendix D),
- to evaluate the funded status of the System and disclose various asset and liability measures as of June 30, 2018,
- to determine the actuarial experience of the System since the last valuation, and
- to analyze and report on trends in System contributions, assets, and liabilities over the past several years.

While there have been no changes to the plan provisions or actuarial methods since last year's valuation, an experience study of the System's demographic assumptions was performed and the results were presented to the Investment Board in June, 2018. As a result, the Investment Board adopted a new set of demographic assumptions, based on the recommendations of the System's actuary, which included:

- Mortality assumption was changed to the family of RP-2014 Mortality Tables for all groups, with mortality improvements modeled using Scale MP-2017.
- Retirement rates for Regular members were lowered to better reflect actual experience. For the Sheriffs and Deputies, the retirement assumption was modified to reflect lower retirement rates at the younger ages. For the Protection Occupation group, the retirement rates were modified both higher and lower across the age ranges.
- Disability rates were lowered for all groups to better reflect the actual experience.
- Termination rates for Regular members were adjusted to better reflect actual experience. Separate termination assumptions were adopted for the two Special Service groups and the assumptions were changed to be service-based rather than age-based.
- The probability of a vested member electing to receive a deferred benefit was adjusted for Regular members to better reflect actual experience.
- The merit component of the salary increase assumption was adjusted to better reflect actual salary increases.

The impact of these assumption changes on the July 1, 2018 valuation results is summarized in the following tables (dollars in millions):

Regular Members	Prior Assumptions	New Assumptions	Difference
Actuarial Liability (AL)	$36,226	$36,289	$63
Actuarial Value of Assets (AVA)	29,513	29,513	0
Unfunded AL (UAL)	$ 6,712	$ 6,776	$63
Funded Ratio	81.5%	81.3%	(0.2%)
Normal Cost Rate	10.40%	10.49%	0.09%
UAL Rate	5.15%	5.21%	0.06%
Actuarial Contribution Rate	15.55%	15.70%	0.15%
Required Contribution Rate	15.73%	15.73%	0.00%

Note: Numbers may not add due to rounding

Sheriffs & Deputies	Prior Assumptions	New Assumptions	Difference
Actuarial Liability (AL)	$725	$697	($27)
Actuarial Value of Assets (AVA)	683	683	0
Unfunded AL (UAL)	$ 42	$ 15	($27)
Funded Ratio	94.2%	97.9%	3.7%
Normal Cost Rate	16.89%	16.85%	(0.04%)
UAL Rate	2.14%	0.46%	(1.68%)
Actuarial Contribution Rate	19.03%	17.31%	(1.72%)
Required Contribution Rate	19.52%	19.02%	(0.50%)

Note: Numbers may not add due to rounding

Protection Occupation	Prior Assumptions	New Assumptions	Difference
Actuarial Liability (AL)	$1,658	$1,656	($2)
Actuarial Value of Assets (AVA)	1,632	1,632	0
Unfunded AL (UAL)	$ 26	$ 24	($2)
Funded Ratio	98.4%	98.5%	0.1%
Normal Cost Rate	16.26%	15.22%	(1.04%)
UAL Rate	0.49%	0.39%	(0.10%)
Actuarial Contribution Rate	16.75%	15.61%	(1.14%)
Required Contribution Rate	17.02%	16.52%	(0.50%)

Note: Numbers may not add due to rounding

The actuarial valuation results provide a “snapshot” view of the System’s financial condition on June 30, 2018. The results reflect net favorable experience for the past plan year as demonstrated by an unfunded actuarial liability (UAL) that was lower than expected after considering the impact of the assumption changes. The total UAL on June 30, 2018 for all three membership groups covered by IPERS is $6.815 billion as compared to an expected UAL of $7.114 billion. The favorable experience was the aggregate result of an experience gain of $162 million on the actuarial value of assets and an experience gain of $137 million on System liabilities.

Historically, the contribution rate for Regular members was set by state statute. Effective with the 2011 valuation, IPERS has the authority to set the Required Contribution Rate for the Regular membership group based on the Actuarial Contribution Rate developed in the annual actuarial valuation, subject to a maximum change of 1.00% per year. Based on the current Contribution Rate Funding Policy, which is described in Appendix D, the Required Contribution Rate remains unchanged at 15.73% of pay for Regular members, while it dropped 0.50% of pay for both the Sheriffs and Deputies and the Protection Occupation groups. The Required Contribution Rate is above the ACR for all three groups, as shown in the following table.

Contribution Rate for FY 2020	Regular Membership	Sheriffs and Deputies	Protection Occupation
1. Normal Cost Rate	10.49%	16.85%	15.22%
2. Amortization of UAL	5.21%	0.46%	0.39%
3. Actuarial Contribution Rate	15.70%	17.31%	15.61%
4. Required Contribution Rate	15.73%	19.02%	16.52%
5. Shortfall/(Margin) (3) – (4)	(0.03%)	(1.71%)	(0.91%)
6. Employee Contribution Rate	6.29%	9.51%	6.61%
7. Employer Contribution Rate (4) - (6)	9.44%	9.51%	9.91%
8. Unfunded Actuarial Liability ($M)	$6,776	$15	$24
9. Funded Ratio	81.3%	97.9%	98.5%

Further details on the valuation results can be found in the following sections of this Executive Summary.

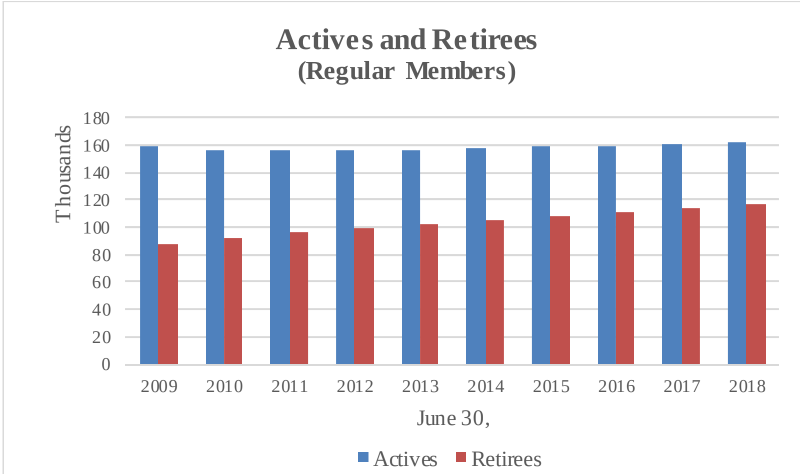
EXPERIENCE FOR THE PRIOR PLAN YEAR

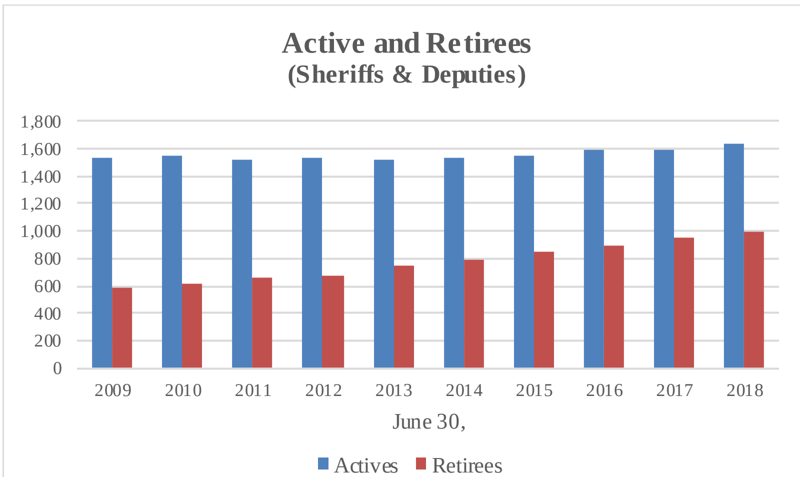
Numerous factors contributed to the change in the Systems' assets, liabilities and the Actuarial Contribution Rate between the June 30, 2017 and June 30, 2018 valuation. The components are examined in the following discussion.

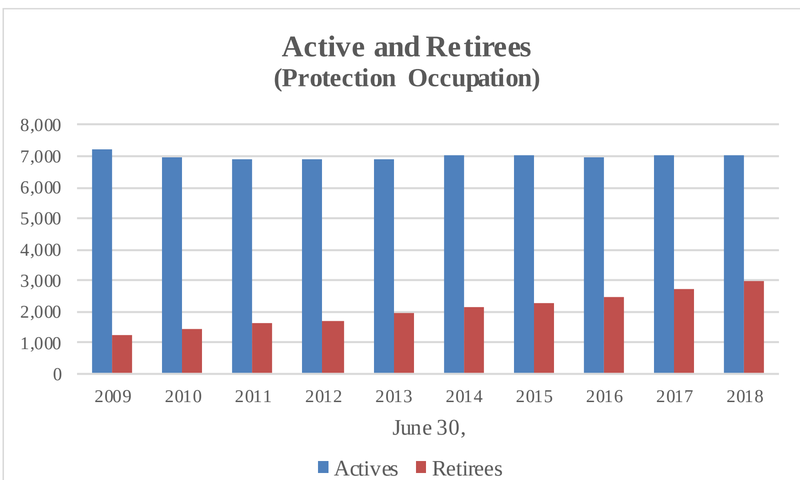
MEMBERSHIP

There were 161,705 active Regular members in the 2018 valuation compared to 161,315 in the 2017 valuation, a 0.2% increase. The graphs on the next page show the number of active and retired members for the past 10 years. The number of active members in the Regular group fell during the four-year period following the Great Recession, but has steadily increased since the 2012 valuation. The current active count of 161,705 is the highest to occur during the 10-year period. When the number of active members increases, it has a positive influence on the System's funding as a larger amount of contributions is received. In addition, the UAL contribution rate is favorably impacted by a larger group of active members and the resulting higher payroll. The UAL is amortized assuming future covered payroll will increase 3.25% per year. If total payroll grows more than 3.25%, the UAL payment is divided by payroll that is larger than expected, which results in a lower UAL contribution rate.

The following graphs show the number of active members compared to the number of members receiving a benefit (retired reemployed members are counted only as retirees) for each of the membership groups. While the number of Regular active members has both increased and decreased at times over this period, the number of members who are receiving a benefit has been steadily increasing. Due to historical reasons, the Sheriffs and Deputies group and the Protection Occupation group have proportionately fewer retirees, but the counts also continue to increase. Finally, it should be noted that the number of active members in the Protection Occupation group decreased overall from 2009 to 2018.


Actives and Retirees
(Regular Members)
Thousands
180
160
140
120
100
80
60
40
20
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
June 30,
Actives Retirees


Active and Retirees
(Sheriffs & Deputies)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
June 30,
Actives Retirees


Active and Retirees
(Protection Occupation)
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
June 30,
Actives Retirees

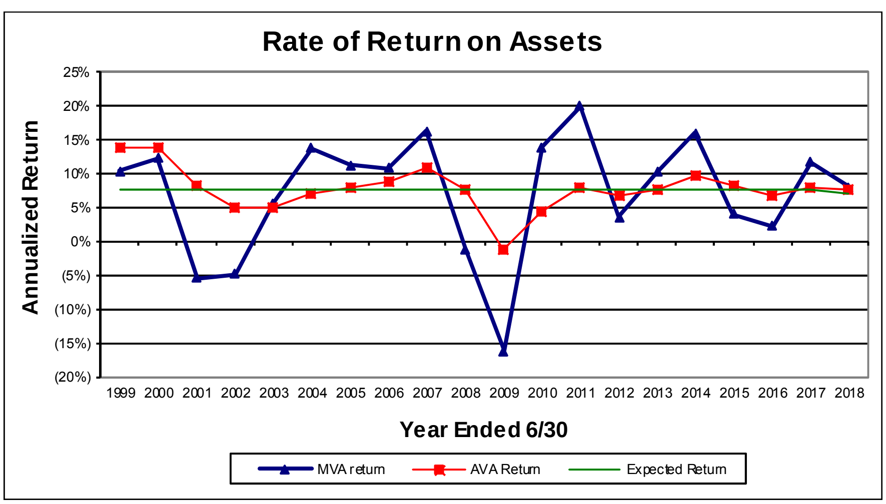
ASSETS

As of June 30, 2018, the System (all membership groups) had total assets of $32.315 billion, when measured on a market value basis. This was an increase of $1.536 billion from the prior year.

The market value of assets is not used directly in the calculation of the unfunded actuarial liability and the Actuarial Contribution Rates. An asset valuation method, which smoothes the effect of market fluctuations, is used to determine the value of assets used in the valuation. This amount, called the "actuarial value of assets", is equal to the expected asset value, based on the actuarial value in the prior year, net cash flows, and the assumed rate of return (7.0%) plus 25% of the difference between the actual market value and the expected asset value. After applying the asset valuation method, the resulting value must be no less than 80% of market value and no more than 120% of market value (referred to as a "corridor"). The corridor did not apply this year. The actuarial value of assets as of June 30, 2018 was $31.828 billion, an increase of $1.356 billion from the value in the prior year. The components of the change in the asset values are shown in the following table:

	Market Value ($M)		Actuarial Value ($M)	
Net Assets, June 30, 2017	$	**30,779**	$	**30,472**
• Employer and Member Contributions	+	1,203	+	1,203
• Benefit Payments and Refunds	-	2,111	-	2,111
• Expected Investment Income, net of expenses (Based on 7.0% assumption)	+	2,123	+	2,102
• Actuarial Gain/(Loss) on Investment Return	+	321	+	162
Net Assets, June 30, 2018 Before FED Transfer	**$**	**32,315**	**$**	**31,828**
• FED Transfer	+	0	+	0
Net Assets, June 30, 2018 After FED Transfer	**$**	**32,315**	**$**	**31,828**
• Application of Corridor		NA	-	0
Final Net Assets, June 30, 2018	**$**	**32,315**	**$**	**31,828**

The time-weighted rate of return on a market value basis, as reported by IPERS, was 7.97%. The dollar-weighted rate of return, net of investment and administrative expenses, measured on the actuarial value of assets was 7.54%. Since this return was above the investment return assumption of 7.00% for FY 2018, this experience resulted in an actuarial gain of $162 million.



Rates of return on the actuarial value of assets are much smoother than market value returns, illustrating the advantage of using an asset smoothing method.

Please see Exhibits 2 and 3 in Section II of this report for a summary of the market and actuarial value of assets by group (Regular, Sheriffs and Deputies, and Protection Occupation group) as of June 30, 2018.

In last year's valuation, there was a deferred (unrecognized) investment gain (actuarial value exceeded market value) of $307 million. Due to the rate of return on the market value of assets for FY 2018, the deferred investment gain has increased to $487 million in the current valuation. The deferred investment gain will be recognized in the smoothing method in future years, but may be offset by actual investment experience if it is less favorable than assumed. For example, a return of about 5.6% on the market value of assets during FY 2019 would fully recognize the $487 million deferred investment gain and result in a return of 7.0% on the actuarial value of assets.

LIABILITIES

The actuarial liability is that portion of the present value of future benefits that will not be paid by future normal costs. The difference between this liability and the actuarial value of assets at the same date is called the unfunded actuarial liability. The dollar amount of the UAL will be reduced if the contributions to the System exceed the normal cost for the year plus interest on the prior year's UAL, assuming that all actuarial assumptions are met.

The unfunded actuarial liability by group, as of June 30, 2018, is shown in the following table:

($Millions)	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total*
Actuarial Liability	$36,289	$697	$1,656	$38,643
Actuarial Value of Assets	29,513	683	1,632	31,828
Unfunded Actuarial Liability*	$ 6,776	$ 15	$ 24	$ 6,815
Funded Ratio	81.3%	97.9%	98.5%	82.4%

*May not add due to rounding.

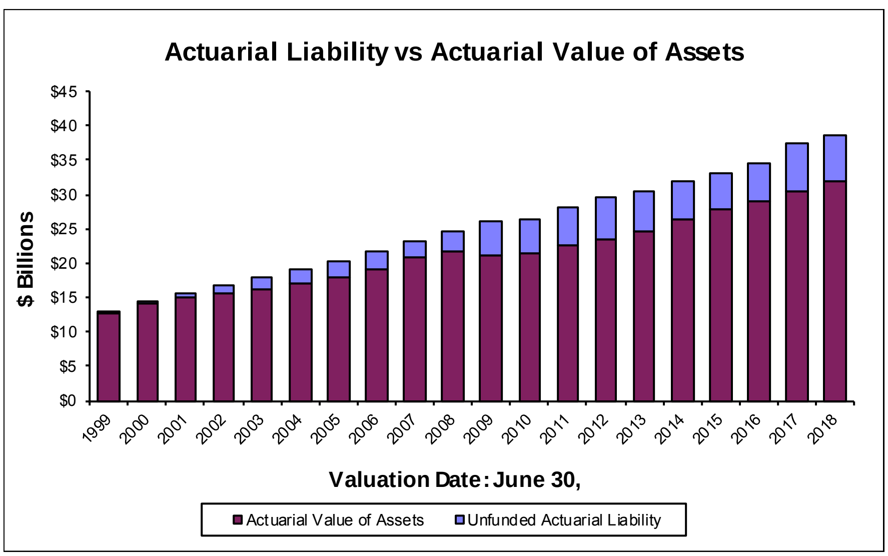
See Exhibit 7 in Section III of the report for the detailed development of the unfunded actuarial liability for each group.

Changes in the UAL occur for various reasons. The net decrease in the UAL from June 30, 2017 to June 30, 2018 was $153 million, largely due to the impact of favorable experience. The components of the net change in the UAL are shown in the following table (in millions):

Unfunded Actuarial Liability, June 30, 2017 ($M)	$ 6,968
• Expected increase from amortization method	185
• Expected decrease from contributions above actuarial rate	(57)
• Investment experience	(162)
• Liability experience*	(137)
• Changes in demographic assumptions	35
• Other	(17)
Unfunded Actuarial Liability before FED transfer, June 30, 2018	$ 6,815
• FED Transfer for favorable experience	0
Unfunded Actuarial Liability after FED transfer, June 30, 2018	$ 6,815

* Liability experience is 0.35% of the actuarial liability.

As can be observed above, various factors impacted the UAL. Actuarial gains (losses), which result from actual experience that is more (less) favorable than anticipated based on the actuarial assumptions, are reflected in the UAL. They are measured as the difference between the expected unfunded actuarial liability and the actual unfunded actuarial liability, taking into account any changes due to actuarial assumptions and methods or benefit provision changes. Overall, the System experienced a net actuarial gain of $299 million. The total actuarial gain may be explained by considering the separate experience of assets and liabilities. As discussed earlier, there was a $162 million actuarial gain as measured on the actuarial value of assets. There was a net actuarial gain of $137 million from demographic experience that was more favorable than anticipated by the actuarial assumptions. While there are various components of demographic experience, both gains and losses, the most significant experience came as a result of favorable salary experience due to smaller salary increases than were expected.

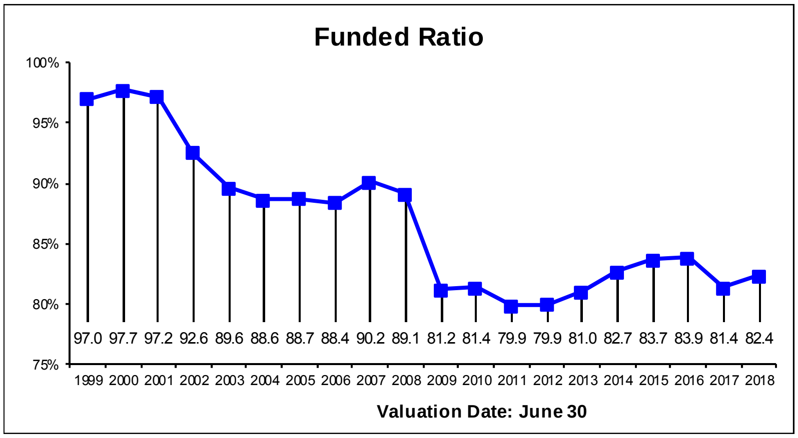


The dollar amount of the UAL has grown over the past two decades due to numerous factors, the most significant of which have been the investment loss of FY 2009, many years of contributions below the Actuarial Contribution Rate, and changes in actuarial assumptions.

An evaluation of the unfunded actuarial liability on a pure dollar basis may not provide a complete analysis since only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the unfunded actuarial liability, and the progress made in its funding, is to track the funded ratio, the ratio of the actuarial value of assets to the actuarial liability. The funded status information, for the entire System, is shown in the following table (in millions).

	6/30/14	6/30/15	6/30/16	6/30/17	6/30/18
Funded Ratio (Actuarial Value)	82.7%	83.7%	83.9%	81.4%	82.4%
Unfunded Actuarial Liability ($M)	$5,544	$5,455	$5,586	$6,968	$6,815

Measures of the funded ratio presented here are not an indication of the System's ability to settle its current obligations, nor, on its own, is it an indication of the need for future funding. In addition, please note that due to the use of an asset smoothing method the funded ratio, based on the market value of assets, may differ from the funded ratio based on the actuarial value of assets.



Negative investment experience in FY 2009 caused a significant drop in the funded ratio, which had been stable at around 90% since 2003. The funded ratio stabilized in FY 2010 due to a strong investment return coupled with benefit reductions and has remained between 80% and 84% in recent years.

CONTRIBUTION RATE

Under the Entry Age Normal cost method, the Actuarial Contribution Rate consists of two components:

- a "normal cost" for the portion of projected liabilities allocated by the actuarial cost method to the service of members during the year following the valuation date, and

- an "unfunded actuarial liability contribution" for the excess of the portion of projected liabilities allocated to service to date over the actuarial value of assets.

This valuation is used to determine the contribution rates that will be effective July 1, 2019 for the fiscal year ending June 30, 2020. Prior to the 2011 valuation, Regular members contributed according to scheduled rates set in statute. Beginning with the 2011 valuation (which applied to FY 2013), IPERS was given the statutory authority to set the Required Contribution Rate for Regular members, subject to a maximum increase of 1.00% per year. Based on IPERS' Contribution Rate Funding Policy, the Required Contribution Rate for Regular members in this valuation (which sets the contribution rate for FY 2020) will remain unchanged from the prior valuation.

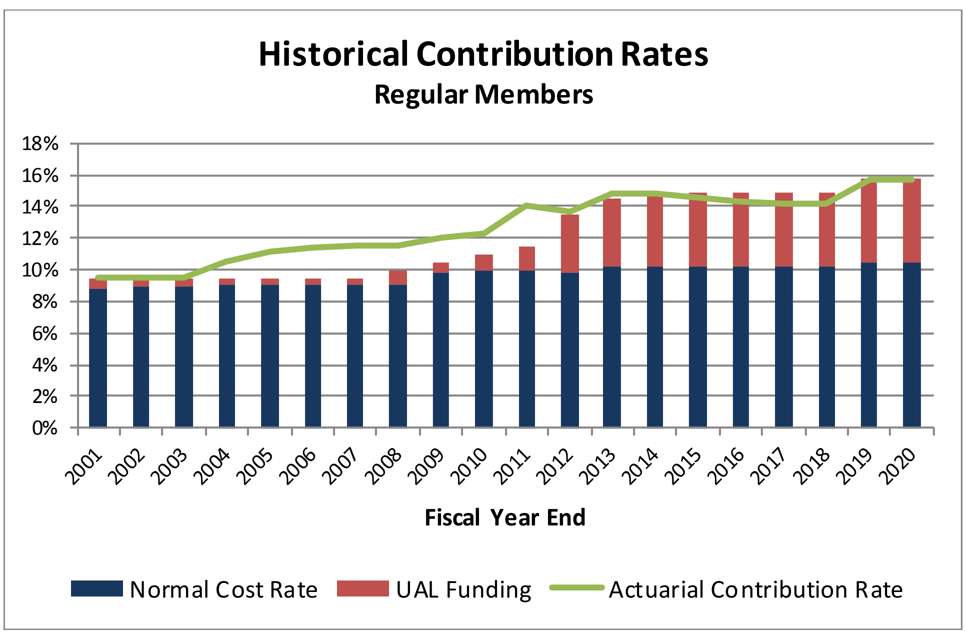
The remaining 5% of the active members, the Sheriffs and Deputies group and the Protection Occupation group, have historically contributed at the Actuarial Contribution Rate which was subject to change each year.

These groups now contribute based on the same funding policy as is used for the Regular members. According to the current Contribution Rate Funding Policy, if the Actuarial Contribution Rate is less than the previous Required Contribution Rate by 0.50% or more, then the Required Contribution Rate shall be lowered by 0.50% provided the funded ratio of the membership group is 95% or higher. The current valuation results show that the Actuarial Contribution Rate has decreased by 2.21% for the Sheriffs and Deputies group and 1.41% for the Protection Occupation group. Both groups also have a funded ratio greater than 95%. Therefore, the Required Contribution Rate for both of these groups will decrease by 0.50% of pay compared to the prior valuation. We would note that, based on the results of this valuation, the Required Contribution Rate is greater than the Actuarial Contribution Rate for all three groups.

See Exhibit 14 in Section IV for the development of these contribution rates which are summarized in the following table:

Contribution Rate for FY 2020	Regular Membership	Sheriffs & Deputies	Protection Occupation
1. Actuarial Contribution Rate	15.70%	17.31%	15.61%
2. Required Contribution Rate	15.73%	19.02%	16.52%
3. Employee Contribution Rate	6.29%	9.51%	6.61%
4. Employer Contribution Rate (2) – (3)	9.44%	9.51%	9.91%
5. Shortfall/(Margin) (1) – (2)	(0.03%)	(1.71%)	(0.91%)

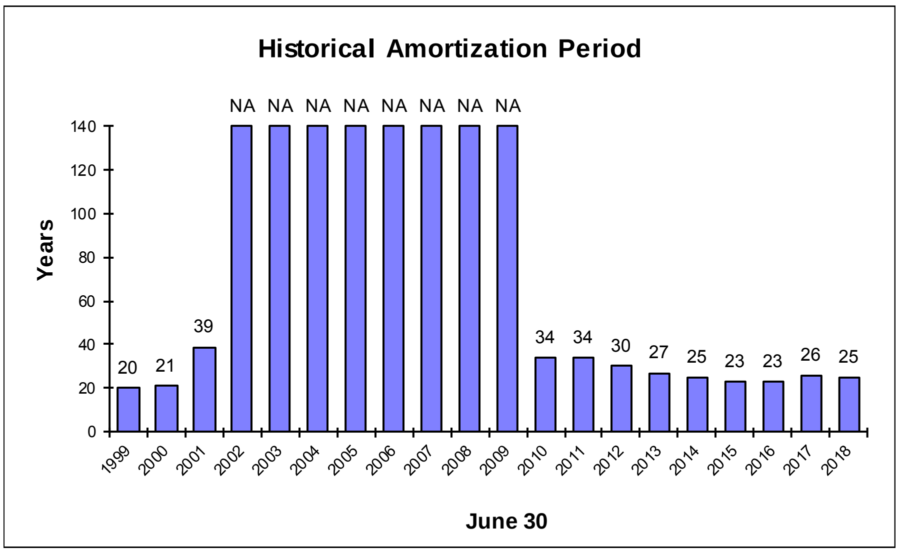
In 2006 and 2010, legislation was passed that increased the statutory contribution rate for Regular members. Beginning with the 2011 valuation (which applied to FY 2013), the Investment Board was given the authority to set the Required Contribution Rate for Regular members subject to certain statutory limitations. A historical summary of the actual contribution rate, split between the normal cost and the remaining amount available to fund the UAL, and the Actuarial Contribution Rate is shown in the following graph:



For a number of years, the actual contributions were less than the Actuarial Contribution Rate and only a small portion of the total contribution rate was available to fund the UAL. Recent changes have increased this portion, providing more progress toward eliminating the UAL.

Based on the results of this valuation and the Contribution Rate Funding Policy adopted by the Investment Board, the Required Contribution Rate for the fiscal year ending June 30, 2020 for the Regular members is 15.73%, which is greater than the Actuarial Contribution Rate by 0.03% of pay.

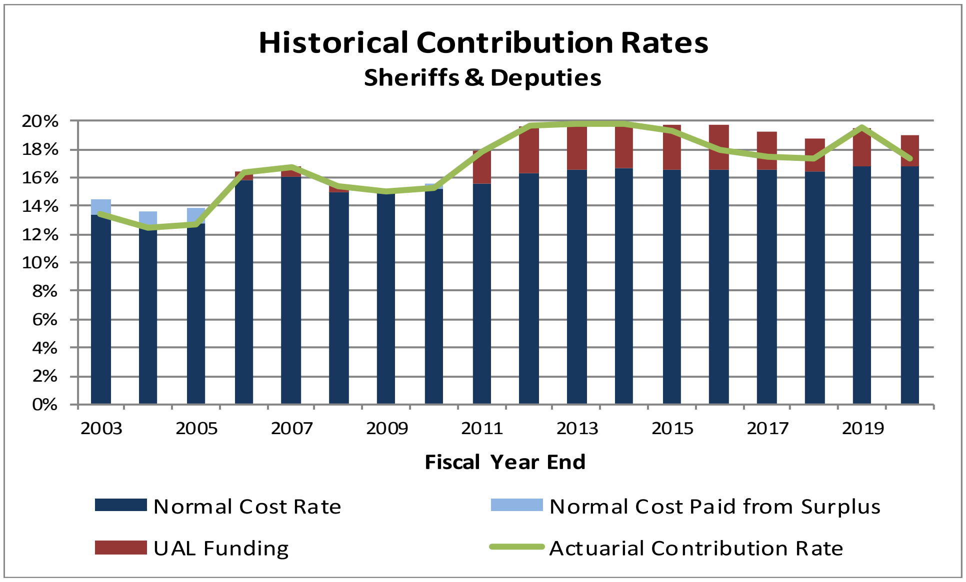
The Actuarial Contribution Rate is determined based on the snapshot of the System taken on the valuation date, June 30, 2018, and applies only for the fiscal year beginning July 1, 2019. The Actuarial Contribution Rate in future years will change each year as the deferred actuarial investment experience is recognized and other experience (both investment and demographic) impacts the System. The Required Contribution Rate will be set in each future year based on the Actuarial Contribution Rate for that year and the Contribution Rate Funding Policy.

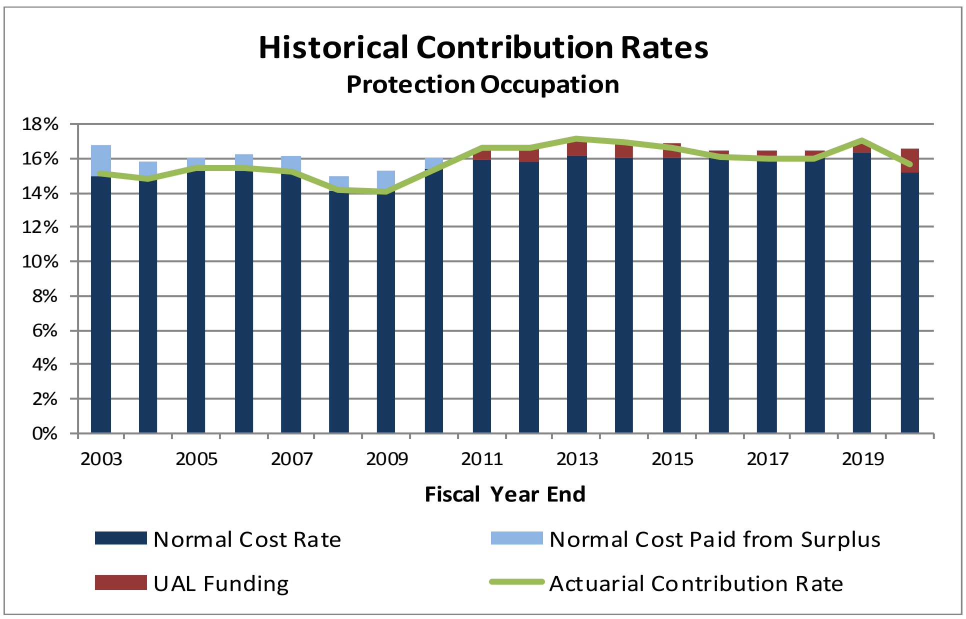


Based on the statutory contribution rate, the period to amortize the UAL was infinite in the 2002 to 2009 valuations. Due to the benefit reductions in 2010 and the increase in the contribution rate beginning in FY 2012, more funds are available to finance the UAL and the years to amortize is finite. Future investment experience will have a significant impact on the System's funding and the years to amortize the UAL.

Note: Years to amortize after 2012 assume the current UAL amortization contribution rate remains level in future years. However, the provisions in the Contribution Rate Funding Policy will result in changes in the contribution rates over time. See Exhibits 12 through 14 for the applicable amortization periods established pursuant to the Actuarial Amortization Method.

As shown in the graphs on the next page, the Sheriffs and Deputies group and the Protection Occupation group have historically contributed the full Actuarial Contribution Rate. During the 20-year period shown, both groups have contributed the full Actuarial Contribution Rate every year (sometimes using surplus for to fund part of the normal cost rate), and have contributed more than the ACR in four of the past five years, due to the Contribution Rate Funding Policy. As a result, the current valuation results show that both groups are close to a funded ratio of 100% (97.9% for Sheriffs and Deputies, and 98.5% for Protection Occupation).


Historical Contribution Rates
Sheriffs & Deputies
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2003
2005
2007
2009
2011
2013
2015
2017
2019
Fiscal Year End
Normal Cost Rate
Normal Cost Paid from Surplus
UAL Funding
Actuarial Contribution Rate


Historical Contribution Rates
Protection Occupation
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2003
2005
2007
2009
2011
2013
2015
2017
2019
Fiscal Year End
Normal Cost Rate
Normal Cost Paid from Surplus
UAL Funding
Actuarial Contribution Rate

SUMMARY

While there have been no changes to the plan provisions or actuarial methods since last year's valuation, an experience study of the System's demographic assumptions was performed and the results were presented to the Board in June, 2018. Based on the actuary's recommendations, the Board adopted a new set of demographic assumptions. As a result of the changes to the demographic assumptions, the unfunded actuarial liability increased by $35 million and the Required Contribution Rate decreased by 0.50% of pay for both the Sheriffs and Deputies and the Protection Occupation groups. For Regular members, the Required Contribution Rate calculated in the current valuation was unaffected by the experience study.

The investment return on the market value of assets for FY 2018 was 7.97%, as reported by IPERS. Due to the application of the asset smoothing method and the deferred asset gains, the investment return on the actuarial value of assets was 7.54%, which is above the assumed investment return of 7.00%. Therefore, there was an experience gain on the actuarial value of assets. In addition, there was also an experience gain on the System's liabilities. The System's combined experience for FY 2018 was an aggregate experience gain of $299 million, resulting in a lower unfunded actuarial liability than was expected.

As mentioned earlier in this section, the System utilizes an asset smoothing method in the valuation process. While this is a common procedure for public retirement systems, it is important to identify the potential impact of the deferred investment experience. The asset smoothing method impacts only the timing of when the actual market experience is recognized in the valuation process. As a result of the return on the market value of assets for FY 2018, there is currently a deferred investment gain of $487 million. The key valuation results, using both actuarial and market value of assets, are shown below:

Actuarial Contribution Rate*	Actuarial Value	Market Value
Regular Members		
Normal Cost	10.49%	10.49%
UAL Contribution	5.21%	4.79%
Total Contribution	15.70%	15.28%
UAL ($M)	$ 6,776	$ 6,326
Funded Ratio	81.3%	82.6%
Sheriffs and Deputies		
Normal Cost	16.85%	16.85%
UAL Contribution	0.46%	0.00%
Total Contribution	17.31%	16.85%
UAL ($M)	$ 15	$ 4
Funded Ratio	97.9%	99.5%
Protection Occupation		
Normal Cost	15.22%	15.22%
UAL Contribution	0.39%	0.00%
Total Contribution	15.61%	15.22%
UAL ($M)	$ 24	$ (2)
Funded Ratio	98.5%	100.1%

*Actuarial Contribution Rate is calculated prior to the application of the Contribution Rate Funding Policy which determines the Required Contribution Rate.

For each membership group, the Actuarial Contribution Rate consists of the normal cost and an amortization payment (not less than zero) of the group's unfunded actuarial liability. The normal cost may only be offset by a negative amortization payment after a membership group has attained a funded ratio of 110.0% or greater for three consecutive years. The Actuarial Contribution Rate for FY 2020 is 15.70% of pay for Regular members, which is 0.03% less than the prior valuation. The Actuarial Contribution Rate for the Sheriffs and Deputies group in this valuation decreased by 2.21% of pay from last year's rate to 17.31% of pay. The Actuarial Contribution Rate for the Protection Occupation group decreased by 1.41% of pay to 15.61% of pay.

Based on the Contribution Rate Funding Policy adopted by the Investment Board, the Required Contribution Rate determined in this year's valuation for Regular members remains unchanged from last year at 15.73% of pay (applicable for the fiscal year ending June 30, 2020). The Required Contribution Rate for the Sheriffs and Deputies group in this valuation decreased by 0.50% of pay from last year's rate to 19.02% of pay. The Required Contribution Rate for the Protection Occupation group also decreased by 0.50% of pay to 16.52% of pay. The Required Contribution Rate remains higher than the Actuarial Contribution Rate for FY 2020 for all three membership groups.

The Actuarial Contribution Rate is determined based on the snapshot of the System taken on the valuation date, June 30, 2018, and applies only for the fiscal year beginning July 1, 2019. The Actuarial Contribution Rate in the future will change each year as the deferred actuarial investment experience is recognized and as other experience (both investment and demographic) impacts the System. While the Required Contribution Rate can vary each year, the annual change to the rate for Regular members is limited by statute to 1.0% and the Contribution Rate Funding Policy also limits the decrease in the rate. Therefore, depending on actual experience in future years, the Required Contribution Rate may vary from the Actuarial Contribution Rate.

The long-term financial health of IPERS is heavily dependent on two key items: (1) future investment returns and (2) systematic contributions to the System at the full actuarially determined rate. Given the System's current funded status, the Actuarial Contribution Rate, and the Required Contribution Rate, the System's funded ratio is expected to improve over the long term, assuming all actuarial assumptions are met in the future and contributions are made according to the current Contribution Rate Funding Policy.

We conclude this executive summary by presenting comparative statistics and actuarial information on both the June 30, 2018 and June 30, 2017 valuations. All figures shown include the Regular membership, Sheriffs and Deputies, and the Protection Occupation group.

SUMMARY OF HISTORICAL CHANGE IN IPERS UNFUNDED ACTUARIAL LIABILITY

($Millions)	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13
Unfunded Actuarial Liability (BOY[1])	1,255	1,867	2,176	2,289	2,507	2,266	2,665	4,895	4,931	5,682	5,916
• **Expected Change**											
− **From Amortization Method**	24	36	42	22	49	44	52	95	96	110	115
− **Contributions different than Actuarial Rate**	61	87	103	125	118	127	140	248	218	65	21
• **Investment Experience**	402	75	(89)	(235)	(622)	5	1,903	666	(66)	168	(15)
• **Liability and Other Experience**	125	82	57	242	187	214	135	(185)	(17)	(109)	(250)
• **Benefit Enhancements**	0	29	0	0	0	6	0	(674)	0	0	0
• **Change in Assumptions/Methods**	0	0	0	64	27	3	0	(114)	417	0	0
• **Change in Actuarial Software**	0	0	0	0	0	0	0	0	103	0	0
• **FED Transfer**	0	0	0	0	0	0	0	0	0	0	0
Unfunded Actuarial Liability (EOY[2])	1,867	2,176	2,289	2,507	2,266	2,665	4,895	4,931	5,682	5,916	5,787

1 = Beginning of Year
2 = End of Year

Note: The amounts shown in each year are not additive because they are calculated on each valuation date and, therefore, represent a value at a different point in time.

SUMMARY OF HISTORICAL CHANGE IN IPERS UNFUNDED ACTUARIAL LIABILITY (continued)

($Millions)	FY14	FY15	FY16	FY17	FY18
Unfunded Actuarial Liability (BOY[1])	5,787	5,544	5,455	5,586	6,968
• **Expected Change**					
− **From Amortization Method**	99	72	54	52	185
− **Contributions different than Actuarial Rate**	0	(20)	(38)	(58)	(57)
• **Investment Experience**	(527)	(171)	236	(102)	(162)
• **Liability and Other Experience**	(29)	30	(121)	57	(154)
• **Benefit Enhancements**	0	0	0	0	0
• **Change in Assumptions/Methods**	215	0	0	1,433	35
• **Change in Actuarial Software**	0	0	0	0	0
• **FED Transfer**	(1)	0	0	0	0
Unfunded Actuarial Liability (EOY[2])	5,544	5,455	5,586	6,968	6,815

1 = Beginning of Year
2 = End of Year

Note: The amounts shown in each year are not additive because they are calculated on each valuation date and, therefore, represent a value at a different point in time.

IOWA PUBLIC EMPLOYEES' RETIREMENT SYSTEM
PRINCIPAL RESULTS

	June 30, 2018	June 30, 2017	% Chg
SYSTEM MEMBERSHIP			
1. Active Membership			
- Number of Members (excluding Retired/Reemployed)	170,376	169,909	0.3
- Projected Payroll for Upcoming Fiscal Year	$8,176M	$8,058M	1.5
- Average Salary	$47,989	$47,425	1.2
2. Inactive Membership			
- Number Not in Pay Status	70,023	67,955	3.0
- Number of Retirees/Beneficiaries	120,755	117,508	2.8
- Average Annual Benefit	$17,036	$16,602	2.6
ASSETS AND LIABILITIES			
1. Net Assets (excluding FED reserve)			
- Market Value	$32,315M	$30,779M	5.0
- Actuarial Value	31,828M	30,472M	4.4
2. Projected Liabilities			
- Retired Members	$20,660M	$19,335M	6.9
- Inactive Members	907M	835M	8.6
- Active Members	24,792M	24,515M	1.1
- Total Liability	$46,358M	$44,685M	3.7
3. Actuarial Liability	$38,643M	$37,440M	3.2
4. Unfunded Actuarial Liability	$6,815M	$6,968M	(2.2)
5. Funded Ratio			
a. Actuarial Value Assets/Actuarial Liability	82.36%	81.39%	1.2
b. Market Value Assets/Actuarial Liability	83.62%	82.21%	1.7
SYSTEM CONTRIBUTIONS			
Required Contribution Rate, Regular Members*	15.73%	15.73%	0.0
Employer Contribution Rate	9.44%	9.44%	0.0
Employee Contribution Rate	6.29%	6.29%	0.0
Total Actuarial Contribution Rate	15.70%	15.73%	(0.2)
Shortfall/(Margin)	(0.03%)	0.00%	NA

Note: Totals may not add due to rounding

M = ($)Millions

* Contribution rates for Sheriffs and Deputies are 9.51% for employers, 9.51% for employees

Contribution rates for Protection Occupation are 9.91% for employers, 6.61% for employees

SECTION II

SYSTEM ASSETS

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In this section, the values assigned to the assets held by the System are presented. These assets are valued on two different bases: the market value and the actuarial value.

Market Value of Net Assets

For certain accounting statement purposes, System assets are valued at current market prices. These values represent the "snapshot" of the fair value of System assets as of the valuation date.

Actuarial Value of Net Assets

The market value of assets may not necessarily be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value for the actuarial valuation, a technique for determining the actuarial value of assets is used which dampens volatility in the market value while still indirectly recognizing market value. The specific technique follows:

Step 1: Determine the expected value of plan assets at the current valuation date using the actuarial assumption for investment return on the prior actuarial value of assets and the actual receipts and disbursements of the fund for the previous 12 months.

Step 2: Subtract the expected value determined in Step 1 from the total market value of the Fund at the current valuation date.

Step 3: Multiply the difference between market and expected values determined in Step 2 by 25%.

Step 4: Add the expected value of Step 1 and the product of Step 3 to determine the actuarial value of assets.

Step 5: Verify the preliminary actuarial value of assets in Step 4 is not more than 120% of the market value of assets, nor less than 80% of the market value. If it is, adjust the actuarial value of assets so it falls within the 80% - 120% corridor.

EXHIBIT 1

ANALYSIS OF NET ASSETS AT MARKET VALUES

($ Millions)

	June 30, 2018			June 30, 2017		
		Amount	% of Total		Amount	% of Total
Cash & Equivalents	$	331	1.0%	$	1,254	4.1%
Capital Assets, Receivables and Payables		(933)	(2.9)		(1,182)	(3.8)
Domestic Equity		7,382	22.8		7,068	23.0
International Equity		5,671	17.5		4,635	15.1
Fixed Income		10,551	32.8		10,090	32.7
Public Real Assets		2,387	7.4		2,208	7.2
Private Real Assets		1,986	6.1		1,984	6.4
Private Equity/Debt		4,414	13.7		3,890	12.6
Securities Lending Collateral Pool		526	1.6		832	2.7
TOTAL NET ASSETS	$	32,315	100.0%	$	30,779	100.0%
FED Reserve (Before current year transfer)		0			0	
Current Year FED Transfer Payable		0			0	
Net Retirement System Assets	$	32,315		$	30,779	

EXHIBIT 2

SUMMARY OF FUND ACTIVITY
(Market Value)

	Regular Membership	Sheriffs & Deputies	Protection Occupation	FED Reserve	Total
NET RETIREMENT SYSTEM ASSETS ON JUNE 30, 2017*	$28,575,078,992	$649,668,861	$1,554,189,858	$0	$30,778,937,711
REVENUE					
Employer contributions	671,598,096	10,564,954	34,589,731	0	716,752,781
Member contributions	447,780,981	10,564,954	23,059,821	0	481,405,756
Service purchase	4,219,054	0	410,592	0	4,629,646
Investment income	2,345,271,870	53,678,541	128,700,445	0	2,527,650,856
Total Revenue	$3,468,870,001	$74,808,449	$186,760,589	$0	$3,730,439,039
DISBURSEMENTS					
Benefit payments	1,948,951,644	31,004,667	72,471,434	0	2,052,427,745
Member refunds	51,092,081	1,681,775	6,150,756	0	58,924,612
Administrative expenses	14,153,625	113,406	486,811	0	14,753,842
Investment expenses	63,726,309	1,458,567	3,497,080	0	68,681,956
Total Expenses	$2,077,923,659	$34,258,415	$82,606,081	$0	$2,194,788,155
PRELIMINARY NET ASSETS ON JUNE 30, 2018	$29,966,025,334	$690,218,895	$1,658,344,366	$0	$32,314,588,595
TRANSFERS					
Membership changes	(3,120,215)	3,353,475	(233,260)	0	0
FED Reserve	0	0	0	0	0
ADJUSTED NET ASSETS ON JUNE 30, 2018	$29,962,905,119	$693,572,370	$1,658,111,106	$0	$32,314,588,595

* Beginning net position as of June 30, 2017 has been restated by ($178,615) for the General Membership and in total due to accounting adjustments

EXHIBIT 3

ACTUARIAL VALUE OF NET ASSETS

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
1. Actuarial Value of Assets as of June 30, 2017*	$28,292,612,060	$642,509,070	$1,537,125,949	$30,472,247,079
2. Actual Receipts/Disbursements				
a. Contributions	1,123,598,131	21,129,908	58,060,144	1,202,788,183
b. Benefit Payments and Refunds	2,000,043,725	32,686,442	78,622,190	2,111,352,357
c. Net Change	(876,445,594)	(11,556,534)	(20,562,046)	(908,564,174)
3. Expected Value of Assets as of June 30, 2018 [(1) x 1.07] + [(2c) x $(1.07)^{.5}$]	29,366,492,532	675,530,533	1,623,455,220	31,665,478,285
4. Preliminary Market Value of Assets as of June 30, 2018	29,966,025,334	690,218,895	1,658,344,366	32,314,588,595
5. Difference Between Market and Expected Values (4) - (3)	599,532,802	14,688,362	34,889,146	649,110,310
6. Preliminary Actuarial Value of Assets as of June 30, 2018 (3) + [(5) x 25%]	29,516,375,733	679,202,624	1,632,177,507	31,827,755,864
7. Transfers				
a. Membership changes	(3,073,208)	3,302,953	(229,745)	0
b. FED Reserve	0	0	0	0
8. Initial Actuarial Value of Assets as of June 30, 2018	$29,513,302,525	$682,505,577	$1,631,947,762	$31,827,755,864
9. Determination of Corridor				
a. 80% of Market Value of Assets	23,970,324,095	554,857,896	1,326,488,885	25,851,670,876
b. 120% of Market Value of Assets	35,955,486,143	832,286,844	1,989,733,327	38,777,506,314
10. Final Actuarial Value of Assets as of June 30, 2018 (8), but not less than (9a), nor greater than (9b)	$29,513,302,525	$682,505,577	$1,631,947,762	$31,827,755,864

* Beginning net position as of June 30, 2017 has been restated by ($176,835) for the General Membership and in total due to accounting adjustments.

EXHIBIT 4

HISTORICAL COMPARISON (ACTUARIAL AND MARKET)

Value as of June 30		Actuarial Value of Net Assets (AVA)	Market Value of Net Assets (MVA)	AVA/MVA
1999	*	12,664,031,437	14,814,311,451	85%
2000	*	14,145,141,535	16,473,516,141	86%
2001		15,112,424,729	15,357,519,356	98%
2002		15,613,114,099	14,387,799,637	109%
2003		16,120,476,011	14,915,941,546	108%
2004		16,951,942,539	16,726,227,853	101%
2005		17,951,490,071	18,224,067,613	99%
2006		19,144,036,519	19,847,676,903	96%
2007		20,759,628,415	22,624,387,015	92%
2008		21,857,423,183	21,844,112,206	100%
2009		21,123,979,941	17,603,316,618	120%
2010		21,537,458,560	19,538,971,423	110%
2011		22,575,309,199	22,772,344,651	99%
2012		23,530,094,461	23,024,773,746	102%
2013		24,711,096,187	24,756,663,715	100%
2014		26,460,428,085	28,038,549,893	94%
2015		27,915,379,103	28,429,834,829	98%
2016		29,033,696,587	28,326,433,656	102%
2017		30,472,423,914	30,779,116,326	99%
2018		31,827,755,864	32,314,588,595	98%

*Reflects reduction for transfers to the Favorable Experience Dividend Reserve Account.

Values are for all three membership groups, but exclude the Favorable Experience Dividend Reserve Account.

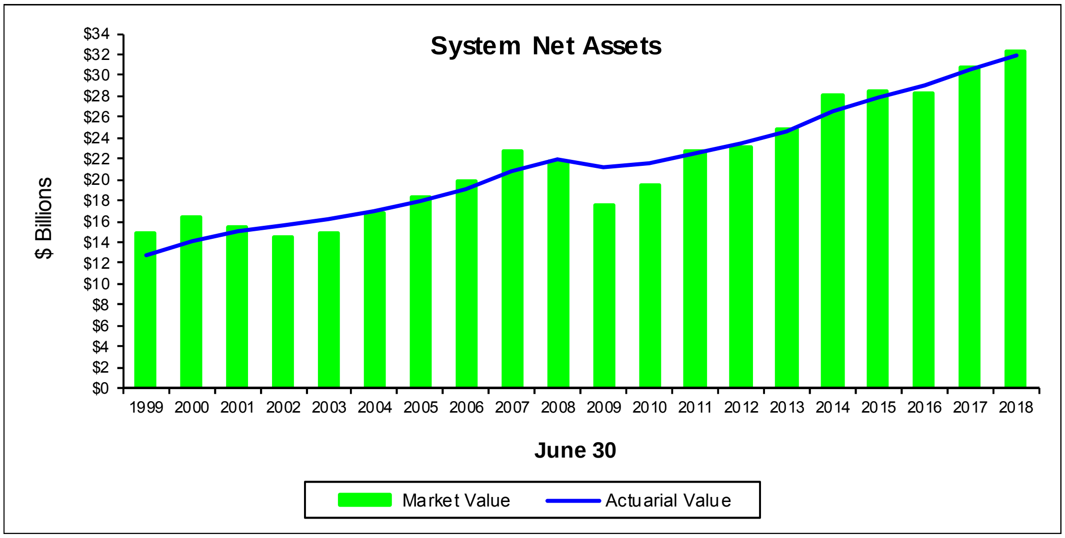

EXHIBIT 5

SUMMARY OF FAVORABLE EXPERIENCE DIVIDEND RESERVE

1. Initial Market Value of FED Reserve as of June 30, 2018	$	0
2. Transfer to Membership Groups		0
3. Final Value of FED Reserve as of June 30, 2018 (1) - (2)	$	0

SECTION III

SYSTEM LIABILITIES

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SECTION III

SYSTEM LIABILITIES

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to the period in which benefits are earned, rather than to the period of benefit distribution. There are several methods used to allocate the cost of benefits to members' working lifetimes. These mathematical techniques are called actuarial cost methods.

The method used for this valuation is referred to as the "entry age normal" actuarial cost method. In general, under this method, a contribution that is a level percent of rates of pay is determined for each member, which if paid from date of hire to retirement date, will finance all future benefit payments. The level percent of pay that is developed is called the **"normal cost"**. The sum of the individual normal cost dollar amounts is divided by expected covered payroll of current actives to determine the normal cost rate for the System.

The actuarial liability is that portion of the present value of future benefits (PVFB) that will not be paid by the normal costs in future years. The difference between this liability and the actuarial value of assets as of the same date is referred to as the **unfunded actuarial liability (UAL).** If contributions exceed the normal cost for the year, after allowing for interest on the previous balance of the UAL, this liability will be reduced. Benefit changes, experience gains and losses, and changes in actuarial assumptions or procedures will also have an effect on the total actuarial liability and on the portion of it that is unfunded.

The UAL is projected to the following year to reflect the time lag from the valuation date to the date the contribution rates are effective and is then amortized according to the Actuarial Amortization Method adopted by the Investment Board.

Effective with the June 30, 2008 valuation, a transfer of assets is performed as of June 30th for all employees whose membership group changed since the prior valuation. The purpose behind the transfer is to better match the assets and liabilities for each membership group by having both the assets and liabilities for each member reside in their current membership group. When employees move between membership groups, an asset transfer for valuation purposes is made based on the funded ratio of their former group prior to the transfer. The asset transfer calculation is determined by multiplying the actuarial liability of the employee transferring by the funded ratio of their former group just prior to the transfer. The asset values after the transfers and the liabilities for the employees reside in their current membership group and are used to prepare the final valuation results.

A summary of the number of employees who transferred is shown below:

From	**To**		
	Regular	**Sheriffs and Deputies**	**Protection Occupation**
Regular		17	191
Sheriffs and Deputies	4		22
Protection Occupation	131	72	

The impact on the UAL from the transfer is shown below:

Regular	**Sheriffs and Deputies**	**Protection Occupation**
($2,977,988)	$1,042,226	$1,949,395

EXHIBIT 6

PRESENT VALUE OF FUTURE BENEFITS
as of June 30, 2018

The actuarial present value of future benefits represents the current value of benefits expected to ultimately be earned by the current members of the System as of the valuation date.

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
Present Value of Future Benefits:				
Active Members				
Retirement benefits	$21,142,587,266	$508,105,531	$1,120,852,669	$22,771,545,466
Death benefits	257,502,749	6,913,861	21,969,590	286,386,200
Termination benefits	1,082,558,342	21,763,890	125,146,842	1,229,469,074
Disability benefits	441,522,391	15,495,550	47,379,439	504,397,380
Inactive Members				
Vested members	751,576,093	10,037,566	45,640,843	807,254,502
Nonvested members	96,756,451	253,980	2,277,399	99,287,830
Retired Members and Beneficiaries	19,516,533,248	341,195,487	801,836,796	20,659,565,531
Total Present Value of Future Benefits	$43,289,036,540	$903,765,865	$2,165,103,578	$46,357,905,983

EXHIBIT 7

UNFUNDED ACTUARIAL LIABILITY
as of June 30, 2018

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
1. Present Value of Future Benefits	$43,289,036,540	$903,765,865	$2,165,103,578	$46,357,905,983
2. Present Value of Future Normal Costs	6,999,875,655	206,426,455	508,770,220	7,715,072,330
3. Actuarial Liability (1) - (2)	$36,289,160,885	$697,339,410	$1,656,333,358	$38,642,833,653
4. Actuarial Value of Net Assets	29,513,302,525	682,505,577	1,631,947,762	31,827,755,864
5. Unfunded Actuarial Liability (3) - (4)	$6,775,858,360	$14,833,833	$24,385,596	$6,815,077,789
6. Funded Ratio (4) / (3)	81.3%	97.9%	98.5%	82.4%

EXHIBIT 8

CALCULATION OF ACTUARIAL (GAIN)/LOSS AND ANY TRANSFER TO THE FAVORABLE EXPERIENCE DIVIDEND RESERVE
Based on the June 30, 2018 Actuarial Valuation

The Favorable Experience Dividend (FED) reserve account was created by legislation in 1998. The main purpose of the account is to help offset the negative impact of postretirement inflation for members who retired after June 30, 1990. The law provided that a portion of the favorable actuarial experience, if any, in subsequent years would be transferred to the FED reserve. Legislation passed in 2000 capped the FED reserve at ten years of expected payouts at the maximum level. Further legislation in 2006 prohibited further transfers to the FED until the System has no remaining UAL. The System currently has an UAL so no transfer is to be made this year, nor is any future transfer assumed for any actuarial valuation calculations.

1. June 30, 2017 Unfunded Actuarial Liability	$	6,968,134,950
2. Normal Cost for year ending June 30, 2018		806,277,386
3. Employer and Employee Contributions*		1,198,158,537
4. Change due to membership transfers		13,633
5. Change due to FED transfer		0
6. Change due to assumptions		34,635,401
7. Expected Unfunded Actuarial Liability as of June 30, 2018 [(1) + (2)] * 1.07 - (3) * $(1.07)^{.5}$ + (4) + (5) + (6)		7,113,885,406
8. Actual Unfunded Actuarial Liability as of June 30, 2018		6,815,077,789
9. (Gain)/loss (8) - (7)		(298,807,617)
10. Portion of gain to transfer to FED		N/A
11. Amount of Actuarial Value of Assets to transfer to FED	$	0
12. Market value of FED transfer	$	0

* Does not include service purchases

EXHIBIT 9

ACTUARIAL (GAIN)/LOSS BY GROUP
Based on the June 30, 2018 Actuarial Valuation

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
1. Expected Actuarial Liability				
a. Actuarial Liability at June 30, 2017	$35,176,950,577	$691,205,752	$1,572,225,700	$37,440,382,029
b. Normal Cost for FY 2018	734,000,976	17,753,900	54,522,510	806,277,386
c. Benefit Payments for FY 2018	(2,000,043,725)	(32,686,442)	(78,622,190)	(2,111,352,357)
d. Interest on (a), (b), and (c) at 7.0%	2,444,949,018	48,502,499	111,167,139	2,604,618,656
e. Transfers and Service Purchases	(1,400,792)	4,033,278	2,170,090	4,802,576
f. Change due to assumption changes	63,506,324	(27,286,341)	(1,584,582)	34,635,401
g. Expected Actuarial Liability as of June 30, 2018	$36,417,962,378	$701,522,646	$1,659,878,667	$38,779,363,691
2. Actuarial Liability at June 30, 2018	$36,289,160,885	$697,339,410	$1,656,333,358	$38,642,833,653
3. Actuarial Liability (Gain)/Loss (2) - (1g)	($128,801,493)	($4,183,236)	($3,545,309)	($136,530,038)
4. Expected Actuarial Value of Assets				
a. Actuarial Value of Assets at June 30, 2017	$28,292,612,060	$642,509,070	$1,537,125,949	$30,472,247,079
b. Contributions for FY 2018	1,123,598,131	21,129,908	58,060,144	1,202,788,183
c. Benefit Payments for FY 2018	(2,000,043,725)	(32,686,442)	(78,622,190)	(2,111,352,357)
d. Interest on (a), (b), and (c) at 7.0%	1,950,326,066	44,577,997	106,891,317	2,101,795,380
e. Transfers	(3,073,208)	3,302,953	(229,745)	0
f. Expected Actuarial Value of Assets as of June 30, 2018	$29,363,419,324	$678,833,486	$1,623,225,475	$31,665,478,285
5. Actuarial Value of Assets at June 30, 2018	$29,513,302,525	$682,505,577	$1,631,947,762	$31,827,755,864
6. Actuarial Value of Assets (Gain)/Loss (4f) - (5)	($149,883,201)	($3,672,091)	($8,722,287)	($162,277,579)
7. Net Actuarial (Gain)/Loss (3) + (6)	($278,684,694)	($7,855,327)	($12,267,596)	($298,807,617)

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SECTION IV

SYSTEM CONTRIBUTIONS

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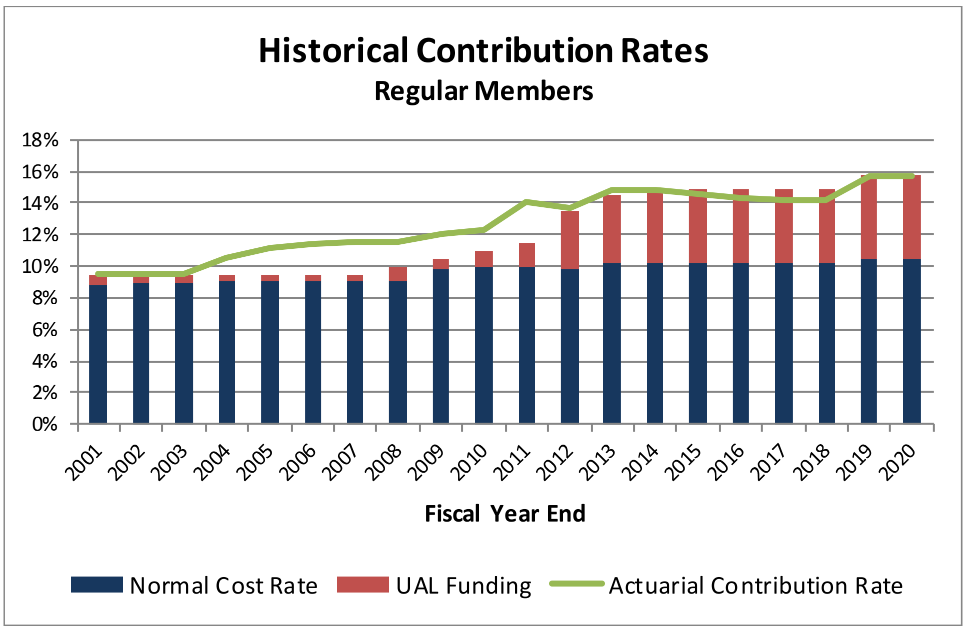
Under the actuarial funding method described in Appendix C, the actuarial contribution rate consists of two elements:

(1) the normal cost rate and
(2) the contribution rate to amortize the unfunded actuarial liability as a level percent of payroll.

The unfunded actuarial liability represents the difference between the portion of the present value of future benefits allocated to service credited prior to the valuation date by the actuarial cost method and the actuarial value of assets as of that date.

In 2006 and 2010, legislation was passed that increased the statutory contribution rate for Regular members. Beginning with the 2011 valuation (applicable for contributions for FY 2013), the Investment Board was given the authority to set the Required Contribution Rate for Regular members subject to certain statutory limitations. A historical summary of the actual contribution rate and the actuarial contribution rate is shown in the graph below:



Effective with the June 30, 2008 valuation, a transfer of assets is performed on June 30th for all split service members (those members with service in more than one membership group) whose membership group changed since the prior valuation. In addition, IPERS also transfers assets for certain split service members who have not changed groups since the last valuation. As a result, all assets and liabilities for each member reside in their current membership group. When members move between membership groups, an asset transfer for valuation purposes is made based on the funded ratio of their former group prior to the transfer. The asset transfer calculation is determined by multiplying the actuarial liability of the members transferring by the funded ratio of their former group just prior to the transfer. The asset values after the transfers and the liabilities for the members reside in their current membership group and are used to prepare the final valuation results.

EXHIBIT 10

ACTUARIAL BALANCE SHEET
as of June 30, 2018

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
ASSETS				
Actuarial value of assets	$29,513,302,525	$682,505,577	$1,631,947,762	$31,827,755,864
Present value of future normal costs	6,999,875,655	206,426,455	508,770,220	7,715,072,330
Present value of future contributions to amortize unfunded actuarial liability	6,775,858,360	14,833,833	24,385,596	6,815,077,789
Total Net Assets	$43,289,036,540	$903,765,865	$2,165,103,578	$46,357,905,983
LIABILITIES				
Present Value of Future Benefits:				
Retired Members and Beneficiaries	$19,516,533,248	$341,195,487	$801,836,796	$20,659,565,531
Active Members	22,924,170,748	552,278,832	1,315,348,540	24,791,798,120
Inactive Members	848,332,544	10,291,546	47,918,242	906,542,332
Total Liabilities	$43,289,036,540	$903,765,865	$2,165,103,578	$46,357,905,983

EXHIBIT 11

PROJECTED UNFUNDED ACTUARIAL LIABILITY ON JUNE 30, 2019

	Regular Membership	Sheriffs & Deputies	Protection Occupation
1. FYE 2019 Required Contribution Rate	15.73%	19.52%	17.02%
2. Normal Cost Rate	10.49%	16.85%	15.22%
3. Contribution Rate Applied to Fund the UAL for FYE 2019 (1) - (2)	5.24%	2.67%	1.80%
4. Unfunded Actuarial Liability/(Surplus) on June 30, 2018	$ 6,775,858,360	$ 14,833,833	$ 24,385,596
5. Expected Payroll for FYE 2019	$ 7,815,927,502	$ 119,826,920	$ 366,478,767
6. Projected UAL on June 30, 2019 [(4) x 1.07] - [(3) x (5) x $1.07^{.5}$]	$ 6,826,521,872	$ 12,562,738	$ 19,268,993

EXHIBIT 12

UAL AMORTIZATION BASES
REGULAR MEMBERS

Amortization Bases	Original Amount	Remaining Payments	Projected July 1, 2019 Balance	Annual Payment*
2014 Initial UAL	$ 5,592,056,086	26	$ 5,959,084,968	$ 357,382,830
2015 Experience	(193,648,198)	17	(192,403,659)	(15,338,869)
2016 Experience	21,763,596	18	21,687,879	1,659,279
2017 Experience	(158,062,524)	19	(157,506,466)	(11,598,999)
2017 Assumption Changes	1,435,708,789	19	1,430,658,025	105,355,683
2018 Experience	(310,129,854)	20	(310,129,854)	(22,041,702)
2018 Assumption Changes	75,130,979	20	75,130,979	5,339,746
Total			**$ 6,826,521,872**	**$ 420,757,968**

* Payment amount reflects mid-year timing.

1. Total UAL Amortization Payments	$	420,757,968
2. Projected Payroll for FYE 2019	$	7,815,927,502
3. Projected Payroll for FYE 2020 (2) x 1.0325	$	8,069,945,146
4. UAL Amortization Payment Rate (1) / (3)		5.21%

Note: Based on the Actuarial Amortization Method, adopted by the Investment Board, annual net experience gains/losses are amortized over a new, closed 20-year period.

EXHIBIT 13

UAL AMORTIZATION BASES
SHERIFFS & DEPUTIES

Amortization Bases	Original Amount	Remaining Payments	Projected July 1, 2019 Balance	Annual Payment*
2014 Initial UAL	$ 27,848,921	26	$ 29,676,756	$ 1,779,797
2015 Experience	(6,576,758)	17	(6,534,491)	(520,945)
2016 Experience	(1,325,410)	18	(1,320,799)	(101,051)
2017 Experience	(1,155,794)	19	(1,151,728)	(84,815)
2017 Assumption Changes	29,533,033	19	29,429,137	2,167,203
2018 Experience	(8,393,018)	20	(8,393,018)	(596,513)
2018 Assumption Changes	(29,143,119)	20	(29,143,119)	(2,071,274)
Total			**$ 12,562,738**	**$ 572,402**

* Payment amount reflects mid-year timing.

1. Total UAL Amortization Payments	$	572,402
2. Projected Payroll for FYE 2019	$	119,826,920
3. Projected Payroll for FYE 2020 (2) x 1.0325	$	123,721,295
4. UAL Amortization Payment Rate (1) / (3)		0.46%

Note: Based on the Actuarial Amortization Method, adopted by the Investment Board, annual net experience gains/losses are amortized over a new, closed 20-year period.

EXHIBIT 14

UAL AMORTIZATION BASES
PROTECTION OCCUPATION

Amortization Bases	Original Amount	Remaining Payments	Projected July 1, 2019 Balance	Annual Payment*
2017 Initial UAL	$ 37,219,648	19	$ 37,088,711	$ 2,731,265
2018 Experience	(12,116,416)	20	(12,116,416)	(861,144)
2018 Assumption Changes	(5,703,302)	20	(5,703,302)	(405,348)
Total			**$ 19,268,993**	**$ 1,464,773**

* Payment amount reflects mid-year timing.

1. Total UAL Amortization Payments	$	1,464,773
2. Projected Payroll for FYE 2019	$	366,478,767
3. Projected Payroll for FYE 2020 (2) x 1.0325	$	378,389,327
4. UAL Amortization Payment Rate (1) / (3)		0.39%

Note: Based on the Actuarial Amortization Method, adopted by the Investment Board, annual net experience gains/losses are amortized over a new, closed 20-year period.

EXHIBIT 15

ANALYSIS OF CONTRIBUTION RATE

The actuarial cost method used to determine the required level of annual contributions by the employees and the employers to support the expected benefits is the Entry Age Normal Cost Method. Under this method, the total cost is comprised of the normal cost rate and the unfunded actuarial liability payment. The payment to amortize the unfunded actuarial liability is determined as a level percentage of payroll, based on the Actuarial Amortization Method, adopted by the Investment Board. This method was revised by the Investment Board in September 2013 (see Appendix C). The contribution rate developed in this exhibit is based on the Funding Policy and the June 30, 2018 actuarial valuation and applies to the fiscal year beginning July 1, 2019 and ending June 30, 2020.

	Regular Membership	Sheriffs & Deputies	Protection Occupation
1. Normal Cost Rate	10.49%	16.85%	15.22%
2. UAL Contribution Rate for FY 2020	5.21%	0.46%	0.39%
3. Funded Ratio as of June 30, 2018	81.3%	97.9%	98.5%
Funded Ratio as of June 30, 2017	80.4%	93.0%	97.8%
Funded Ratio as of June 30, 2016	82.9%	96.4%	100.9%
4. UAL Contribution Rate Applicable for FY 2020** (2) if positive	5.21%	0.46%	0.39%
5. Actuarial Contribution Rate for FY 2020 (1) + (4)	15.70%	17.31%	15.61%
6. Required Contribution Rate for FY 2019	15.73%	19.52%	17.02%
7. Required Contribution Rate for FY 2020*	15.73%	19.02%	16.52%
Employer Contribution Rate	9.44%	9.51%	9.91%
Employee Contribution Rate	6.29%	9.51%	6.61%

* The Required Contribution Rate is the Actuarial Contribution Rate, but not more than 1% greater than the prior year's Required Contribution Rate for Regular Members, nor lower than the prior year's Required Contribution Rate unless the difference is at least 0.50% and the funded ratio is at least 95%, in which case the Required Contribution Rate is the prior year's Required Contribution Rate less 0.50% for all groups.

** The UAL Contribution Rate is allowed to be negative only if the funded ratio was at least 110% in each of the past three years.

EXHIBIT 16

UNFUNDED ACTUARIAL LIABILITY AMORTIZATION SCHEDULE
REGULAR MEMBERS

This schedule illustrates the funding of the UAL over the remaining amortization period assuming all assumptions are met in the future (no experience gains or losses).

Fiscal Year Ending June 30	Projected Active Member Payroll	Unfunded Actuarial Liability (BOY)	Annual Contributions	
			Dollars	% of Payroll
	--------------$ in millions--------------			
2020	8,070	6,827	421	5.21
2021	8,332	6,869	434	5.21
2022	8,603	6,901	449	5.21
2023	8,883	6,920	463	5.21
2024	9,171	6,925	478	5.21
2025	9,469	6,915	494	5.21
2026	9,777	6,888	510	5.21
2027	10,095	6,843	526	5.21
2028	10,423	6,778	543	5.21
2029	10,762	6,690	561	5.21
2030	11,111	6,578	579	5.21
2031	11,473	6,439	598	5.21
2032	11,845	6,271	618	5.21
2033	12,230	6,071	638	5.21
2034	12,628	5,837	658	5.21
2035	13,038	5,564	680	5.21
2036	13,462	5,251	702	5.21
2037	13,900	4,892	751	5.40
2038	14,351	4,458	773	5.38
2039	14,818	3,970	626	4.22
2040	15,299	3,601	678	4.43
2041	15,797	3,153	700	4.43
2042	16,310	2,650	722	4.43
2043	16,840	2,088	746	4.43
2044	17,387	1,463	770	4.43
2045	17,952	769	795	4.43
2046	18,536	0	0	0.00

SECTION V

HISTORICAL FUNDING AND OTHER INFORMATION

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SECTION V – HISTORICAL FUNDING AND OTHER INFORMATION

In this section, we provide some historical information regarding the funding progress of the System. These exhibits retain some of the information that used to be required for accounting purposes and are included because they provide relevant information on the System's historical funding.

EXHIBIT 17

SUMMARY OF VALUATION MEMBERSHIP

	June 30, 2018	June 30, 2017
Active Employees:		
Vested	98,237	98,675
Not yet vested	72,139	71,234
Total active employees	170,376	169,909
Retirees and beneficiaries currently receiving benefits*	120,755	117,508
Inactive vested members entitled to benefits but not yet receiving them	25,693	25,984
Inactive, nonvested members entitled to a refund of contributions**	44,330	41,971

* Retired/reemployed members are included in retiree counts, but not the active or inactive counts. Counts are 10,601 for 2018 and 10,787 for 2017.

** Includes deceased vested inactive members with employee contributions still held by the System.

EXHIBIT 18

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Net Actuarial Value of Assets (a)	Actuarial Liability (AL) (b)	Unfunded AL (UAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (P/R) (c)	UAL as a Percentage of Covered P/R [(b-a)/c]
6/30/03	$16,120,476,011	$17,987,374,960	1,866,898,949	89.62%	$4,881,100,238	38.25%
6/30/04	16,951,942,539	19,128,410,606	2,176,468,067	88.62%	5,072,027,906	42.91%
6/30/05	17,951,490,071	20,240,098,667	2,288,608,596	88.69%	5,236,860,886	43.70%
6/30/06	19,144,036,519	21,651,122,419	2,507,085,900	88.42%	5,523,863,321	45.39%
6/30/07	20,759,628,415	23,026,113,782	2,266,485,367	90.16%	5,781,706,199	39.20%
6/30/08	21,857,423,183	24,522,216,589	2,664,793,406	89.13%	6,131,445,367	43.46%
6/30/09	21,123,979,941	26,018,593,823	4,894,613,882	81.19%	6,438,643,124	76.02%
6/30/10	21,537,458,560	26,468,419,650	4,930,961,090	81.37%	6,571,182,005	75.04%
6/30/11	22,575,309,199	28,257,080,114	5,681,770,915	79.89%	6,574,872,719	86.42%
6/30/12	23,530,094,461	29,446,197,486	5,916,103,025	79.91%	6,786,158,720	87.18%
6/30/13	24,711,096,187	30,498,342,320	5,787,246,133	81.02%	6,880,131,134	84.12%
6/30/14	26,460,428,085	32,004,456,088	5,544,028,003	82.68%	7,099,277,280	78.09%
6/30/15	27,915,379,103	33,370,318,731	5,454,939,628	83.65%	7,326,348,141	74.46%
6/30/16	29,033,696,587	34,619,749,147	5,586,052,560	83.86%	7,556,515,720	73.92%
6/30/17	30,472,423,914	37,440,382,029	6,967,958,115	81.39%	7,863,160,443	88.62%
6/30/18	31,827,755,864	38,642,833,653	6,815,077,789	82.36%	7,983,219,527	85.37%

Note: Includes all three membership groups.

EXHIBIT 19

SCHEDULE OF EMPLOYER CONTRIBUTIONS

The Employer Actuarial Contribution Rate (ACR) is determined as a rate of pay as part of the annual valuation. The dollar amounts displayed in this table are based on analysis by IPERS each year to consider the actual contributions received (using the actual contribution rate in effect) and then determining what the ACR amount would have been on the same payroll.

	Actuarial Contribution Rate (ACR)				Percentage of ACR Contributed			
Fiscal Year Ending	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
6/30/03	$270,363,338	$5,670,239	$13,738,478	$289,772,054	99.2%	100.0%	100.0%	99.2%
6/30/04	309,006,609	5,489,797	14,263,836	328,760,242	90.3%	100.0%	100.0%	90.9%
6/30/05	341,552,685	6,236,611	15,391,729	363,181,025	84.7%	100.0%	100.0%	85.6%
6/30/06	364,424,911	6,228,675	16,888,833	387,542,419	82.7%	100.0%	100.0%	83.8%
6/30/07	387,578,925	6,577,652	17,723,013	411,879,590	82.2%	100.0%	100.0%	83.3%
6/30/08	408,882,080	6,301,171	17,644,966	432,828,217	96.4%	100.0%	100.0%	87.2%
6/30/09	441,951,764	6,365,911	24,736,688	473,054,363	86.9%	100.0%	100.0%	87.8%
6/30/10	467,839,274	6,725,778	27,328,184	501,893,236	88.7%	100.0%	100.0%	89.5%
6/30/11	530,692,453	7,994,058	29,711,050	568,397,561	81.1%	100.0%	100.0%	82.3%
6/30/12	528,525,785	8,999,273	30,864,449	568,389,507	98.1%	100.0%	100.0%	98.2%
6/30/13	573,480,969	9,246,766	32,118,873	614,846,608	97.8%	100.0%	100.0%	98.0%
6/30/14	596,983,323	9,583,512	32,434,713	639,001,548	100.0%	100.0%	100.0%	100.0%
6/30/15	602,423,393	9,588,844	32,548,775	644,561,012	102.1%	102.4%	101.7%	101.9%
6/30/16	618,051,508	9,427,481	32,612,466	660,091,455	103.7%	110.4%	102.2%	103.7%
6/30/17	628,387,062	9,507,927	33,623,646	671,518,635	105.0%	110.1%	102.4%	105.0%
6/30/18	641,386,156	9,753,998	33,724,988	684,865,142	104.7%	108.3%	102.6%	104.7%

EXHIBIT 20

EXPECTED BENEFIT PAYMENTS

The following table shows the expected benefit payments to be made over the next 20 years. These payments include those expected to be made to current retirees and beneficiaries, current active members, and current deferred vested members (included in the active values) if all actuarial assumptions are met in future years. The benefits reflected include expected refunds and death benefits as well as retirement benefit payments.

These payouts do not include any current non-vested inactive members, any future members, or any FED payments.

Fiscal Year End	Actives at 6/30/18	Retirees at 6/30/18	Total
2019	$166,744,000	$2,053,503,000	$2,220,247,000
2020	306,494,000	2,019,709,000	2,326,203,000
2021	445,948,000	1,983,652,000	2,429,600,000
2022	583,684,000	1,946,054,000	2,529,738,000
2023	720,328,000	1,906,355,000	2,626,683,000
2024	855,253,000	1,864,726,000	2,719,979,000
2025	989,084,000	1,820,811,000	2,809,895,000
2026	1,127,198,000	1,775,009,000	2,902,207,000
2027	1,266,610,000	1,727,083,000	2,993,693,000
2028	1,405,774,000	1,676,793,000	3,082,567,000
2029	1,545,816,000	1,624,752,000	3,170,568,000
2030	1,686,469,000	1,571,083,000	3,257,552,000
2031	1,827,304,000	1,515,367,000	3,342,671,000
2032	1,968,139,000	1,457,680,000	3,425,819,000
2033	2,111,524,000	1,398,082,000	3,509,606,000
2034	2,255,042,000	1,336,675,000	3,591,717,000
2035	2,397,728,000	1,273,578,000	3,671,306,000
2036	2,538,459,000	1,208,943,000	3,747,402,000
2037	2,681,193,000	1,142,957,000	3,824,150,000
2038	2,824,227,000	1,075,855,000	3,900,082,000

Note: Cash flows are the expected future non-discounted payments to current members. These numbers exclude refund payouts to current non-vested inactives and assume future retirees elect the normal form of annuity payment (Option 2) and future withdrawals elect refunds according to valuation assumptions. All three membership groups are included.

RISK CONSIDERATIONS

While actuarial assumptions allow for a projection of how future contributions and investment returns will meet the cash flow needs for future benefit payments, actual experience will not unfold exactly as anticipated by the assumptions. In this section, we discuss some of the risk factors that can have a significant impact – good or bad – on the actuarial projection of liability and contribution rates.

There are a number of risks inherent in the funding of a defined benefit plan. These include:

- economic risks, such as investment return and inflation;
- demographic risks such as mortality, payroll growth, aging population including impact of baby boomers, and retirement ages; and
- external risks such as the regulatory and political environment.

The most significant risk factor is investment return because of the volatility of returns and the size of plan assets compared to payroll (see Exhibit 20). A perusal of historical rates over 10-20 years reveals that the actual return each year is rarely close to the average return for the same period. This is an expected result given the underlying capital market assumptions and the asset allocation.

A key demographic risk for all retirement systems, including IPERS, is improvements in mortality (longevity) greater than anticipated. While the actuarial assumptions reflect small, continuous improvements in mortality experience and these assumptions are refined every experience study, the risk arises because there is a possibility of some sudden shift, perhaps from a significant medical breakthrough that could quickly increase liabilities, Likewise, there is some possibility of a significant public health crisis that could result in a significant number of additional deaths in a short time period, would also be significant, although more easily absorbed.

Finally, the projections for funding anticipate a stable employment level, i.e., active member count remains the same. A significant change in the employment level of governmental employees, perhaps resulting from a sustained decline in the Iowa population over time, could have an adverse impact on the System's funding status.

As a plan matures and the funded status changes, the risk factors may change. The following three exhibits summarize some historical information that helps indicate how certain key risk metrics have changed over time.

EXHIBIT 21

HISTORICAL LEVERAGE RATIO

As a retirement system matures, the size of the market value of assets increases relative to the covered payroll of active members, on which the System is funded. The size of the plan assets relative to covered payroll, sometimes referred to as a leverage ratio, is an important indicator of the contribution risk for the System. The higher this ratio, the more sensitive a plan's contribution rate is to investment return volatility.

	Market Value of Assets ($ Millions)			Covered Payroll ($ Millions)			Leverage Ratio		
Fiscal Year End	Regular Members	Sheriffs & Deputies	Protection Occupation	Regular Members	Sheriffs & Deputies	Protection Occupation	Regular Members	Sheriffs & Deputies	Protection Occupation
6/30/09	$16,592.7	$312.5	$698.1	$6,059.4	$85.9	$293.3	2.74	3.64	2.38
6/30/10	18,375.9	353.3	809.7	6,180.7	84.8	305.7	2.97	4.17	2.65
6/30/11	21,365.7	422.9	983.8	6,185.9	90.5	298.5	3.45	4.67	3.30
6/30/12	21,567.5	437.4	1,019.9	6,377.4	93.3	315.5	3.38	4.69	3.23
6/30/13	23,137.3	484.5	1,134.8	6,473.8	93.6	312.7	3.57	5.18	3.63
6/30/14	26,157.8	559.3	1,321.5	6,679.7	97.7	321.9	3.92	5.72	4.11
6/30/15	26,480.4	578.3	1,371.1	6,893.3	100.5	332.6	3.84	5.76	4.12
6/30/16	26,341.4	588.1	1,396.9	7,114.9	105.9	335.8	3.70	5.56	4.16
6/30/17	28,575.3	649.7	1,554.2	7,405.5	109.5	348.2	3.86	5.93	4.46
6/30/18	29,962.9	693.6	1,658.1	7,515.6	115.2	352.4	3.99	6.02	4.71

EXHIBIT 21

HISTORICAL LEVERAGE RATIO
(continued)

Fiscal	Leverage Ratio			Increase in ACR with a Return 10% Lower than Assumed		
Fiscal Year End	Regular Members	Sheriffs & Deputies	Protection Occupation	Regular Members	Sheriffs & Deputies	Protection Occupation
6/30/09	2.74	3.64	2.38	1.47%	1.95%	1.28%
6/30/10	2.97	4.17	2.65	1.59%	2.24%	1.42%
6/30/11	3.45	4.67	3.30	1.85%	2.50%	1.77%
6/30/12	3.38	4.69	3.23	1.81%	2.51%	1.73%
6/30/13	3.57	5.18	3.63	1.91%	2.78%	1.95%
6/30/14	3.92	5.72	4.11	2.10%	3.07%	2.20%
6/30/15	3.84	5.76	4.12	2.68%	4.02%	2.21%
6/30/16	3.70	5.56	4.16	2.58%	3.88%	2.23%
6/30/17	3.86	5.93	4.46	2.74%	4.21%	3.17%
6/30/18	3.99	6.02	4.71	2.84%	4.28%	3.35%

Note: The impact of asset smoothing is not reflected in the impact on the ACR.

EXHIBIT 22

HISTORICAL CASH FLOWS

Plans with negative cash flows will experience increased sensitivity to investment return volatility. Cash flows, for this purpose, are measured as contributions less benefit payments and expenses. If the System has negative cash flows and then experiences returns below the assumed rate, there are fewer assets to be reinvested to earn the higher returns that typically follow. While any negative cash flow will produce such a result, it is typically a negative cash flow of more than 5% of MVA that causes significant concerns. While this is not a concern for IPERS at this time, it is important to monitor this metric so that any trends can be identified.

Fiscal Year End	Market Value of Assets (MVA)	Contributions	Benefit Payments and Expenses	Net Cash Flow	Net Cash Flow as a Percent of MVA
6/30/07	$22,624,387,015	$574,604,219	$1,066,549,966	($491,945,747)	(2.17%)
6/30/08	21,844,112,206	634,189,547	1,120,978,091	(486,788,544)	(2.23%)
6/30/09	17,603,316,618	695,559,397	1,191,706,184	(496,146,787)	(2.82%)
6/30/10	19,538,971,423	755,210,092	1,283,181,315	(527,971,223)	(2.70%)
6/30/11	22,772,344,651	789,353,899	1,460,600,613	(671,246,714)	(2.95%)
6/30/12	23,024,773,746	942,394,013	1,554,642,740	(612,248,727)	(2.66%)
6/30/13	24,756,663,715	1,019,108,941	1,661,824,635	(642,715,694)	(2.60%)
6/30/14	28,038,549,893	1,082,521,228	1,768,869,433	(686,348,205)	(2.45%)
6/30/15	28,429,834,829	1,115,600,029	1,882,337,766	(766,737,737)	(2.70%)
6/30/16	28,326,433,656	1,176,666,912	1,965,566,274	(788,899,362)	(2.79%)
6/30/17	30,779,116,326	1,182,392,100	2,077,514,238	(895,122,138)	(2.91%)
6/30/18	32,314,588,595	1,202,788,183	2,194,788,155	(991,999,972)	(3.07%)

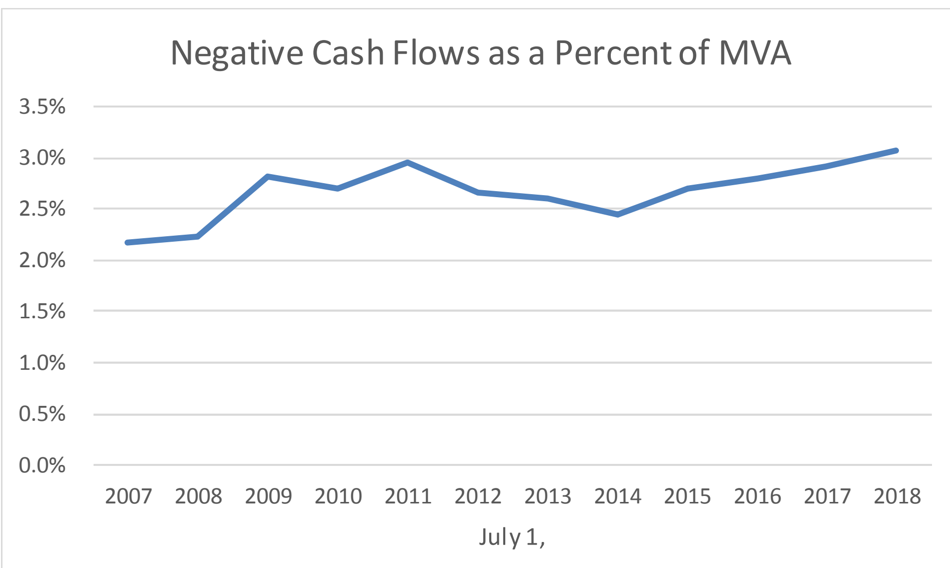

EXHIBIT 23

LIABILITY MATURITY MEASUREMENTS

Most public sector retirement systems have been in operation for many years. As a result, they have aging plan populations indicated by an increasing ratio of retirees to active members and a growing percentage of retiree liability. The retirement of the baby boomers over the next 10-15 years is expected to further exacerbate the aging of the retirement system population. With more of the total liability residing with retirees, investment volatility has a greater impact on the funding of the system since it is more difficult to restore the system financially after losses occur when there is comparatively less payroll over which to spread costs.

The retirement system is also growing larger with respect to the sponsoring entities, as can be seen by the ratio of actuarial liability to payroll.

Projections provide the most effective way of analyzing the impact of these changes on future funding measures, but studying several key metrics from the valuation can also provide some valuable insight.

Regular Members

Fiscal Year End	Retiree Liability (a)	Total Actuarial Liability (b)	Retiree Percentage (a) / (b)	Covered Payroll (c)	Ratio (b) / (c)
6/30/07	$8,941,802,561	$22,023,863,090	40.6%	$5,510,430,731	4.00
6/30/08	9,611,150,768	23,332,771,315	41.2%	5,763,634,079	4.05
6/30/09	10,238,166,793	24,733,483,621	41.4%	6,059,370,512	4.08
6/30/10	11,293,531,095	25,080,605,814	45.0%	6,180,689,916	4.06
6/30/11	12,698,425,109	26,752,154,635	47.5%	6,185,889,267	4.32
6/30/12	13,573,602,957	27,852,385,453	48.7%	6,377,421,205	4.37
6/30/13	14,329,968,181	28,799,324,938	49.8%	6,473,818,092	4.45
6/30/14	15,230,657,798	30,204,846,287	50.4%	6,679,683,181	4.52
6/30/15	16,028,939,271	31,451,851,955	51.0%	6,893,254,991	4.56
6/30/16	16,768,695,428	32,577,657,593	51.5%	7,114,861,564	4.58
6/30/17	18,304,044,337	35,176,950,577	52.0%	7,405,484,923	4.75
6/30/18	19,516,533,248	36,289,160,885	53.8%	7,515,600,156	4.83

EXHIBIT 23
(continued)

Sheriffs & Deputies

Fiscal Year End	Retiree Liability (a)	Total Actuarial Liability (b)	Retiree Percentage (a) / (b)	Covered Payroll (c)	Ratio (b) / (c)
6/30/07	$105,514,847	$345,220,872	30.6%	$78,112,455	4.42
6/30/08	119,881,091	374,066,361	32.0%	81,485,774	4.59
6/30/09	150,926,387	412,167,101	36.6%	85,935,900	4.80
6/30/10	169,436,571	447,627,643	37.9%	84,755,693	5.28
6/30/11	185,018,412	475,559,019	38.9%	90,506,138	5.25
6/30/12	195,188,608	502,716,830	38.8%	93,265,452	5.39
6/30/13	223,706,198	533,033,438	42.0%	93,607,893	5.69
6/30/14	240,964,615	556,135,092	43.3%	97,693,639	5.69
6/30/15	266,693,628	591,002,036	45.1%	100,469,418	5.88
6/30/16	281,179,979	624,791,635	45.0%	105,868,170	5.90
6/30/17	325,186,602	691,205,752	47.0%	109,516,368	6.31
6/30/18	341,195,487	697,339,410	48.9%	115,222,566	6.05

Protection Occupation

Fiscal Year End	Retiree Liability (a)	Total Actuarial Liability (b)	Retiree Percentage (a) / (b)	Covered Payroll (c)	Ratio (b) / (c)
6/30/07	$169,925,365	$657,029,820	25.9%	193,163,013	3.40
6/30/08	191,726,385	815,378,913	23.5%	286,325,514	2.85
6/30/09	234,387,583	872,943,101	26.9%	293,336,712	2.98
6/30/10	306,902,663	940,186,193	32.6%	305,736,396	3.08
6/30/11	368,833,144	1,029,366,460	35.8%	298,477,314	3.45
6/30/12	383,175,993	1,091,095,203	35.1%	315,472,063	3.46
6/30/13	446,902,048	1,165,983,944	38.3%	312,705,149	3.73
6/30/14	503,104,371	1,243,474,709	40.5%	321,900,460	3.86
6/30/15	547,545,074	1,327,464,740	41.2%	332,623,732	3.99
6/30/16	607,529,406	1,417,299,919	42.9%	335,785,986	4.22
6/30/17	705,541,965	1,572,225,700	44.9%	348,159,152	4.52
6/30/18	801,836,796	1,656,333,358	48.4%	352,396,805	4.70

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APPENDIX A

SUMMARY STATISTICS ON SYSTEM MEMBERSHIP

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APPENDIX A

SUMMARY STATISTICS ON SYSTEM MEMBERSHIP

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RECONCILIATION OF ACTIVE MEMBERS

Below is a summary of the changes in active members (excluding retired re-employed members) between June 30, 2017 and June 30, 2018.

	Regular Membership	Sheriffs & Deputies	Protection Occupation	Total
6/30/2017 Starting count	161,315	1,594	7,000	169,909
New actives	16,054	60	726	16,840
Returning actives	2,623	3	55	2,681
Nonvested Terminations	(7,237)	(14)	(172)	(7,423)
Elected Refund	(3,166)	(20)	(170)	(3,356)
Vested Terminations	(2,707)	(16)	(179)	(2,902)
Total Withdrawals	(13,110)	(50)	(521)	(13,681)
Deaths	(185)	0	(2)	(187)
Disability Retirements	(71)	(1)	(10)	(82)
AE Benefits	(226)	0	(1)	(227)
Service Retirements	(4,625)	(30)	(218)	(4,873)
Total Retirements	(4,922)	(31)	(229)	(5,182)
Other/transfer	(70)	62	4	(4)
6/30/2018 Ending count	161,705	1,638	7,033	170,376

HISTORICAL SUMMARY OF MEMBERS

The following table displays selected historical data (including Regular, Sheriffs and Deputies, and Protection Occupation groups) as available.

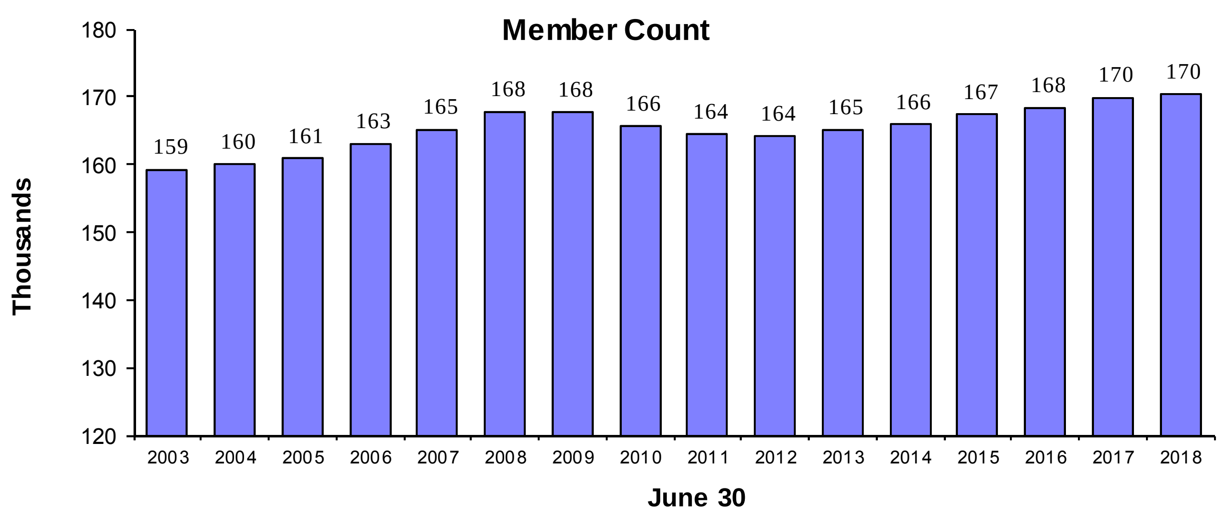
Valuation Date June 30	Total Count	Number	Average Age	Average Entry Age	Average Service	Average Annual Pay ($)	Average % Change	Number Retired Reemployed	Number Inactive Vested	Number Retired	Active/Retired Ratio
1994	216,989	141,423	44.2			22,968	1.6%			54,295	2.60
1995	216,973	144,912	44.1			23,322	1.5%			56,353	2.57
1996	221,891	147,431	44.2			25,218	8.1%			57,914	2.55
1997	224,357	147,736	44.6	33.1	11.5	26,031	3.2%		28,377	59,320	2.49
1998	241,767	148,917	44.7	33.2	11.5	26,767	2.8%		31,202	61,648	2.42
1999	250,168	152,440	44.8	33.4	11.4	27,322	2.1%	4,853	34,332	63,396	2.40
2000	249,970	153,039	44.8	33.2	11.6	29,032	6.3%	5,050	31,219	65,712	2.33
2001	255,963	154,610	45.0	33.5	11.5	30,341	4.5%	4,886	32,650	68,703	2.25
2002	264,974	158,467	45.1	33.8	11.3	32,119	5.9%	5,387	34,792	71,715	2.21
2003	268,813	159,310	45.2	33.8	11.4	31,950	-0.5%	6,126	35,375	74,128	2.15
2004	272,573	160,003	45.4	33.8	11.6	33,082	3.5%	6,438	35,788	76,782	2.08
2005	267,214	160,876	45.6	33.8	11.8	34,066	3.0%	6,592	26,919	79,419	2.03
2006	271,007	163,052	45.7	34.0	11.7	35,475	4.1%	8,044	25,918	82,037	1.99
2007	276,421	165,216	45.7	34.0	11.7	36,615	3.2%	7,848	26,435	84,770	1.95
2008	282,778	167,823	45.7	34.1	11.6	38,515	5.2%	8,523	27,626	87,309	1.92
2009	294,076	167,691	46.0	34.2	11.8	40,326	4.7%	8,427	28,240	89,718	1.87
2010	287,611	165,626	46.0	34.1	11.9	40,635	0.8%	8,347	28,472	93,513	1.77
2011	291,825	164,436	45.8	34.1	11.7	40,782	0.4%	8,321	29,077	98,312	1.67
2012	294,996	164,200	45.8	34.2	11.6	42,223	3.5%	8,265	29,119	101,677	1.61
2013	299,793	165,095	45.7	34.1	11.6	42,404	0.4%	9,925	28,443	104,640	1.58
2014	302,558	165,911	45.7	34.1	11.6	44,225	4.3%	9,931	28,713	107,934	1.54
2015	306,154	167,368	45.6	34.1	11.5	45,247	2.3%	10,295	27,659	111,127	1.51
2016	309,572	168,372	45.5	34.0	11.5	46,399	2.5%	10,608	26,960	114,240	1.47
2017	313,401	169,909	45.4	34.1	11.3	47,425	2.2%	10,787	25,984	117,508	1.45
2018	316,824	170,376	45.3	34.0	11.3	47,989	1.2%	10,601	25,693	120,755	1.41

Note: The Total Count figure represents the number of members valued in this report. The Retired Reemployed figure represents the number of members who have both an in-pay record and a not-in-pay record.

SUMMARY OF ACTIVE MEMBERS

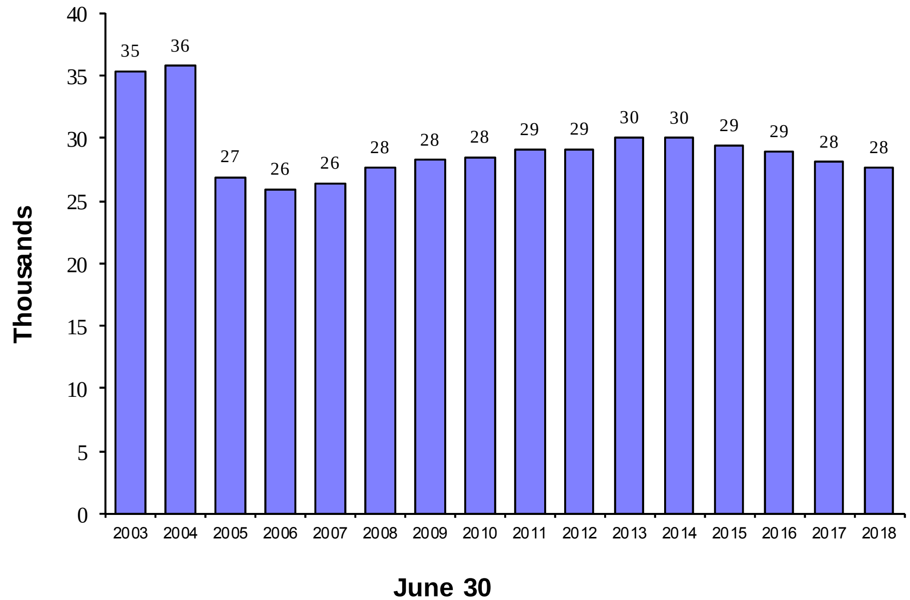
	Regular Membership	Sheriffs & Deputies	Protection Occupations	Total 6/30/2018	Total 6/30/2017	Percent Change
Total Active Members	161,705	1,638	7,033	170,376	169,909	0.3
Projected Covered Payroll* (millions)	$7,695	$118	$364	$8,176	$8,058	1.5
Average Age	45.5	41.0	41.4	45.3	45.4	(0.2)
Average Entry Age	34.2	26.5	30.5	34.0	34.1	(0.3)
Average Earnings	$47,586	$71,807	$51,712	$47,989	$47,425	1.2
Retired Reemployed	8,342	115	182	8,639	8,673	(0.4)

*Payroll figures as of June 30 are actual amounts paid during the prior fiscal year, increased by the assumed salary increase factor for the upcoming fiscal year.



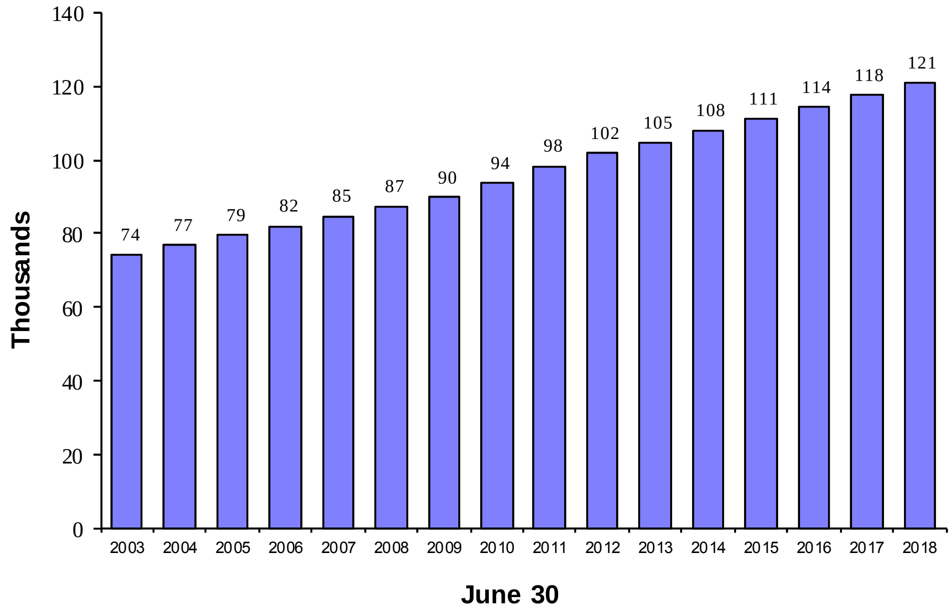
SUMMARY OF INACTIVE VESTED MEMBERS

	Regular Membership	Sheriffs & Deputies	Protection Occupations	Total 6/30/2018	Total 6/30/2017	Percent Change
Inactive Vested	24,648	104	941	25,693	25,984	(1.1%)
Inactive Retired Reemployed	1,898	19	45	1,962	2,114	(7.2%)
Total Inactive Vested	26,546	123	986	27,655	28,098	(1.6%)



SUMMARY OF RETIRED MEMBERS AND BENEFICIARIES

Regular Membership	Sheriffs & Deputies	Protection Occupations	Total 6/30/2018	Total 6/30/2017	Percent Change
116,782	988	2,985	120,755	117,508	2.8%



AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR ACTIVE MEMBERS*

Males and Females - Regular Membership

Years of Service

Age	0 to 5 No.	0 to 5 Avg. Salary	5 to 10 No.	5 to 10 Avg. Salary	10 to 15 No.	10 to 15 Avg. Salary	15 to 20 No.	15 to 20 Avg. Salary	20 to 25 No.	20 to 25 Avg. Salary	25 to 30 No.	25 to 30 Avg. Salary	30 to 35 No.	30 to 35 Avg. Salary	35 to 40 No.	35 to 40 Avg. Salary	40 and over No.	40 and over Avg. Salary	Total No.	Total Avg. Salary
Under 25	6,905	18,829	65	25,437	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	6,970	18,891
25-29	11,188	33,130	3,012	43,172	52	37,992	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	14,252	35,270
30-34	7,390	34,361	6,859	48,694	2,211	54,216	29	45,772	0	NA	0	NA	0	NA	0	NA	0	NA	16,489	43,005
35-39	6,762	33,831	4,540	48,204	5,888	59,198	1,799	61,999	17	51,834	0	NA	0	NA	0	NA	0	NA	19,006	47,805
40-44	5,680	32,091	3,895	44,417	3,575	55,766	4,522	65,616	1,221	69,065	8	57,884	0	NA	0	NA	0	NA	18,901	49,529
45-49	4,651	31,646	3,537	42,285	3,464	51,382	3,098	61,196	3,960	70,086	965	70,685	17	62,836	1	77,597	0	NA	19,693	51,349
50-54	3,873	31,129	2,885	38,340	3,298	45,583	3,217	52,514	2,754	62,796	3,074	72,059	1,046	72,527	39	63,286	0	NA	20,186	50,690
55-59	3,936	28,739	2,697	37,843	2,894	42,575	3,400	46,455	3,160	52,700	2,486	62,590	2,522	71,883	928	68,421	67	60,562	22,090	48,316
60-64	4,016	21,067	2,408	33,653	2,087	41,208	2,326	45,720	2,311	49,994	1,788	55,399	1,157	64,194	987	70,725	529	64,810	17,609	42,645
65-69	3,270	13,599	1,834	22,145	983	31,883	748	41,177	582	44,920	455	49,881	309	58,096	174	64,960	291	74,128	8,646	28,555
70 & over	3,321	16,594	1,641	14,855	805	13,453	277	17,151	83	24,889	33	36,442	17	44,717	8	64,357	20	48,493	6,205	16,209
Totals	60,992	28,376	33,373	40,925	25,257	49,470	19,416	55,003	14,088	60,049	8,809	64,563	5,068	69,299	2,137	69,099	907	67,126	170,047	43,449

*Including retired/reemployed members

AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR ACTIVE MEMBERS*

Males and Females - Sheriffs and Deputies

Years of Service

	0 to 5		5 to 10		10 to 15		15 to 20		20 to 25		25 to 30		30 to 35		35 to 40		40 and over		Total	
Age	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary
Under 25	40	46,150	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	40	46,150
25-29	128	55,137	74	63,010	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	202	58,021
30-34	67	55,456	118	63,808	71	66,891	2	55,548	0	NA	0	NA	0	NA	0	NA	0	NA	258	62,423
35-39	34	58,632	42	67,297	129	70,048	59	70,044	1	100,320	0	NA	0	NA	0	NA	0	NA	265	68,261
40-44	17	51,664	31	64,737	42	70,794	120	73,525	48	76,463	1	57,276	0	NA	0	NA	0	NA	259	71,077
45-49	13	56,326	11	66,467	32	67,832	58	72,624	102	74,507	34	80,247	1	59,709	0	NA	0	NA	251	72,645
50-54	17	22,674	12	64,855	13	68,817	26	71,966	54	73,180	70	78,974	18	74,918	1	81,897	0	NA	211	70,331
55-59	22	17,659	6	54,507	3	39,786	13	74,703	24	72,405	19	84,129	29	80,305	5	115,607	0	NA	121	66,522
60-64	21	13,939	14	27,679	2	63,381	12	65,030	1	50,669	10	83,373	14	71,759	11	73,565	14	84,203	99	55,196
65-69	13	13,597	7	11,667	6	15,619	0	NA	0	NA	1	102,928	0	NA	2	78,906	1	81,008	30	23,130
70 & over	5	8,830	4	20,605	6	41,936	2	19,915	0	NA	0	NA	0	NA	0	NA	0	NA	17	24,589
Totals	377	46,447	319	60,857	304	67,156	292	71,717	230	74,393	135	80,363	62	76,479	19	85,630	15	83,990	1,753	64,957

*Including retired/reemployed members

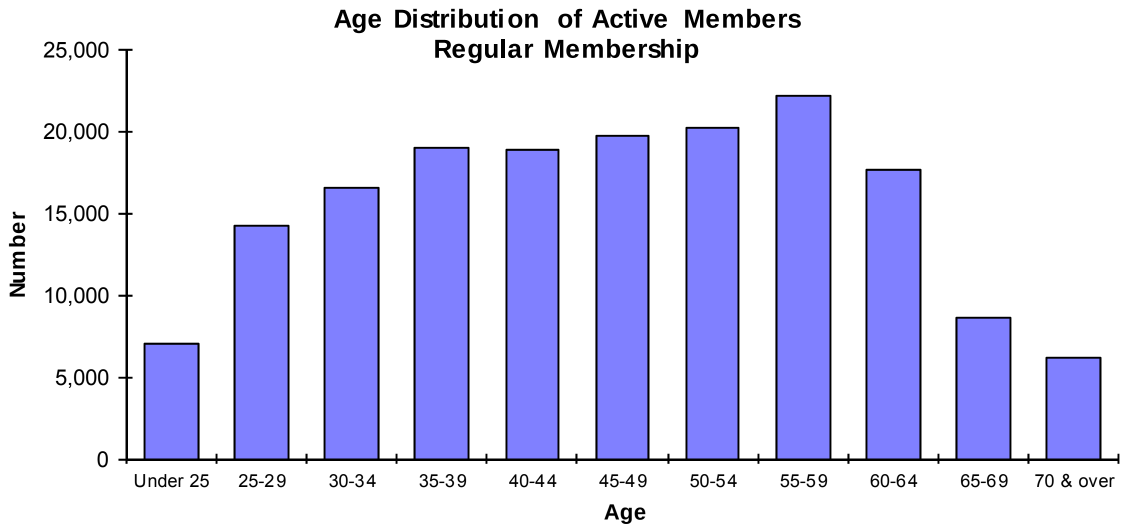
AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR ACTIVE MEMBERS*

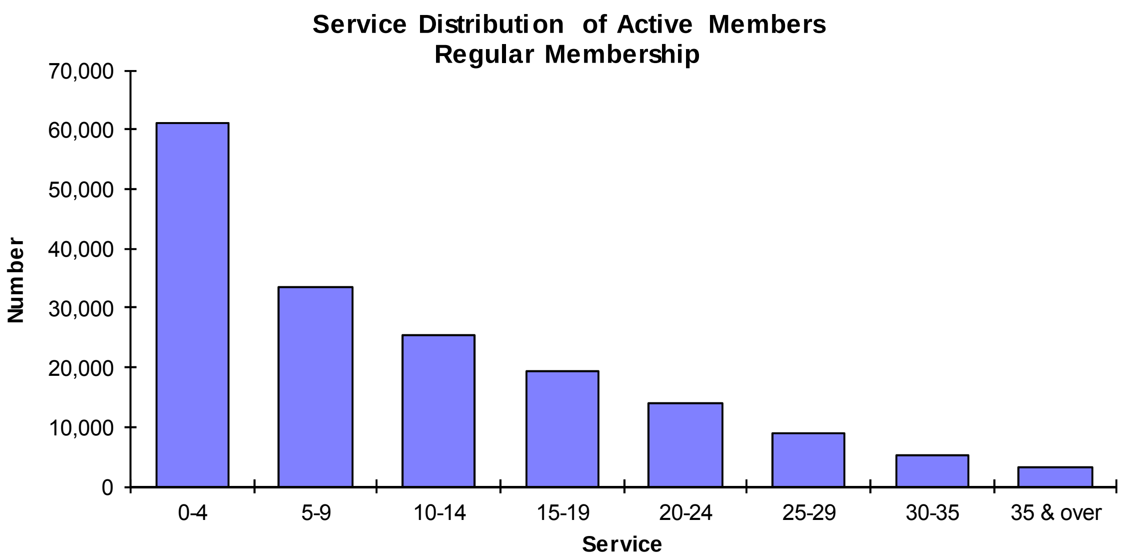
Males and Females - Protection Occupation

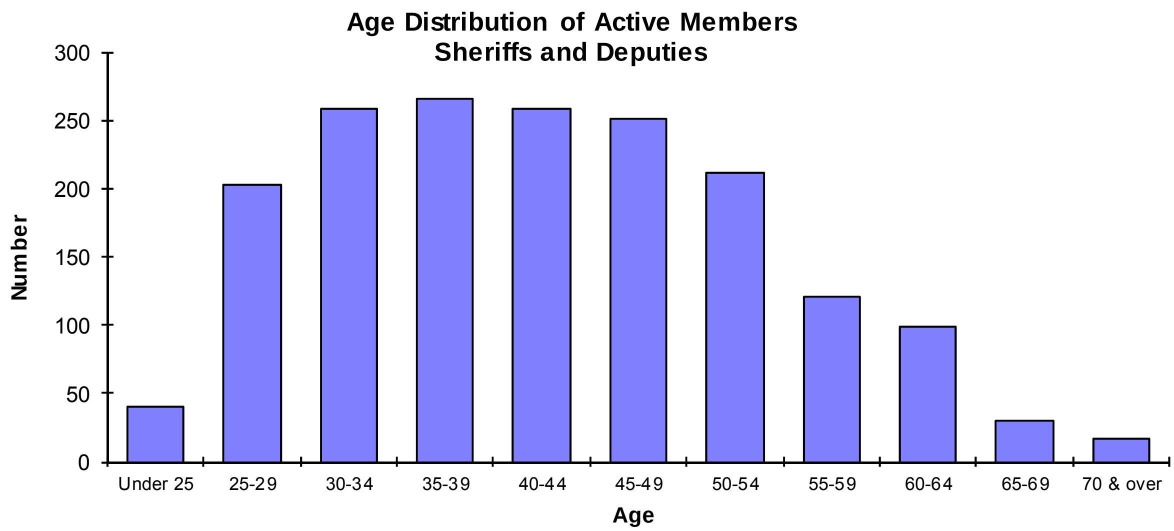
Years of Service

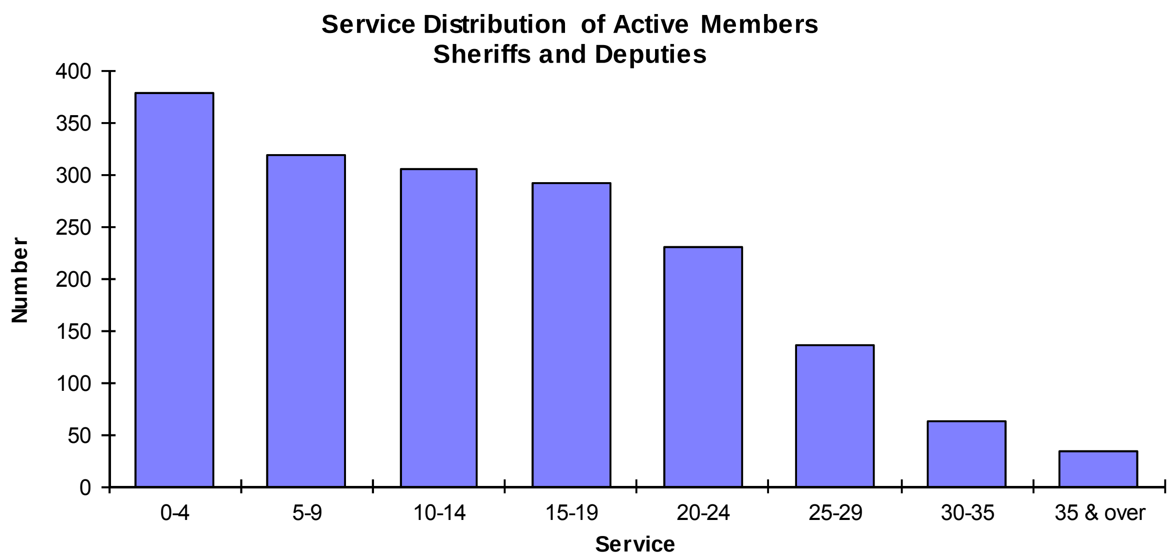
	0 to 5		5 to 10		10 to 15		15 to 20		20 to 25		25 to 30		30 to 35		35 to 40		40 and over		Total	
Age	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary	No.	Avg. Salary
Under 25	505	28,860	10	38,471	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	515	29,047
25-29	707	37,215	157	46,470	9	58,925	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	873	39,103
30-34	401	37,340	351	50,724	162	56,505	2	46,714	0	NA	0	NA	0	NA	0	NA	0	NA	916	45,879
35-39	263	33,811	230	49,851	347	58,551	108	60,525	1	68,162	0	NA	0	NA	0	NA	0	NA	949	49,821
40-44	208	35,705	157	46,627	193	57,378	234	60,757	87	63,881	3	67,923	0	NA	0	NA	0	NA	882	51,927
45-49	146	34,982	134	46,071	174	54,326	194	58,922	219	63,751	60	67,245	2	73,272	0	NA	0	NA	929	54,152
50-54	101	34,490	106	43,016	126	55,619	168	58,416	156	64,993	147	68,104	50	69,581	0	NA	0	NA	854	56,785
55-59	89	35,423	74	43,703	105	51,144	127	56,861	103	60,789	66	63,507	83	68,132	22	66,479	3	64,604	672	54,676
60-64	79	24,028	52	37,628	60	47,787	81	52,934	46	51,701	39	49,923	18	57,905	27	79,690	6	72,770	408	46,484
65-69	45	12,021	25	22,296	25	38,931	18	42,302	15	58,512	5	63,312	4	60,627	7	63,611	5	57,794	149	33,584
70 & over	37	16,537	21	12,158	3	23,734	1	12,844	5	17,076	1	2,513	0	NA	0	NA	0	NA	68	15,281
Totals	2,581	33,697	1,317	46,323	1,204	55,497	933	58,280	632	62,229	321	64,509	157	67,295	56	72,490	14	65,671	7,215	47,783

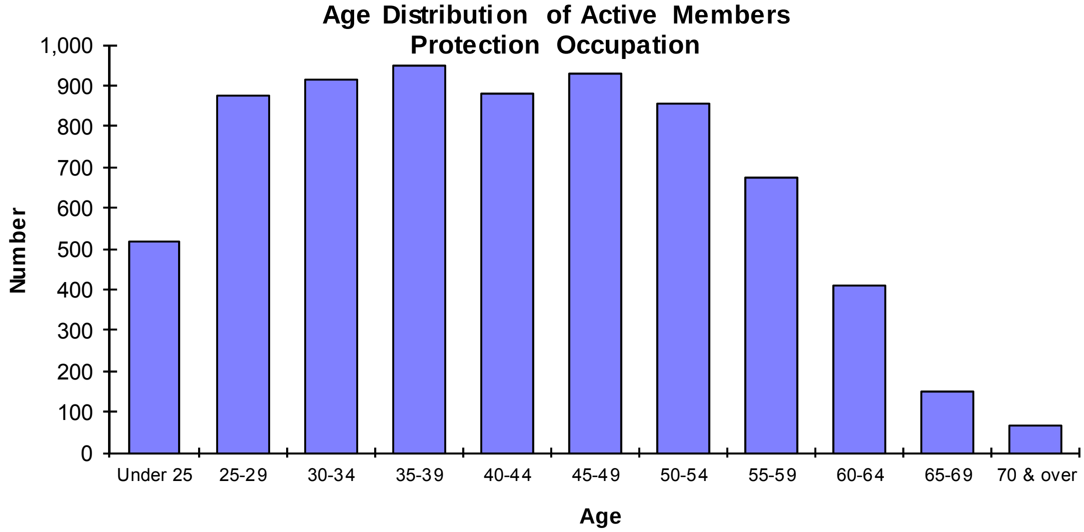
*Including retired/reemployed members

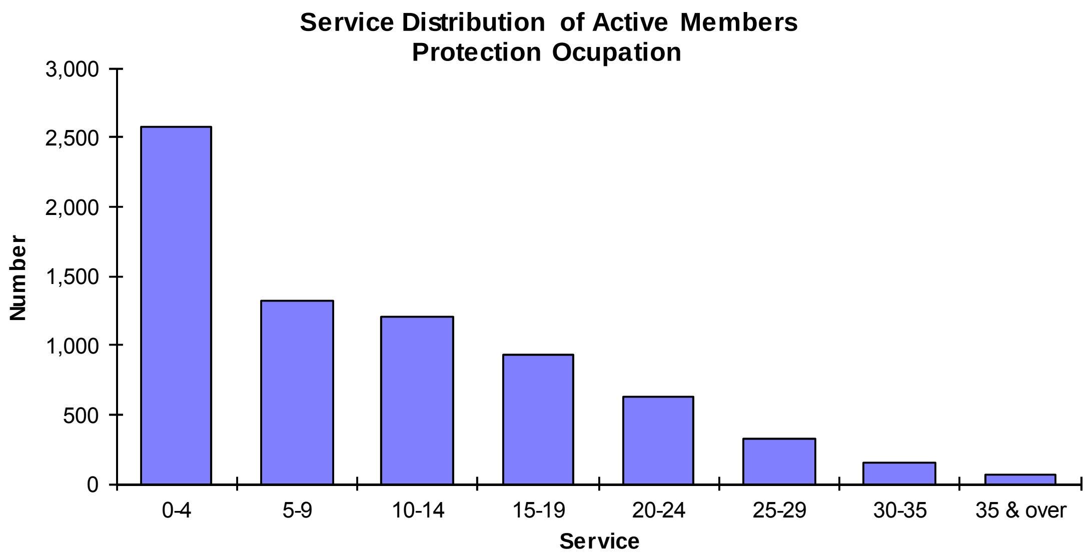

Age Distribution of Active Members
Regular Membership
Number
25,000
20,000
15,000
10,000
5,000
0
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Active Members
Regular Membership
Number
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
0-4
5-9
10-14
15-19
20-24
25-29
30-35
35 & over
Service


Age Distribution of Active Members
Sheriffs and Deputies
Number
300
250
200
150
100
50
0
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Active Members
Sheriffs and Deputies
Number
400
350
300
250
200
150
100
50
0
0-4
5-9
10-14
15-19
20-24
25-29
30-35
35 & over
Service


Age Distribution of Active Members
Protection Occupation
Number
1,000
900
800
700
600
500
400
300
200
100
0
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Active Members
Protection Ocupation
Number
3,000
2,500
2,000
1,500
1,000
500
0
0-4
5-9
10-14
15-19
20-24
25-29
30-35
35 & over
Service

AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR INACTIVE VESTED MEMBERS*

Males and Females - Regular Membership

	Years of Service																			
	0 to 5		5 to 10		10 to 15		15 to 20		20 to 25		25 to 30		30 to 35		35 to 40		40 and over		Total	
Age	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.
Under 25	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA
25-29	9	10,315	70	23,331	1	24,822	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	80	21,885
30-34	145	23,050	668	29,799	73	37,441	1	28,083	0	NA	0	NA	0	NA	0	NA	0	NA	887	29,322
35-39	415	25,779	1,287	32,449	421	40,591	33	37,808	2	56,408	0	NA	0	NA	0	NA	0	NA	2,158	32,859
40-44	325	24,443	1,317	31,130	561	41,196	198	47,141	15	35,657	0	NA	0	NA	0	NA	0	NA	2,416	33,908
45-49	386	24,469	1,496	27,292	781	34,826	351	44,388	114	52,986	10	42,563	0	NA	0	NA	0	NA	3,138	31,714
50-54	401	21,447	1,844	23,849	1,020	28,534	484	39,937	203	46,411	82	64,323	12	50,853	1	72,707	0	NA	4,047	28,760
55-59	477	18,240	2,025	20,494	1,129	24,791	583	30,774	256	35,874	103	43,642	27	51,866	3	62,012	0	NA	4,603	24,201
60-64	1,059	13,448	1,707	18,147	845	20,730	401	23,051	167	35,878	42	31,213	5	65,436	5	46,418	1	57,576	4,232	18,880
65-69	2,124	9,812	860	11,155	274	16,728	123	18,231	51	23,480	12	28,432	3	108,761	1	28,170	2	82,825	3,450	11,397
70 & over	1,181	6,578	237	7,434	76	8,416	27	7,159	11	18,449	1	34,724	1	46,129	0	NA	1	54,210	1,535	6,972
Totals	6,522	14,056	11,511	23,711	5,181	28,950	2,201	34,139	819	39,909	250	47,529	48	56,463	10	51,900	4	69,359	26,546	24,027

*Including inactive retired/reemployed members

AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR INACTIVE VESTED MEMBERS*

Males and Females - Sheriffs and Deputies

	Years of Service																			
	0 to 5		5 to 10		10 to 15		15 to 20		20 to 25		25 to 30		30 to 35		35 to 40		40 and over		Total	
Age	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.
Under 25	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA
25-29	0	NA	2	59,385	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	59,385
30-34	3	50,992	3	36,618	1	52,259	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	7	45,013
35-39	4	41,461	14	43,468	4	42,785	1	14,356	0	NA	0	NA	0	NA	0	NA	0	NA	23	41,734
40-44	3	45,144	8	44,187	12	44,616	4	57,493	0	NA	0	NA	0	NA	0	NA	0	NA	27	46,455
45-49	1	36,099	5	43,302	6	48,927	3	40,571	4	63,015	1	50,216	0	NA	0	NA	0	NA	20	48,508
50-54	2	25,353	7	38,400	3	45,875	3	49,745	3	64,273	0	NA	0	NA	0	NA	0	NA	18	44,399
55-59	5	9,105	1	33,367	2	41,275	2	54,048	1	59,539	0	NA	0	NA	0	NA	0	NA	11	29,916
60-64	3	14,703	4	40,846	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	7	29,642
65-69	4	6,778	0	NA	0	NA	1	18,420	0	NA	0	NA	0	NA	0	NA	0	NA	5	9,106
70 & over	1	880	0	NA	2	1,783	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	3	1,482
Totals	26	25,334	44	42,562	30	42,536	14	45,842	8	63,052	1	50,216	0	NA	0	NA	0	NA	123	40,682

*Including inactive retired/reemployed members

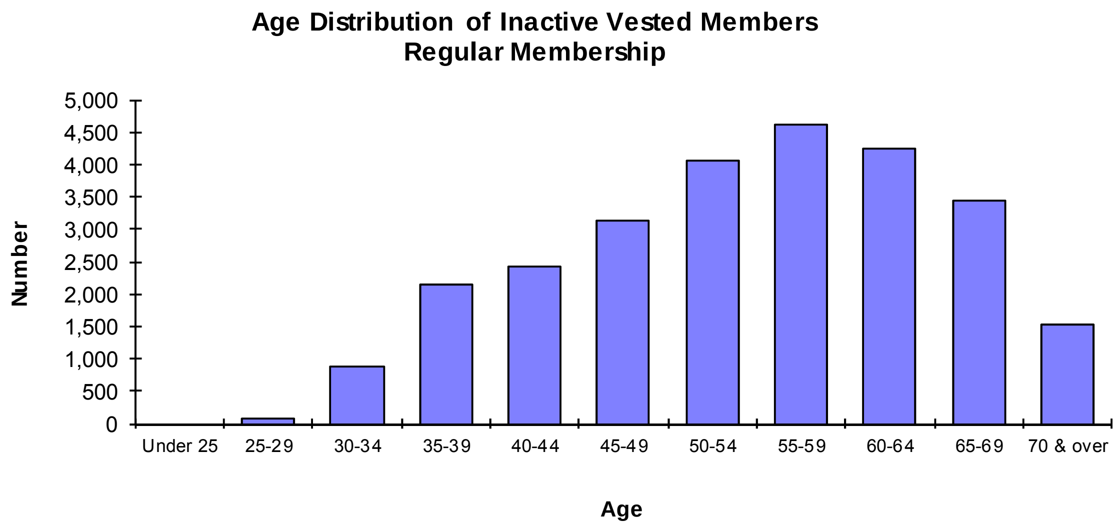
AGE AND SERVICE DISTRIBUTION AS OF JUNE 30, 2018 FOR INACTIVE VESTED MEMBERS*

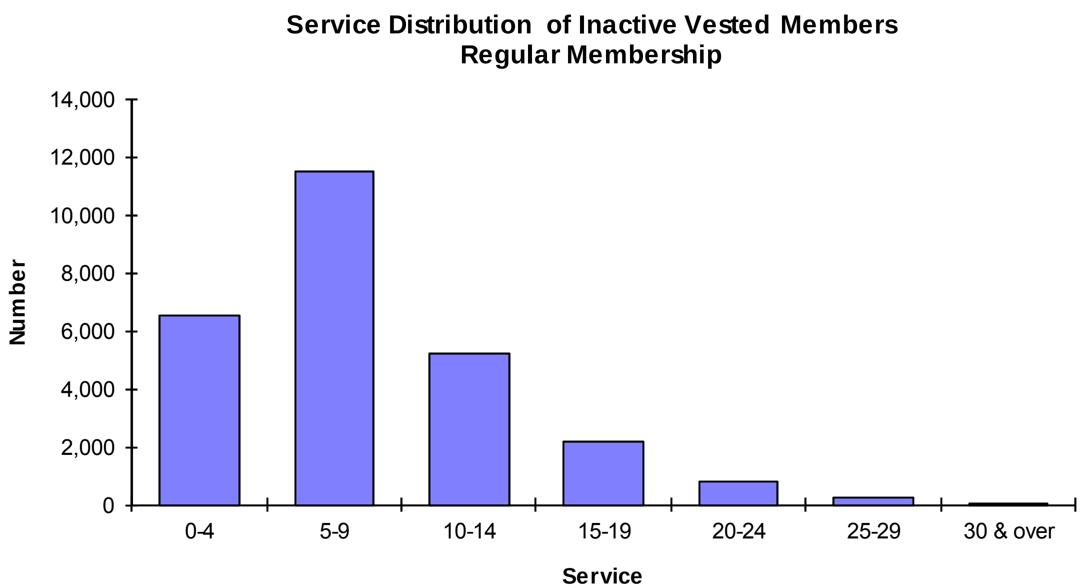
Males and Females - Protection Occupation

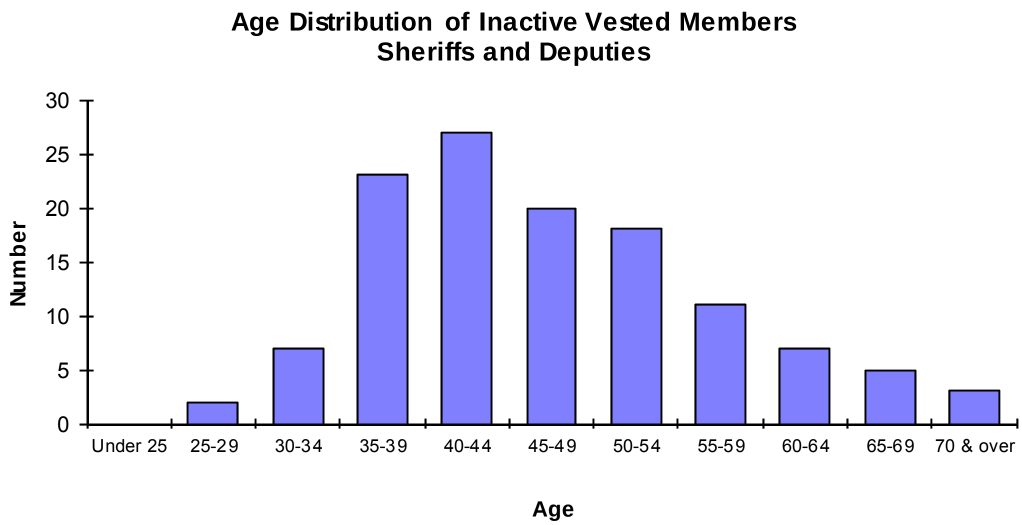
Years of Service

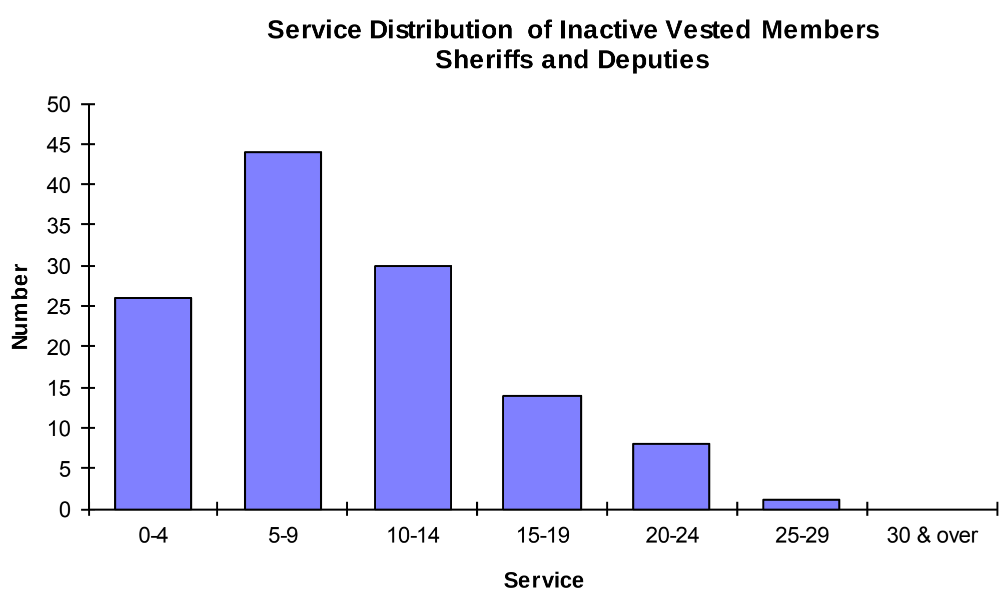
	0 to 5		5 to 10		10 to 15		15 to 20		20 to 25		25 to 30		30 to 35		35 to 40		40 and over		Total	
Age	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.	No.	Avg. Sal.
Under 25	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA
25-29	22	31,112	21	27,814	1	34,664	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	44	29,619
30-34	31	23,992	74	30,729	8	43,796	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	113	29,806
35-39	27	19,517	86	26,864	29	37,298	5	38,428	0	NA	0	NA	0	NA	0	NA	0	NA	147	27,966
40-44	10	29,406	80	22,369	29	30,752	18	40,312	2	32,027	0	NA	0	NA	0	NA	0	NA	139	27,087
45-49	9	22,365	65	21,583	38	24,748	17	44,119	13	49,507	5	48,817	0	NA	0	NA	0	NA	147	28,451
50-54	8	15,402	55	18,699	47	23,047	21	34,393	20	50,580	8	52,315	1	100,695	0	NA	0	NA	160	28,050
55-59	26	12,934	37	17,244	25	24,640	9	25,022	3	2,732	1	28,757	0	NA	0	NA	0	NA	101	18,341
60-64	44	9,041	23	7,907	8	17,623	5	13,906	3	12,658	0	NA	0	NA	0	NA	0	NA	83	9,978
65-69	26	13,951	13	4,306	1	8,198	2	3,813	1	60,103	0	NA	0	NA	0	NA	0	NA	43	11,503
70 & over	7	9,559	2	2,016	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	9	7,882
Totals	210	17,797	456	22,520	186	27,674	77	34,966	42	43,465	14	49,383	1	100,695	0	NA	0	NA	986	24,811

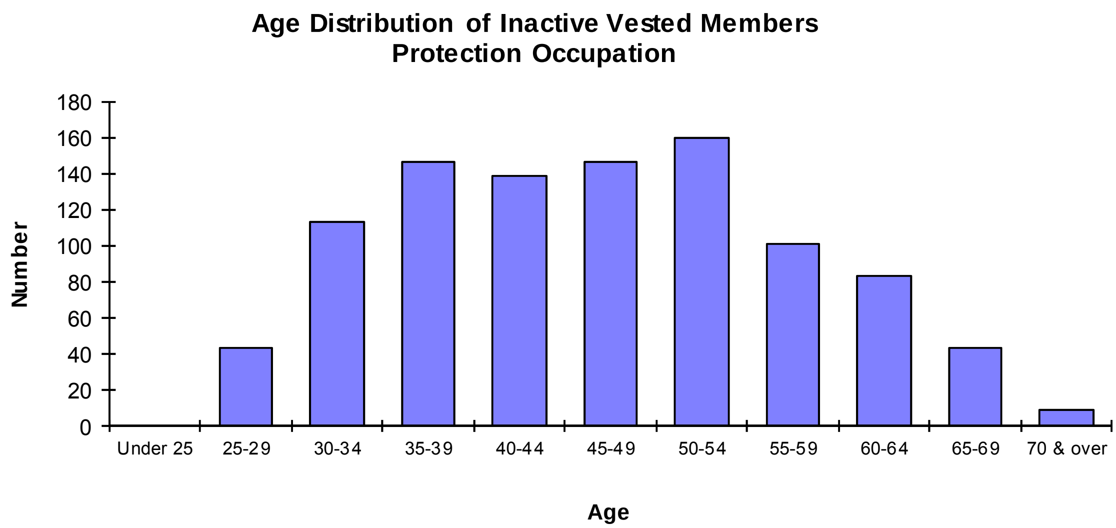
*Including inactive retired/reemployed members

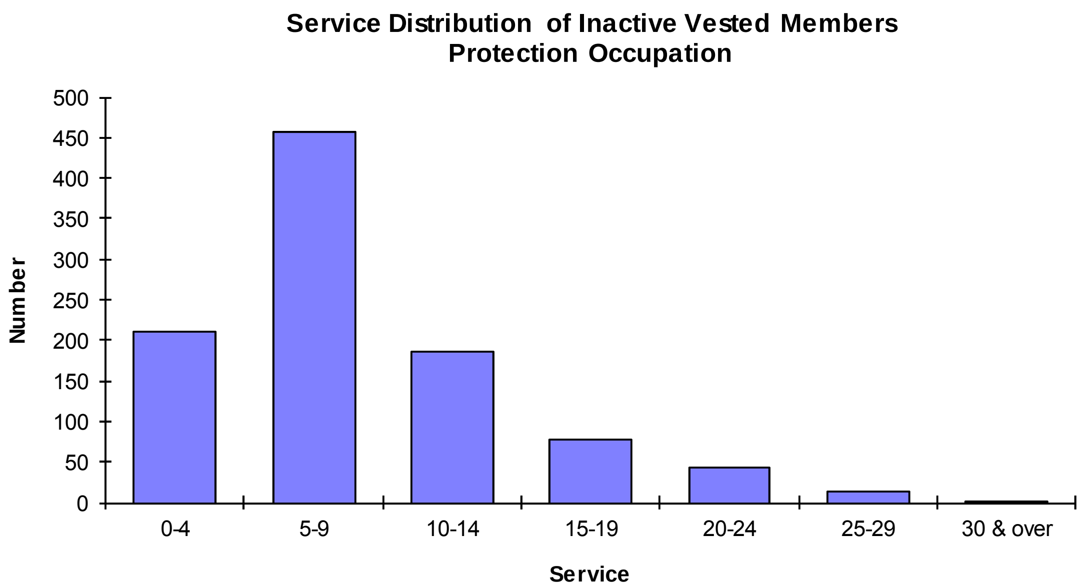

Age Distribution of Inactive Vested Members
Regular Membership
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Number
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Inactive Vested Members
Regular Membership
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Number
0-4
5-9
10-14
15-19
20-24
25-29
30 & over
Service


Age Distribution of Inactive Vested Members
Sheriffs and Deputies
Number
30
25
20
15
10
5
0
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Inactive Vested Members
Sheriffs and Deputies
Number
50
45
40
35
30
25
20
15
10
5
0
0-4
5-9
10-14
15-19
20-24
25-29
30 & over
Service


Age Distribution of Inactive Vested Members
Protection Occupation
Number
180
160
140
120
100
80
60
40
20
0
Under 25
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70 & over
Age


Service Distribution of Inactive Vested Members
Protection Occupation
Number
500
450
400
350
300
250
200
150
100
50
0
0-4
5-9
10-14
15-19
20-24
25-29
30 & over
Service

ANALYSIS OF RETIREES AND BENEFICIARIES

Males and Females - Regular Membership

	Number of Members and Beneficiaries									Average
					Contingent			Period		Annual
Age	Option 1	Option 2	Option 3	Option 4	Beneficiary	Option 5	Option 6	Certain	Total	Benefit
Under 40	4	1	5	0	57	0	8	11	86	$8,300
40 to 44	9	6	5	2	27	0	4	4	57	7,255
45 to 49	21	15	3	9	44	3	10	5	110	8,343
50 to 54	67	43	11	12	95	10	40	2	280	10,680
55 to 59	824	812	294	307	207	316	1,228	12	4,000	21,754
60 to 64	2,630	3,138	1,251	1,006	397	1,079	4,387	17	13,905	23,125
65 to 69	5,447	6,370	3,232	1,954	699	2,179	7,439	36	27,356	21,175
70 to 74	5,486	6,080	3,715	1,837	931	2,226	5,382	26	25,683	17,524
75 to 79	4,363	4,116	2,761	1,812	1,022	1,866	2,067	18	18,025	13,920
80 to 84	3,638	2,934	1,735	1,942	1,064	1,632	375	9	13,329	11,135
85 to 89	2,416	1,935	936	1,154	873	961	49	2	8,326	8,392
90 to 94	1,219	1,147	438	459	461	422	2	0	4,148	6,307
95 to 99	324	442	135	89	130	176	1	0	1,297	5,090
100 & up	15	95	17	7	14	32	0	0	180	4,660
Counts	26,463	27,134	14,538	10,590	6,021	10,902	20,992	142	116,782	$16,661
% of Total	22.7%	23.2%	12.4%	9.1%	5.2%	9.3%	18.0%	0.1%	100.0%	

ANALYSIS OF RETIREES AND BENEFICIARIES

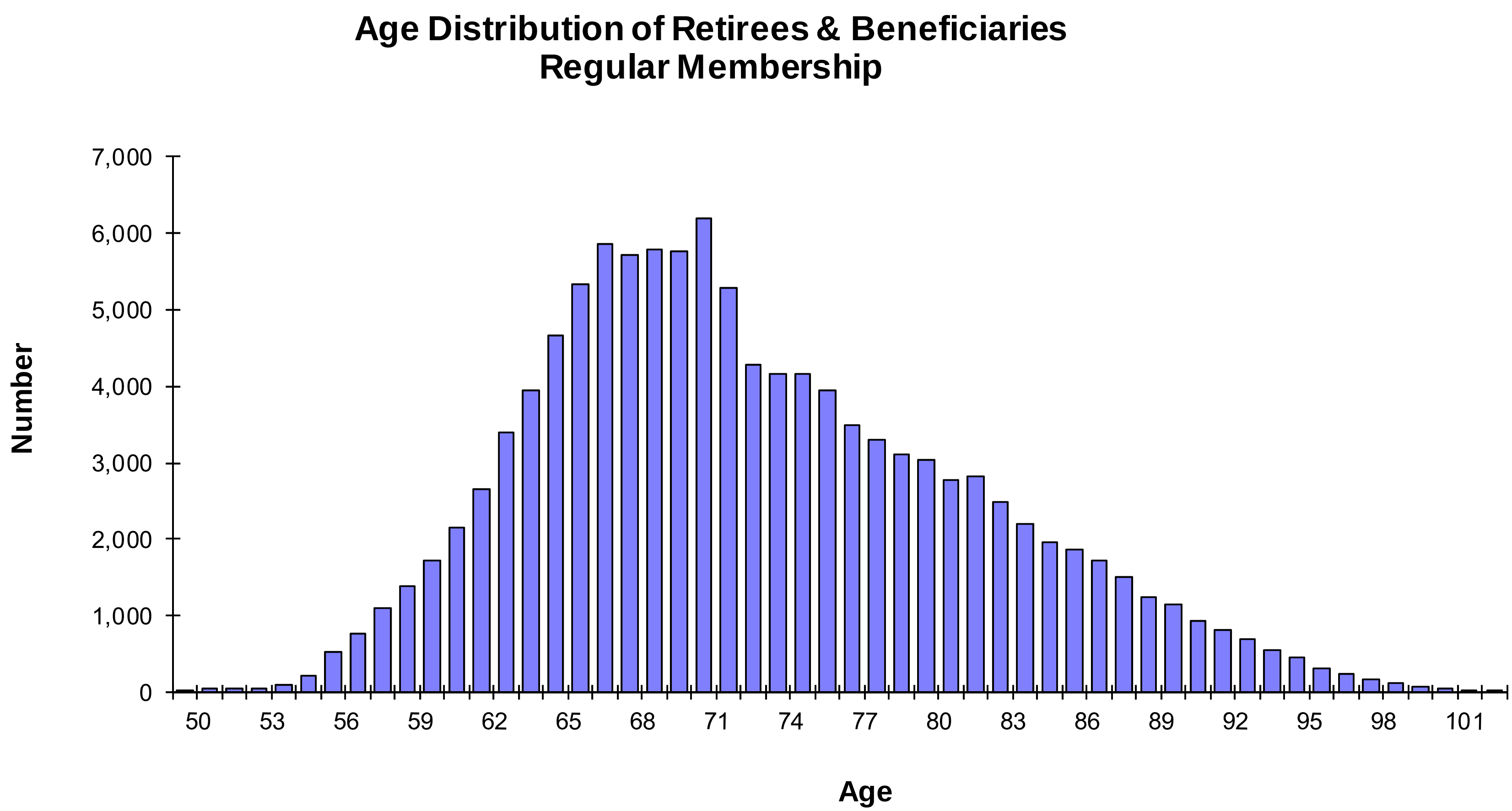
Males and Females - Sheriffs and Deputies

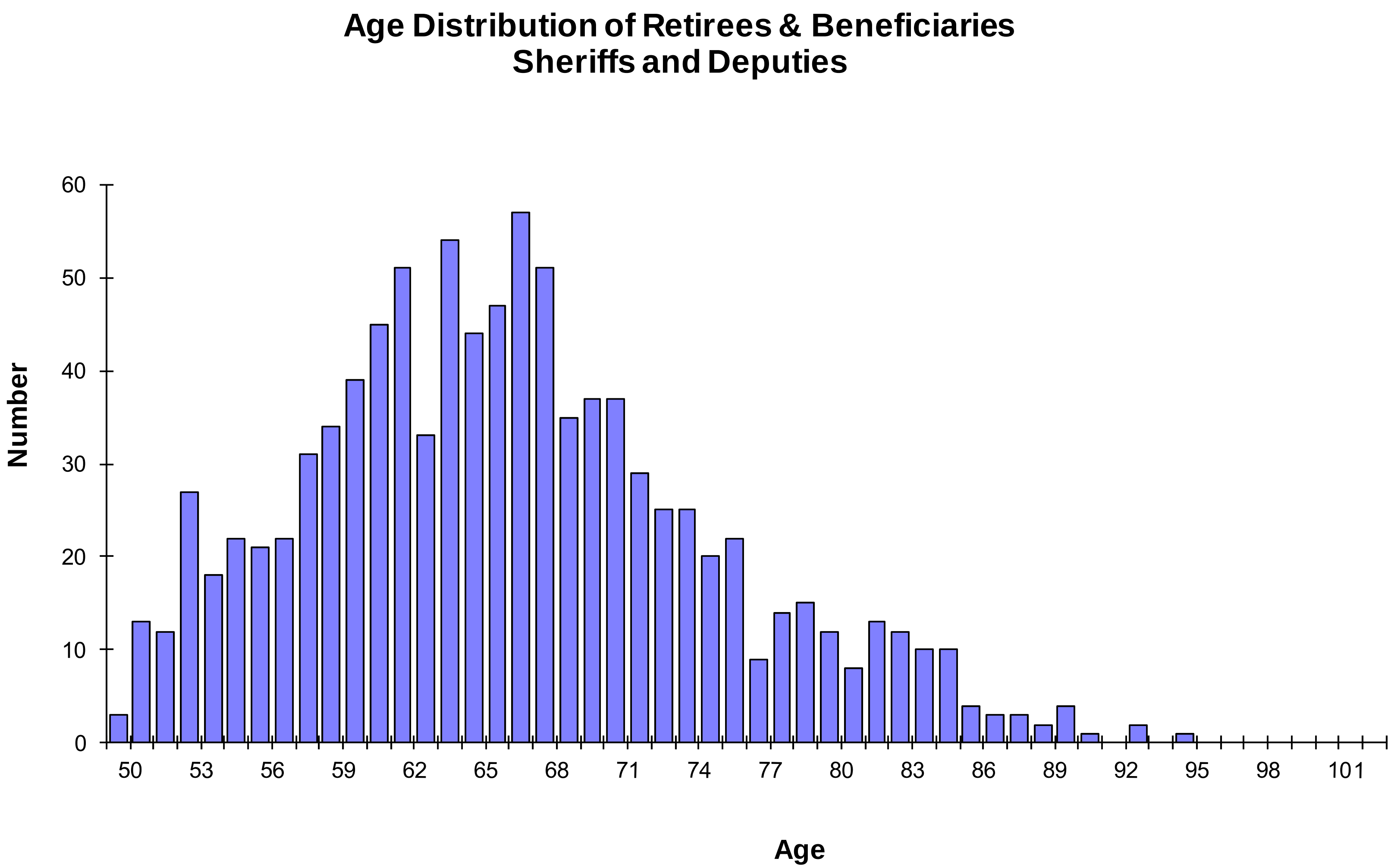
	Number of Members and Beneficiaries									Average
					Contingent			Period		Annual
Age	Option 1	Option 2	Option 3	Option 4	Beneficiary	Option 5	Option 6	Certain	Total	Benefit
Under 40	1	0	1	0	1	0	0	0	3	$23,729
40 to 44	0	0	0	0	2	0	2	0	4	17,944
45 to 49	2	0	0	1	1	0	0	0	4	32,127
50 to 54	13	11	1	14	2	4	28	0	73	42,652
55 to 59	20	13	10	28	5	6	48	0	130	39,785
60 to 64	33	29	16	44	13	12	75	0	222	38,980
65 to 69	42	25	14	34	9	12	97	1	234	33,029
70 to 74	36	16	15	27	14	7	38	0	153	27,591
75 to 79	18	10	3	21	11	5	12	0	80	23,261
80 to 84	15	3	3	19	8	3	4	0	55	16,594
85 to 89	2	4	3	6	6	1	0	0	22	11,256
90 to 94	2	1	0	1	3	0	0	0	7	10,780
95 to 99	0	1	0	0	0	0	0	0	1	9,619
100 & up	0	0	0	0	0	0	0	0	0	NA
Counts	184	113	66	195	75	50	304	1	988	$32,659
% of Total	18.6%	11.4%	6.7%	19.7%	7.6%	5.1%	30.8%	0.1%	100.0%	

ANALYSIS OF RETIREES AND BENEFICIARIES

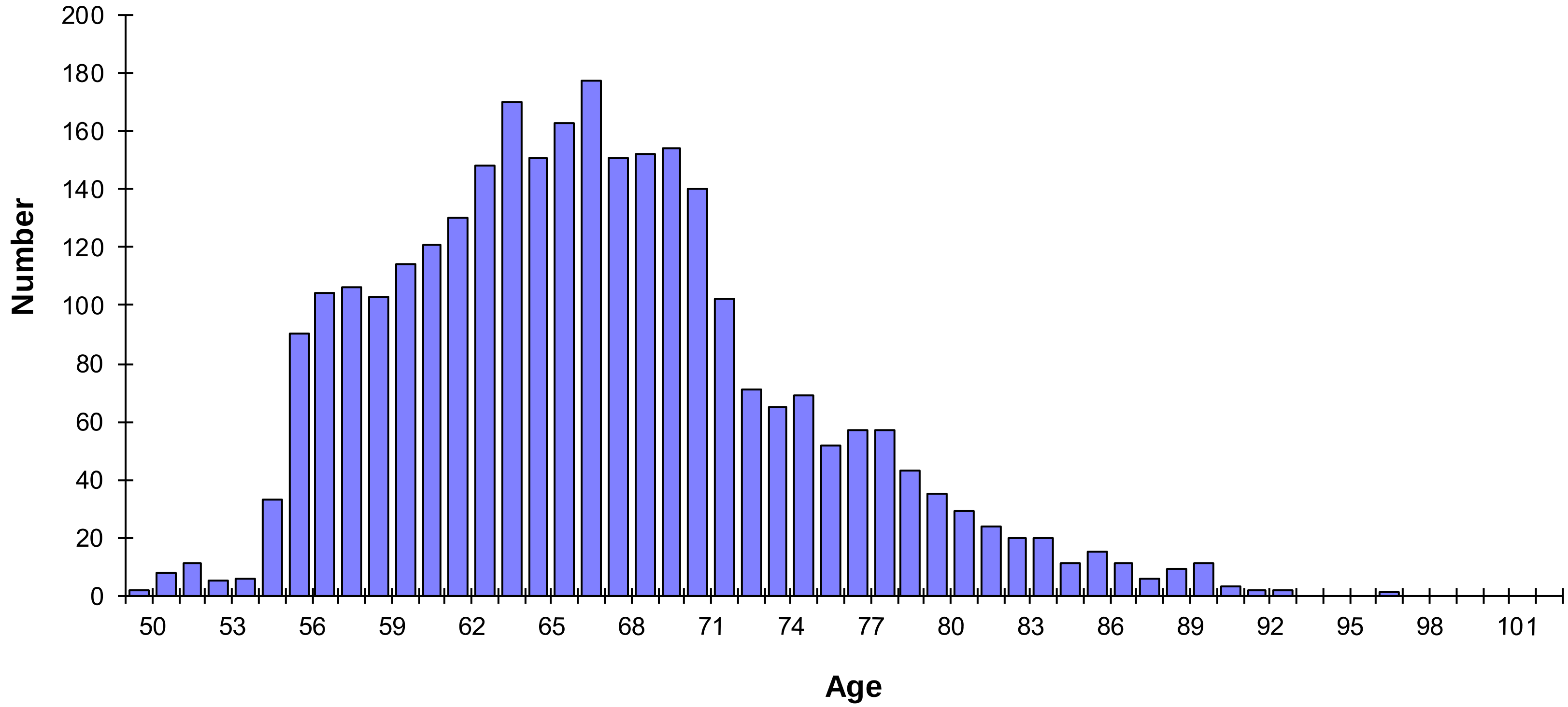
Males and Females - Protection Occupation

Age	Option 1	Option 2	Option 3	Option 4	Contingent Beneficiary	Option 5	Option 6	Period Certain	Total	Average Annual Benefit
	Number of Members and Beneficiaries									
Under 40	0	1	0	2	3	0	0	0	6	$18,305
40 to 44	1	0	0	1	1	1	2	0	6	29,558
45 to 49	2	0	1	4	3	2	6	1	19	23,604
50 to 54	6	1	6	6	4	2	7	0	32	21,453
55 to 59	63	61	35	89	14	15	157	2	436	32,859
60 to 64	132	85	33	117	26	33	257	0	683	30,431
65 to 69	150	154	56	118	35	30	250	1	794	26,303
70 to 74	111	94	42	79	29	31	146	0	532	21,192
75 to 79	58	42	26	53	33	11	55	0	278	16,976
80 to 84	33	10	6	39	21	11	8	0	128	13,746
85 to 89	9	2	1	18	17	5	0	0	52	11,685
90 to 94	6	1	1	6	4	0	0	0	18	9,785
95 to 99	0	0	0	0	0	1	0	0	1	2,683
100 & up	0	0	0	0	0	0	0	0	0	NA
Counts	571	451	207	532	190	142	888	4	2,985	$25,446
% of Total	19.1%	15.1%	6.9%	17.8%	6.4%	4.8%	29.7%	0.1%	100.0%	


Age Distribution of Retirees & Beneficiaries
Regular Membership
Number
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
50
53
56
59
62
65
68
71
74
77
80
83
86
89
92
95
98
101
Age


Age Distribution of Retirees & Beneficiaries
Sheriffs and Deputies
Number
60
50
40
30
20
10
0
50
53
56
59
62
65
68
71
74
77
80
83
86
89
92
95
98
101
Age

Age Distribution of Retirees & Beneficiaries
Protection Occupation



SUMMARY OF DATA FILE RECONCILIATION

The following table reconciles the data we received from IPERS to the final membership counts used in the valuation.

Records on the in-pay data file	120,987
Removed those no longer entitled to benefits	(250)
Added those still entitled to benefits	18
Records used in the valuation	120,755

Records on the not-in-pay data file	251,026
Records removed because the member has received all benefits	(26)
Records used in the valuation*	251,000

* These records are allocated as follows:

Active members	170,376
Retired, reemployed members	8,639
Vested inactive members	27,655
Nonvested inactive members	44,330
Total	251,000

Nonvested inactive members include deceased vested inactive members with employee contributions still held by the System. Records that had no remaining benefit or had passed away prior to the valuation date were removed.

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APPENDIX B

SUMMARY OF PLAN PROVISIONS

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Chapter 97B of the Iowa code sets out the IPERS provisions, which are briefly summarized as follows:

Participation: In general, the System covers people in non-federal public employment within the State of Iowa. Membership is mandatory if a person is in covered employment. Exceptions to this are set out in the law. Notable exceptions are those covered by another public system in Iowa (such as judges, state patrol, and policemen and firemen in cities having civil service), employees of the Regents' institutions, and employees of the community colleges who elect alternative coverage.

Service Credit: A member will receive membership credit for service rendered after July 4, 1953 (special rules apply to service before this date). Service is counted to the complete quarter of a calendar year. A member will not receive credit for more than four quarters of service in a calendar year regardless of the number of employers reporting covered wages for that member. A calendar year is the 12-month period beginning January 1 and ending December 31.

Members may purchase service under specified conditions. To make such a purchase, the member must pay the actuarial cost of such service.

REGULAR MEMBERS:

Average Salary: The average of the member's highest three years of covered wages. Effective July 1, 2012 the average of a member's highest five years of covered wages, but not less than the member's highest three years as of June 30, 2012, if vested at that time.

Age and Service Requirements for Benefits:

Normal Retirement: Earliest of the first day of the month of the member's 65th birthday, age 62 with 20 years of service or Rule of 88 (age plus service equals/exceeds 88), with a minimum of age 55.

Early Retirement: First day of any month starting with the month of the member's 55th birthday but preceding the normal retirement date.

Inactive Vested Benefit: Four years of service (seven years effective July 1, 2012). Prior to July 1, 2005 inactive members could become eligible for a vested benefit merely by reaching age 55.

Pre-retirement Death Benefit: Upon death of a member before benefits have started.

Disability Benefit: Upon meeting requirements to be vested, if the active or inactive member begins receiving federal Social Security disability or Railroad Retirement disability benefits.

Retirement Benefits:

Normal Retirement	An annuity equal to 2% of Average Salary for each year of service up to 30 years plus 1% of AS for each of the next 5 years of service. Maximum years of service recognized for benefit accrual purposes is 35 with a resulting maximum benefit of 65% of Average Salary.
Early Retirement	An annuity, determined in the same manner as for normal retirement. However, a reduction of 0.25% per month is applied for each month the benefit commences prior to normal retirement age (based on service at early retirement). Effective July 1, 2012, the reduction changed to 0.50% per month and applies to each month that the benefit commences before age 65. Transition rules apply if members have service both before and after July 1, 2012.
Pre-retirement Death Benefits	Beneficiaries of members may receive a lump sum determined by a formula that includes how much the member contributed to IPERS, years of service, highest year's salary, and other factors. Beneficiaries may have the option of receiving a monthly benefit based on the present value of the member's accrued benefit at death.
Disability Benefits	An annuity, payable immediately, equal to the Normal Retirement Benefit without an early retirement adjustment.

Termination Benefits:

Less than four* years of Service (Nonvested)	A refund of all of the member's accumulated contributions.
Four* or more years of Service (Vested)	At the member's election either: (1) a refund of all of the member's accumulated contributions plus a portion (years of service divided by 30) of the employer's contributions with interest, or (2) a deferred benefit determined in the same manner as for normal retirement. Payments can begin at normal or early retirement. * Effective July 1, 2012 seven years of service for those not vested at that time.

Form of Annuity:	The base form, or normal form, is a life annuity with a guaranteed return of employee contributions (Option 2).

Optional Forms of Payment:

Option 1: The member specifies a dollar amount, in $1,000 increments, that the member wishes to have paid to a designated beneficiary following the death of the member. The death benefit will be in the form of a single payment and cannot exceed the amount of a member's own accumulated contributions to IPERS, and it cannot lower the member's benefit as calculated under Option 2 by more than 50%.

Option 3: After the member's death, all benefits cease.

Option 4: The member receives a reduced monthly benefit so that a lifetime monthly benefit may be provided after the member's death to the person named by the member as the contingent annuitant. The member specifies what benefit the contingent annuitant will receive after the death of the member. The monthly benefit can be the same as the member's monthly benefit or three-fourths, one-half, or one-fourth of the amount. These choices may be restricted if the contingent annuitant is not the member's spouse and is more than ten years younger than the member.

Option 5: If the member dies before ten full years (120 months of payments) have ended, the member's beneficiary will receive a monthly benefit for the remainder of the ten years. Members who have attained age 90 as of the first month of entitlement are not allowed to select this option.

Option 6: The member receives a reduced monthly benefit so that a lifetime monthly benefit may be provided after the member's death to the person named by the member as the contingent annuitant. In addition, the monthly amounts are also reduced to pay for a pop-up feature. The pop-up feature provides that if the contingent annuitant dies before the member, the member's benefit will pop back up to what it would have been under IPERS Option 2, and death benefits may be payable to the member's designated beneficiary if certain conditions are met.

Actuarial Equivalent Lump Sum Payment:

If a vested member is entitled to receive a benefit and it is less than $50 per month under Option 2, the member shall receive a retirement benefit in an actuarial equivalent lump sum payment. The lump sum will include the member's and employer's accumulated contributions.

Post-retirement Benefit Increases:

Annual dividends are paid to those retired prior to July 1, 1990. Effective with the November 2000 dividend payment, the dividend is adjusted by the least of the following percentages: (1) the change in the CPI, (2) percentage certified to by the actuary as affordable by the System, and (3) 3%.

Favorable Experience Dividend (FED): For members who retired after June 30, 1990, a favorable experience dividend (FED) reserve account has been established under Iowa Code §97B.49F(2). The main purpose of this account is to help offset the negative effects of postretirement inflation. All members and beneficiaries who receive a monthly allowance qualify for favorable experience dividend payments. Each November, IPERS determines if a FED payment should be paid the following January subject to the following conditions:

- The member must be retired one year.
- The FED rate cannot exceed 3%.
- The FED payment will be issued in a lump sum in January.
- The FED payment is not guaranteed.

The formula is as follows:
(December's Monthly benefit) X (12 months) X (Rate) X (Full calendar years retired) = FED

Source of Funds:

Regular Membership:

Contribution Rates			
Time Period	**Employees****	**Employer**	**Total**
Prior to 7/1/07	3.70%	5.75%	9.45%
7/1/07 – 6/30/08	3.90%	6.05%	9.95%
7/1/08 – 6/30/09	4.10%	6.35%	10.45%
7/1/09 – 6/30/10	4.30%	6.65%	10.95%
7/1/10 – 6/30/11	4.50%	6.95%	11.45%
7/1/11 – 6/30/12	5.38%	8.07%	13.45%
7/1/12 and later	Determined by Contribution Rate Funding Policy*		

*Change in contribution rate cannot exceed 1.0% per year.
**Employee rate is 40% of total contribution rate.

SHERIFFS/DEPUTIES AND PROTECTION OCCUPATION:

Average Salary: The average of the member's highest three years of covered wages

Age and Service Requirements for Benefits:

Normal Retirement: Generally age 55. However, a member of the Sheriffs and Deputy Sheriffs may retire at age 50 with 22 years of service.

Inactive Vested Benefit	Four years of service. Prior to July 1, 2005 inactive members could become eligible for vested benefits merely by reaching age 55.
Pre-retirement Death Benefit	Upon death of a member before benefits have started.
Disability Benefit	Upon meeting requirements to be vested, (i) if the active or inactive member begins receiving federal Social Security or Railroad Retirement disability benefits, or (ii) upon being determined by IPERS to be disabled under the provisions of Iowa Code section 97B.50A. The disability benefits under Iowa Code section 97B.50A must be applied for through IPERS within one (1) year after termination of employment. Benefits under Iowa Code section 97B.50A may be paid for in-service disability or ordinary disability.

Retirement Benefits:

Normal Retirement	60% of Average Salary after completion of 22 years of service, plus an additional 1.5% of Average Salary for years of service greater than 22 but not more than 30. Maximum formula is 72% of Average Salary.
Pre-retirement Death Benefit	Beneficiaries of members may receive a lump sum determined by a formula that includes how much the member contributed to IPERS, years of service, highest year's salary, and other factors. Beneficiaries may have the option of receiving a monthly benefit based on the present value of the member's accrued benefit at death.
Disability Benefits	An annuity, payable immediately, equal to the Normal Retirement Benefit, without an adjustment. The benefit is the greater of the Normal Retirement Benefit and either 50% (for ordinary disability) or 60% (for in-service disability) of Average Salary.

Termination Benefits:

Less than four years of Service (Non-vested)	A refund of all of the member's accumulated contributions.
Four or more years of Service (Vested)	At the member's election either: (1) a refund of all of the member's accumulated contributions plus a portion (years of service divided by 22) of the employer's contributions with interest, or

	(2) a deferred benefit determined in the same manner as for normal retirement. Payments begin at normal retirement.
Form of Annuity:	The base form, or normal form, is a life annuity with a guaranteed return of employee contributions (Option 2).
Optional Forms of Payment:	*Option 1:* The member specifies a dollar amount, in $1,000 increments, that the member wishes to have paid to a designated beneficiary following the death of the member. The death benefit will be in the form of a single payment and cannot exceed the amount of a member's own accumulated contributions to IPERS, and it cannot lower the member's benefit as calculated under Option 2 by more than 50%.
	Option 3: After the member's death, all benefits cease.
	Option 4: The member receives a reduced monthly benefit so that a lifetime monthly benefit may be provided after the member's death to the person named by the member as the contingent annuitant. The member specifies what benefit the contingent annuitant will receive after the death of the member. The monthly benefit can be the same as the member's monthly benefit or three-fourths, one-half, or one-fourth of the amount. These choices may be restricted if the contingent annuitant is not the member's spouse and is more than ten years younger than the member.
	Option 5: If the member dies before ten full years (120 months of payments) have ended, the member's beneficiary will receive a monthly benefit for the remainder of the ten years. Members who have attained age 90 as of the first month of entitlement are not allowed to select this option.
	Option 6: The member receives a reduced monthly benefit so that a lifetime monthly benefit may be provided after the member's death to the person named by the member as the contingent annuitant. In addition, the monthly amounts are also reduced to pay for a pop-up feature. The pop-up feature provides that if the contingent annuitant dies before the member, the member's benefit will pop back up to what it would have been under IPERS Option 2, and death benefits may be payable to the member's designated beneficiary if certain conditions are met.
	Level Income Payment Option: A Level Income payment alternative is authorized for members of the Sheriffs and Deputies group and the Protection Occupation group. This alternative applies to all IPERS retirement options listed above except Option 6. The Level Income payment

	alternative permits a member to receive a relatively level income both before and after age 62 when benefits from IPERS and Social Security are combined. Higher IPERS benefits are paid prior to age 62. When the member reaches age 62, the member's IPERS benefit is permanently reduced. This amount is determined when the member retires and is not recomputed based on the actual Social Security benefit.
Actuarial Equivalent Lump Sum Payment:	If a vested member is entitled to receive a benefit and it is less than $50 per month under Option 2, the member shall receive a retirement benefit in an actuarial equivalent lump sum payment. The lump sum will include the member's and employer's accumulated contributions.
Post-retirement Benefit Increases:	Annual dividends are paid to those retired prior to July 1, 1990. Effective with the November 2000 dividend payment, the dividend is adjusted by the least of the following percentages: (1) the change in the CPI, (2) percentage certified to by the actuary as affordable by the System, and (3) 3%.
Favorable Experience Dividend (FED):	For members who retired after June 30, 1990, a favorable experience dividend (FED) reserve account has been established under Iowa Code §97B.49F(2). The main purpose of this account is to help offset the negative effects of postretirement inflation. All members and beneficiaries who receive a monthly allowance qualify for favorable experience dividend payments. Each November, IPERS determines if a FED payment should be paid the following January subject to the following conditions: • The member must be retired one year. • The FED rate cannot exceed 3%. • The FED payment will be issued in a lump sum in January. • The FED payment is not guaranteed. The formula is as follows: (December's Monthly benefit) x (12 months) x (Rate) x (Full calendar years retired) = FED
Source of Funds:	
Sheriffs and Deputies:	Determined by Contribution Rate Funding Policy. Employees contribute 50% and employers contribute 50%.
Protection Occupation:	Determined by Contribution Rate Funding Policy. Employees contribute 40% and employers contribute 60%.

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APPENDIX C

ACTUARIAL ASSUMPTIONS AND METHODS

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Sound financing of any retirement system requires that benefits accruing to its members shall be paid for during their active working lifetime so that when a member (or his beneficiary) becomes entitled to a benefit, the monies necessary to provide such benefit shall be on hand. In this way, the cost of benefits for present active members will not become a liability to future members and taxpayers.

The principal purpose of an actuarial valuation is to calculate, on the basis of certain assumptions, the present value of benefits that are payable in the future from the system to present members (and their beneficiaries) and the present value of future contributions to be made by the members and their employers. Having calculated such present values, the level of annual contribution to the system required to fund (or pay for) the benefits, in accordance with the above stated principle of sound financing, may be determined.

VALUATION ASSUMPTIONS

Retirement System contribution requirements and actuarial present values are calculated by applying experience assumptions to the benefit provisions and census (member) information of the Retirement System, using the actuarial cost method.

The principal areas of risk which require experience assumptions about future activities of the Retirement System are:

- long-term rates of investment return to be generated by the assets of the system
- patterns of pay increases to members
- rates of mortality among members, retirants and beneficiaries
- rates of withdrawal of active members
- rates of disability among active members
- the age patterns of actual retirements

In making a valuation, the monetary effect of each assumption is calculated for as long as a present member survives -- a period of time which can be as long as a century.

Actual experience of the Retirement System will not coincide exactly with assumed experience. Each valuation provides a complete recalculation of assumed future experience and takes into account all past differences between assumed and actual experiences. The result is a continual series of adjustments to the computed contribution rate, or alternatively to the amortization period for the unfunded actuarial liability.

From time to time, one or more of the assumptions are modified to reflect experience trends (but not random or temporary year to year fluctuations). A complete review of the actuarial assumptions was completed in 2018, based on experience from 2014-2017. A review of the economic actuarial assumptions was completed in 2017, followed by a review of the demographic assumptions that was completed in 2018. The Investment Board has adopted and approved the use of the economic assumptions presented in the 2017 Economic Experience Study, as well as the demographic assumptions presented in the 2018 Demographic Experience Study. The following is a summary of the assumptions and methods used in the valuation:

ECONOMIC ASSUMPTIONS:

Rate of Inflation (effective June 30, 2017)

2.60% per annum

Rate of Crediting Interest on Contribution Balances (effective June 30, 2017)

3.50% per annum, compounded annually

Rate of Investment Return (effective June 30, 2017)

7.00% per annum, compounded annually, net of expenses.

Wage Growth Assumption (effective June 30, 2017)

3.25% per annum based on 2.60% inflation assumption and 0.65% real wage inflation.

Payroll Increase Assumption (effective June 30, 2017)

3.25% per year

Cost of Living Adjustments Assumption (effective June 30, 2017)

2.60% for members who retired before July 1, 1990. No cost-of-living adjustments are assumed to be granted to future retirees

DEMOGRAPHIC ASSUMPTIONS:

Rates of Mortality

Pre-Retirement (effective June 30, 2018)

State		
	Male	RP-2014 Employee Table, Generational using MP-2017, setback 4 years
	Female	RP-2014 Employee Table, Generational using MP-2017, setback 4 years
School		
	Male	RP-2014 Employee Table, Generational using MP-2017, setback 4 years
	Female	RP-2014 Employee Table, Generational using MP-2017, setback 8 years
Other		
	Male	RP-2014 Employee Table, Generational using MP-2017, setback 3 years
	Female	RP-2014 Employee Table, Generational using MP-2017, setback 4 years
Sheriffs/Deputies and Protection Occupation		
	Male	RP-2014 Employee Table, Generational using MP-2017, setback 3 years
	Female	RP-2014 Employee Table, Generational using MP-2017, setback 4 years

5% of active deaths are assumed to be service related for non-regular members.

Post-Retirement (effective June 30, 2018)

State	RP-2014 Healthy Annuitant, Generational using MP-2017
Male	8.5% increase in rates above age 75
Female	No age adjustment
School	RP-2014 Healthy Annuitant, Generational using MP-2017
Male	2 Year setback, 10% decrease in rates below age 75, 20% increase above age 75
Female	2 Year setback, 25% decrease below age 75, 10% increase above age 75
Other	RP-2014 Healthy Annuitant, Generational using MP-2017
Male	1 Year set forward,10% decrease below age 75, 8% increase above age 75
Female	1 Year setback, 10% decrease below age 75, 5% increase above age 75
Sheriffs/Deputies and Protection Occupation	RP-2014 Healthy Annuitant, Generational using MP-2017
Male	1 Year set forward, 10% increase above age 75
Female	No age adjustment
Beneficiaries:	Same as members
Disabled Members	RP-2014 Disabled Mortality, Generational using MP-2017
Male	3 Year age set forward
Female	5 Year age set forward

Retirement Rates (effective June 30, 2018)

Upon meeting the requirements for early retirement, the following rates apply to Regular Members:

	Assumed Retirement Rates – Early		
Age	State	School	Other
55	5.0%	6.0%	4.0%
56	5.0%	6.0%	4.0%
57	5.0%	6.0%	4.0%
58	5.0%	7.0%	4.0%
59	5.0%	8.0%	5.0%
60	5.0%	10.0%	5.0%
61	15.0%	15.0%	10.0%
62	15.0%	15.0%	15.0%
63	15.0%	15.0%	15.0%
64	15.0%	15.0%	15.0%

Upon reaching the requirements for normal retirement (unreduced benefits), the following rates apply:

Assumed Retirement Rates – Select Unreduced

Age	State	School	Other
55	20.0%	25.0%	20.0%
56	15.0%	25.0%	20.0%
57	15.0%	25.0%	17.0%
58	15.0%	25.0%	20.0%
59	15.0%	25.0%	20.0%
60	15.0%	25.0%	17.0%
61	20.0%	33.0%	20.0%
62	40.0%	40.0%	30.0%
63	35.0%	30.0%	25.0%
64	30.0%	30.0%	30.0%
65	30.0%	30.0%	30.0%

Assumed Retirement Rates – Ultimate Unreduced

Age	State	School	Other
55	15.0%	20.0%	12.0%
56	15.0%	20.0%	12.0%
57	15.0%	20.0%	12.0%
58	15.0%	20.0%	12.0%
59	15.0%	21.0%	12.0%
60	15.0%	23.0%	15.0%
61	20.0%	28.0%	20.0%
62	40.0%	35.0%	30.0%
63	30.0%	30.0%	20.0%
64	30.0%	30.0%	25.0%
65	30.0%	45.0%	40.0%
66	30.0%	35.0%	30.0%
67	20.0%	25.0%	20.0%
68	20.0%	25.0%	20.0%
69	35.0%	40.0%	40.0%
70	100.0%	100.0%	100.0%

	Assumed Retirement Rates	
Age	Sheriffs and Deputies	Protection Occupation
50	17.0%	
51	15.0%	
52	15.0%	
53	15.0%	
54	15.0%	
55	15.0%	25.0%
56	15.0%	10.0%
57	15.0%	10.0%
58	15.0%	10.0%
59	15.0%	10.0%
60	15.0%	10.0%
61	15.0%	15.0%
62	30.0%	30.0%
63	30.0%	25.0%
64	30.0%	25.0%
65	100.0%	100.0%

Terminated vested members are assumed to retire at age 62 (55 for Sheriffs/Deputies and Protection Occupation groups).

For Regular membership, retired reemployed members are assumed to retire at a rate of 25% per year until age 80 when all are assumed to retire.

All retirees are assumed to elect a modified cash refund annuity (Option 2).

Rates of Disablement (effective June 30, 2018)

	Assumed Rates					
	Males			Females		
Age	State	School	Other	State	School	Other
27	0.020%	0.020%	0.020%	0.020%	0.020%	0.020%
32	0.020%	0.020%	0.020%	0.020%	0.020%	0.020%
37	0.030%	0.034%	0.030%	0.030%	0.030%	0.030%
42	0.050%	0.056%	0.050%	0.040%	0.040%	0.040%
47	0.100%	0.098%	0.110%	0.070%	0.070%	0.070%
52	0.180%	0.142%	0.260%	0.180%	0.130%	0.160%
57	0.260%	0.230%	0.500%	0.310%	0.190%	0.280%
62	0.340%	0.318%	0.720%	0.500%	0.260%	0.400%

Age	Assumed Rates Sheriffs/Deputies Protection Occupation Rate
27	0.130%
32	0.130%
37	0.130%
42	0.150%
47	0.200%
52	0.240%
57	0.320%
62	0.430%

Rates of Termination of Employment (effective June 30, 2018)

Regular Membership

	Male			Female		
Years of Service	State	School	Other	State	School	Other
1	11.00%	14.20%	19.00%	11.00%	14.20%	19.99%
5	4.75%	6.60%	7.50%	4.75%	6.60%	8.35%
10	2.25%	2.70%	4.10%	2.25%	2.70%	4.93%
15	1.60%	1.70%	2.64%	1.60%	1.70%	3.36%
20	1.10%	1.20%	2.10%	1.10%	1.20%	2.66%
25	0.80%	1.00%	1.60%	0.80%	1.00%	1.98%
30	0.80%	1.00%	1.10%	0.80%	1.00%	1.30%

Sheriffs/Deputies and Protection Occupation

Age	Sheriffs/Deputies	Protection Occupation
1	4.00%	10.00%
5	1.00%	6.50%
10	1.00%	3.50%
15	1.00%	2.20%
20	1.00%	1.45%
25	1.00%	1.00%
30	1.00%	1.00%

Probability of Electing a Deferred Vested Benefit (effective June 30, 2018)

	Regular Membership					
	Male			Female		
Years of Service	State	School	Other	State	School	Other
5	62.0%	74.0%	62.0%	56.0%	80.0%	70.0%
10	71.0%	79.0%	71.0%	62.0%	80.0%	73.0%
15	76.0%	84.0%	76.0%	72.0%	85.0%	80.0%
20	81.0%	89.0%	81.0%	82.0%	90.0%	85.0%
25	86.0%	94.0%	86.0%	92.0%	95.0%	90.0%
30	90.0%	95.0%	90.0%	100.0%	100.0%	90.0%

	Sheriffs/Deputies and Protection Occupation
Years of Service	Rate
5	53.0%
10	65.0%
15	85.0%
20	95.0%
25	100.0%
30	100.0%

Rates of Salary Increase* (effective June 30, 2018)

	Annual Increase			
Years of Service	State	School	Other	Sheriffs/Deputies and Protection Occupation
1	14.25%	16.25%	14.25%	16.25%
5	7.75%	5.75%	5.35%	5.75%
10	5.50%	4.55%	4.55%	4.55%
15	4.45%	3.75%	4.05%	4.05%
20	3.85%	3.40%	3.75%	3.75%
25	3.60%	3.25%	3.65%	3.75%
30	3.35%	3.25%	3.65%	3.25%
35+	3.25%	3.25%	3.25%	3.25%

* Includes 3.25 % wage growth

ACTUARIAL COST METHOD (adopted 1996)

The actuarial cost method is a procedure for allocating the actuarial present value of pension plan benefits and expenses to time periods. The method used for the valuation is known as the entry age normal actuarial cost method. Under this method, a total contribution rate is determined which consists of two parts: (i) the normal cost rate and (ii) the unfunded actuarial liability (UAL) rate. The entry age normal cost method has the following characteristics:

(i) The annual normal costs for each individual active member are sufficient to accumulate the value of the member's pension at time of retirement.

(ii) Each annual normal cost is a constant percentage of the member's year by year projected compensation rates.

The entry age normal actuarial cost method allocates the actuarial present value of each member's projected benefits on a level basis over the member's compensation rates between the entry age of the member and the assumed exit ages.

ACTUARIAL AMORTIZATION METHOD (adopted 2013)

The portion of the actuarial present value of benefits allocated to the valuation year is called the normal cost. The portion of the actuarial present value of benefits not provided for by the actuarial present value of future normal costs is called the actuarial liability. Deducting the actuarial value of assets from the actuarial liability determines the unfunded actuarial liability (UAL). The one-year lag between the valuation date and the date the contribution rate is effective is reflected in calculating the corresponding amortization payment. The UAL is amortized according to the Actuarial Amortization Method adopted by the Investment Board and summarized below:

1. Amortization payments will be calculated as a level percentage of payroll.
2. For the actuarial valuation prepared as of June 30, 2013, the amortization period of the UAL shall be 30-year open for all membership groups.
3. For the actuarial valuation prepared as of June 30, 2014:
   a. The UAL for each membership group shall be amortized over a 30-year closed period.
   b. This will be designated as the initial UAL base for subsequent valuations and it will be amortized over the remaining years of the 30-year closed period set on June 30, 2014.
4. For each valuation subsequent to June 30, 2014, annual net experience gains/losses for each membership group will be amortized over a new, closed 20-year period.
5. Subsequent plan amendments or changes in actuarial assumptions or methods that create a change in the UAL will be amortized over a demographically appropriate period selected by the Investment Board at the time that the change is incurred.
6. The dollar amount of the UAL payment for purposes of computing the UAL component of the actuarial and required contribution rate will be the sum of the amortization payments for each amortization schedule divided by the total projected payroll. Unless the plan has been 110 percent funded for the current and prior two years, a negative amortization payment shall be ignored.

7. If the valuation shows that the group has surplus, the prior amortization bases will be eliminated and one base equal to the amount of surplus shall be established. The amortization period of a surplus shall be a 30-year open period for all groups.

ACTUARIAL VALUE OF ASSETS SMOOTHING METHOD (adopted 2007)

The market value of assets, representing a fair value of System assets, may not necessarily be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value for the actuarial valuation, a technique for determining the actuarial value of assets is used which dampens volatility in the market value while still indirectly recognizing market value. The specific technique follows:

Step 1: Determine the expected value of plan assets at the current valuation date using the actuarial assumption for investment return applied to the prior actuarial value and the actual receipts and disbursements of the fund for the previous 12 months.

Step 2: Subtract the expected value determined in Step 1 from the total market value of the Fund at the current valuation date.

Step 3: Multiply the difference between market and expected values determined in Step 2 by 25%.

Step 4: Add the expected value of Step 1 and the product of Step 3 to determine the actuarial value of assets.

Step 5: Verify the preliminary actuarial value of assets in Step 4 is not more than 120% of the market value of assets nor less than 80% of the market value. If it is, adjust the actuarial value of assets so it falls within the 80% - 120% corridor.

TECHNICAL VALUATION PROCEDURES

Data Procedures

In-pay members:

If a birth date is not available, the member is assumed to be 80. If a retirement date is also not available, the member is assumed to have retired at 65.

If a beneficiary birth date is needed but not supplied, husbands are assumed to be 3 years older than wives.

Not in-pay members:

If a birth date is not available, the member is assumed to be the average age of the members with the same status.

If gender is not provided, regular members are assumed to be female and Sheriffs/Deputies and Protection Occupation members are assumed to be male.

Salaries for first year members are annualized based on the number of quarters with wages.

Membership Transfers

IPERS provides a code in the valuation data to indicate that a member is in a membership group (regular, Sheriffs and Deputies and Protection Occupation) different from that on the prior valuation date. The actuarial liability for these members is calculated under the assumptions and provisions of the prior membership group. A preliminary funded ratio (before asset transfer) is determined for the three membership groups. Assets are then transferred from the prior to the current membership group based on the funded ratio of the prior group times the actuarial liability of the member in the prior group. Then, the members are revalued in the current membership group for purposes of valuation calculations.

Other Valuation Procedures

No actuarial accrued liability in excess of the unclaimed member contribution balance is held for nonvested, inactive members. Inactive vested members who have died are treated in the same manner.

The wages used in the projection of benefits and liabilities are considered earnings for the current year ending June 30, increased by the salary scale.

The calculations for the actuarial contribution rate are determined as of mid-year. This is a reasonable estimate since contributions are made throughout the year.

The projected IRC Section 415 limit for active participants was not valued. The impact was assumed to be *de minimus*.

The compensation limitation under IRC Section 401(a)(17) is considered in this valuation.

No future additions to, or payments from, the Favorable Experience Dividend Reserve Account or the Active Member Supplemental Accounts are reflected in the valuation.

DEFINITION OF TERMS

Accrued Service	Service credited under the system that was rendered before the date of the actuarial valuation.
Actuarial Assumptions	Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of retirement system benefits between future normal cost and actuarial accrued liability. Sometimes referred to as the "actuarial funding method."
Actuarial Equivalent	A single amount or series of amounts of equal value to another single amount or series of amounts computed on the basis of a given set of actuarial assumptions.
Actuarial Liability	The difference between the actuarial present value of system benefits and the actuarial value of future normal costs. Also referred to as "accrued liability" or "actuarial accrued liability."
Actuarial Present Value	The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment.
Amortization	Paying off an interest-discounted amount with periodic payments of interest and principal, as opposed to paying off with lump sum payment.
Experience Gain (Loss)	The difference between actual experience and actuarial assumptions anticipated experience during the period between two actuarial valuation dates.
Normal Cost	The actuarial present value of retirement system benefits allocated to the current year by the actuarial cost method.

Unfunded Actuarial Liability

The difference between actuarial liability and the actuarial value of assets. Sometimes referred to as "unfunded accrued liability" or "unfunded liability".

Most retirement systems have unfunded actuarial liability. They arise anytime new benefits are added and anytime an actuarial loss is realized.

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APPENDIX D

CONTRIBUTION RATE FUNDING POLICY

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Background:
IPERS is charged with setting a "Required Contribution Rate" for each membership category within IPERS that will discharge its liabilities. Iowa Code §97B.11(3)(d) provides the basic framework for implementing this charge by stating:

> The Required Contribution Rate that is set by the system for a membership category shall be the contribution rate the system actuarially determines, based upon the most recent actuarial valuation of the system and using the actuarial methods, assumptions, and funding policy approved by the Investment Board, is the rate required by the system to discharge its liabilities as a percentage of the covered wages of members in that membership category. However, the Required Contribution Rate set by the system for members in regular service for a fiscal year shall not vary by more than one percentage point from the Required Contribution Rate for the prior fiscal year.

Goal:
To establish policy and procedures in setting contribution rates that combined with investment income will fund the benefits specified in Chapter 97B of the Iowa Code.

To move towards fully funding the benefits (100 percent or greater funded ratio) in as expeditious manner as is reasonable within the guidelines acknowledged herein.

Procedure:
The Investment Board shall retain a consulting actuary to conduct an annual actuarial valuation of assets and liabilities. The consulting actuary shall use the entry age normal cost method and all other actuarial assumptions and methods approved by the Investment Board.

In the annual valuation process, the consulting actuary shall calculate an Actuarial Contribution Rate and a Required Contribution Rate pursuant to this policy. Each shall be calculated as a level percent of pay.

There is a one-year lag between the completion of an annual actuarial valuation report and the fiscal year to which the contribution rates calculated therein are applied. Therefore, the Actuarial Contribution Rate and the Required Contribution Rate declared in the annual valuation process are applicable to the fiscal year immediately following the completion of the valuation report (for example the rates declared in the report presented to the Investment Board in December 2013 are applicable to the rates for the fiscal year beginning July 1, 2014).

Actuarial Contribution Rate (ACR):

1. ACR is the combined employer and employee contribution rate that is the minimum rate necessary to fund the benefits using the actuarial assumptions and methods approved by the Investment Board.

2. A separate ACR shall be determined for each membership group within IPERS according to this policy.

3. The ACR shall consist of:

    a. Normal cost and an amortization payment (not less than zero) of any unfunded actuarial liability.
    b. Normal cost may only be offset by a negative amortization payment after a membership group has attained a funded ratio of 110 percent or greater for 3 consecutive years.

Required Contribution Rate:

1. The Required Contribution Rate is the combined employer and employee rate payable pursuant to this policy and Iowa Code §97B.11(3)(d).

2. The Required Contribution Rate shall be determined by comparing the ACR determined in the annual valuation process to the Required Contribution Rate of the previous year.

    a. If the ACR is less than the previous Required Contribution Rate by fewer than 50 basis points, then the Required Contribution Rate shall remain unchanged from the previous year.

    b. If the ACR is less than the previous Required Contribution Rate by 50 basis points or more, then the Required Contribution Rate shall be lowered by 50 basis points provided the funded ratio of the membership group is 95 percent or higher.

    c. If the ACR is greater than the Required Contribution Rate of the previous year, then the Required Contribution Rate shall be:

        i. Increased to be equal to ACR for Sheriffs and Deputies.
        ii. Increased to be equal to ACR for Protection Occupation Members.
        iii. Increased to be equal to ACR for Regular Members, or one percentage point greater than the prior year's Required Contribution Rate, whichever is smaller.

Policy Guidelines:

In adopting actuarial assumptions and methods to be used in setting contribution rates, the Investment Board shall strive to provide a balance among the following:

1. Stability in contribution rates (such as use of smoothing and amortization schedules that do not produce dramatic swings in the required contributions from year to year).

2. Disciplined funding approach (such as requiring full payment of normal cost and an amortization payment towards the unfunded actuarial liability and deferring decreases in contribution rates until strong funded ratios are attained).

3. Interperiod equity (such as shortening the amortization schedule when reasonable and amortization of retroactive benefit enhancements over a reasonable time period such as the average working lifetime for active members and the average life expectancy of retired members).

4. Support an affordable, sustainable plan (in consultation with the Benefits Advisory Committee review affordability of required contribution rates and/or the benefit provisions).

5. At a minimum, this policy will be reviewed in conjunction with the quadrennial experience study.

IOWA PUBLIC EMPLOYEES' RETIREMENT SYSTEM
CERTIFICATION

This Addendum is being prepared solely for the purpose of providing the information required under Chapter 97 D.5 of the Iowa code. Calculations are based on the following prescribed methods:

Actuarial cost method: Entry Age Normal
Amortization method: Level percent of payroll
Amortization period: 30 years, open period

All other assumptions, methodologies, and System provisions used are consistent with those used in the June 30, 2018 valuation for the Iowa Public Employees' Retirement System.

The results shown in this Addendum may not be consistent with those in the June 30, 2018 valuation. The June 30, 2018 valuation results were determined in accordance with generally accepted actuarial principles and practices that are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying opinion and supporting recommendations of the American Academy of Actuaries. The results shown in this Addendum are not necessarily based on the methodologies adopted by the System.

We are available to answer any questions on the material contained in this report, or to provide explanations or further details as may be appropriate.

The undersigned credentialed actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Patrice Beckham

Patrice A. Beckham, FSA, EA, FCA, MAAA

October 29, 2018
Date

Brent A. Banister

Brent A. Banister, PhD, FSA, EA, FCA, MAAA

October 29, 2018
Date

IOWA PUBLIC EMPLOYEES' RETIREMENT SYSTEM
SUMMARY OF VALUATION RESULTS UNDER PRESCRIBED METHODOLOGY PER CHAPTER 97 D.5

This addendum report has been prepared to present the results of a valuation of the Iowa Public Employees' Retirement System as of June 30, 2018, based on the prescribed methodology under Chapter D.5.

The unfunded actuarial accrued liability has been amortized as a level percent of payroll over 30 years. The payroll growth assumption used was 3.25%.

A summary of results from the current and the prior valuation follows.

	Regular Membership Actuarial Valuation as of	
	June 30, 2018	**June 30, 2017**
Summary of Costs		
Normal cost	10.49%	10.40%
UAL amortization	4.67%	4.86%
Total	15.16%	15.26%
Less Employee Contribution Rate	(6.29%)	(6.29%)
Employer Required Contribution Rate	8.87%	8.97%
Funded Status		
Actuarial liability	$36,289,160,885	$35,176,950,577
Actuarial value of assets	29,513,302,525	28,292,788,895
Unfunded actuarial liability	$6,775,858,360	$6,884,161,682
Funded Ratio	81.3%	80.4%
Asset Values		
Market value of assets (MVA)	$29,962,905,119	$28,575,257,607
Actuarial Value of Assets (AVA)	29,513,302,525	28,292,788,895
MVA/AVA	102%	101%

	Sheriffs and Deputies Actuarial Valuation as of	
	June 30, 2018	**June 30, 2017**
Summary of Costs		
Normal cost	16.85%	16.85%
UAL amortization	0.56%	2.34%
Total	17.41%	19.19%
Less Employee Contribution Rate	(9.51%)	(9.76%)
Employer Required Contribution Rate	7.90%	9.43%
Funded Status		
Actuarial liability	$697,339,410	$691,205,752
Actuarial value of assets	682,505,577	642,509,070
Unfunded actuarial liability	$14,833,833	$48,696,682
Funded Ratio	97.9%	93.0%
Asset Values		
Market value of assets (MVA)	$693,572,370	$649,668,861
Actuarial Value of Assets (AVA)	682,505,577	642,509,070
MVA/AVA	102%	101%

	Protection Occupation Group* Actuarial Valuation as of	
	June 30, 2018	**June 30, 2017**
Summary of Costs		
Normal cost	15.22%	16.31%
UAL amortization	0.28%	0.55%
Total	15.50%	16.86%
Less Employee Contribution Rate	(6.61%)	(6.81%)
Employer Required Contribution Rate	8.89%	10.05%
Funded Status		
Actuarial liability	$1,656,333,358	$1,572,225,700
Actuarial value of assets	1,631,947,762	1,537,125,949
Unfunded actuarial liability	$24,385,596	$35,099,751
Funded Ratio	98.5%	97.8%
Asset Values		
Market value of assets (MVA)	$1,658,111,106	$1,554,189,858
Actuarial Value of Assets (AVA)	1,631,947,762	1,537,125,949
MVA/AVA	102%	101%

* Includes all public safety members other than Sheriffs and Deputies.