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## Correspondence Memorandum

**Date:** March 6, 2017  
**To:** Employee Trust Funds Board  
**From:** Cindy Klimke-Armatoski  
Chief Trust Financial Officer  
**Subject:** December 31, 2016 Actuarial Valuation of Retired Lives

**Staff requests the Employee Trust Funds Board (Board) approve the report, 34<sup>th</sup> Annual Actuarial Valuation of Retired Lives as of December 31, 2016.**

Gabriel Roeder Smith & Company (GRS) has completed the actuarial valuation of Wisconsin Retirement System retired lives as of December 31, 2016. This valuation determines the amounts to be transferred from member and employer accounts to fund 2016 new annuities, and the amount available to provide increases for existing Core and Variable annuities.

GRS is recommending Core annuities be increased by 2.0%. This is based on the 7.9% 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 2016 which will receive a prorated increase.

Variable annuities will be increased by 4.0%. This is based on the 10% 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.

Core and Variable increases will first be included on May 1, 2017 annuity payments.

Actuaries from GRS will be at the Board meeting to present the report and answer questions.

Attachment: 34<sup>th</sup> Annual Actuarial Valuation of Retired Lives

Reviewed and approved by Robert J. Conlin, Secretary

Electronically Signed 3/10/17

Board	Mtg Date	Item #
ETF	3.23.17	5A

**WISCONSIN RETIREMENT SYSTEM**  
**34<sup>TH</sup> ANNUAL ACTUARIAL VALUATION OF RETIRED LIVES**  
**DECEMBER 31, 2016**

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March 6, 2017

Employee Trust Funds Board  
 Madison, Wisconsin

Ladies and Gentlemen:

The results of the **34th annual actuarial valuation of core and variable annuities** being paid from the Wisconsin Retirement System are presented in this report. This report should not be relied on for any other purpose.

The date of this valuation was December 31, 2016. Actuarial assumptions used in the valuation are summarized in the Appendix.

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

	<b>Core</b>	<b>Variable</b>
Number of Annuitants	197,647	40,647
Annual Amount	\$ 4,523.1	\$ 363.6
Fund Balance	51,972.0	3,792.0
Actuarial Reserve	50,941.4	3,645.1
<b>Ratio</b>	<b>1.020</b>	<b>1.040</b>

**Based upon these results, the increase in the core annuities is 2.0% and variable annuities will be increased by 4.0%.**

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.

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.

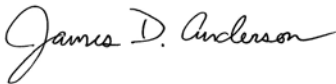
Respectfully submitted,



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



Mark Buis, FSA, EA, FCA, MAAA



James D. Anderson, FSA, EA, MAAA

BBM/MB/JDA:bd

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## **SECTION A**

### **EXECUTIVE SUMMARY**

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## EXECUTIVE SUMMARY

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### 1. Retiree Dividend in Core Annuities

The Core annuity fund return (after applying the five year smoothing method under the Market Recognition Account) of 7.9% exceeds the 5.0% assumed investment return threshold that triggers an annuity adjustment. This valuation determined the amount of available surplus. The available surplus in the core fund is \$1,030.6 million as of December 31, 2016. After adjusting for expected improvements in longevity and various other items (described in detail on page 6), **the result is a 2.0% increase in benefits.**

### 2. Change in Variable Annuities

The variable fund effective earnings rate was 10.0% resulting in a surplus of \$146.9 million. The surplus of \$146.9 million will **result in a 4.0% 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 \$3 billion in unrecognized asset losses as of December 31, 2016 which will be recognized over the next four years. Although only half of this applies to the annuitant reserve, this will put downward pressure on dividends being granted over the next few years.

The value of previously granted dividends is approximately \$5.4 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 will happen naturally as long as investments in the core fund attain the long term investment goal of 7.2%.

**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 2.0%, and  
Variable annuities will be increased by 4.0%.

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**SECTION B**  
**OPERATION OF THE SYSTEM**

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## **OPERATION OF THE RETIREMENT SYSTEM**

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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 investment earnings differ from the assumed rate, the difference, positive or negative, is recorded in a supplemental reserve.

## OPERATION OF THE RETIREMENT SYSTEM

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The Wisconsin Retirement System (WRS) maintains separate reserves for core and variable annuities. Each year, the actuary determines the actuarial reserve for core and variable annuities separately. WRS' practice with respect to the use of supplemental reserves 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. Only 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 these benefits.**

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**SECTION C**  
**CORE ANNUITIES**

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**CORE ANNUITY DIVISION**  
**DEVELOPMENT OF ASSETS AND LIABILITIES**

	\$ Millions		Ratio
	Assets	Liabilities	
<b>Ending Balance December 31, 2015</b>	\$49,147.0	\$48,897.5	1.005
Closing Adjustments	72.0	0.0	
Variable Terminations	63.9	63.9	
2016 Core Annuity Average Adjustment: 0.5%	0.0	232.0	
<b>Beginning Balance January 1, 2016</b>	49,282.9	49,193.4	1.002
<b>Increases</b>			
Reserve Transfers	3,513.7	3,513.7	
Regular Interest	2,435.1	2,435.1	
Additional Earnings	1,242.9	0.0	
Addition for Experience Study/Mortality Reserve	0.0	280.2	
Other	0.0	21.6	
<b>Total Increases</b>	7,191.7	6,250.6	
<b>Decreases</b>			
Annuities & Lump Sums	4,502.6	4,502.6	
Credit Re-establishments	0.0	0.0	
Subtraction for Experience Study/Mortality Reserve	0.0	0.0	
Other	0.0	0.0	
<b>Total Decreases</b>	4,502.6	4,502.6	
<b>Ending Balance December 31, 2016</b>	<b>\$51,972.0</b>	<b>\$50,941.4</b>	<b>1.020</b>

The ending liability balance includes a data reserve of \$50.9 million and a liability for previously granted dividends of \$5,422 million (prior to any 2017 adjustments).

## **RESERVE TRANSFER RECOMMENDATION**

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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 \$3,474,267,907. Adjustments to prior transfers, related to estimated annuities for which final computations have now been made, totaled \$39,379,347. Reserve transfers are distributed as follows:

<b>Group</b>	<b>Regular Transfer</b>	<b>Adjustment to Prior Transfer</b>	<b>Total Transfer</b>
General	\$2,984,492,765	\$35,171,146	\$3,019,663,911
Protective with Social Security	357,750,336	3,397,609	361,147,945
Protective without Social Security	95,402,277	282,792	95,685,069
Executive & Elected	36,622,529	527,800	37,150,329
<b>Totals</b>	<b>\$3,474,267,907</b>	<b>\$39,379,347</b>	<b>\$3,513,647,254</b>

Accordingly, we recommend that \$3,513,647,254 be transferred to the Core Annuity Reserve. The results in this report assume that this transfer has been made.

## DISCUSSION OF DIVIDEND

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The Core Annuity Fund balance, \$51,972.0 million, was greater than the actuarial present value of core annuities and reserves, \$50,941.4 million, by \$1,030.6 million, which resulted in an annuity adjustment of 2.0%. The primary sources of the 2.0% adjustment are:

	<u>% of APV</u>
1. SWIB net of fee investment return	8.29%
2. MRA adjustment	<u>(0.39)%</u>
3. Published effective earnings rate	7.90%
4. Adjustment to relate earnings to average core annuity fund balance	<u>(0.36)%</u>
5. Earnings rate based on average balance	7.54%
6. Expected dividend before adjustments: 1.0754/1.05-1	2.42%
7. Adjustment to relate average asset to ending liability	0.02%
8. Carryover from last year due to timing of dividend accounting adjustments and rounding	0.18%
9. Experience study/mortality reserve adjustment	(0.55)%
10. Experience and other effects	(0.05)%
11. Statutory adjustment to round to nearest one-tenth percent	<u>(0.02)%</u>
<b>12. Computed average dividend rate: (6)+(7)+(8)+(9)+(10)+(11)</b>	<b>2.0%</b>
13. Adjustment for members at or near the statutory floor	0.0%
<b>14. Final maximum computed dividend rate: (12)+(13), if greater than 0.5% of core annuities, otherwise 0%</b>	<b>2.0%</b>

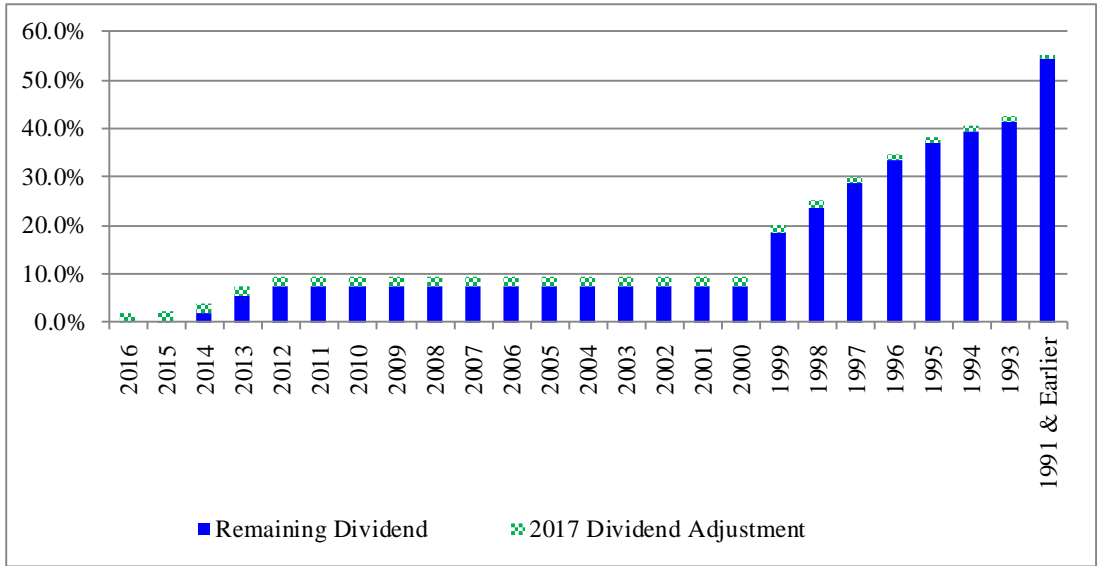
See pages 30 and 31 for a description of items on this page.

In accordance with the Administrative Code, ETF 20.25 and Section 40.27(2) Wisconsin Statutes (see page 29), the dividend adjustment is 2.0% effective April 1, 2017.

## DISCUSSION OF DIVIDEND

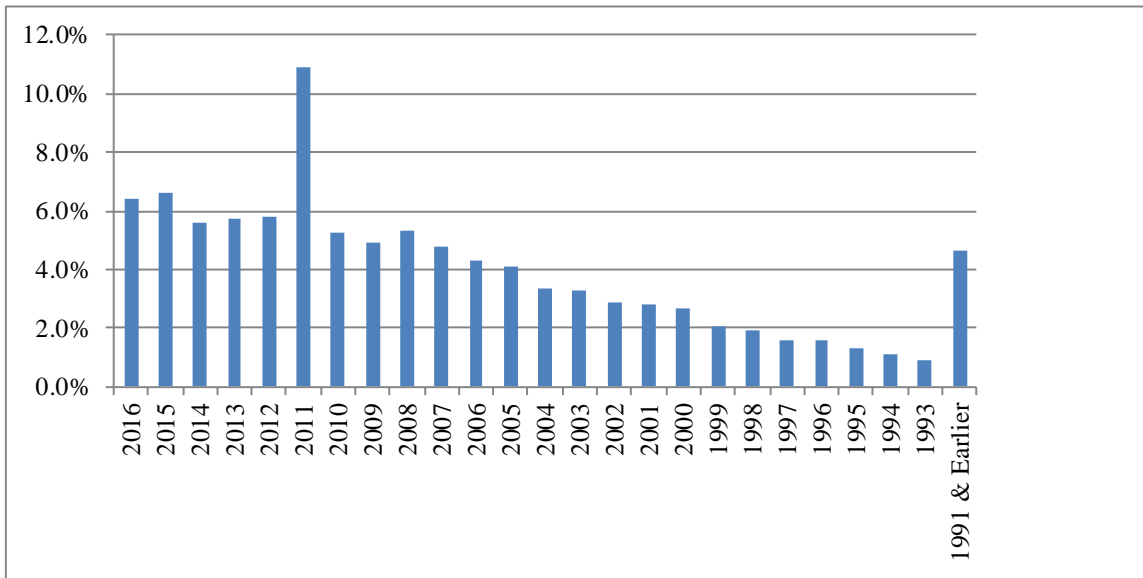
As shown on the prior page, the adjustment for all core fund members is 2.0%. This is the fourth positive dividend adjustment since 2008, and will be spread equally over all annuitants as shown in the chart below.

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



After the 2017 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



Looking ahead, a few years of spreading positive dividends over all annuitants is needed to decrease the probability of leveraged negative dividends that occurred between 2008 and 2012. Over this period, the liability for dividends decreased from about \$9.2 billion to \$3.0 billion. The value of previously granted dividends is approximately \$5.4 billion. However, there are currently about \$3 billion in unrecognized assets losses 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 2016  
TABULATED BY TYPE OF ANNUITY AND OPTION**

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
<b>REGULAR RETIREMENT</b>				
SL	Straight Life	1,503	\$ 29,988,027	\$ 412,060,660
SL	Straight Life (accelerated)	0	3,985,847	14,061,275
A60	Life Annuity with 60 payments guaranteed	927	18,613,849	259,527,172
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	3,076,071	11,431,819
A180	Life Annuity with 180 payments guaranteed	1,949	39,306,305	568,513,281
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	7,536,472	29,934,926
A180F	Life Annuity with 180 payments guaranteed (forced)	35	350,591	4,295,850
JOINT	Joint and 75% Survivor	913	23,053,426	351,439,120
JOINT	Joint and 75% Survivor (accelerated)	0	3,925,557	14,955,100
R25	Reduced 25% on First Death	422	12,253,175	177,892,725
R25	Reduced 25% on First Death (accelerated)	0	1,358,130	5,305,883
C100	100% Continued to Named Survivor	1,087	23,255,542	358,246,580
C100	100% Continued to Named Survivor (accelerated)	0	3,285,797	12,947,407
C180	100% Continued to Named Survivor with 180 payments guaranteed	3,019	71,287,378	1,126,667,775
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	14,073,821	56,913,792
LOL	Life with Optional Length Guaranteed	3	232,134	2,400,572
LOLF	Life with Optional Length Guaranteed (Forced)	1	2,739	21,760
AC24	Annuity Certain with 24 Payments	1	79,958	201,960
AC60	Annuity Certain with 60 Payments	1	64,707	301,537
AC120	Annuity Certain with 120 Payments	1	145,387	1,165,992
AC180	Annuity Certain between 24 and 180 Payments	0	163,418	1,071,986
SLNSD	Straight Life - Named Survivor Deceased	4	93,666	990,374
	Total Regular	9,866	\$ 256,131,997	\$ 3,410,347,546
	Average Age at Retirement	61.2 Years		
<b>DISABILITY RETIREMENT</b>				
SL	Straight Life	13	\$ 431,251	\$ 5,950,001
A60	Life Annuity with 60 payments guaranteed	5	181,472	2,508,818
A180	Life Annuity with 180 payments guaranteed	14	576,996	8,349,110
JOINT	Joint and 75% Survivor	6	197,351	2,888,686
R25	Reduced 25% on First Death	3	107,803	1,599,512
C100	100% Continued to Named Survivor	8	296,936	4,546,475
C180	100% Continued to Named Survivor with 180 payments guaranteed	49	1,554,003	25,303,218
	Total Disability	98	\$ 3,345,812	\$ 51,145,820
	Average Age at Retirement	55.9 Years		
<b>DEATH-IN-SERVICE BENEFITS</b>				
SL	Straight Life	9	\$ 140,999	\$ 1,965,685
SL	Straight Life (accelerated)	0	8,593	25,586
A60	Life Annuity with 60 payments guaranteed	6	46,312	702,467
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	15,096	117,175
A180	Life Annuity with 180 payments guaranteed	47	663,446	9,697,671
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	77,171	265,957
	Total Death-in-Service	62	\$ 951,617	\$ 12,774,541
	Average Age at Retirement	55.0 Years		
<b>GRAND TOTAL</b>		<b>10,026</b>	<b>\$ 260,429,426</b>	<b>\$ 3,474,267,907</b>

*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
<b>REGULAR RETIREMENT</b>				
SL	Straight Life	26,072	\$ 518,115,442	\$ 5,609,721,942
SL	Straight Life (accelerated)	0	19,738,001	45,121,814
A60	Life Annuity with 60 payments guaranteed	20,481	407,074,007	4,195,491,764
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	13,637,432	31,944,096
A120	Life Annuity with 120 payments guaranteed	67	858,986	2,380,499
A180	Life Annuity with 180 payments guaranteed	38,718	738,456,336	8,012,447,238
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	37,590,834	95,621,049
A180F	Life Annuity with 180 payments guaranteed (forced)	312	2,416,084	21,394,830
JOINT	Joint and 75% Survivor	22,206	556,923,410	6,550,580,908
JOINT	Joint and 75% Survivor (accelerated)	0	18,992,776	44,691,386
R25	Reduced 25% on First Death	14,029	383,436,888	3,892,806,446
R25	Reduced 25% on First Death (accelerated)	0	7,550,377	18,202,638
C100	100% Continued to Named Survivor	18,142	387,134,668	4,774,463,008
C100	100% Continued to Named Survivor (accelerated)	0	16,318,713	39,727,175
C180	100% Continued to Named Survivor with 180 payments guaranteed	49,052	1,163,819,861	15,517,084,712
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	71,661,897	182,318,623
LOL	Life with Optional Length Guaranteed	42	788,964	5,020,442
LOLF	Life with Optional Length Guaranteed (Forced)	3	39,317	147,099
AC24	Annuity Certain with 24 Payments	3	268,555	336,662
AC60	Annuity Certain with 60 Payments	5	512,799	1,343,804
AC120	Annuity Certain with 120 Payments	12	1,327,947	5,486,263
AC180	Annuity Certain between 24 and 180 Payments	11	2,197,774	9,117,855
C50	50% Continued to One Beneficiary	39	499,258	1,717,541
C50W180	50% Continued to One Beneficiary with 180 Months guaranteed	3	23,254	65,610
C75WSS	75% Continued to One Beneficiary and Social Security Integrated	50	1,088,748	5,160,017
R25W120	Reduced 25% on Death of Annuitant or Named Survivor with 120 Months guaranteed	2	19,174	49,755
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	60	341,608	1,055,664
A180WSS	Life with 180 Months Guaranteed and Social Security Integrated	60	1,232,078	4,005,447
PF6213	Police and Firemen s.62.13 *	59	1,925,738	7,066,146
SLNSD	Straight Life - Named Survivor Deceased	683	17,982,292	179,051,741
Total Regular		190,111	\$4,371,973,218	\$49,253,622,174

(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
<b>DISABILITY RETIREMENT</b>				
SL	Straight Life	735	\$ 18,692,829	\$ 184,012,037
A60	Life Annuity with 60 payments guaranteed	401	9,914,662	93,244,642
A180	Life Annuity with 180 payments guaranteed	1,069	25,033,743	259,383,536
JOINT	Joint and 75% Survivor	512	10,971,009	120,891,110
R25	Reduced 25% on First Death	211	4,556,826	48,524,320
C100	100% Continued to Named Survivor	1,222	21,182,926	233,969,350
C180	100% Continued to Named Survivor with 180 payments guaranteed	2,003	40,729,207	527,820,653
DWSMC	Disability with Spouse or Minor/Dependent Child	23	512,486	3,916,284
DWOSMC	Disability without Spouse or Minor/Dependent Child	2	39,773	292,373
PF6213	Police and Firemen s.62.13 *	14	246,940	976,032
SLNSD	Straight Life - Named Survivor Deceased	6	167,238	1,718,722
Total Disability		6,198	\$ 132,047,639	\$ 1,474,749,059
<b>DEATH-IN-SERVICE BENEFITS</b>				
SL	Straight Life	248	\$ 3,336,496	\$ 36,034,251
SL	Straight Life (accelerated)	0	110,877	276,028
A60	Life Annuity with 60 payments guaranteed	135	2,182,447	23,406,197
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	64,433	287,708
A180	Life Annuity with 180 payments guaranteed	920	12,391,358	149,117,785
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	704,245	2,135,395
C180	100% Continued to Named Survivor with 180 payments guaranteed	2	10,575	156,240
LOL	Life with Optional Length Guaranteed	8	183,101	1,301,615
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	23	27,733	113,131
PF6213	Police and Firemen s.62.13 *	2	59,427	240,752
Total Death-in-Service		1,338	\$ 19,070,692	\$ 213,069,102
<b>GRAND TOTAL</b>		<b>197,647</b>	<b>\$4,523,091,549</b>	<b>\$50,941,440,335</b>

*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>		
	<u>Original</u>	<u>Dividends</u>	<u>Total</u>	<u>Original</u>	<u>Dividends</u>	<u>Total</u>	<u>Original</u>	<u>Dividends</u>	<u>Total</u>
<b>Benefit Amount</b>	\$ 535,113	\$1,390,625	\$1,925,738	\$ 56,986	\$189,954	\$246,940	\$ 14,477	\$ 44,950	\$ 59,427
<b>Present Value</b>	1,994,642	5,071,504	7,066,146	225,237	750,795	976,032	58,637	182,115	240,752

**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	3	\$ 23,553	7	\$ 67,670	10	\$ 91,223
20-24	0	0	5	50,163	12	74,929	17	125,092
25-29	0	0	7	51,868	18	83,367	25	135,235
30-34	1	4,368	14	107,061	23	156,549	38	267,978
35-39	1	8,010	24	174,287	30	249,407	55	431,704
40-44	9	105,110	16	165,846	26	159,260	51	430,216
45-49	58	460,659	68	1,531,719	43	339,200	169	2,331,578
50-54	1,237	35,774,581	310	8,417,981	67	835,740	1,614	45,028,302
55-59	12,645	367,406,606	689	17,830,751	138	1,963,699	13,472	387,201,056
60-64	31,602	822,424,233	1,160	27,005,599	194	3,622,738	32,956	853,052,570
65-69	48,570	1,136,414,344	1,263	27,598,184	225	3,887,358	50,058	1,167,899,886
70-74	36,517	795,019,588	962	19,529,305	160	2,640,925	37,639	817,189,818
75-79	24,109	495,172,053	729	13,665,254	120	1,803,114	24,958	510,640,421
80-84	16,867	348,695,838	527	9,408,217	96	1,065,293	17,490	359,169,348
85-89	10,962	229,448,808	286	4,500,401	73	915,178	11,321	234,864,387
90-94	4,852	95,025,490	115	1,691,404	48	681,191	5,015	97,398,085
95& Up	1,511	25,298,787	20	296,046	20	107,867	1,551	25,702,700
Certain Only*	1,170	20,714,743	0	0	38	417,207	1,208	21,131,950
<b>Totals</b>	<b>190,111</b>	<b>\$4,371,973,218</b>	<b>6,198</b>	<b>\$132,047,639</b>	<b>1,338</b>	<b>\$19,070,692</b>	<b>197,647</b>	<b>\$4,523,091,549</b>

Averages in Years

Age at retirement 59.7

Attained age 70.4

52.0

67.9

51.7

67.2

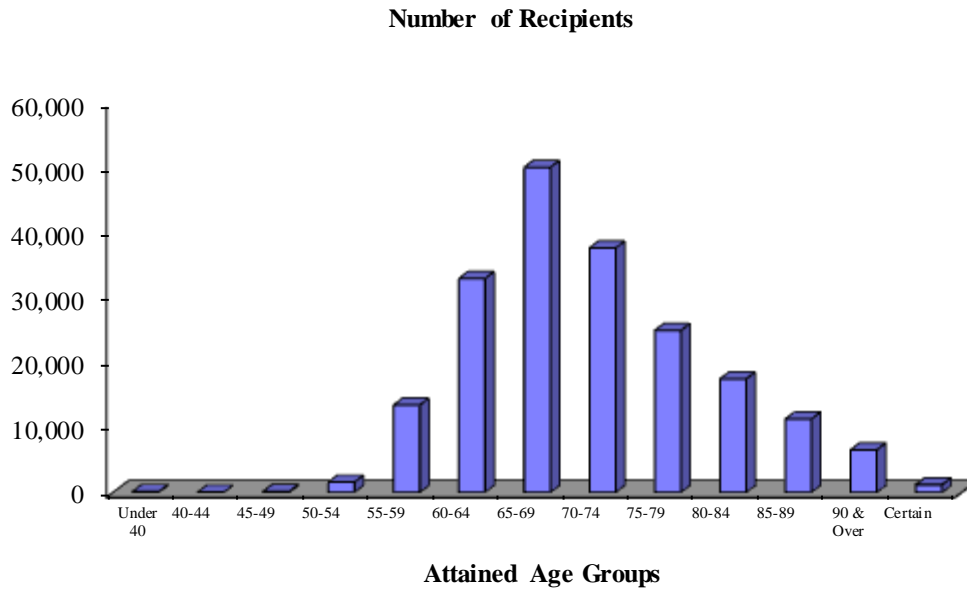
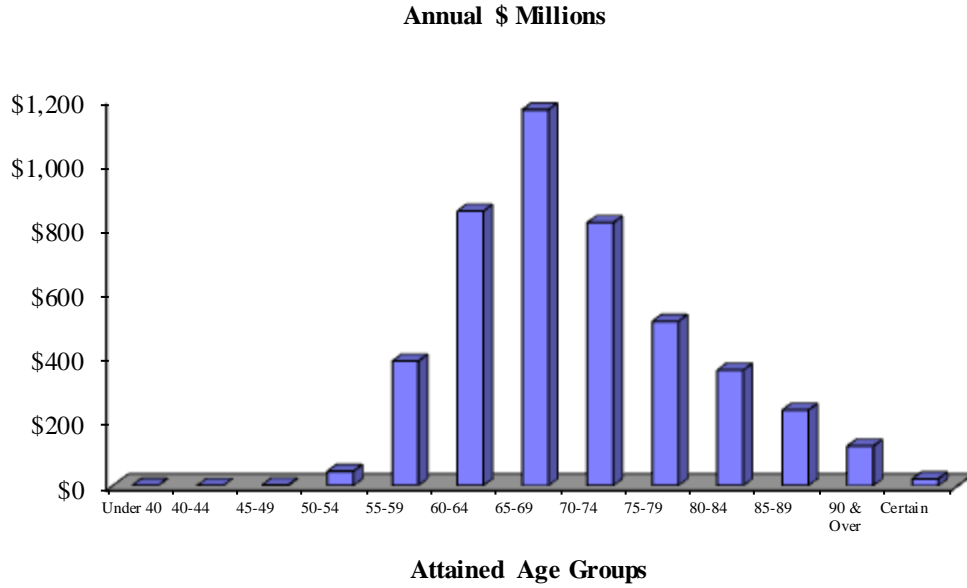
59.5

70.3

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

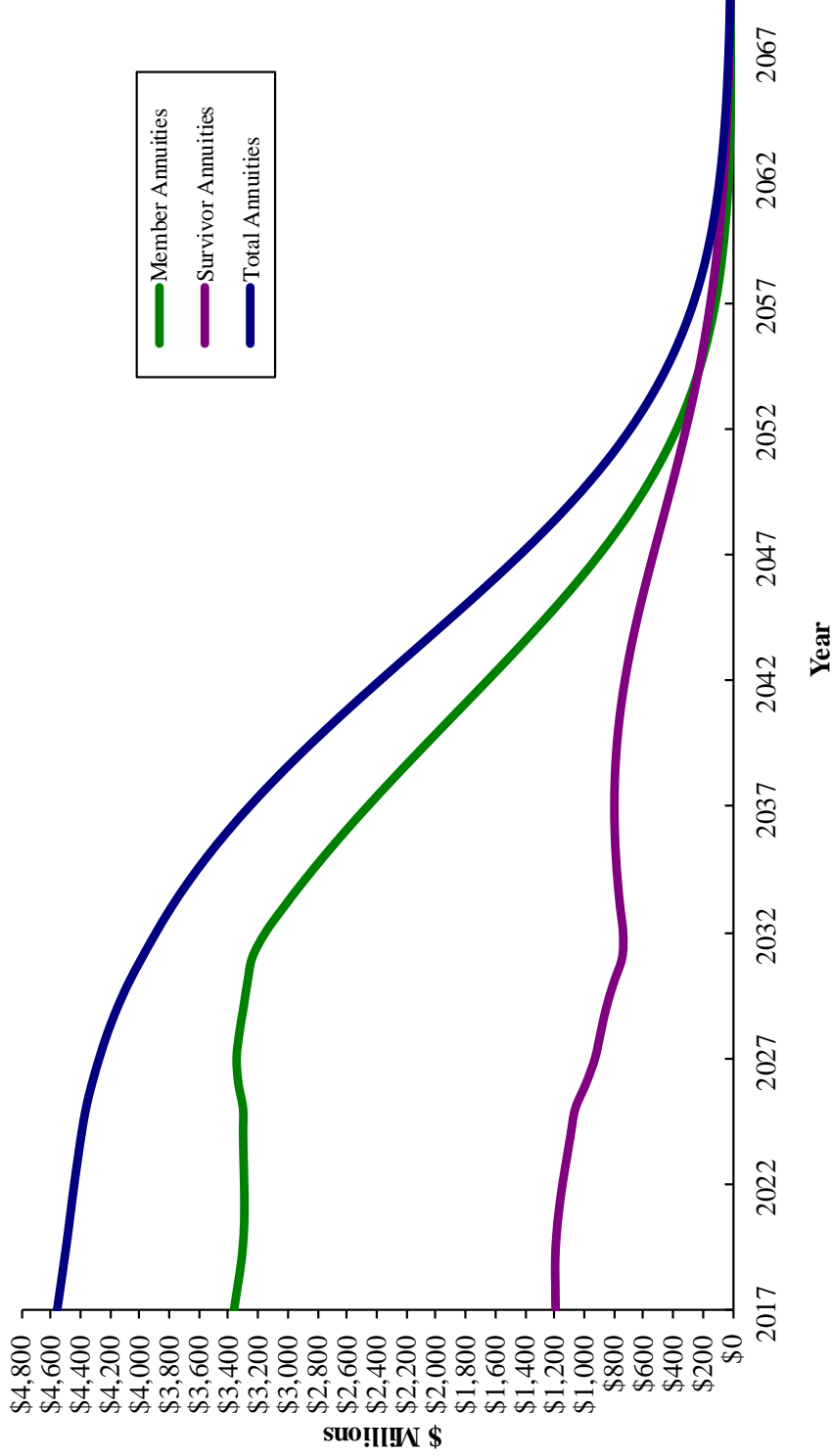
## CORE ANNUITIES BEING PAID BY ATTAINED AGE\*

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\* 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 DIVIDENDS**



Total Future Payments	\$117.3 billion
From Present Assets	52.0
From Investment Return	65.3

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**SECTION D**  
**VARIABLE ANNUITIES**

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**VARIABLE ANNUITY DIVISION**  
**DEVELOPMENT OF ASSETS AND LIABILITIES**

	\$ Millions		Ratio
	Assets	Liabilities	
<b>Ending Balance December 31, 2015</b>	\$3,704.8	\$3,910.1	0.947
Closing Adjustments	1.5	0.0	
Variable Terminations	(63.9)	(63.9)	
2016 Adjustment: -5%	0.0	(191.1)	
Beginning Balance January 1, 2016	3,642.4	3,655.1	0.997
<b>Increases</b>			
Reserve Transfers	174.1	174.1	
Regular Interest	177.9	177.9	
Additional Earnings	166.8	0.0	
Addition for Experience Study/Mortality Reserve	0.0	19.6	
Other	0.0	0.0	
<b>Total Increases</b>	518.8	371.6	
<b>Decreases</b>			
Annuities & Lump Sums	369.2	369.2	
Credit Re-establishments	0.0	0.0	
Subtraction for Experience Study/Mortality Reserve	0.0	0.0	
Other	0.0	12.4	
Total Decreases	369.2	381.6	
<b>Ending Balance December 31, 2016</b>	<b>\$3,792.0</b>	<b>\$3,645.1</b>	<b>1.040</b>

## **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 \$160,539,190. Adjustments to prior transfers, relating to estimated annuities for which final computations have now been made, totaled \$13,587,664. Reserve transfers were distributed as follows:

<b>Group</b>	<b>Regular Transfer</b>	<b>Adjustment to Prior Transfer</b>	<b>Total Transfer</b>
General	\$142,206,777	\$11,298,992	\$153,505,769
Protective with Social Security	12,369,082	1,165,591	13,534,673
Protective without Social Security	1,914,979	103,013	2,017,992
Executive & Elected	4,048,352	1,020,068	5,068,420
<b>Totals</b>	<b>\$160,539,190</b>	<b>\$13,587,664</b>	<b>\$174,126,854</b>

Accordingly, we recommend that \$174,126,854 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, \$3,792.0 million, were more than the actuarial present value of variable annuities, \$3,645.1 million, by \$146.9 million as of December 31, 2016 or 4.0% of the Actuarial Present Value (APV) of variable annuity payments. In accordance with Section 40.28(2) of the Wisconsin statutes (see page 29), variable annuities will be increased by 4.0% effective April 1, 2017. The primary sources of the 4.0% are as follows:

	<u>% of APV</u>
1. SWIB net of fee investment return	10.6%
2. Adjustment to published effective rate	<u>(0.6)%</u>
3. Published effective earnings rate	10.0%
4. Adjustment to relate earnings to average variable annuity fund balance	<u>(0.3)%</u>
5. Earnings rate based on average balance	9.7%
6. Expected change before adjustments: $1.097/1.05-1$	4.5%
7. Adjustment to relate average asset to ending liability	0.1%
8. Carryover from last year due to timing of distribution, accounting adjustments and truncation	(0.3)%
9. Experience study/mortality reserve adjustment	(0.5)%
11. Experience and other effects	0.2%
12. Statutory adjustment: (truncate to whole percent)	<u>0.0%</u>
<b>13. Variable annuity change: (6)+(7)+(8)+(9)+(10)+(11)+(12)</b>	<b>4.0%</b>

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

**TRANSFERS TO ANNUITY RESERVE  
TO FINANCE VARIABLE ANNUITIES APPROVED IN 2016  
TABULATED BY TYPE OF ANNUITY AND OPTION**

Alpha Code	Type of Benefit	Number	Annual Amount	Present Value
<b>REGULAR RETIREMENT</b>				
SL	Straight Life	249	\$ 1,441,604	\$ 18,752,487
SL	Straight Life (accelerated)	0	206,572	765,506
A60	Life Annuity with 60 payments guaranteed	158	955,198	12,635,471
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	137,772	538,860
A180	Life Annuity with 180 payments guaranteed	388	2,120,748	29,905,182
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	392,096	1,591,682
JOINT	Joint and 75% Survivor	195	1,150,177	17,277,477
JOINT	Joint and 75% Survivor (accelerated)	0	244,637	868,308
R25	Reduced 25% on First Death	94	669,165	9,516,097
R25	Reduced 25% on First Death (accelerated)	0	83,412	355,016
C100	100% Continued to Named Survivor	171	883,849	13,542,718
C100	100% Continued to Named Survivor (accelerated)	0	147,996	536,208
C180	100% Continued to Named Survivor with 180 payments guaranteed	612	3,092,550	48,244,831
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	834,935	3,381,890
AC24	Annuity Certain with 24 Payments	0	0	0
AC60	Annuity Certain with 60 Payments	0	6,677	29,116
AC120	Annuity Certain with 120 Payments	0	10,963	85,945
AC180	Annuity Certain between 24 and 180 Payments	0	7,659	52,427
	Total Regular	1,867	\$ 12,386,010	\$ 158,079,221
	Average Age at Retirement	60.2 Years		
<b>DISABILITY RETIREMENT</b>				
SL	Straight Life	3	\$ 14,760	\$ 196,614
A60	Life Annuity with 60 payments guaranteed	1	6,372	89,412
A180	Life Annuity with 180 payments guaranteed	2	7,690	109,690
JOINT	Joint and 75% Survivor	1	6,840	93,300
C100	100% Continued to Named Survivor	2	18,185	277,275
C180	100% Continued to Named Survivor with 180 payments guaranteed	12	47,785	770,496
	Total Disability	21	\$ 101,632	\$ 1,536,787
	Average Age at Retirement	55.4 Years		
<b>DEATH-IN-SERVICE BENEFITS</b>				
SL	Straight Life	3	\$ 7,514	\$ 105,853
SL	Straight Life (accelerated)	0	4,964	14,796
A180	Life Annuity with 180 payments guaranteed	11	52,403	761,034
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	3,833	41,499
	Total Death-in-Service	14	\$ 68,714	\$ 923,182
	Average Age at Retirement	53.1 Years		
<b>GRAND TOTAL</b>		<b>1,902</b>	<b>\$ 12,556,356</b>	<b>\$ 160,539,190</b>

*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
<b>REGULAR RETIREMENT</b>				
SL	Straight Life	4,899	\$ 39,734,249	\$ 370,413,492
SL	Straight Life (accelerated)	0	719,391	1,750,961
A60	Life Annuity with 60 payments guaranteed	3,727	30,336,611	274,639,286
A60	Life Annuity with 60 payments guaranteed (accelerated)	0	440,223	1,127,632
A120	Life Annuity with 120 payments guaranteed	15	85,168	261,074
A180	Life Annuity with 180 payments guaranteed	7,702	58,967,075	571,574,772
A180	Life Annuity with 180 payments guaranteed (accelerated)	0	1,512,959	3,964,345
A180F	Life Annuity with 180 payments guaranteed (forced)	32	246,106	1,828,699
JOINT	Joint and 75% Survivor	4,936	49,768,557	523,529,805
JOINT	Joint and 75% Survivor (accelerated)	0	768,897	1,795,483
R25	Reduced 25% on First Death	3,599	48,573,366	420,907,515
R25	Reduced 25% on First Death (accelerated)	0	314,736	826,967
C100	100% Continued to Named Survivor	3,680	33,101,252	348,794,281
C100	100% Continued to Named Survivor (accelerated)	0	609,702	1,350,995
C180	100% Continued to Named Survivor with 180 payments guaranteed	10,239	85,215,210	1,017,961,405
C180	100% Continued to Named Survivor with 180 payments guaranteed (accelerated)	0	2,492,018	6,707,651
LOL	Life with Optional Length Guaranteed	4	54,996	193,527
AC24	Annuity Certain with 24 Payments	1	3,547	2,498
AC60	Annuity Certain with 60 Payments	0	65,541	176,301
AC120	Annuity Certain with 120 Payments	1	81,601	371,748
AC180	Annuity Certain between 24 and 180 Payments	0	468,171	2,179,934
C50	50% Continued to One Beneficiary	21	188,640	624,611
C50W180	50% Continued to One Beneficiary with 180 Months guaranteed	3	24,406	72,723
C75WSS	75% Continued to One Beneficiary and Social Security Integrated	19	141,084	722,375
R25W120	Reduced 25% on Death of Annuitant or Named Survivor with 120 Months guaranteed	2	12,214	33,866
A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	19	62,158	206,576
A180WSS	Life with 180 Months Guaranteed and Social Security Integrated	10	58,160	191,553
SLNSD	Straight Life - Named Survivor Deceased	131	1,486,795	12,937,469
Total Regular		39,040	\$355,532,833	\$3,565,147,544

(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
<b>DISABILITY RETIREMENT</b>					
1	SL	Straight Life	128	\$ 552,251	\$ 4,767,932
3	A60	Life Annuity with 60 payments guaranteed	70	435,282	3,557,553
7	A180	Life Annuity with 180 payments guaranteed	239	1,005,147	9,520,557
10	JOINT	Joint and 75% Survivor	106	747,436	7,307,992
12	R25	Reduced 25% on First Death	44	245,847	2,182,537
14	C100	100% Continued to Named Survivor	235	1,202,141	11,449,288
16	C180	100% Continued to Named Survivor with 180 payments guaranteed	431	2,046,022	23,285,349
30	DWSMC	Disability with Spouse or Minor/Dependent Child	3	8,956	40,585
35	SLNSD	Straight Life - Named Survivor Deceased	0	0	0
Total Disability			1,256	\$ 6,243,082	\$ 62,111,793
<b>DEATH-IN-SERVICE BENEFITS</b>					
1	SL	Straight Life	68	\$ 417,779	\$ 4,194,030
2	SL	Straight Life (accelerated)	0	12,550	16,269
3	A60	Life Annuity with 60 payments guaranteed	32	212,975	1,653,081
4	A60	Life Annuity with 60 payments guaranteed (accelerated)	0	2,941	13,449
7	A180	Life Annuity with 180 payments guaranteed	242	1,175,859	11,715,533
8	A180	Life Annuity with 180 payments guaranteed (accelerated)	0	37,251	211,448
23	AC180	Annuity Certain between 24 and 180 Payments	0	0	0
28	A60WSS	Life with 60 Months Guaranteed and Social Security Integrated	9	7,447	31,185
Total Death-in-Service			351	\$ 1,866,802	\$ 17,834,995
<b>GRAND TOTAL</b>			<b>40,647</b>	<b>\$ 363,642,717</b>	<b>\$ 3,645,094,332</b>

*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	3	\$ 4,238	3	\$ 2,645	6	\$ 6,883
25-29	0	0	3	1,526	5	3,092	8	4,618
30-34	0	0	6	3,059	3	1,696	9	4,755
35-39	1	246	11	9,066	8	8,968	20	18,280
40-44	4	31,706	4	2,404	9	17,863	17	51,973
45-49	12	39,111	21	63,134	15	43,431	48	145,676
50-54	320	1,224,549	92	197,584	17	33,864	429	1,455,997
55-59	2,815	13,578,689	163	409,187	36	138,638	3,014	14,126,514
60-64	6,519	31,353,794	237	708,841	47	193,099	6,803	32,255,734
65-69	9,803	67,268,710	214	1,131,131	60	242,593	10,077	68,642,434
70-74	7,368	76,963,066	186	1,401,380	37	321,431	7,591	78,685,877
75-79	4,419	60,611,587	135	1,151,192	30	274,233	4,584	62,037,012
80-84	3,349	48,224,471	102	711,535	26	211,411	3,477	49,147,417
85-89	2,535	34,571,382	56	318,412	24	132,622	2,615	35,022,416
90-94	1,237	15,516,693	19	114,288	19	120,390	1,275	15,751,371
95& Up	411	4,561,336	4	16,105	6	56,397	421	4,633,838
Certain Only*	247	1,587,493	0	0	6	64,429	253	1,651,922
<b>Totals</b>	<b>39,040</b>	<b>\$355,532,833</b>	<b>1,256</b>	<b>\$6,243,082</b>	<b>351</b>	<b>\$1,866,802</b>	<b>40,647</b>	<b>\$363,642,717</b>

Averages in Years

Age at retirement 59.1

Attained age 70.2

52.5

66.4

51.2

67.6

58.9

70.1

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

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**SECTION E**  
**COMPARATIVE STATEMENTS**

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**CORE ANNUITIES  
COMPARATIVE STATEMENT  
1983 THROUGH 2016**

Valuation Date	Number	\$ Millions			Ratio	Change in		
		Annual Annuities	Fund Balance	Actuarial Reserve		Annuitants Average	Maximum	CPI*
1983	57,770	\$ 177.7	\$ 1,830.3	\$ 1,738.3	1.053	5.0 %		3.8 %
1984	60,302	214.3	2,255.5	2,120.3	1.064	6.0 %		4.0 %
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 %
<b>34-Year Average</b>						<b>3.9 %</b>		<b>2.7 %</b>
<b>10-Year Average</b>						<b>0.5 %</b>		<b>1.8 %</b>

\* 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.

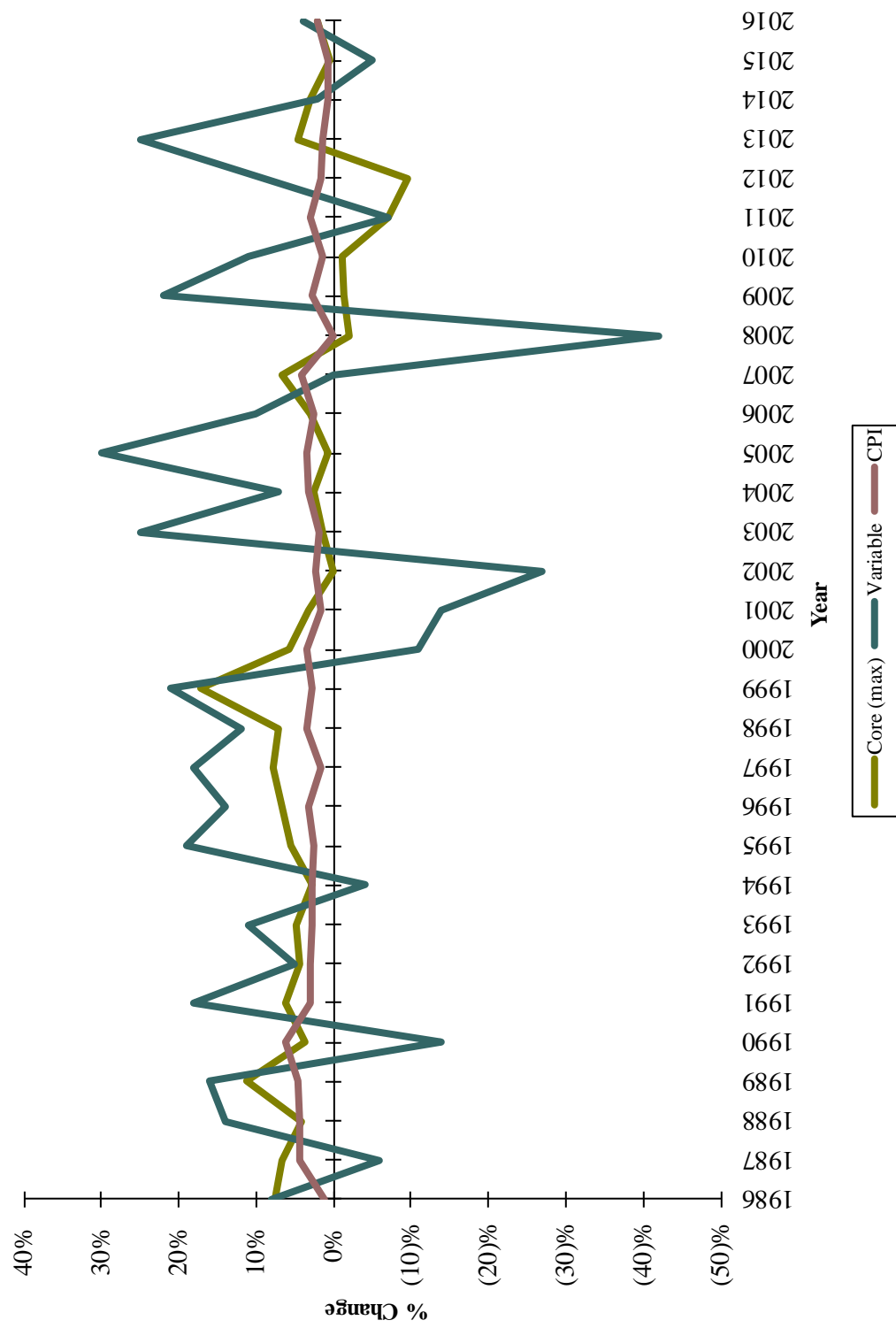
**VARIABLE ANNUITIES  
COMPARATIVE STATEMENT  
1983 THROUGH 2016**

Valuation Date	Number	\$ Millions				Change in	
		Annual Annuities	Fund Balance	Actuarial Reserve	Ratio	Annuities	CPI*
1983	13,598	\$ 25.9	\$ 289.4	\$ 245.0	1.181	18.0 %	3.8 %
1984	14,520	34.2	329.2	327.5	1.005	0.0 %	4.0 %
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 %
<b>34-Year Average</b>						<b>4.3 %</b>	<b>2.7 %</b>
<b>10-Year Average</b>						<b>0.0 %</b>	<b>1.8 %</b>

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



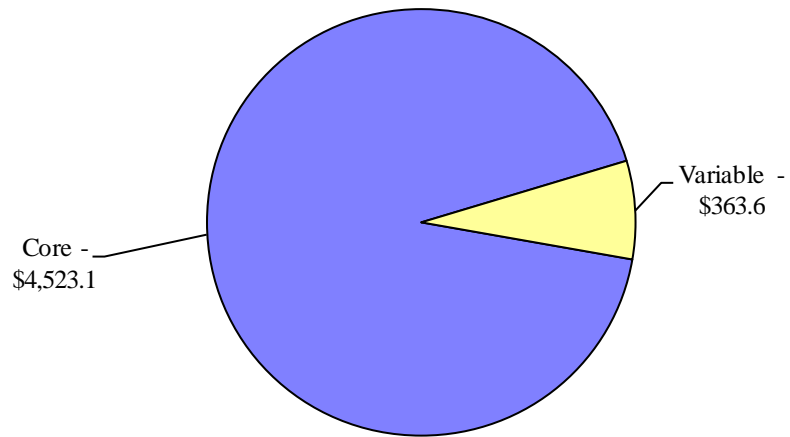
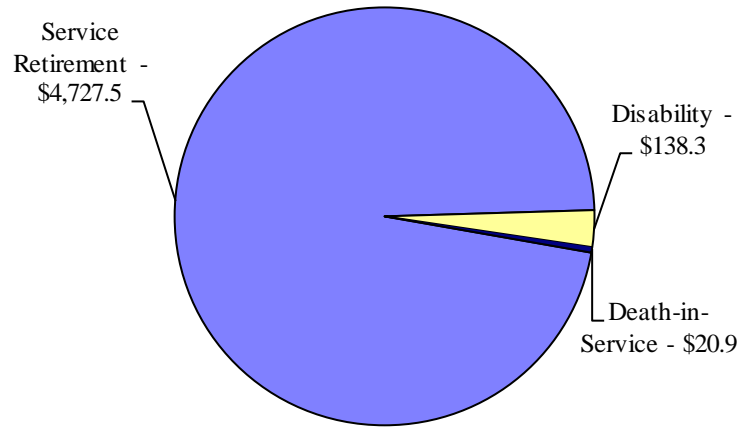
## HISTORY OF % CHANGES IN ANNUITIES AND CPI



# ANNUAL ANNUITIES BEING PAID BY TYPE

## \$ MILLIONS

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**ANNUITIES BEING PAID  
TABULATED BY YEAR OF RETIREMENT  
(\$1,000S ANNUALLY)**

Year Ret'd	Core Annuities				Variable Annuities				Avg. Total Annuity
	No.	Initial	Increases	Total	No.	Initial	Increases	Total	
2016	9,560	\$ 248,063	\$ 0	\$ 248,063	1,831	\$ 11,562	\$ 0	\$ 11,562	\$30,465
2015	10,157	259,353	753	260,106	1,771	10,914	(546)	10,368	30,123
2014	9,170	217,814	4,525	222,339	1,732	9,956	(307)	9,649	28,277
2013	9,512	218,842	13,044	231,886	1,724	7,967	1,683	9,650	28,373
2012	9,489	216,429	17,811	234,240	1,761	6,850	2,193	9,043	28,911
2011	15,195	398,204	32,625	430,829	3,193	15,560	3,545	19,105	34,063
2010	8,318	195,198	16,033	211,231	1,658	6,238	2,263	8,501	29,702
2009	7,852	180,384	14,857	195,241	1,459	4,307	2,855	7,162	29,445
2008	8,509	197,912	16,246	214,158	1,781	11,271	(394)	10,877	27,057
2007	8,336	180,549	14,841	195,390	1,900	12,432	(438)	11,994	25,004
2006	8,071	165,061	13,570	178,631	1,757	12,056	734	12,790	23,782
2005	8,050	160,939	13,259	174,198	1,782	12,827	1,190	14,017	23,480
2004	7,233	136,226	11,223	147,449	1,651	11,973	2,026	13,999	22,402
2003	7,273	137,856	11,354	149,210	1,527	9,974	4,602	14,576	22,591
2002	6,848	124,616	10,264	134,880	1,351	13,427	905	14,332	21,933
2001	6,735	123,580	10,159	133,739	1,409	21,018	(1,728)	19,290	22,786
2000	6,712	120,539	10,010	130,549	1,191	23,790	(4,363)	19,427	22,458
1999	5,592	87,170	19,891	107,061	1,005	16,082	(194)	15,888	22,034
1998	5,435	79,687	24,682	104,369	1,032	14,629	1,560	16,189	22,276
1997	4,550	64,943	26,276	91,219	869	10,364	3,165	13,529	23,133
1996	4,425	61,445	30,902	92,347	895	9,294	4,522	13,816	24,128
1995	3,917	52,655	30,925	83,580	779	6,633	5,117	11,750	24,494
1994	3,531	44,880	29,071	73,951	801	6,597	4,624	11,221	24,300
1993	3,132	37,866	26,871	64,737	697	4,922	4,360	9,282	23,785
1992	2,612	29,772	23,604	53,376	589	3,859	3,789	7,648	23,480
1991	2,281	25,108	22,346	47,454	541	3,044	4,080	7,124	24,268
1990	3,638	42,126	40,668	82,794	895	5,522	5,586	11,108	26,149
1989	2,622	29,718	33,261	62,979	609	3,252	4,333	7,585	27,171
1988	1,819	16,093	20,588	36,681	452	1,865	3,096	4,961	23,096
1987	1,495	12,275	17,446	29,721	402	1,588	2,385	3,973	23,031
1986	1,283	10,218	16,627	26,845	366	1,323	2,250	3,573	24,065
1985	1,136	9,019	16,571	25,590	293	776	1,860	2,636	25,337
1984	779	5,566	11,234	16,800	243	660	1,585	2,245	24,829
1983	613	3,419	7,275	10,694	196	447	1,339	1,786	20,596
1982	441	1,852	4,494	6,346	130	218	793	1,011	16,797
1981	361	1,293	3,368	4,661	99	127	452	579	14,597
1980	236	813	2,177	2,990	72	86	393	479	14,761
1979	159	470	1,387	1,857	52	54	276	330	13,666
1978	129	349	1,037	1,386	33	23	128	151	11,911
1977	102	237	731	968	35	23	124	147	10,934
Prior	339	607	1,940	2,547	84	43	247	290	4,531
<b>Total</b>	<b>197,647</b>	<b>\$3,899,146</b>	<b>\$623,946</b>	<b>\$4,523,092</b>	<b>40,647</b>	<b>\$293,553</b>	<b>\$70,090</b>	<b>\$363,643</b>	<b>\$24,725</b>

**LIABILITIES AS OF DECEMBER 31, 2016**  
**TABULATED BY YEAR OF RETIREMENT**  
**(\$1,000S ANNUALLY)**

Year Ret'd	Core Liabilities				Variable Liabilities				Total Liabilities
	No.	Initial	Increases	Total	No.	Initial	Increases	Total	
2016	9,560	\$ 3,269,398	\$ 0	\$ 3,269,398	1,831	\$ 148,149	\$ 0	\$ 148,149	\$3,417,546
2015	10,157	3,371,473	9,800	3,381,273	1,771	139,641	(6,981)	132,660	3,513,933
2014	9,170	2,800,499	58,101	2,858,600	1,732	126,597	(3,905)	122,692	2,981,292
2013	9,512	2,770,520	165,135	2,935,655	1,724	100,403	21,217	121,620	3,057,275
2012	9,489	2,739,319	225,378	2,964,697	1,761	85,594	27,402	112,996	3,077,693
2011	15,195	5,117,904	419,201	5,537,105	3,193	197,527	44,998	242,526	5,779,631
2010	8,318	2,477,029	203,442	2,680,471	1,658	78,487	28,475	106,962	2,787,434
2009	7,852	2,323,140	191,374	2,514,514	1,459	53,641	35,557	89,198	2,603,712
2008	8,509	2,490,731	204,579	2,695,310	1,781	138,463	(4,875)	133,588	2,828,898
2007	8,336	2,256,111	185,413	2,441,524	1,900	151,839	(5,349)	146,489	2,588,013
2006	8,071	2,020,600	166,118	2,186,718	1,757	144,134	8,769	152,903	2,339,621
2005	8,050	1,918,956	158,040	2,076,996	1,782	149,373	13,862	163,236	2,240,232
2004	7,233	1,579,246	130,078	1,709,324	1,651	138,413	23,416	161,829	1,871,152
2003	7,273	1,553,594	127,912	1,681,506	1,527	112,180	51,763	163,943	1,845,449
2002	6,848	1,366,099	112,473	1,478,571	1,351	149,141	10,058	159,199	1,637,770
2001	6,735	1,319,671	108,463	1,428,134	1,409	221,572	(18,261)	203,310	1,631,444
2000	6,712	1,245,914	103,373	1,349,286	1,191	244,156	(44,775)	199,381	1,548,667
1999	5,592	864,447	196,297	1,060,745	1,005	156,046	(1,877)	154,169	1,214,914
1998	5,435	755,979	233,648	989,627	1,032	134,845	14,375	149,220	1,138,848
1997	4,550	584,142	235,712	819,853	869	91,358	27,898	119,255	939,109
1996	4,425	529,915	265,542	795,457	895	76,858	37,387	114,245	909,702
1995	3,917	430,443	252,133	682,576	779	51,961	40,088	92,050	774,625
1994	3,531	347,156	224,546	571,702	801	49,546	34,731	84,278	655,980
1993	3,132	278,935	197,858	476,793	697	34,628	30,657	65,284	542,077
1992	2,612	206,086	163,709	369,796	589	25,554	25,091	50,645	420,441
1991	2,281	163,785	145,752	309,536	541	18,653	24,987	43,640	353,177
1990	3,638	270,759	261,499	532,258	895	34,600	35,011	69,611	601,869
1989	2,622	174,623	195,258	369,881	609	18,454	24,590	43,044	412,924
1988	1,819	86,739	111,158	197,897	452	9,743	16,166	25,909	223,805
1987	1,495	61,139	86,390	147,529	402	7,448	11,189	18,637	166,166
1986	1,283	47,454	77,771	125,225	366	6,160	10,469	16,628	141,853
1985	1,136	40,610	74,719	115,329	293	3,469	8,311	11,780	127,109
1984	779	22,986	46,669	69,654	243	2,680	6,440	9,120	78,774
1983	613	13,073	27,695	40,768	196	1,650	4,920	6,570	47,338
1982	441	7,204	17,393	24,597	130	751	2,729	3,481	28,078
1981	361	5,067	13,347	18,414	99	479	1,705	2,184	20,598
1980	236	2,984	7,997	10,981	72	275	1,272	1,548	12,529
1979	159	1,568	4,639	6,207	52	164	844	1,008	7,215
1978	129	1,181	3,540	4,721	33	81	453	534	5,256
1977	102	769	2,402	3,171	35	79	425	504	3,675
Prior	339	2,287	7,354	9,641	84	159	912	1,070	10,712
<b>Total</b>	<b>197,647</b>	<b>\$45,519,536</b>	<b>\$5,421,904</b>	<b>\$50,941,440</b>	<b>40,647</b>	<b>\$3,104,949</b>	<b>\$540,146</b>	<b>\$3,645,095</b>	<b>\$54,586,534</b>

**COMPARISON OF ACTUAL TO EXPECTED DEATHS AMONG RETIRED LIVES  
(NORMAL RETIREMENT ONLY)  
DURING 2016**

Age	Male Deaths		Female Deaths		Total Deaths	
	Actual	Expected	Actual	Expected	Actual	Expected
30-34					1	1
35-39					1	1
40-44		2		9		11
45-49		18		77		95
50-54	4	816		517	4	2
55-59	33	5,558	40	7,344	73	49
60-64	79	12,466	69	19,175	148	167
65-69	183	19,679	167	28,868	350	401
70-74	229	15,122	230	19,433	459	490
75-79	325	10,317	312	13,571	637	601
80-84	413	7,326	418	9,772	831	811
85-89	491	4,374	573	6,983	1,064	1,007
90-94	308	1,707	509	3,477	817	762
95-99	115	369	329	1,230	444	394
100 & Up	14	34	60	166	74	62
<b>Totals</b>	<b>2,194</b>	<b>77,788</b>	<b>2,707</b>	<b>110,624</b>	<b>4,901</b>	<b>4,746</b>
<b>188,412</b>						

Average						
Ages	81.3	80.7	70.9	84.0	83.6	71.3
				82.8		82.3
						71.1

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**SECTION F**  
**APPENDIX**

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**ACTUARIAL ASSUMPTIONS USED IN THE  
RETIRED LIFE ACTUARIAL VALUATION**

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The interest rate used in the valuation was 5.0% a year, compounded yearly, as provided in Section 40.02 of the Wisconsin Statutes. Please note that we have assumed all current dividends to be payable in the future. 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 2015 Mortality Table, as adopted by the Board in connection with the 2012-2014 Experience Study. This table includes margin for future improvements in mortality by incorporating half of the MP-2015 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 - 2016 with 5% Interest**

Sample Attained Ages in 2016	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)		Probability of Death Next Year	
	Males	Females	Males	Females	Males	Females
40	\$212.18	\$217.30	44.6	47.9	0.096%	0.059%
45	203.58	209.85	39.6	42.8	0.126%	0.092%
50	192.84	200.64	34.6	37.8	0.171%	0.137%
55	179.99	189.45	29.8	32.9	0.399%	0.244%
60	165.62	176.13	25.3	28.1	0.569%	0.350%
65	148.39	159.99	20.8	23.5	0.867%	0.533%
70	128.80	140.83	16.6	19.0	1.429%	0.903%
75	107.08	119.17	12.8	14.8	2.430%	1.639%
80	84.34	95.93	9.3	11.0	4.469%	3.069%
85	63.12	72.84	6.5	7.8	8.345%	6.143%

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

Sample Attained Ages in 2016	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)		Probability of Death Next Year	
	Males	Females	Males	Females	Males	Females
40	\$198.68	\$207.47	37.2	41.4	0.146%	0.102%
45	186.71	197.67	32.2	36.4	0.244%	0.154%
50	172.91	185.79	27.5	31.6	0.484%	0.271%
55	156.89	171.64	22.9	26.8	0.656%	0.401%
60	138.23	154.74	18.6	22.2	1.156%	0.626%
65	117.74	134.96	14.6	17.8	1.889%	1.081%
70	95.51	112.80	11.0	13.7	3.274%	1.959%
75	73.23	89.31	7.8	10.0	6.231%	3.696%
80	53.78	66.82	5.4	7.0	11.477%	7.541%
85	38.08	48.76	3.6	4.8	18.515%	13.013%

## **STATUTORY PROVISIONS - POST-RETIREMENT ADJUSTMENTS**

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### **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**

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**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**

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### **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%.