

Survivors Selecting Annuities

Overall Summary

What is the Survivors Selecting Annuities Assumption and how is it Used?

The Survivors Selecting Annuities (Survivor Annuity) assumption estimates the rate at which survivors of active members select an annuity. When a member dies their survivor can select an annuity or take a refund of contributions and interest.

This assumption is set by age for each system, plan, and gender.

Survivors of members who are vested and leave employment are also eligible to select an annuity. We use this assumption to find a weighted average for those annuities.

High-Level Takeaways

We used a different rate calculation method than the last demographic experience study.

We calculated rates using a trend line approach, where a trend line is fit to the actual experience and the rate at each age is calculated. We then adjusted that trend line to account for the increase in eligible survivors due to recent law changes.

Since we have so little experience data for the Public Safety Employees' Retirement System (PSERS), the Washington State Patrol Retirement System (WSPRS), and for female members in the Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF), we took the following approaches for those systems.

- ◆ **PSERS.**
We applied blended PERS Plans 1/2 actual rates to PSERS.
- ◆ **WSPRS.**
We used the LEOFF results for each respective plan (LEOFF 1 rates for WSPRS 1 and LEOFF 2 rates for WSPRS 2).
- ◆ **LEOFF/WSPRS Females.**
We combined the male and female data to calculate the rates.

Assumptions

All assumptions used in the development of survivors selecting annuities rates match those disclosed in the [2012 Actuarial Valuation Report](#).

General Methodology

We calculated different assumptions for survivors of active and inactive members.

Calculation Method for Actives

For active members, we studied the counts of survivors selecting annuities at each age. Then, we determined a trend line that best matched the data. Finally, we adjusted the trend at each age to account for the increase in eligible survivors due to recent law changes (see the **Law Changes** section.)

Calculation Method for Inactives

For inactive members, we used the same method as in the prior study. Specifically, we calculated a single weighted average age of survivors selecting annuities for each system and plan.

Data

We began with 18 years of experience study records, from 1995-2012. No special data was added for this assumption and no data was excluded due to the Great Recession or any other event.

Law Changes

Since the last experience study, state law now allows domestic partners and same-sex spouses to qualify as survivors.

◆ E2SSB 5688 (2009).

- ▲ Applied to all citizens and members of all retirement plans.
- ▲ This bill provided that registered domestic partners would be treated exactly like married couples under state law.

◆ ESSB 6239 (2012).

- ▲ Applied to all citizens and members of all retirement plans.
- ▲ This bill established same-sex marriage, created full reciprocity with other states, and automatically converted most (but not all) same-sex domestic partnerships registered in Washington to marriages.

Results

By Plan

PERS

Past Experience:

For the Public Employees' Retirement System (PERS) Plan 1, actual rates were lower than expected for males and higher than expected for females. For PERS 2, actual rates were higher than expected for males and females (much higher for females). For PERS 3, actual rates were much lower than expected for males and females.

The two tables displayed on the right show the Actual-to-Expected (A/E) Ratios for PERS by plan, gender, and age.

PERS Male – Survivors of Active Deaths Selecting Annuities									
Age	Plan 1			Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00	0	1	0.00
30 - 34	0	0	0.00	1	0	0.00	1	3	0.34
35 - 39	0	0	0.00	2	0	0.00	1	3	0.34
40 - 44	4	4	0.98	6	4	1.68	7	8	0.87
45 - 49	28	28	0.99	17	13	1.27	8	11	0.71
50 - 54	71	69	1.03	78	67	1.17	11	16	0.68
55 - 59	90	90	1.00	137	121	1.13	21	22	0.97
60 - 64	59	71	0.83	153	154	1.00	20	21	0.95
65+	25	32	0.78	85	78	1.09	3	5	0.57
Total	277	294	0.94	479	436	1.10	72	91	0.80

PERS Female – Survivors of Active Deaths Selecting Annuities									
Age	Plan 1			Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00	0	0	0.00
30 - 34	0	0	0.00	0	0	0.00	2	1	1.75
35 - 39	0	0	0.00	0	0	0.00	3	2	1.50
40 - 44	2	1	1.39	1	2	0.48	1	2	0.42
45 - 49	7	10	0.72	4	4	1.11	6	5	1.09
50 - 54	40	38	1.06	25	19	1.32	5	10	0.51
55 - 59	65	52	1.25	45	39	1.16	4	9	0.44
60 - 64	42	47	0.90	59	31	1.91	0	3	0.00
65+	23	25	0.91	27	24	1.11	1	3	0.29
Total	179	173	1.03	161	119	1.36	22	37	0.60

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The three tables on this page show a sample of our best estimate rates of survivors of active deaths selecting annuities.

PERS 1 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
40	0.0000	0.4622	0.2578	0.0000	0.1027	0.0000
45	0.5000	0.5634	0.4799	0.0000	0.3418	0.2631
50	0.3750	0.6140	0.5550	0.6154	0.4853	0.3728
55	0.8065	0.7151	0.6015	0.4706	0.4853	0.4406
60	0.6897	0.7151	0.6352	0.4545	0.4853	0.4899
65	0.7143	0.7481	0.6946	0.5455	0.5183	0.5615
70	0.5000	0.7481	0.7164	0.6667	0.5183	0.5934
75	0.0000	0.7481	0.7164	0.0000	0.5183	0.5934
80	0.5000	0.7481	0.7164	1.0000	0.5183	0.5934

PERS 2 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
40	0.0000	0.0553	0.0234	0.0000	0.0490	0.0000
45	0.0952	0.1036	0.1468	0.0625	0.0490	0.0638
50	0.2381	0.2968	0.2701	0.1176	0.1330	0.1343
55	0.4444	0.4417	0.3935	0.2558	0.2170	0.2049
60	0.5156	0.5866	0.5169	0.2955	0.2170	0.2754
65	0.5938	0.6196	0.6732	0.2059	0.2500	0.3790
70	0.7143	0.6196	0.7966	0.6000	0.2500	0.4495
75	0.6667	0.6196	0.7966	0.0000	0.2500	0.4495
80	0.6000	0.6196	0.7966	0.0000	0.2500	0.4495

PERS 3 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
25	0.0000	0.4365	0.0000	0.0000	0.1214	0.1411
30	0.0000	0.4902	0.0532	0.0000	0.2358	0.1592
35	0.5000	0.4902	0.1533	0.0000	0.2930	0.1774
40	0.0000	0.5439	0.2533	0.0000	0.3502	0.1955
45	0.3333	0.5439	0.3533	0.5000	0.4646	0.2136
50	0.3333	0.6298	0.4534	0.0000	0.5218	0.2317
55	0.4286	0.7049	0.5534	0.2500	0.5790	0.2499
60	1.0000	0.7586	0.6534	0.0000	0.5790	0.2680
65	0.6667	0.7916	0.7865	1.0000	0.6120	0.3191
70	0.0000	0.7916	0.7865	0.0000	0.6120	0.3191
75	0.0000	0.7916	0.7865	0.0000	0.6120	0.3191
80	0.0000	0.7916	0.7865	0.0000	0.6120	0.3191

TRS**Past Experience:**

For the Teachers' Retirement System (TRS) Plan 1, actual rates were lower than expected for males and higher than expected for females. For TRS 2, actual rates were higher than expected for males and for females. For TRS 3, actual rates were lower than expected for males and females.

The tables on the right show the A/E Ratios for TRS by plan, gender, and age.

TRS Male – Survivors of Active Deaths Selecting Annuities									
Age	Plan 1			Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00	0	1	0.00
30 - 34	0	0	0.00	0	0	0.00	3	3	0.99
35 - 39	0	0	0.00	0	0	0.00	1	4	0.28
40 - 44	5	4	1.41	0	0	0.00	7	9	0.78
45 - 49	6	8	0.72	0	0	0.00	8	13	0.63
50 - 54	38	37	1.04	3	2	1.77	16	16	1.02
55 - 59	37	38	0.98	10	10	1.02	30	23	1.31
60 - 64	19	20	0.95	10	9	1.09	12	11	1.06
65+	9	10	0.87	1	1	0.71	3	3	0.97
Total	114	117	0.98	24	22	1.09	80	82	0.97

TRS Female – Survivors of Active Deaths Selecting Annuities									
Age	Plan 1			Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00	0	2	0.00
30 - 34	0	0	0.00	0	0	0.00	5	7	0.76
35 - 39	0	0	0.00	0	0	0.00	4	7	0.55
40 - 44	0	0	0.00	0	0	0.00	8	16	0.51
45 - 49	17	12	1.45	1	0	0.00	20	19	1.07
50 - 54	14	18	0.80	1	2	0.58	29	30	0.98
55 - 59	35	27	1.32	11	7	1.54	31	29	1.06
60 - 64	12	15	0.78	12	14	0.84	16	13	1.19
65+	4	4	1.02	5	7	0.77	5	4	1.24
Total	82	75	1.09	30	30	1.01	118	126	0.93

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The tables on this page show a sample of our best estimate rates of survivors of active deaths selecting annuities.

TRS 1 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
40	0.0000	0.5977	0.2849	0.0000	0.4075	0.0306
45	0.0000	0.6469	0.5142	1.0000	0.4576	0.3205
50	0.6923	0.6961	0.5918	0.2500	0.4576	0.4186
55	0.5882	0.6961	0.6398	0.5556	0.4576	0.4792
60	0.7500	0.6961	0.6746	0.4286	0.4576	0.5232
65	0.5714	0.7291	0.7349	0.6667	0.4906	0.5908
70	1.0000	0.7291	0.7349	0.0000	0.4405	0.5908
75	0.0000	0.7291	0.7349	0.0000	0.4405	0.5908
80	0.0000	0.7291	0.7349	0.0000	0.4405	0.5908

TRS 2 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
50	0.0000	0.1951	0.1830	0.0000	0.1788	0.0992
55	0.6667	0.5243	0.3737	0.0000	0.2934	0.2518
60	0.5000	0.7124	0.5644	0.5556	0.4652	0.4045
65	0.0000	0.7454	0.7881	0.6667	0.5555	0.5901
70	0.0000	0.7454	0.7881	0.0000	0.8419	0.5901
75	0.0000	0.7454	0.7881	0.0000	0.8419	0.5901
80	0.0000	0.7454	0.7881	0.0000	0.8419	0.5901

TRS 3 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
25	0.0000	0.3454	0.0000	0.0000	0.4550	0.0000
30	0.0000	0.3454	0.1186	0.5000	0.5109	0.2032
35	0.0000	0.4018	0.2507	0.0000	0.5669	0.3067
40	0.0000	0.4582	0.3323	0.5000	0.5109	0.3707
45	0.1667	0.4808	0.3916	0.5000	0.5109	0.4172
50	0.1250	0.5146	0.4381	0.3333	0.4550	0.4537
55	0.4000	0.5146	0.4765	0.5833	0.4550	0.4837
60	0.5714	0.5710	0.5090	0.5556	0.4550	0.5093
65	0.5000	0.6604	0.5704	0.5000	0.4880	0.5645
70	0.0000	0.7168	0.5955	0.0000	0.4880	0.5842
75	0.0000	0.7168	0.5955	0.0000	0.4880	0.5842
80	0.0000	0.7168	0.5955	0.0000	0.4880	0.5842

SERS**Past Experience**

For the School Employees' Retirement System (SERS) Plan 2, actual rates were lower than expected for males and females (much higher for females). For SERS 3, actual rates were slightly higher for males and lower for females.

The next two tables show the A/E Ratios for SERS by plan, gender, and age.

SERS Male – Survivors of Active Deaths Selecting Annuities						
Age	Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00
30 - 34	0	0	0.00	0	0	0.00
35 - 39	0	0	0.00	0	0	0.00
40 - 44	0	0	0.00	1	1	0.86
45 - 49	2	1	1.70	1	3	0.36
50 - 54	1	5	0.20	15	15	1.00
55 - 59	19	15	1.24	12	10	1.17
60 - 64	17	20	0.85	19	20	0.96
65+	26	28	0.94	14	11	1.22
Total	65	69	0.94	62	61	1.02

SERS Female – Survivors of Active Deaths Selecting Annuities						
Age	Plan 2			Plan 3		
	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00
30 - 34	0	0	0.00	0	0	0.00
35 - 39	0	0	0.00	2	1	1.96
40 - 44	0	0	0.00	3	5	0.59
45 - 49	3	1	5.74	12	13	0.92
50 - 54	13	5	2.49	23	26	0.89
55 - 59	21	9	2.44	27	36	0.75
60 - 64	20	14	1.42	15	21	0.72
65+	10	11	0.88	3	8	0.38
Total	67	40	1.68	85	110	0.77

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The tables displayed below show a sample of our best estimate rates of survivors of active deaths selecting annuities.

SERS 2 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
40	0.0000	0.0559	0.0000	0.0000	0.0000	0.0000
45	0.0000	0.1538	0.1783	0.0000	0.0396	0.1592
50	0.0000	0.3007	0.3061	0.4444	0.1376	0.2533
55	0.5000	0.3986	0.3851	0.4286	0.2029	0.3115
60	0.4286	0.5944	0.4425	0.6667	0.3008	0.3537
65	0.5000	0.6763	0.5205	0.2857	0.3664	0.4199
70	0.0000	0.7742	0.5576	0.3333	0.3664	0.4472
75	0.0000	0.8721	0.5576	0.0000	0.3664	0.4472
80	1.0000	0.8721	0.5576	0.0000	0.3664	0.4472

SERS 3 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates	Old Rates	New Rates	Actual Rates	Old Rates	New Rates
	Male			Female		
35	0.0000	0.0000	0.0000	0.0000	0.3467	0.2464
40	0.0000	0.2392	0.0000	0.0000	0.3467	0.3169
45	0.0000	0.3553	0.2570	0.2000	0.4033	0.3408
50	0.0000	0.4134	0.3888	0.4706	0.4033	0.3555
55	1.0000	0.4715	0.4702	0.3333	0.5732	0.3662
60	0.5000	0.5295	0.5293	0.1667	0.5732	0.3746
65	1.0000	0.5625	0.6088	0.3333	0.6062	0.4146
70	1.0000	0.5625	0.6470	0.0000	0.6062	0.4205
75	0.0000	0.5625	0.6470	0.0000	0.6062	0.4205
80	0.0000	0.5625	0.6470	0.0000	0.6062	0.4205

PSERS

Past Experience:

PSERS Plan 2 opened in 2006 and does not yet have enough experience data to develop this assumption based on PSERS experience. In the prior study we applied PERS 2 rates to PSERS. For this study, we have applied a blended rate that is a combination of PERS 1 and PERS 2 because the unreduced or Normal Retirement Age (NRA) in PSERS falls between the NRA in PERS 1 and PERS 2. In general, the closer a member is to NRA at their death, the more likely the survivor will select an annuity. We believe this new method will provide a better estimate for PSERS than the previous method.

Specifically, we applied the PERS 2 rate for members under age 53. For members between age 53 and 65, we applied a 50/50 blend of PERS 1 and PERS 2 rates. For members age 66 and older, we applied the PERS 2 rates.

PSERS Male – Survivors of Active Deaths Selecting Annuities			
Age	Plan 2		
	Actual	Expected	Ratio
20 - 24	0	0	0.00
25 - 29	0	0	0.00
30 - 34	0	0	0.00
35 - 39	0	0	0.00
40 - 44	1	0	20.71
45 - 49	0	0	0.00
50 - 54	1	0	3.45
55 - 59	0	0	0.00
60 - 64	0	0	0.00
65+	0	0	0.00
Total	2	0	5.92

The table on the left shows the A/E Ratios for PSERS males by age. We saw no active female deaths in PSERS.

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The table below shows a sample of our best estimate rates of survivors of active deaths selecting annuities. Please note that columns labeled Actual Rates are the actual PERS 1 and PERS 2 rates, blended consistent with the method described in the **PSERS – Past Experience** section.

PSERS 2 Sample of Rates						
Ratio of Survivors of Active Deaths Selecting Annuities						
Age	Actual Rates (Blended PERS 1 & 2)	Old Rates (PERS 2)	New Rates (Blended PERS 1 & 2)	Actual Rates (Blended PERS 1 & 2)	Old Rates (PERS 2)	New Rates (Blended PERS 1 & 2)
	Male			Female		
40	0.0000	0.0553	0.1461	0.0000	0.0490	0.0745
45	0.0952	0.1036	0.3016	0.0625	0.0490	0.1736
50	0.2381	0.2968	0.3977	0.1176	0.1330	0.2349
55	0.6254	0.4417	0.4674	0.3632	0.2170	0.2794
60	0.6026	0.5866	0.5222	0.3750	0.2170	0.3144
65	0.5938	0.6196	0.6003	0.2059	0.2500	0.3762
70	0.7143	0.6196	0.6386	0.6000	0.2500	0.4006
75	0.6667	0.6196	0.6386	0.0000	0.2500	0.4006
80	0.6000	0.6196	0.6386	0.0000	0.2500	0.4006

LEOFF**Past Experience**

Data is limited due to very few female deaths in LEOFF plans. As such, we calculated combined rates for both genders. For LEOFF 1, actual rates were higher than expected. For LEOFF 2, actual rates were much higher than expected.

The following table shows the A/E Ratios for LEOFF by plan, gender, and age.

LEOFF Male & Female – Survivors of Active Deaths Selecting Annuities						
Age	Plan 1			Plan 2		
	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	1	0	0.00
30 - 34	0	0	0.00	0	0	0.00
35 - 39	0	0	0.00	8	1	7.15
40 - 44	2	1	1.79	8	6	1.35
45 - 49	8	6	1.30	14	7	2.05
50 - 54	19	12	1.54	29	12	2.51
55 - 59	23	16	1.42	8	4	2.03
60 - 64	55	38	1.47	9	6	1.55
65+	543	503	1.08	0	1	0.00
Total	650	577	1.13	77	36	2.16

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The tables displayed to the right show a sample of our best estimate rates of survivors of active deaths selecting annuities.

LEOFF 1 Sample of Rates			
Ratio of Survivors Selecting Annuities			
Age	Actual Rates	Old Rates	New Rates
	Male & Female		
40	0.0000	0.5670	0.6370
45	1.0000	0.5670	0.6370
50	1.0000	0.5670	0.6370
55	0.8750	0.5670	0.6370
60	0.8462	0.5670	0.6370
65	0.7500	0.6000	0.6700
70	0.8125	0.6000	0.6700
75	0.6757	0.6000	0.6700
80	0.6333	0.6000	0.6700

LEOFF 2 Sample of Rates			
Ratio of Survivors of Active Deaths Selecting Annuities			
Age	Actual Rates	Old Rates	New Rates
	Male & Female		
35	0.5000	0.0728	0.2837
40	0.4000	0.1714	0.4310
45	0.5000	0.2701	0.5220
50	0.7143	0.3030	0.5881
55	1.0000	0.4017	0.6400
60	0.7500	0.5332	0.6827
65	0.0000	0.5662	0.7521
70	0.0000	0.5662	0.7521
75	0.0000	0.5662	0.7521
80	0.0000	0.5662	0.7521

WSPRS

Past Experience:

WSPRS is too small to develop reliable assumptions based on past plan experience. As with the prior demographic experience study, we applied LEOFF 1 rates to WSPRS 1 and LEOFF 2 rates to WSPRS 2.

The table below shows the A/E Ratios for WSPRS by plan, gender, and age.

WSPRS Male & Female – Survivors of Active Deaths Selecting Annuities						
Age	Plan 1			Plan 2		
	Actual	Expected	Ratio	Actual	Expected	Ratio
20 - 24	0	0	0.00	0	0	0.00
25 - 29	0	0	0.00	0	0	0.00
30 - 34	2	0	0.00	0	0	0.00
35 - 39	1	0	0.00	0	0	0.00
40 - 44	5	3	1.49	0	0	0.00
45 - 49	0	1	0.00	0	0	0.00
50 - 54	2	1	1.79	0	0	0.00
55 - 59	0	1	0.00	0	0	0.00
60 - 64	0	0	0.00	0	0	0.00
65+	0	0	0.00	0	0	0.00
All	10	6	1.79	0	0	0.00

Best Estimate Rates of Survivors of Active Deaths Selecting Annuities

The two tables on the right show a sample of our best estimate rates of survivors of active deaths selecting annuities.

Please note that columns labeled Actual Rates for WSPRS 1 and WSPRS 2 are the actual rates for LEOFF 1 and LEOFF 2, respectively.

WSPRS 1 Sample of Rates			
Ratio of Survivors Selecting Annuities			
Age	Actual Rates (LEOFF 1)	Old Rates (LEOFF 1)	New Rates (LEOFF 1)
	Male & Female		
40	0.0000	0.5670	0.6370
45	1.0000	0.5670	0.6370
50	1.0000	0.5670	0.6370
55	0.8750	0.5670	0.6370
60	0.8462	0.5670	0.6370
65	0.7500	0.6000	0.6700
70	0.8125	0.6000	0.6700
75	0.6757	0.6000	0.6700

WSPRS 2 Sample of Rates			
Ratio of Survivors of Active Deaths Selecting Annuities			
Age	Actual Rates (LEOFF 2)	Old Rates (LEOFF 2)	New Rates (LEOFF 2)
	Male & Female		
35	0.5000	0.0728	0.2837
40	0.4000	0.1714	0.4310
45	0.5000	0.2701	0.5220
50	0.7143	0.3030	0.5881
55	1.0000	0.4017	0.6400
60	0.7500	0.5332	0.6827
65	0.0000	0.5662	0.7521
70	0.0000	0.5662	0.7521
75	0.0000	0.5662	0.7521