



STATE OF WISCONSIN
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 Robert J. Conlin
 SECRETARY

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Correspondence Memorandum

Date: March 4, 2020
To: Employee Trust Funds Board
From: Cindy Klimke-Armatoski
 Chief Trust Financial Officer
Subject: December 31, 2019 Actuarial Valuation of Retired Lives

ETF requests the Employee Trust Funds Board (Board) approve the report, 37th Annual Actuarial Valuation of Retired Lives as of December 31, 2019.

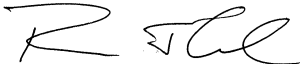
Gabriel Roeder Smith & Company (GRS) has completed the actuarial valuation of the Wisconsin Retirement System retired lives as of December 31, 2019. This valuation determines the amounts to be transferred from member and employer accounts to fund 2019 new annuities, and the amount available to provide increases for existing Core and Variable annuities.

GRS is recommending Core annuities be increased by 1.7%. This is based on the 7.7% effective rate interest credited to the Core annuity reserve and mortality experienced during the last year. The increase will be applied to all Core annuities except those originating in 2019, which will receive a prorated increase.

GRS is recommending Variable annuities be increased by 21.0%. This is based on the 29.0% effective rate interest credited to the Variable annuity reserve and mortality experienced during the last year. The Variable annuity increase will be applied equally to all Variable annuities, regardless of the effective date, and will first be included on May 1, 2020, annuity payments.

Pursuant to provisions of the Wisconsin Administrative Code, Secretary Conlin and the Board Chair, Wayne Koessler, reviewed and approved the recommended rates which were announced to the public. Actuaries from GRS will be at the Board meeting to present the report and answer questions.

Attachment: 37th Annual Actuarial Valuation of Retired Lives

Reviewed and approved by Robert J. Conlin, Secretary  Electronically Signed 3/9/20

Board	Mtg Date	Item #
ETF	3.26.20	5B

Wisconsin Retirement System

37th Annual Actuarial Valuation of Retired Lives

December 31, 2019



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March 4, 2020

Employee Trust Funds Board
Madison, Wisconsin

Ladies and Gentlemen:

The results of the **37th annual actuarial valuation of core and variable annuities** being paid from the Wisconsin Retirement System are presented in this report. The purpose of this report is to establish the ratio of assets to liabilities in the Core and Variable Funds and to make recommendations for related benefit adjustments in accordance with statutory provisions and administrative code. This report should not be relied on for any other purpose.

The date of this valuation was December 31, 2019. Actuarial assumptions used in the valuation are summarized in the Appendix. The assumptions and methods were unchanged from those used in the prior valuation.

The results of the valuation may be briefly summarized as follows (\$ millions):

	Core	Variable
Number of Annuitants	216,944	41,777
Annual Amount of Annuities Paid	\$ 5,183.7	\$ 379.7
Fund Balance	59,138.4	4,519.4
Actuarial Reserve	58,157.0	3,728.6
Ratio	1.017	1.212

Based upon these results, core annuities will be increased 1.7% and variable annuities will be increased by 21.0%.

This report was prepared at the request of the Wisconsin Retirement System and those designated or approved by the Wisconsin Retirement System. This report may be provided to parties other than the Wisconsin Retirement System only in its entirety and only with the permission of the Wisconsin Retirement System. GRS is not responsible for unauthorized use of this report. The valuation was based upon data furnished by the WRS staff, concerning Fund assets and individual annuitants and beneficiaries. Data was checked for internal consistency, but was not audited. We are not responsible for the accuracy or completeness of the information provided by the Wisconsin Retirement System.

Future actuarial measurements may differ significantly from the current measurements 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; and changes in plan provisions or applicable law.

This report does not include an assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. However, an additional assessment of risk for the Wisconsin Retirement System was conducted in the fall of 2019 in conjunction with the State of Wisconsin Investment Board. Additional discussion of various risk factors is also included in the active lives valuation report issued in June.

To the best of our knowledge this report is complete and accurate. All calculations have been made in conformity with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. Brian B. Murphy, Mark Buis and James D. Anderson are all Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The signing actuaries are independent of the plan sponsor.

The cooperation of the Secretary and his staff in gathering materials for this valuation is acknowledged with appreciation.

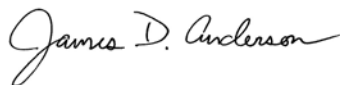
Respectfully submitted,



Brian B. Murphy, FSA, EA, FCA, MAAA



Mark Buis, FSA, EA, FCA, MAAA



James D. Anderson, FSA, EA, FCA, MAAA

BBM/MB/JDA:sc



SECTION A

EXECUTIVE SUMMARY

Executive Summary

1. Retiree Dividend in Core Annuities

The net of fee investment return of 19.36% in the core annuity fund was higher than the assumed investment return of 7.0% on a market value basis. However, under the asset valuation method, investment gains and losses are spread over a 5-year period. Partial recognition of this year's gain was combined with the continued phase-in of investment gains and losses from prior years resulting in a published effective earnings rate of 7.7%. The 7.7% published effective earnings rate exceeds the 5.0% investment return threshold that triggers an annuity adjustment. This valuation determined the amount of available surplus/deficit. The surplus in the core fund is \$981.4 million as of December 31, 2019. After adjusting for expected improvements in longevity and various other items (described in detail on page 6), **the result is a 1.7% increase in the core annuity benefit.**

2. Change in Variable Annuities

The variable fund effective earnings rate was 29.0% resulting in a surplus of \$790.8 million. The surplus of \$790.8 million will **result in a 21.0% increase in all variable annuities in force.**

3. General Comments

Due to the asset smoothing method used in the core annuity fund, there are approximately \$5.7 billion in unrecognized asset gains as of December 31, 2019 which will be recognized over the next four years. Although approximately half of this applies to the annuitant reserve, this will put upward pressure on dividends being granted over the next few years.

The present value of previously granted dividends is approximately \$6.5 billion. It is important that the value of dividend payments continue to build up in order to avoid the possibility of leveraged negative adjustments in the future. This buildup will happen naturally as long as investments in the core fund attain the long-term investment assumption of 7.0% adopted with the most recent experience study.

4. Conclusion

In accordance with the Administrative Code, ETF 20.25, Section 40.27(2) and Section 40.28(2) of the Wisconsin Statutes:

Core annuities will be increased by 1.7%, and
Variable annuities will be increased by 21.0%.

SECTION B

OPERATION OF THE RETIREMENT SYSTEM

Operation of the Retirement System

Each year, as of December 31, an actuarial valuation of the liability for retired persons receiving benefits from the Wisconsin Retirement System is conducted. The purpose of the valuation is to determine the actuarial present value of future benefit payments on behalf of current retired lives. This present value is the “actuarial reserve.” Theoretically, if an amount of money equal to the actuarial present value were invested at a yield equal to the valuation interest rate, the initial amount plus the continuing investment income would provide exactly the right amount of money to pay the annuities of all current retired persons and their beneficiaries for the rest of their lives. The fund would decrease each year, and would become zero many decades in the future when the last annuitant dies.

The above is a “closed group” description of the operation of the annuity reserve fund. But the fund is really an “open group.” The size of the fund does not actually decrease because each year more benefits are added to the rolls than are removed and fresh money is transferred into the annuity reserve fund to finance the benefits of the new annuitants. (The actuary calculates the reserve transfers for new annuitants each year as a by-product of the actuarial valuation.)

According to theory, the fund will eventually reach a state when the number of people entering (retiring) each year is approximately equal to the number of people exiting (dying) each year. When this mature state is reached, the amount of money in the fund will remain approximately level in constant dollars from year to year. Each year, the reserve transfers for the new annuitants plus real investment earnings on the whole fund (total money in) will be approximately equal to the benefit payments (total money out). The only source of growth in assets would be the result of the effects of inflation. The dollars in the fund would increase, but the “real” value of the fund would not change.

There are at least two factors that cause the actual operation to be different from the theoretical operation described above. The first is that annuitants may have longer or shorter lifetimes than expected. In recognition of this, the actuary monitors mortality experience of the retirement system and recommends a new mortality table when appropriate. The second factor is that actual investment earnings are rarely equal to the assumed rate. When either mortality or investment earnings differ from expectations, the difference, positive or negative, is recorded in a supplemental reserve. The operation of the supplemental reserve is described on the next page.

Operation of the Retirement System

The Wisconsin Retirement System (WRS) maintains separate reserves for core and variable annuities.

The basic objective of the Core Fund is to earn an optimum long-term return while taking acceptable risk. The Core Fund has a significant amount of stocks, but also invests in other assets such as bonds, real estate and private equity. It is considered a fully diversified, balanced fund invested for the long-term needs of the Retirement System. The Variable Fund is an “all-stocks” fund. Participants in this fund are exposed to a higher degree of risk (because of possible losses from unfavorable stock market performance), in exchange for the possibility of greater returns over the life of the investment in the fund. Investment return in the Core Fund is smoothed via operation of the Market Recognition Account. Variable Fund returns are not smoothed.

Annuity adjustments for both Core and Variable annuities depend on whether or not returns credited to those funds exceed or fall short of 5%. If there are negative Core and/or Variable annuity adjustment rates based on investment losses, the Core portion of a participant’s annuity can never be decreased below the finalized initial amount. However, there is no limit to how much the Variable portion of a participant’s annuity can be reduced.

WRS practice with respect to annuity adjustments is described below.

Core Annuity Division: If the supplemental reserve is positive and is at least 0.5% of core annuity liabilities, core annuity increases (dividends) may be granted. If the supplemental reserve is negative and is equal to or greater than 0.5% of core annuity liabilities in absolute value, prior core annuity dividends are reduced by an aggregate amount equal to the shortfall. Increases or decreases become effective in April following the December 31 valuation.

Variable Annuity Division: If the supplemental reserve is at least 2% of variable annuity liabilities, substantially all of the reserve (dropping fractions of a percent) is used to increase or decrease variable annuities for the ensuing year. Increases or decreases become effective in April following the December 31 valuation.

In calculating both the dividend for the Core annuities and the adjustment for Variable annuities, a 5.0% assumed investment return is used to fund the original benefit. Returns in excess of 5.0% can produce an increase in a member’s annuity. Returns below 5% result in a decrease. Please see page 29 for a full description of the statutory provisions.



SECTION C

CORE ANNUITIES

Core Annuity Division Development of Assets and Liabilities

	\$ Millions		Ratio
	Assets	Liabilities	
Ending Balance December 31, 2018	\$56,493.8	\$56,629.3	0.998
Closing Adjustments	(5.2)	0.0	
Variable Terminations	50.7	50.7	
2019 Core Annuity Average Adjustment: 0%	0.0	0.0	
Beginning Balance January 1, 2019	56,539.3	56,680.0	0.998
Increases			
Reserve Transfers	3,692.5	3,692.5	
Regular Interest (5%)	2,797.5	2,797.5	
Additional Earnings	1,299.3	0.0	
Addition for Experience Study/Mortality Reserve	0.0	113.8	
Other	0.0	63.4	
Total Increases	7,789.3	6,667.2	
Decreases			
Annuities & Lump Sums	5,162.5	5,162.5	
Credit Re-establishments	27.7	27.7	
Subtraction for Experience Study/Mortality Reserve	0.0	0.0	
Other	0.0	0.0	
Total Decreases	5,190.2	5,190.2	
Ending Balance December 31, 2019	\$59,138.4	\$58,157.0	1.017

The ending liability balance includes a data reserve of \$58.1 million and a liability for previously granted dividends of \$6,500 million (prior to any 2020 adjustments).

Reserve Transfer Recommendation

Amounts to be transferred from the Employer Reserve and the Employee Reserve to the Annuity Reserve to cover liabilities for new annuities are computed as the first step in the annual actuarial valuation. The actuarial present value at time of retirement of core annuities reported as new since the last actuarial valuation is \$3,674,964,902. Adjustments to prior transfers, related to estimated annuities for which final computations have now been made, totaled \$17,584,367. Reserve transfers are distributed as follows:

Group	Regular Transfer	Adjustment to Prior Transfer	Total Transfer
General	\$3,062,942,977	\$16,040,831	\$3,078,983,808
Protective with Social Security	462,516,438	1,037,338	463,553,776
Protective without Social Security	111,767,291	246,298	112,013,589
Executive & Elected	37,738,196	259,900	37,998,096
Totals	\$3,674,964,902	\$17,584,367	\$3,692,549,269

Accordingly, we recommend that \$3,692,549,269 be transferred to the Core Annuity Reserve. The results in this report assume that this transfer has been made.

Discussion of Dividend

The Core Annuity Fund balance, \$59,138.4 million, was higher than the actuarial present value of core annuities and reserves, \$58,157.0 million, by \$981.4 million, which resulted in an annuity adjustment of 1.7%. The primary sources of the 1.7% adjustment are:

	% of APV
1. SWIB net of fee investment return	19.36%
2. MRA adjustment	(11.66)%
3. Published effective earnings rate	7.70%
4. Adjustment to relate earnings to average core annuity fund balance	(0.36)%
5. Earnings rate based on average balance	7.34%
6. Expected dividend before adjustments: $1.0734/1.05-1$	2.23%
7. Adjustment to relate average asset to ending liability	0.00%
8. Carryover from last year due to timing of dividend accounting adjustments and rounding	(0.24)%
9. Experience study/mortality reserve adjustment	(0.20)%
10. Experience and other effects	(0.10)%
11. Statutory adjustment to round to nearest one-tenth percent	0.01%
12. Computed average dividend rate: (6)+(7)+(8)+(9)+(10)+(11)	1.7%
13. Adjustment for members at or near the statutory floor	0.0%
14. Final computed dividend rate: (12)+(13), if greater than 0.5% (or less than -0.5%) of core annuities, otherwise 0%	1.7%

See pages 30 and 31 for a description of items on this page.

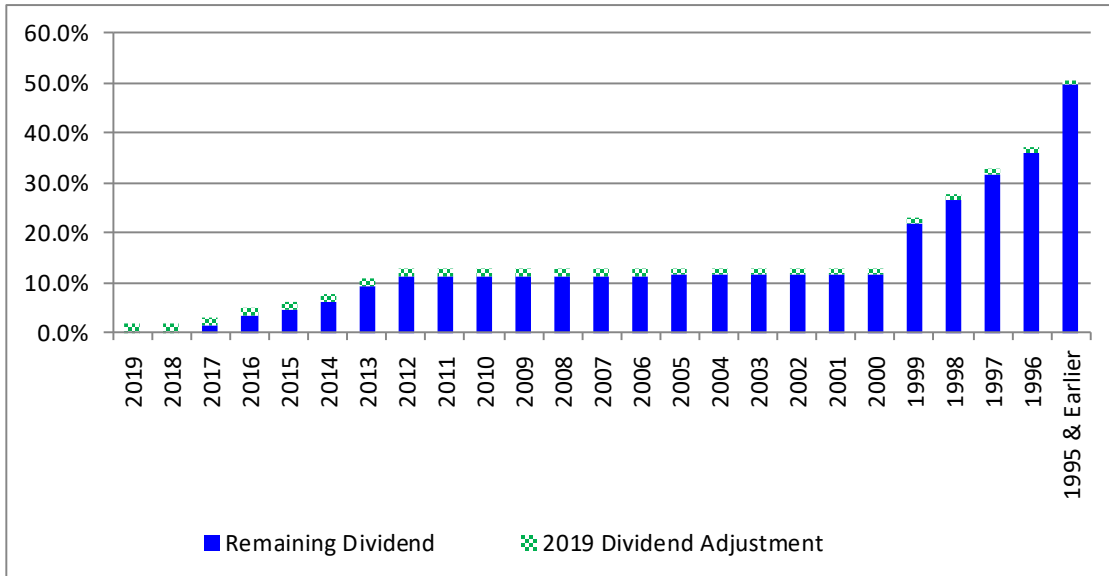
In accordance with the Administrative Code, ETF 20.25 and Section 40.27(2) Wisconsin Statutes (shown on page 29 of this report), the dividend adjustment is 1.7% effective April 1, 2020.



Discussion of Dividend

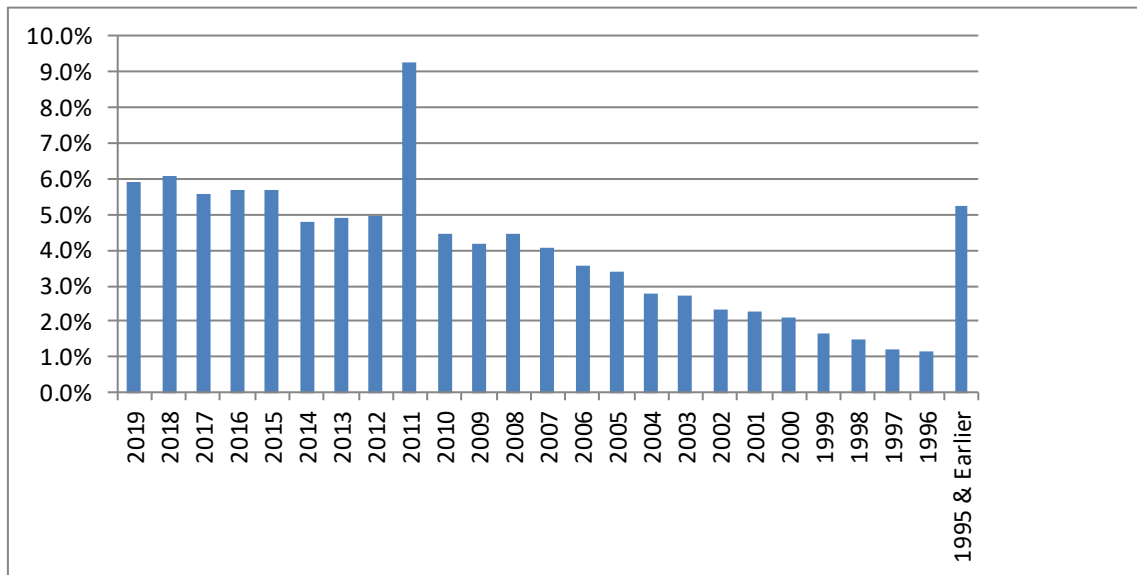
As shown on the prior page, the adjustment for core fund members is 1.7%.

Dividend Remaining (as a Percentage of Total Benefit) by Year of Retirement



After the 2020 dividend adjustment, members retired prior to 2000 continue to have the highest dividend remaining as a percentage of total benefit and also represent a shrinking portion of the liabilities. The chart below shows liabilities by year of retirement.

Liabilities (as a Percentage of Total) by Year of Retirement



Between 2008 and 2012, the liability for dividends decreased from about \$9.2 billion to \$3.0 billion. The value of previously granted dividends is approximately \$6.5 billion as of December 31, 2019. In addition, there are currently about \$5.7 billion in unrecognized asset gains that will be recognized over the next four years, about half of which will be applied to the annuitant reserve.

Transfers to Annuity Reserve to Finance Core Annuities Approved in 2019 Tabulated by Type of Annuity and Option

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
REGULAR RETIREMENT				
SL	Straight Life	1,621	\$ 33,152,594	\$ 454,050,426
SL	Straight Life (accelerated)	0	3,564,379	13,993,105
A60	Life Annuity with 60 payments guaranteed	844	17,807,204	246,344,976
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	2,496,940	8,728,866
A180	Life Annuity with 180 payments guaranteed	1,905	38,875,103	563,823,195
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	6,987,614	26,914,124
A180F	Life Annuity with 180 payments guaranteed (forced)	41	506,910	6,292,320
JOINT	Joint and 75% Survivor	871	22,718,237	348,777,163
JOINT	Joint and 75% Survivor (accelerated)	0	3,345,327	13,221,954
R25	Reduced 25% on First Death	375	11,736,775	173,276,864
R25	Reduced 25% on First Death (accelerated)	0	1,460,313	6,218,422
C100	100% Continued to Named Survivor	1,060	23,487,726	360,891,419
C100	100% Continued to Named Survivor (accelerated)	0	3,172,126	12,339,615
C180	100% Continued to Named Survivor with 180 payments guaranteed	3,210	78,420,508	1,247,447,010
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	13,954,092	59,596,691
LOL	Life with Optional Length Guaranteed	2	351,021	3,698,567
AC24	Annuity Certain with 24 Payments	2	199,504	453,509
AC60	Annuity Certain with 60 Payments	2	183,607	870,838
AC120	Annuity Certain with 120 Payments	1	94,732	778,628
AC180	Annuity Certain between 24 and 180 Payments	1	236,939	1,615,271
SLNSD	Straight Life - Named Survivor Deceased	1	16,031	110,846
	Total Regular	9,936	\$ 262,767,682	\$ 3,549,443,809
	Average Age at Retirement	61.2 Years		
DISABILITY RETIREMENT				
SL	Straight Life	57	\$ 1,345,080	\$ 18,945,729
A60	Life Annuity with 60 payments guaranteed	7	170,730	2,354,670
A180	Life Annuity with 180 payments guaranteed	53	1,359,281	20,392,194
JOINT	Joint and 75% Survivor	20	516,361	8,262,456
R25	Reduced 25% on First Death	2	52,167	802,015
C100	100% Continued to Named Survivor	34	925,356	15,323,899
C180	100% Continued to Named Survivor with 180 payments guaranteed	90	2,474,649	40,534,373
AC24	Annuity Certain with 24 Payments	1	3,694	6,739
	Total Disability	264	\$ 6,847,318	\$ 106,622,075
	Average Age at Retirement	53.9 Years		
DEATH-IN-SERVICE BENEFITS				
SL	Straight Life	9	\$ 100,236	\$ 1,419,330
SL	Straight Life (accelerated)	0	23,904	102,430
A60	Life Annuity with 60 payments guaranteed	8	152,145	2,316,793
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	2,428	5,246
A180	Life Annuity with 180 payments guaranteed	55	939,152	14,309,247
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	117,895	745,972
	Total Death-in-Service	72	\$ 1,335,760	\$ 18,899,018
	Average Age at Retirement	54.1 Years		
GRAND TOTAL		10,272	\$ 270,950,760	\$ 3,674,964,902

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.



Core Annuities Being Paid Tabulated by Type of Annuity and Option

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
REGULAR RETIREMENT				
SL	Straight Life	28,795	\$ 601,875,845	\$ 6,458,714,833
SL	Straight Life (accelerated)	0	16,353,890	41,828,350
A60	Life Annuity with 60 payments guaranteed	21,011	443,119,530	4,520,994,213
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	11,794,898	27,500,650
A120	Life Annuity with 120 payments guaranteed	26	279,390	735,518
A180	Life Annuity with 180 payments guaranteed	41,556	836,793,471	9,024,015,777
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	33,030,437	86,331,424
A180F	Life Annuity with 180 payments guaranteed (forced)	394	3,440,764	31,918,591
JOINT	Joint and 75% Survivor	23,506	623,624,799	7,183,649,578
JOINT	Joint and 75% Survivor (accelerated)	0	15,070,619	38,478,750
R25	Reduced 25% on First Death	13,990	404,230,253	4,058,865,985
R25	Reduced 25% on First Death (accelerated)	0	6,352,445	16,800,117
C100	100% Continued to Named Survivor	20,216	455,009,511	5,546,978,373
C100	100% Continued to Named Survivor (accelerated)	0	14,161,917	37,102,335
C180	100% Continued to Named Survivor with 180 payments guaranteed	56,895	1,426,645,181	18,623,137,435
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	64,886,344	179,207,188
LOL	Life with Optional Length Guaranteed	33	1,129,455	8,844,579
LOLF	Life with Optional Length Guaranteed (Forced)	2	38,205	110,659
AC24	Annuity Certain with 24 Payments	2	238,239	405,338
AC60	Annuity Certain with 60 Payments	7	541,155	1,571,282
AC120	Annuity Certain with 120 Payments	13	1,180,083	5,054,364
AC180	Annuity Certain between 24 and 180 Payments	6	1,778,306	7,950,460
C50	50% Continued to One Beneficiary	25	265,338	920,933
C50W180	50% Continued to One Beneficiary with 180 Months guaranteed	1	3,672	11,237
C75WSS	75% Continued to One Beneficiary and Social Security Integrated	36	784,555	3,135,306
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	22	85,666	235,423
A180WSS	Life with 180 Months Guaranteed and Social Security Integrated	31	614,327	1,681,828
PF6213	Police and Firemen s.62.13 *	21	673,715	2,313,007
SLNSD	Straight Life - Named Survivor Deceased	774	21,672,864	210,084,678
Total Regular		207,362	\$4,985,674,874	\$56,118,578,211

(concluded on next page)

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.



Core Annuities Being Paid Tabulated by Type of Annuity and Option

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
DISABILITY RETIREMENT				
SL	Straight Life ⁽¹⁾	2,745	\$ 56,993,526	\$ 440,231,718
A60	Life Annuity with 60 payments guaranteed	370	9,712,487	89,210,424
A180	Life Annuity with 180 payments guaranteed	1,046	25,982,170	269,170,835
JOINT	Joint and 75% Survivor	500	11,587,476	127,411,690
R25	Reduced 25% on First Death	198	4,479,836	47,190,002
C100	100% Continued to Named Survivor	1,156	21,314,618	233,843,558
C180	100% Continued to Named Survivor with 180 payments guaranteed	2,131	45,794,434	582,100,065
AC24	Annuity Certain with 24 Payments	1	3,694	5,586
AC180	Annuity Certain between 24 and 180 Payments	0	2,458	4,288
DWSMC	Disability with Spouse or Minor/Dependent Child	2	33,771	277,010
PF6213	Police and Firemen s.62.13 *	7	118,804	527,276
SLNSD	Straight Life - Named Survivor Deceased	7	198,335	2,017,895
Total Disability		8,163	\$ 176,221,609	\$ 1,791,990,347
DEATH-IN-SERVICE BENEFITS				
SL	Straight Life	245	\$ 3,408,274	\$ 36,255,595
SL	Straight Life (accelerated)	0	104,319	402,688
A60	Life Annuity with 60 payments guaranteed	136	2,451,929	26,918,602
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	46,887	186,030
A180	Life Annuity with 180 payments guaranteed	1,011	14,987,951	179,045,991
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	563,383	2,236,916
C180	100% Continued to Named Survivor with 180 payments guaranteed	2	11,046	157,376
LOL	Life with Optional Length Guaranteed	5	173,630	972,367
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	18	14,150	57,214
PF6213	Police and Firemen s.62.13 *	2	62,071	204,766
Total Death-in-Service		1,419	\$ 21,823,640	\$ 246,437,545
GRAND TOTAL		216,944	\$ 5,183,720,123	\$ 58,157,006,103

⁽¹⁾ Includes 1,952 members formerly covered under the LTDI program.

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.

*Additional Information for Police and Firemen 62.13 Annuities

	<u>Regular Retirement</u>			<u>Disability Retirement</u>			<u>Death-in-Service Retirement</u>		
	Original	Dividends	Total	Original	Dividends	Total	Original	Dividends	Total
Benefit Amount	\$ 165,135	\$ 508,580	\$ 673,715	\$ 26,249	\$ 92,555	\$118,804	\$ 14,477	\$ 47,594	\$ 62,071
Present Value	563,161	1,749,846	2,313,007	116,497	410,779	527,276	47,749	157,017	204,766



Core Annuities Being Paid Tabulated by Attained Ages

Attained Ages	Regular		Disability		Death-in-Service		Totals	
	No.	Annual Amount	No.	Annual Amount	No.	Annual Amount	No.	Annual Amount
Under 20	0	\$ 0	0	\$ 0	2	\$ 28,514	2	\$ 28,514
20-24	0	0	5	42,731	12	114,649	17	157,380
25-29	0	0	10	79,083	20	111,139	30	190,222
30-34	1	4,527	30	421,386	24	163,834	55	589,747
35-39	1	8,117	84	1,148,535	43	245,294	128	1,401,946
40-44	15	118,243	192	3,231,956	30	330,770	237	3,680,969
45-49	179	508,327	340	6,270,065	58	453,077	577	7,231,469
50-54	2,510	42,748,126	712	13,917,915	72	803,796	3,294	57,469,837
55-59	15,172	347,955,299	1,309	27,989,524	153	2,077,271	16,634	378,022,094
60-64	33,690	758,595,172	1,620	37,010,340	214	3,321,001	35,524	798,926,513
65-69	49,592	1,175,323,760	1,223	28,709,672	236	4,779,782	51,051	1,208,813,214
70-74	43,306	1,118,465,242	989	23,735,703	187	3,786,894	44,482	1,145,987,839
75-79	27,532	679,253,198	740	15,605,667	124	2,055,731	28,396	696,914,596
80-84	17,897	420,236,921	506	10,509,721	88	1,465,725	18,491	432,212,367
85-89	10,584	266,666,656	278	5,014,608	63	738,957	10,925	272,420,221
90-94	4,478	119,451,120	96	1,941,895	36	708,538	4,610	122,101,553
95 & Up	1,175	34,070,562	28	589,114	23	251,569	1,226	34,911,245
Certain Only*	1,230	22,269,604	1	3,694	34	387,099	1,265	22,660,397
Totals	207,362	\$4,985,674,874	8,163	\$176,221,609	1,419	\$21,823,640	216,944	\$5,183,720,123

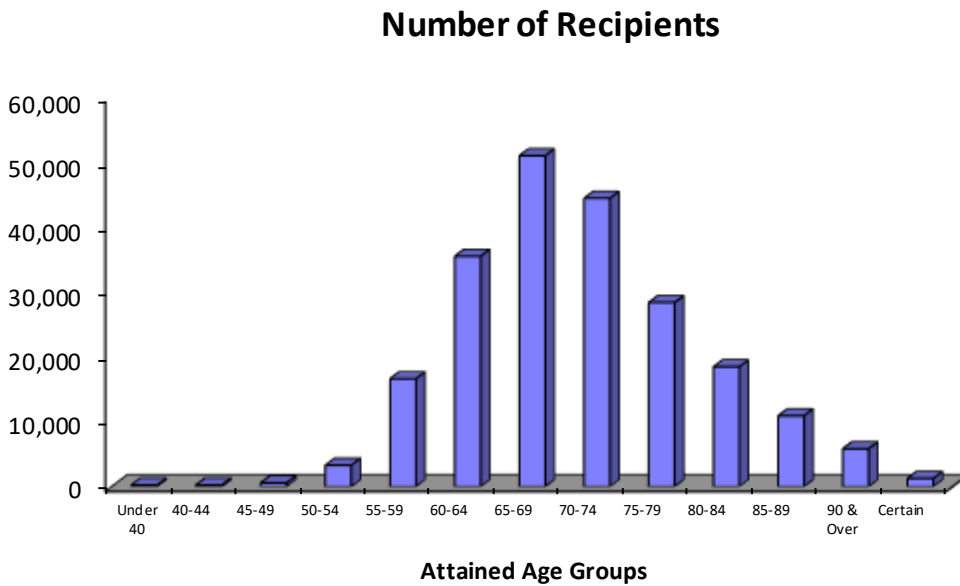
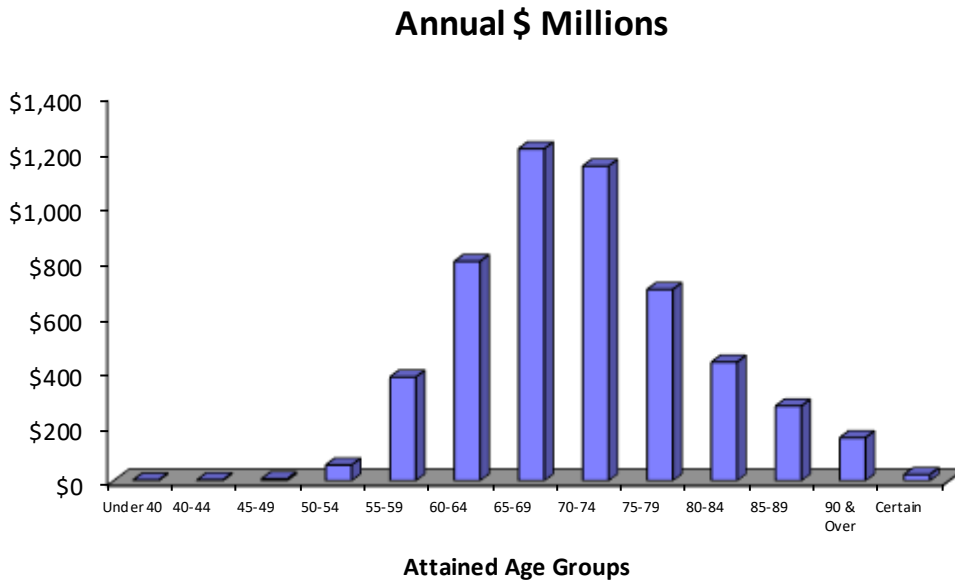
Averages in Years

Age at retirement	59.8	50.9	52.1	59.5
Attained age	71.1	64.3	67.4	70.9

* Certain Only category consists of continuations of 5, 10 and 15-year certain and life annuities to beneficiaries of deceased annuitants.

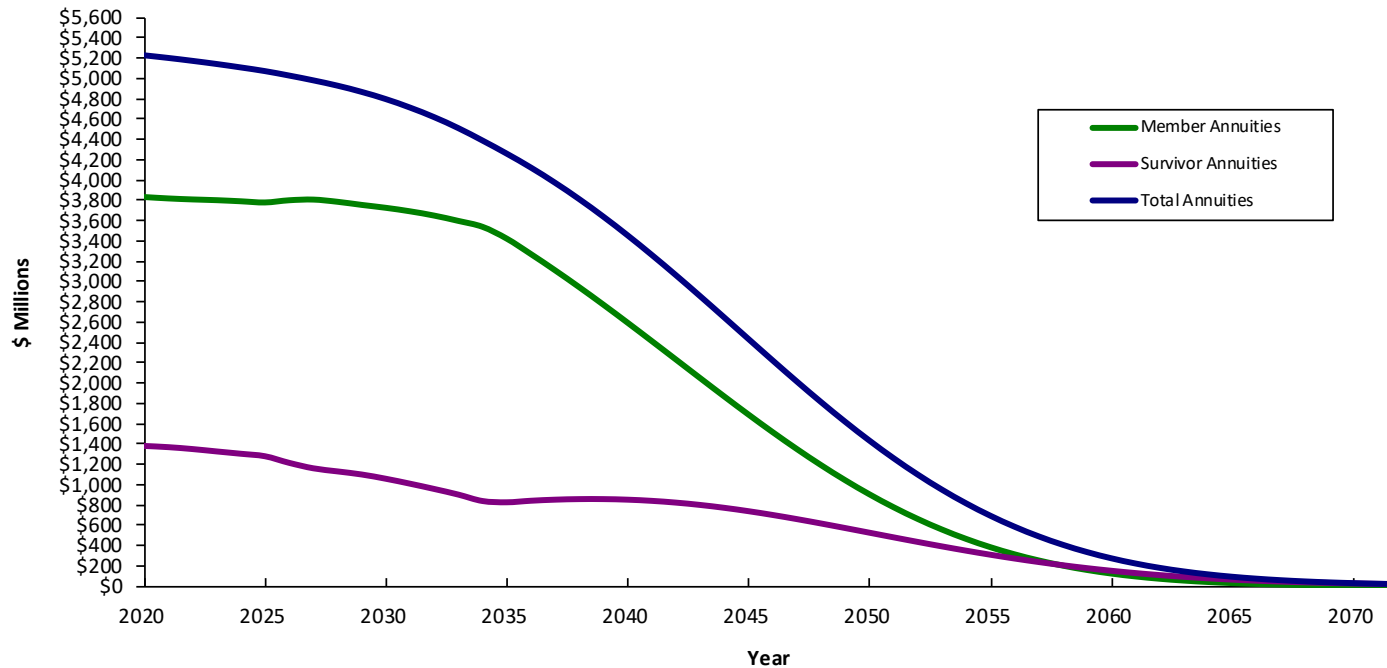


Core Annuities Being Paid by Attained Age*



* Includes regular and disability retirees and survivor beneficiaries. The “certain” category includes annuities paid for a fixed period which is not dependent upon the age of the recipient.

Projected Future Core Annuity Payments on Behalf of Present Retired Lives Including Present and Future Expected Dividends



	\$ Billions	
	<u>With Expected Dividends</u>	<u>Without Expected Dividends</u>
Total Future Benefit Payments	\$128.1	\$98.6
Present Assets	59.1	59.1
Future Investment Return Needed	69.0	39.5

Based upon the assumptions used in the valuation, future dividends are expected to be approximately 1.9% per year. Of course actual dividends will be based upon actual future investment return and the operation of the Market Recognition Account.

SECTION D

VARIABLE ANNUITIES

Variable Annuity Division Development of Assets and Liabilities

	\$ Millions		Ratio
	Assets	Liabilities	
Ending Balance December 31, 2018	\$3,749.1	\$4,207.6	0.891
Closing Adjustments	(1.7)	0.0	
Variable Terminations	(50.7)	(50.7)	
2019 Adjustment: -10%	0.0	(411.0)	
Beginning Balance January 1, 2019	3,696.7	3,745.9	0.987
Increases			
Reserve Transfers	197.7	197.7	
Regular Interest (5%)	182.5	182.5	
Additional Earnings	833.4	0.0	
Addition for Experience Study/Mortality Reserve	0.0	8.7	
Other	0.0	0.0	
Total Increases	1,213.6	388.9	
Decreases			
Annuities & Lump Sums	391.0	391.0	
Credit Re-establishments	(0.1)	(0.1)	
Subtraction for Experience Study/Mortality Reserve	0.0	0.0	
Other	0.0	15.3	
Total Decreases	390.9	406.2	
Ending Balance December 31, 2019	\$4,519.4	\$3,728.6	1.212



Reserve Transfer Recommendation

Amounts to be transferred from the Employer Reserve and the Employee Reserve to the Annuity Reserve to cover liabilities for new annuities are computed as the first step in the annual actuarial valuation. The actuarial present value at time of retirement of variable annuities reported as new since the last actuarial valuation is \$186,487,402. Adjustments to prior transfers, relating to estimated annuities for which final computations have now been made, totaled \$11,180,410. Reserve transfers were distributed as follows:

Group	Regular Transfer	Adjustment to Prior Transfer	Total Transfer
General	\$161,253,762	\$ 9,851,023	\$171,104,785
Protective with Social Security	19,140,607	1,080,709	20,221,316
Protective without Social Security	2,748,130	112,638	2,860,768
Executive & Elected	3,344,903	136,040	3,480,943
Totals	\$186,487,402	\$11,180,410	\$197,667,812

Accordingly, we recommend that \$197,667,812 be transferred to the Variable Annuity Reserve. The results in this report assume that this transfer has been made.

Discussion of Variable Annuity Change

Variable Annuity Reserves, \$4,519.4 million, were more than the actuarial present value of variable annuities, \$3,728.6 million, by \$790.8 million as of December 31, 2019 or 21.2% of the Actuarial Present Value (APV) of variable annuity payments. In accordance with Section 40.28(2) of the Wisconsin statutes (see page 29 of this report), variable annuities will be increased by 21.0% effective April 1, 2020. The primary sources of the 21.0% are as follows:

	% of APV
1. SWIB net of fee investment return	28.5%
2. Adjustment to published effective rate	0.5%
3. Published effective earnings rate	29.0%
4. Adjustment to relate earnings to average variable annuity fund balance	(0.8)%
5. Earnings rate based on average balance	28.2%
6. Expected change before adjustments: $(1.282)/1.05-1$	22.1%
7. Adjustment to relate average asset to ending liability	0.3%
8. Carryover from last year due to timing of distribution, accounting adjustments and truncation	(1.3)%
9. Experience study/mortality reserve adjustment	(0.2)%
10. Experience and other effects	0.3%
11. Statutory adjustment: (truncate to whole percent)	(0.2)%
12. Variable annuity change: (6)+(7)+(8)+(9)+(10)+(11)	21.0%

Please see pages 30 and 31 for a description of the items on this page.

In accordance with the Administrative Code, ETF 20.25 and Section 40.28(2) Wisconsin Statutes (shown on page 29 of this report), variable annuities will be increased by 21.0% effective April 1, 2020.



Transfers to Annuity Reserve to Finance Variable Annuities Approved in 2019 Tabulated by Type of Annuity and Option

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
REGULAR RETIREMENT				
SL	Straight Life	256	\$ 1,618,259	\$ 21,261,597
SL	Straight Life (accelerated)	0	225,990	903,921
A60	Life Annuity with 60 payments guaranteed	148	856,546	12,164,933
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	206,896	815,079
A180	Life Annuity with 180 payments guaranteed	356	2,019,521	29,656,701
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	521,075	2,148,595
A180F	Life Annuity with 180 payments guaranteed (forced)	3	7,793	98,165
JOINT	Joint and 75% Survivor	179	1,242,906	18,988,029
JOINT	Joint and 75% Survivor (accelerated)	0	234,867	969,906
R25	Reduced 25% on First Death	70	513,296	7,708,775
R25	Reduced 25% on First Death (accelerated)	0	101,445	388,566
C100	100% Continued to Named Survivor	186	1,144,712	17,885,345
C100	100% Continued to Named Survivor (accelerated)	0	227,557	931,757
C180	100% Continued to Named Survivor with 180 payments guaranteed	569	3,878,678	61,351,171
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	868,259	3,802,324
LOL	Life with Optional Length Guaranteed	1	158,598	1,692,230
AC24	Annuity Certain with 24 Payments	0	2,476	4,516
AC60	Annuity Certain with 60 Payments	0	7,766	37,973
AC120	Annuity Certain with 120 Payments	1	2,881	22,592
AC180	Annuity Certain between 24 and 180 Payments	0	2,415	14,143
	Total Regular	1,769	\$ 13,841,936	\$ 180,846,318
	Average Age at Retirement	60.0 Years		
DISABILITY RETIREMENT				
SL	Straight Life	5	\$ 21,630	\$ 332,517
A180	Life Annuity with 180 payments guaranteed	11	79,077	1,152,833
JOINT	Joint and 75% Survivor	3	16,493	254,429
C100	100% Continued to Named Survivor	8	47,981	813,052
C180	100% Continued to Named Survivor with 180 payments guaranteed	17	92,430	1,494,058
	Total Disability	44	\$ 257,611	\$ 4,046,889
	Average Age at Retirement	53.2 Years		
DEATH-IN-SERVICE BENEFITS				
SL	Straight Life	2	\$ 9,631	\$ 133,032
A60	Life Annuity with 60 payments guaranteed	1	4,665	70,394
A180	Life Annuity with 180 payments guaranteed	16	84,767	1,312,091
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	15,665	78,678
	Total Death-in-Service	19	\$ 114,728	\$ 1,594,195
	Average Age at Retirement	56.4 Years		
GRAND TOTAL		1,832	\$ 14,214,275	\$ 186,487,402

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.



Variable Annuities Being Paid Tabulated by Type of Annuity and Option

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
REGULAR RETIREMENT				
SL	Straight Life	5,093	\$ 41,764,125	\$ 388,964,135
SL	Straight Life (accelerated)	0	604,214	1,648,651
A60	Life Annuity with 60 payments guaranteed	3,641	30,279,378	270,330,100
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	538,979	1,328,643
A120	Life Annuity with 120 payments guaranteed	7	40,942	99,277
A180	Life Annuity with 180 payments guaranteed	7,969	61,409,030	586,765,539
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	1,631,277	4,570,017
A180F	Life Annuity with 180 payments guaranteed (forced)	37	237,212	1,729,136
JOINT	Joint and 75% Survivor	4,946	51,711,500	522,276,020
JOINT	Joint and 75% Survivor (accelerated)	0	742,851	2,063,875
R25	Reduced 25% on First Death	3,363	46,711,131	387,041,567
R25	Reduced 25% on First Death (accelerated)	0	288,336	704,247
C100	100% Continued to Named Survivor	3,855	35,660,983	367,498,902
C100	100% Continued to Named Survivor (accelerated)	0	562,436	1,684,553
C180	100% Continued to Named Survivor with 180 payments guaranteed	11,040	93,870,738	1,081,886,481
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	2,485,597	7,284,167
LOL	Life with Optional Length Guaranteed	4	211,187	1,828,250
AC24	Annuity Certain with 24 Payments	0	27,184	30,849
AC60	Annuity Certain with 60 Payments	0	40,208	76,915
AC120	Annuity Certain with 120 Payments	2	74,210	337,912
AC180	Annuity Certain between 24 and 180 Payments	0	391,641	1,468,904
C50	50% Continued to One Beneficiary	13	139,549	431,903
C50W180	50% Continued to One Beneficiary with 180 Months guaranteed	1	11,336	32,470
C75WSS	75% Continued to One Beneficiary and Social Security Integrated	17	139,108	565,676
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	8	36,746	107,955
A180WSS	Life with 180 Months Guaranteed and Social Security Integrated	4	27,510	76,426
SLNSD	Straight Life - Named Survivor Deceased	151	1,461,701	13,144,909
Total Regular		40,151	\$371,099,109	\$3,643,977,479

(concluded on next page)

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.



Variable Annuities Being Paid Tabulated by Type of Annuity and Option

Numeric Code	Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
DISABILITY RETIREMENT					
1	SL	Straight Life	128	\$ 614,160	\$ 5,559,314
3	A60	Life Annuity with 60 payments guaranteed	73	483,172	3,912,024
7	A180	Life Annuity with 180 payments guaranteed	247	1,070,427	10,434,682
10	JOINT	Joint and 75% Survivor	106	762,446	7,145,265
12	R25	Reduced 25% on First Death	41	236,668	2,158,560
14	C100	100% Continued to Named Survivor	226	1,234,092	11,500,674
16	C180	100% Continued to Named Survivor with 180 payments guaranteed	439	2,185,558	24,123,413
30	DWSMC	Disability with Spouse or Minor/Dependent Child	1	554	5,953
Total Disability			1,261	\$ 6,587,077	\$ 64,839,885
DEATH-IN-SERVICE BENEFITS					
1	SL	Straight Life	65	\$ 439,870	\$ 4,242,886
2	SL	Straight Life (accelerated)	0	739	3,021
3	A60	Life Annuity with 60 payments guaranteed	29	228,292	1,720,523
4	A60	Life Annuity with 60 payments guaranteed (accelerated)	0	3,221	6,850
7	A180	Life Annuity with 180 payments guaranteed	263	1,283,049	13,405,613
8	A180	Life Annuity with 180 payments guaranteed (accelerated)	0	70,080	331,656
28	A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	8	6,676	24,370
Total Death-in-Service			365	\$ 2,031,927	\$ 19,734,919
GRAND TOTAL			41,777	\$ 379,718,113	\$ 3,728,552,283

In cases where an individual is receiving more than one annuity, the person only appears once in the above number counts, but the corresponding annual amounts can show up in several different places, depending on the option elected for the different annuities. This can result in, for example, a number count of zero (or a very low number count) combined with a significant annual dollar amount in the above table.



Variable Annuities Being Paid Tabulated by Attained Ages

Attained Ages	Regular		Disability		Death-in-Service		Totals	
	No.	Annual Amount	No.	Annual Amount	No.	Annual Amount	No.	Annual Amount
20-24	0	\$ 0	2	\$ 1,826	3	\$ 3,729	5	\$ 5,555
25-29	0	0	3	3,882	3	1,714	6	5,596
30-34	0	0	8	7,705	5	3,525	13	11,230
35-39	0	0	16	28,963	9	6,437	25	35,400
40-44	6	36,970	12	33,774	7	24,030	25	94,774
45-49	55	66,260	30	55,274	23	56,131	108	177,665
50-54	578	1,754,170	94	280,760	17	81,250	689	2,116,180
55-59	3,036	15,148,050	158	529,890	46	171,643	3,240	15,849,583
60-64	6,274	27,536,206	214	606,844	46	153,243	6,534	28,296,293
65-69	9,039	49,119,598	234	886,214	57	274,887	9,330	50,280,699
70-74	8,775	82,438,996	181	1,223,351	45	339,187	9,001	84,001,534
75-79	5,001	72,368,383	128	1,254,063	36	261,817	5,165	73,884,263
80-84	3,372	55,757,804	100	1,035,243	21	267,409	3,493	57,060,456
85-89	2,313	39,268,284	52	372,442	17	140,784	2,382	39,781,510
90-94	1,130	20,354,177	22	221,766	19	123,063	1,171	20,699,006
95 & Up	314	5,690,594	7	45,080	8	93,200	329	5,828,874
Certain Only*	258	1,559,617	0	0	3	29,878	261	1,589,495
Totals	40,151	\$371,099,109	1,261	\$6,587,077	365	\$2,031,927	41,777	\$379,718,113

Averages in Years

Age at retirement	59.2	52.6	52.0	59.0
Attained age	71.1	66.6	67.9	71.0

* Certain only category consists of continuations of 5, 10 and 15-year certain and life annuities to beneficiaries of deceased annuitants.



SECTION E

COMPARATIVE STATEMENTS

Core Annuities Comparative Statement 1985 Through 2019

Valuation Date	Number	\$ Millions				Change in		
		Annual	Fund	Actuarial	Ratio	Annuities		CPI*
		Annuities	Balance	Reserve		Average	Maximum	
1985	62,953	\$ 257.6	\$ 2,758.2	\$ 2,561.0	1.077	7.2 %		3.8 %
1986	65,425	303.5	3,256.9	3,021.2	1.078	7.6 %		1.1 %
1987	67,688	366.9	3,833.7	3,594.6	1.067	6.7 %		4.4 %
1988	70,017	420.6	4,319.6	4,150.9	1.041	4.1 %		4.4 %
1989	73,232	488.7	5,487.4	4,928.1	1.113	11.3 %		4.6 %
1990	77,666	611.3	6,443.8	6,219.1	1.036	3.6 %		6.2 %
1991	79,465	660.4	7,137.8	6,711.3	1.063	6.3 %		3.0 %
1992	81,508	732.3	7,782.4	7,456.6	1.044	4.4 %		3.0 %
1993	83,836	801.7	8,608.2	8,205.3	1.049	4.9 %		2.7 %
1994	86,214	882.2	9,286.2	9,029.6	1.028	2.8 %		2.7 %
1995	88,998	955.8	10,351.7	9,804.1	1.056	5.6 %		2.6 %
1996	92,198	1,065.8	11,699.8	10,977.1	1.066	6.6 %		3.3 %
1997	95,128	1,188.4	13,185.1	12,240.4	1.077	7.7 %		1.7 %
1998	99,112	1,349.5	14,951.8	13,943.0	1.072	7.2 %		1.6 %
1999	102,817	1,513.8	16,857.8	15,687.2	1.075	17.1 %	**	2.7 %
2000	107,425	1,867.0	20,517.8	19,405.3	1.057	5.7 %		3.4 %
2001	112,142	2,048.6	21,979.7	21,283.6	1.033	3.3 %		1.6 %
2002	116,289	2,226.6	23,142.4	23,202.9	0.997	0.0 %		2.4 %
2003	121,582	2,364.7	25,071.9	24,724.0	1.014	1.4 %		1.9 %
2004	126,211	2,500.3	26,920.0	26,232.2	1.026	2.6 %		3.3 %
2005	131,674	2,691.4	28,575.3	28,359.7	1.008	0.8 %		3.4 %
2006	137,117	2,843.6	31,180.5	30,273.9	1.030	3.0 %		2.6 %
2007	142,906	3,075.3	35,050.1	32,877.5	1.066	6.6 %		4.1 %
2008	144,033	3,399.3	35,798.1	36,551.5	0.979	(2.1)%	(2.1)%	0.1 %
2009	150,671	3,449.3	36,655.8	37,072.7	0.989	(1.1)%	(1.3)%	2.7 %
2010	155,775	3,532.4	37,798.4	38,148.5	0.991	(0.9)%	(1.2)%	1.5 %
2011	167,453	3,842.0	40,411.5	42,078.3	0.960	(4.0)%	(7.0)%	3.0 %
2012	173,655	3,806.3	40,591.6	41,852.4	0.970	(3.0)%	(9.6)%	1.7 %
2013	180,056	3,800.7	44,273.2	42,300.5	1.047	4.7 %	4.7 %	1.5 %
2014	185,605	4,102.3	47,135.7	45,790.7	1.029	2.9 %	2.9 %	0.8 %
2015	191,795	4,364.9	49,147.0	48,897.5	1.005	0.5 %	0.5 %	0.7 %
2016	197,647	4,523.1	51,972.0	50,941.4	1.020	2.0 %	2.0 %	2.1 %
2017	203,202	4,747.0	54,900.0	53,590.0	1.024	2.4 %	2.4 %	2.1 %
2018	211,126	5,040.9	56,493.8	56,629.3	0.998	0.0 %	0.0 %	1.9 %
2019	216,944	5,183.7	59,138.4	58,157.0	1.017	1.7 %	1.7 %	2.3 %
35-Year Average						3.6 %		2.6 %
20-Year Average						1.3 %		2.1 %
10-Year Average						0.6 %		1.8 %
5-Year Average						1.3 %		1.8 %

* CPI percentage increase determined by ratio of current year CPI-U67 December index over prior year December index.

** Including 10.6% Act 11 transfer.

In cases where there is a negative dividend, a maximum decrease is calculated to account for annuitants that are already at the floor and whose dividend cannot be reduced.



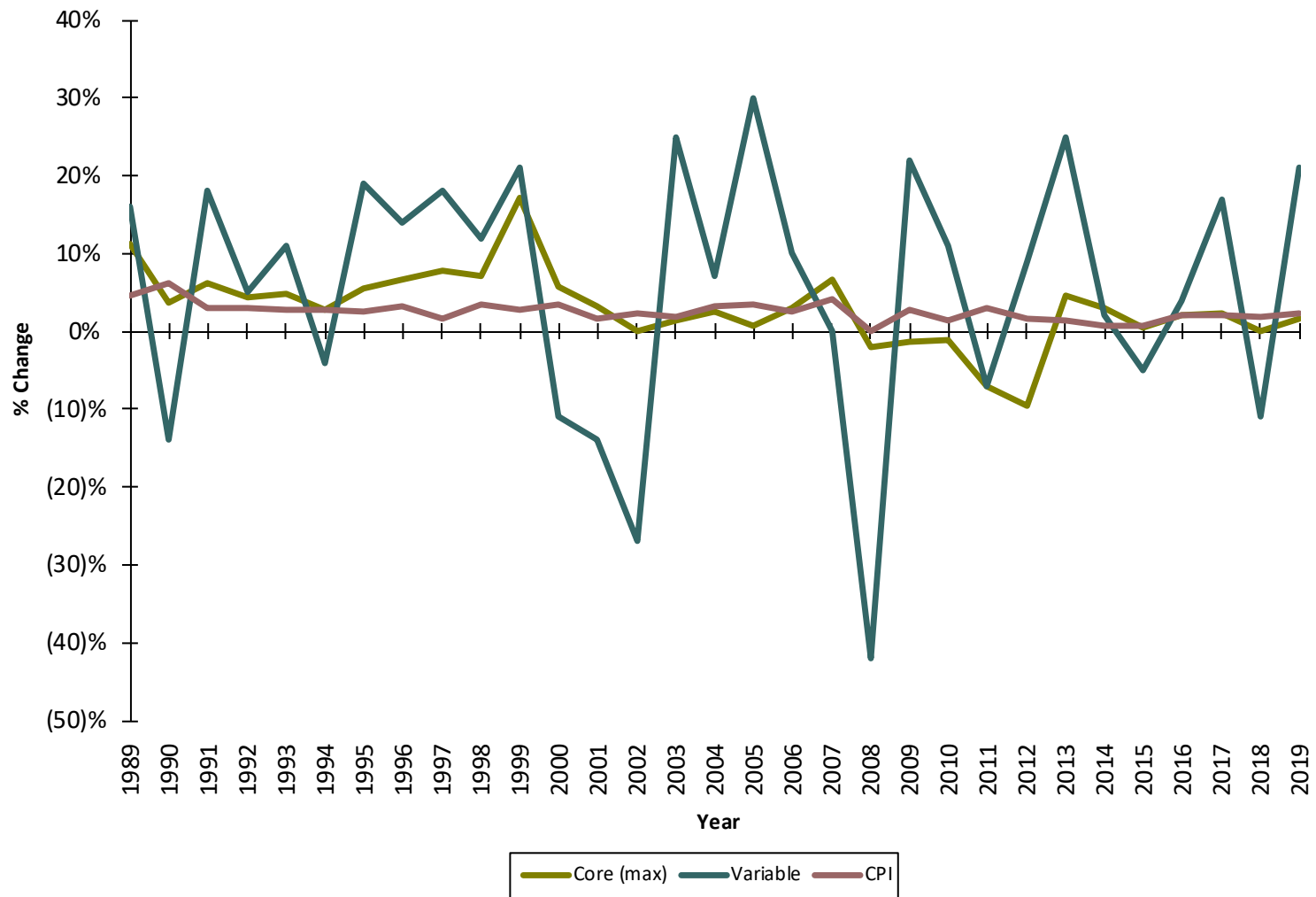
Variable Annuities Comparative Statement 1985 Through 2019

Valuation		\$ Millions				Change in	
Date	Number	Annual Annuities	Fund Balance	Actuarial Reserve	Ratio	Annuities	CPI*
1985	15,529	\$ 38.0	\$ 463.1	\$ 366.6	1.263	26.0 %	3.8 %
1986	16,276	51.8	538.7	498.6	1.080	8.0 %	1.1 %
1987	17,084	60.4	548.8	584.2	0.939	(6.0)%	4.4 %
1988	17,779	61.4	682.6	594.0	1.149	14.0 %	4.4 %
1989	18,502	75.9	878.1	756.5	1.161	16.0 %	4.6 %
1990	19,922	101.0	868.6	1,013.4	0.857	(14.0)%	6.2 %
1991	20,538	91.5	1,101.3	929.7	1.184	18.0 %	3.0 %
1992	20,968	112.6	1,208.6	1,147.4	1.053	5.0 %	3.0 %
1993	21,623	123.7	1,407.9	1,268.6	1.110	11.0 %	2.7 %
1994	22,248	144.6	1,418.0	1,487.0	0.954	(4.0)%	2.7 %
1995	22,978	150.2	1,854.2	1,556.0	1.192	19.0 %	2.6 %
1996	23,725	189.8	2,264.9	1,976.7	1.146	14.0 %	3.3 %
1997	24,462	228.2	2,800.0	2,371.5	1.181	18.0 %	1.7 %
1998	25,424	289.5	3,400.5	3,035.5	1.120	12.0 %	1.6 %
1999	26,257	345.8	4,432.9	3,659.1	1.212	21.0 %	2.7 %
2000	27,321	445.3	4,211.4	4,749.3	0.887	(11.0)%	3.4 %
2001	28,314	424.4	3,901.8	4,547.4	0.858	(14.0)%	1.6 %
2002	28,662	374.0	2,899.3	3,999.1	0.726	(27.0)%	2.4 %
2003	29,496	273.3	3,635.9	2,892.2	1.257	25.0 %	1.9 %
2004	30,270	346.0	3,909.9	3,654.5	1.070	7.0 %	3.3 %
2005	31,499	376.5	4,092.7	3,970.7	1.031	3.0 %	3.4 %
2006	32,683	391.8	4,594.2	4,145.2	1.108	10.0 %	2.6 %
2007	33,880	432.6	4,625.0	4,563.7	1.013	0.0 %	4.1 %
2008	34,927	427.0	2,574.5	4,491.0	0.573	(42.0)%	0.1 %
2009	34,836	240.3	3,078.4	2,512.7	1.225	22.0 %	2.7 %
2010	35,866	288.4	3,340.6	3,005.4	1.111	11.0 %	1.5 %
2011	38,949	330.3	3,197.9	3,462.9	0.924	(7.0)%	3.0 %
2012	39,873	304.6	3,463.9	3,169.6	1.093	9.0 %	1.7 %
2013	40,317	324.5	4,187.3	3,347.0	1.251	25.0 %	1.5 %
2014	39,420	386.5	3,995.4	3,917.1	1.020	2.0 %	0.8 %
2015	40,152	387.8	3,704.8	3,910.1	0.947	(5.0)%	0.7 %
2016	40,647	363.6	3,792.0	3,645.1	1.040	4.0 %	2.1 %
2017	40,877	369.9	4,324.9	3,682.1	1.175	17.0 %	2.1 %
2018	41,187	425.8	3,738.6	4,207.6	0.891	(10.0)%	1.9 %
2019	41,777	379.7	4,519.4	3,728.6	1.212	21.0 %	2.3 %
35-Year Average						4.4 %	2.6 %
20-Year Average						0.4 %	2.1 %
10-Year Average						6.1 %	1.8 %
5-Year Average						4.7 %	1.8 %

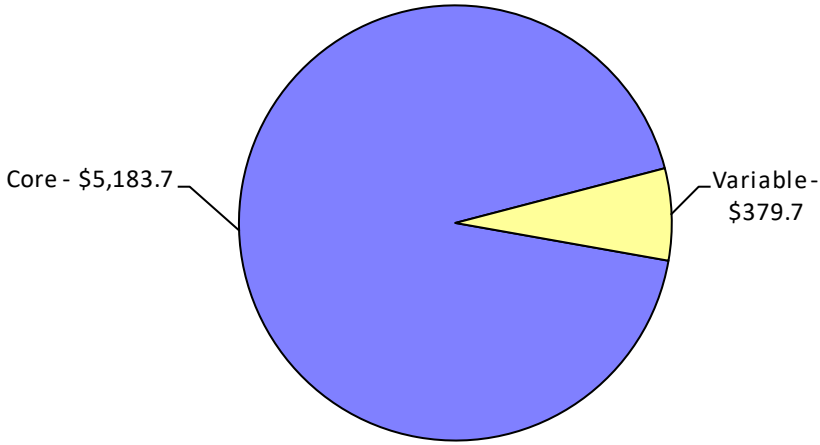
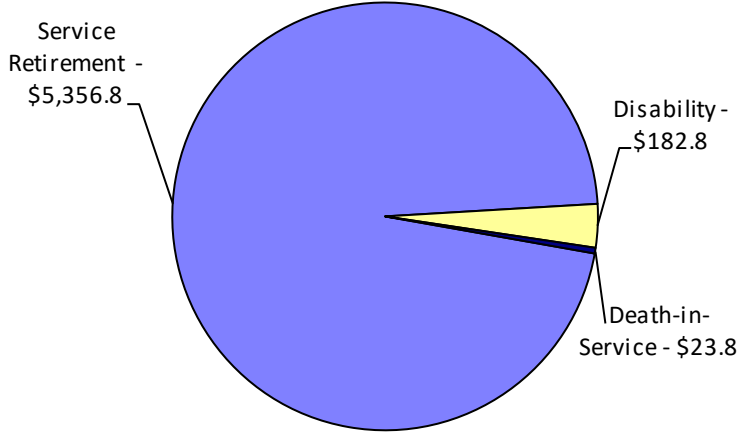
* CPI percentage increase determined by ratio of current year CPI-U67 December index over prior year December index.



History of % Changes in Annuities and CPI



Annual Annuities Being Paid by Type \$ Millions



Annuities Being Paid Tabulated by Year of Retirement⁽¹⁾ (\$1,000s annually)

Year Ret'd ²	Core Annuities				Variable Annuities				Avg. Total Annuity
	No.	Initial	Increases	Total	No.	Initial	Increases	Total	
2019	9,707	\$ 255,640	\$ 0	\$ 255,640	1,756	\$ 13,004	\$ 0	\$ 13,004	\$31,202
2018	10,202	267,190	0	267,190	1,583	12,759	(1,276)	11,483	30,000
2017	9,855	245,085	3,242	248,327	1,518	9,054	480	9,534	28,847
2016	10,139	248,917	8,615	257,532	1,555	8,990	856	9,846	28,878
2015	10,262	247,046	11,537	258,583	1,671	9,492	384	9,876	28,994
2014	9,293	206,318	13,376	219,694	1,694	9,222	566	9,788	27,463
2013	9,614	204,360	21,331	225,691	1,668	7,141	2,332	9,473	27,199
2012	9,510	199,484	25,509	224,993	1,708	6,033	2,689	8,722	27,880
2011	15,188	377,656	48,667	426,323	3,109	14,398	4,961	19,359	32,682
2010	8,318	188,247	24,143	212,390	1,602	5,653	2,784	8,437	29,221
2009	7,808	177,651	22,923	200,574	1,414	4,098	3,365	7,463	29,313
2008	8,420	195,295	25,107	220,402	1,653	9,987	568	10,555	28,056
2007	8,237	178,760	22,979	201,739	1,815	11,282	639	11,921	26,085
2006	7,958	162,527	20,972	183,499	1,687	11,261	1,822	13,083	24,799
2005	7,890	157,942	20,413	178,355	1,701	11,816	2,325	14,141	24,651
2004	6,902	131,812	17,057	148,869	1,544	10,955	3,072	14,027	23,708
2003	6,880	132,154	17,112	149,266	1,410	9,074	5,449	14,523	23,883
2002	6,366	118,922	15,377	134,299	1,249	12,169	2,057	14,226	23,415
2001	6,433	119,354	15,439	134,793	1,320	19,274	92	19,366	24,068
2000	6,306	115,610	15,050	130,660	1,103	21,829	(2,308)	19,521	23,964
1999	5,260	83,492	23,409	106,901	935	14,769	1,211	15,980	23,415
1998	5,022	75,202	27,370	102,572	935	12,975	2,749	15,724	23,721
1997	4,102	59,768	27,662	87,430	780	9,227	3,963	13,190	24,722
1996	3,917	56,006	31,659	87,665	793	8,200	5,149	13,349	25,974
1995	3,434	47,191	30,800	77,991	685	5,736	5,392	11,128	26,196
1994	2,990	39,372	28,217	67,589	674	5,571	4,806	10,377	26,429
1993	2,625	32,628	25,383	58,011	578	4,021	4,282	8,303	25,584
1992	2,131	24,857	21,542	46,399	480	3,107	3,636	6,743	25,114
1991	1,806	20,461	19,800	40,261	432	2,413	3,767	6,180	26,164
1990	2,845	33,766	35,362	69,128	718	4,258	5,123	9,381	28,130
1989	1,978	23,229	27,869	51,098	461	2,456	3,817	6,273	29,451
1988	1,268	11,476	15,933	27,409	325	1,297	2,481	3,778	25,009
1987	1,013	8,240	12,402	20,642	273	989	1,722	2,711	23,517
1986	817	6,609	11,512	18,121	241	841	1,646	2,487	25,759
1985	724	5,707	11,168	16,875	194	509	1,388	1,897	26,589
1984	469	3,250	6,974	10,224	141	363	991	1,354	25,502
1983	350	1,922	4,362	6,284	115	243	816	1,059	21,598
1982	222	891	2,270	3,161	62	86	355	441	16,295
1981	191	595	1,668	2,263	59	66	261	327	13,773
1980	118	420	1,175	1,595	30	33	168	201	15,227
Prior	374	764	2,518	3,282	106	68	419	487	6,556
Total	216,944	\$4,465,816	\$717,904	\$5,183,720	41,777	\$294,719	\$84,999	\$379,718	\$25,645

⁽¹⁾ Includes 1,952 members formerly covered under the LTDI program based on year of termination.

⁽²⁾ The number of retirements during 2019 may not match the number of new retirees on Page 8 of this report due to Reporting Lag.

Liabilities as of December 31, 2019 Tabulated by Year of Retirement⁽¹⁾ (\$1,000s annually)

Year Ret'd ²	Core Liabilities				Variable Liabilities				Total Liabilities
	No.	Initial	Increases	Total	No.	Initial	Increases	Total	
2019	9,707	\$ 3,433,877	\$ 0	\$ 3,433,877	1,756	\$ 171,939	\$ 0	\$ 171,939	\$3,605,815
2018	10,202	3,531,196	0	3,531,196	1,583	162,384	(16,239)	146,146	3,677,342
2017	9,855	3,202,064	42,515	3,244,579	1,518	116,911	6,204	123,114	3,367,693
2016	10,139	3,202,299	111,598	3,313,898	1,555	112,213	10,686	122,899	3,436,797
2015	10,262	3,160,061	148,690	3,308,751	1,671	119,676	4,839	124,515	3,433,266
2014	9,293	2,617,468	171,336	2,788,804	1,694	115,004	7,057	122,061	2,910,865
2013	9,614	2,584,903	272,507	2,857,410	1,668	89,417	29,197	118,614	2,976,023
2012	9,510	2,547,429	328,785	2,876,214	1,708	76,540	34,115	110,655	2,986,869
2011	15,188	4,777,076	617,826	5,394,902	3,109	176,220	60,724	236,944	5,631,847
2010	8,318	2,305,537	297,643	2,603,180	1,602	67,835	33,406	101,240	2,704,421
2009	7,808	2,144,715	278,214	2,422,928	1,414	47,617	39,097	86,714	2,509,642
2008	8,420	2,299,908	296,925	2,596,832	1,653	113,947	6,442	120,389	2,717,222
2007	8,237	2,080,612	268,288	2,348,900	1,815	127,562	7,217	134,779	2,483,679
2006	7,958	1,845,808	238,822	2,084,631	1,687	124,464	20,131	144,594	2,229,225
2005	7,890	1,742,752	225,743	1,968,495	1,701	126,709	24,932	151,641	2,120,136
2004	6,902	1,423,987	184,516	1,608,503	1,544	117,715	33,006	150,720	1,759,223
2003	6,880	1,392,935	180,486	1,573,421	1,410	95,284	57,213	152,497	1,725,918
2002	6,366	1,214,250	157,178	1,371,427	1,249	125,984	21,296	147,279	1,518,707
2001	6,433	1,167,341	151,080	1,318,421	1,320	186,200	886	187,086	1,505,507
2000	6,306	1,086,468	141,409	1,227,877	1,103	204,426	(21,609)	182,817	1,410,695
1999	5,260	750,230	209,380	959,610	935	129,541	10,615	140,156	1,099,765
1998	5,022	643,996	234,241	878,237	935	108,268	22,938	131,206	1,009,443
1997	4,102	484,904	223,993	708,897	780	73,233	31,452	104,684	813,581
1996	3,917	431,956	243,364	675,320	793	60,411	37,937	98,348	773,668
1995	3,434	344,901	224,530	569,431	685	40,187	37,783	77,970	647,401
1994	2,990	270,133	193,496	463,630	674	37,332	32,211	69,543	533,173
1993	2,625	213,366	165,971	379,337	578	25,103	26,712	51,815	431,152
1992	2,131	151,885	131,904	283,789	480	18,184	21,282	39,466	323,254
1991	1,806	118,455	114,928	233,384	432	13,324	20,799	34,123	267,507
1990	2,845	192,826	202,132	394,958	718	23,687	28,505	52,192	447,150
1989	1,978	120,339	144,667	265,006	461	12,276	19,078	31,354	296,360
1988	1,268	55,682	77,446	133,128	325	6,097	11,656	17,753	150,881
1987	1,013	36,957	55,634	92,591	273	4,205	7,320	11,525	104,117
1986	817	27,920	49,050	76,969	241	3,551	6,947	10,498	87,468
1985	724	23,153	45,336	68,488	194	2,024	5,516	7,540	76,029
1984	469	12,249	26,485	38,734	141	1,334	3,637	4,971	43,705
1983	350	6,871	15,670	22,541	115	874	2,918	3,792	26,333
1982	222	3,476	8,796	12,272	62	303	1,249	1,552	13,824
1981	191	2,222	6,268	8,491	59	231	917	1,148	9,639
1980	118	1,543	4,324	5,867	30	111	574	685	6,552
Prior	374	2,806	9,272	12,078	106	223	1,365	1,587	13,665
Total	216,944	\$51,656,558	\$6,500,448	\$58,157,006	41,777	\$3,038,544	\$690,009	\$3,728,552	\$61,885,559

⁽¹⁾ Includes 1,952 members formerly covered under the LTDI program based on year of termination.

⁽²⁾ The number of retirements during 2019 may not match the number of new retirees on Page 8 of this report due to Reporting Lag.

Comparison of Actual to Expected Deaths Among Retired Lives (Normal Retirement Only) During 2019

Age	Male Deaths			Female Deaths			Total Deaths		
	Actual	Expected	Exposure	Actual	Expected	Exposure	Actual	Expected	Exposure
30-34						1			1
35-39						1			1
40-44			1			10			11
45-49			16	1		64	1		80
50-54	4	2	952			507	4	2	1,459
55-59	19	25	5,240	16	20	6,937	35	45	12,177
60-64	64	75	11,462	69	76	17,929	133	151	29,391
65-69	194	192	18,557	163	192	29,792	357	384	48,349
70-74	277	311	18,905	255	292	26,525	532	603	45,430
75-79	400	362	12,658	346	341	16,797	746	703	29,455
80-84	441	438	8,129	466	447	11,397	907	885	19,526
85-89	447	472	4,824	569	582	7,442	1,016	1,054	12,266
90-94	365	328	2,015	552	520	3,934	917	848	5,949
95-99	126	119	438	289	282	1,222	415	401	1,660
100 & Up	16	13	39	68	58	199	84	71	238
Totals	2,353	2,337	83,236	2,794	2,810	122,757	5,147	5,147	205,993
Average Ages	81.4	81.0	71.5	84.0	83.4	71.8	82.8	82.3	71.7



SECTION F

APPENDIX

Actuarial Assumptions Used in the Retired Life Actuarial Valuation

The interest rate used in the valuation was 5.0% a year, compounded yearly, as provided in Section 40.02 of the Wisconsin Statutes. To the extent that unfavorable investment performance reduces current dividends, liabilities would be lower than reported in this valuation. The mortality table used in the valuation was the Wisconsin 2018 Mortality Table, as adopted by the Board in connection with the 2015-2017 Experience Study. This table includes margin for future improvements in mortality by incorporating 60% of the MP-2018 fully generational scale. The impact of the new mortality tables is recognized equally over a three-year period.

Single Life Retirement Values Wisconsin Projected Experience Table - 2018 with 5% Interest

Sample Attained Ages in 2019	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)		Probability of Death Next Year	
	Males	Females	Males	Females	Males	Females
40	\$212.96	\$217.63	45.3	48.2	0.099%	0.061%
45	204.65	210.28	40.3	43.1	0.124%	0.092%
50	194.18	201.13	35.3	38.1	0.162%	0.134%
55	181.54	189.97	30.4	33.2	0.376%	0.241%
60	167.29	176.71	25.8	28.4	0.544%	0.352%
65	150.31	160.75	21.3	23.7	0.832%	0.526%
70	131.09	141.76	17.1	19.2	1.350%	0.874%
75	109.61	120.10	13.2	15.0	2.266%	1.581%
80	86.87	96.74	9.7	11.1	4.160%	2.976%
85	65.44	73.54	6.8	7.9	7.780%	5.984%

The values shown above are for non-disabled participants. Sample values for disabled participants are as follows:

Sample Attained Ages in 2019	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)		Probability of Death Next Year	
	Males	Females	Males	Females	Males	Females
40	\$199.56	\$207.83	37.7	41.8	0.143%	0.102%
45	187.92	198.13	32.8	36.7	0.235%	0.153%
50	174.47	186.35	28.0	31.8	0.466%	0.271%
55	158.72	172.25	23.4	27.0	0.629%	0.398%
60	140.24	155.41	19.1	22.4	1.096%	0.613%
65	119.88	135.75	15.0	18.0	1.778%	1.052%
70	97.88	113.76	11.3	13.9	3.068%	1.900%
75	75.72	90.28	8.2	10.2	5.815%	3.588%
80	56.09	67.67	5.7	7.1	10.710%	7.338%
85	40.07	49.49	3.9	4.9	17.284%	12.667%



Statutory Provisions - Post-Retirement Adjustments

Core Annuities - 40.27(2)

“CORE ANNUITY RESERVE SURPLUS DISTRIBUTIONS. Surpluses in the core annuity reserve established under s. 40.04 (6) and (7) shall be distributed by the board if the distribution will result in at least a 0.5% increase in the amount of annuities in force, except as otherwise provided by the department by rule, on recommendation of the actuary, as follows:

(a) The distributions shall be expressed as percentage increases in the amount of the monthly annuity in force, including prior distributions of surpluses but not including any amount paid from funds other than the core annuity reserve fund, preceding the effective date of the distribution. For purposes of this subsection, annuities in force include any disability annuity suspended because the earnings limitation had been exceeded by that annuitant in that year.

(b) Prorated percentages based on the annuity effective date may be applied to annuities with effective dates during the calendar year preceding the effective date of the distribution, as provided by rule, but no other distinction may be made among the various types of annuities payable from the core annuity reserve.

(c) The distributions shall not be offset against any other benefit being received but shall be paid in full, nor shall any other benefit being received be reduced by the distributions. The annuity reserve surplus distributions authorized under this subsection may be revoked by the board in part or in total as to future payments upon recommendation of the actuary if a deficit occurs in the core annuity reserves and such deficit would result in a 0.5 percent or greater decrease in the amount of annuities in force, except as otherwise provided by the department by rule.

(d) Notwithstanding s 40.03 (2) (i), (7) (d), and (8) (d), the department may promulgate rules under this subsection without the approval of the teachers retirement board and the Wisconsin retirement board.”

Variable Annuities - 40.28(2)

“Whenever the balance in the variable annuity reserve, as of December 31 of any year, exceeds or is less than the then present value of all variable annuities in force, determined in accordance with the rate of interest and approved actuarial tables then in effect, by at least 2% of the present value of all variable annuities in force, the amount of each variable annuity payment shall be proportionately increased or decreased, disregarding fractional percentages, and effective on a date determined by rule, so as to reduce the variance between the balance of the variable annuity reserve and the present value of variable annuities to less than one percent.”

Narrative Regarding the Development of Dividend and Variable Annuity Changes Shown on Pages 6 and 16

- 1. SWIB Net of Fee Investment Return**
State of Wisconsin Investment Board net earnings rate on the Core/Variable Fund.
- 2. MRA Adjustment (Core)/Adjustment to Published Effective Rate (Variable)**
Item 3 below minus Item 1 above. For core annuities, this is the MRA adjustment which takes into account five-year smoothing of gains and losses.
- 3. Published Effective Earnings Rate**
The earnings rate published by DETF is funds' earnings credits expressed as a percentage of the beginning year balance adjusted for benefit payments and reserve transfers.
- 4. Adjustment to Relate Earnings to Average Core/Variable Annuity Balance**
Item 5 below minus Item 3 above.
- 5. Earnings Rate Based on Average Balance**
This is similar to the published earnings rate except that the rate is determined as a percentage of the average balance during the year instead of the adjusted beginning of year balance.
- 6. Expected Dividend (Variable Change) before Adjustments**
The relative difference in fund growth based on actual versus the 5% assumed earnings rates.
- 7. Adjustment to Relate Average Asset to Ending Liability**
The final dividend/variable change is calculated based on the end of year assets divided by the end of year liabilities. Since the calculations in Items 5 and 6 are based on average (approximately mid-year) balances, this adjustment is needed so that the final rate will be based on the end of year liabilities.
- 8. Carryover from Last Year Due to Timing of Distribution and Accounting Adjustments (and Truncation for Variable Annuity)**
The dividend or variable rate changes are made effective April 1 of each year. This adjustment takes into account the fact that the prior year dividend/variable increase was in effect for less than a full year as well as any accounting adjustments made to the asset value at the beginning of the year. This adjustment also carries over any truncated or rounded amounts from the prior year.

Narrative Regarding the Development of Dividend and Variable Annuity Changes Shown on Pages 6 and 16

9. Experience Study/Mortality Reserve Adjustment

A study is conducted for WRS every three years to analyze the assumptions that are made in the valuation versus the experience that actually occurred. If the results of the study show material changes in experience, WRS generally adopts a new set of assumptions. When assumptions are changed, this item displays the effect of the change on the dividend/variable rate. Although the mortality table now includes a projection for expected future improvements in mortality, each valuation phases into the full table incrementally over the three year experience study cycle. By increasing reserves gradually each year, instead of all at once every three years, the effect on dividends and variable increases will also be more gradual.

10. Experience and Other Effects

After making all other known adjustments, this is the remainder of all other experience. Changes here are primarily attributable to mortality experience and, generally to a lesser extent, on any data adjustments.

11. Statutory Adjustment to Round/Truncate

By statute, the dividend rate is calculated to the nearest one-tenth of a percent. For the variable annuity change, the rate is truncated to a whole percent. This is the adjustment made from the calculated dividend/variable annuity rate change without rounding/truncation to the statutory rate.

12. Computed Average Dividend Rate/Variable Annuity Change

This is the end of year asset value divided by the end of year liability. It is reconciled to the published earnings rate (Item 3) by making the adjustments in Items 6 through 11.

13. Adjustment for Members Not Eligible for Negative Dividend

This is an adjustment that is sometimes made for Core Fund recipients to reflect that some members may not have any remaining dividends and hence are not subject to a further negative dividend.

14. Final Maximum Computed Dividend Rate

When there is a negative dividend for the Core Fund, this will affect people differently based upon year of retirement. In years when there is a negative dividend, this will be the largest negative dividend that will occur in the Core Fund. If greater in absolute value than 0.5% of core annuities, Item 12 plus Item 13, otherwise 0%.



March 4, 2020

Mr. Robert Conlin
Wisconsin D.E.T.F.
4822 Madison Yards Way
Madison, Wisconsin 53705

Re: Retired Life Actuarial Valuation

Dear Bob:

Enclosed are 60 bound copies of the report of the December 31, 2019 Retired Lives Actuarial Valuation.

Sincerely,

A handwritten signature in black ink that reads "Mark Buis". The signature is written in a cursive, slightly slanted style.

Mark Buis, FSA, EA, FCA, MAAA

MB:sc
Enclosures