SOA Research INSTITUTE

2015-2018 Group Annuity Mortality Experience Report

Mortality and Longevity

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2015-2018 Group Annuity Mortality Experience Report

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2015-2018 Group Annuity Mortality Experience Report

Section 1: Executive Summary

The Group Annuity Experience Committee of the Society of Actuaries (SOA) has performed a mortality study of insurance company annuity experience under group pension contracts issued primarily in the United States for the years 2015 - 2018. This experience is predominantly based on retired lives, which includes benefit payments made under ongoing pension plans and/or terminated plans ("pension closeouts") and partially guaranteed arrangements, such as certain Immediate Participation Guarantee contracts and non-guaranteed arrangements.

MIB's Actuarial and Statistical Research Group collected, validated, and summarized the data for this report. Consistent with the 2011 – 2014 Group Annuity Experience Report (hereafter referred to as the "Prior Study")[1], a database application was employed enabling access to more granular groupings. Thirteen insurance companies and a committee of volunteers, who are listed at the end of this report, supported this effort.

Table 1.1 summarizes mortality trends and mortality improvement trends for 2015 – 2018. Actual-to-Expected (A/E) ratios and Annual Mortality Improvement rates by Expected Basis are as follows:

Table 1.1

AGGREGATE GROUP ANNUITY MORTALITY AND MORTALITY IMPROVEMENT TRENDS, 2015-2018

Expected Basis	Actual-to-Expected Ratios (2015-2018)		Annual Mortality Improvement[2] (2015-2018)	
	By Lives	By Income	By Lives	By Income
1983 GAM	89.0%	81.6%	0.3%	0.3%
1994 GAM Basic with Projection	103.5%	97.2%	-0.3%	-0.3%
1994 GAR	111.2%	104.5%	-0.3%	-0.3%
Pri-2012 Projected with MP-2020 to Experience Year	102.7%	97.2%	0.0%	0.1%
Pri-2012 Projected with MP-2020 to Study Midpoint	102.6%	97.2%	0.3%	0.4%

In this report, statistics shown By Lives include all data, while statistics By Income include only records for which an income amount was available.

[1] In December 2018, the SOA published a Group Annuity Experience Update including data from the years 2015 and 2016, which overlap this study's experience period. Some of the data from the 2015-16 experience update is also included in this study, but the list of contributing companies between the two is not the same.

[2] Results for mortality improvement are based on the log-linear regression of results over the four-year period. Results using Arithmetic Average Improvement are also available in the Excel worksheet on the "MortImp" tabs.

As shown by the mortality improvement results By Income, these A/E ratios have decreased 1.2%[3] from 82.8% in 2015 to 81.5% in 2018 based on the (unprojected) 1983 GAM table, which represents a 0.3% average annual mortality improvement rate.

Using the 1994 GAM Basic with Projection, the A/E ratio By Income was at 97.7% in 2015 and 97.8% in 2018. Annual mortality improvement was 0.3% slower than Scale AA over the four-year period.

These rates of improvement are substantially lower than the 1.1% average overall improvement and 0.9% average improvement relative to projection Scale AA for the 2007-2014 period shown in the Prior Study. This observation is consistent with other SOA research into U.S. mortality improvement.

In 2019, the SOA released the Pri-2012 Mortality Tables for measuring private pension plan obligations. These tables were intended to update and supplant the RP-2014 Mortality Tables, which were used as a basis of comparison in the Prior Study. In addition, the SOA has been issuing annual updates to Mortality Improvement Scale MP-2014, with Scale MP-2020 representing the most recent update available at the time data was processed for this study. The above Table 1.1 includes two A/E ratios using Pri-2012 projected with MP-2020 as the expected basis. The first expected basis projects mortality improvement to the year in which experience is being measured. The second projected basis uses MP-2020 to project the Pri-2012 base rates to the midpoint of the 2015-2018 study period.

[3] All percentage changes in A/E Ratios in this report are calculated as differences rather than ratios.

Section 2: Format of the Data

All experience is available by lives and by income. The data are available with the following breakdowns:

- Experience Years (4): 2015, 2016, 2017, 2018
- Sex: Male, Female
- Attained Age Groups: 0-54, 55-59, 60-64, . . . , 90-94, 95+
- Annual Income Groups: $0-4,999, $5,000-9,999, $10,000-24,999, $25,000-49,999, $50,000-99,999, $100,000-249,999, $250,000-499,999, $500,000+
- Retirement Classes: Before Normal Retirement Date, on or after NRD, Unknown
- Certain Options: Life-Only, Life & Certain Period, Cash Refund, Unknown (includes Temporary Life Annuities)
- Survivor Options: 0% (Single Life), 1-50% (Joint & Survivor), 51-75% (Joint & Survivor), 76-100% (Joint & Survivor), Unknown Joint Status
- Guarantee Status: Guaranteed, Non-Guaranteed
- Durations: 0-1 years, 2-5 years, 6-10 years, Ultimate (11+)

To ensure the deaths are reliable, the data reflect annuitants who are receiving life contingent payments or, in some cases, are past normal retirement date but not currently receiving payments. For joint-and-survivor ("J&S") annuities, only the person in payment status is counted in the exposure and death statistics. Some companies did not include exposures and deaths for spouses, but those that did only included them to the extent that the spouses outlive the participants. Data from trusteed/reimbursement contracts (for which a third party administrator maintains the benefit records) are included for some contributing companies but may not be for others.

The Committee believes that any lags in reporting of deaths are minimal at this point and that results are generally credible in the formats provided. Results at the very low and very high ages may not be credible. Users who create their own pivot tables from the data should be careful to ensure there is adequate exposure in the resulting cells.

Actual-to Expected (A/E) ratios are available using the 1983 Group Annuitant Mortality Table (83 GAM and 1983 GAM Basic), the 1994 Group Annuitant Mortality Table (94 GAM Basic with Projection or 94 GAM Static), the 1994 Group Annuity Reserving Table (94 GAR), and the Pri-2012 Mortality Tables projected with Mortality Improvement Scale MP-2020. All these tables are applied on a sex-distinct basis. The 94 GAR tables are a combination of the 94 GAM Static Table and Projection Scale AA. Whenever reference is made to the use of the 94 GAR, it implies application of generational mortality techniques. These sets of tables represent the most recent group annuity valuation tables.

The 83 GAM and 94 GAM, with variants, along with Projection Scale AA may be downloaded from http://mort.soa.org (Table Identities 825-826, 832-835, and 923-924, respectively). Note that IRS Revenue Ruling 2001-62 refers to a 94 GAR variant that was projected to 2002. This version of the 94 GAR, "IRS 1994 GAR," is not present in the data.

Table 2.1 below shows the seven mortality bases that are available in the data.

Table 2.1
MORTALITY BASES INCLUDED IN THE STUDY

Mortality Table	Valuation Margin	Projection Scale	Projection Year
83 GAM	**Included**	**None**	**n/a**
83 GAM Basic	None	None	n/a
94 GAM Static	Included	None	n/a
94 GAM Basic with Projection	**None**	**Scale AA**	**Year of Experience**
94 GAR	**Included**	**Scale AA**	**Year of Experience**
Pri-2012	**N/A**	**MP-2020**	**Year of Experience**
Pri-2012	**N/A**	**MP-2020**	**Midpoint of Study Period**

The mortality tables shown in bold font above are already present in each of the pivot tables. The 83 GAM and 94 GAR were selected as they are prescribed valuation bases. The 94 GAM Basic with Projection was selected as a best-estimate version because a valuation margin is not included but a mortality improvement projection is included. Other bases may easily be added to any pivot table by any user who wishes to see results on those bases.

Section 3: Principal Observations

3.1 GENERAL COMMENTARY

This section of the report will describe each of the pivot tables that have been provided and includes relevant observations. Each topic is referred to by the tab name and is generally discussed in the order that they appear in the accompanying Excel file.

This discussion uses the 1994 GAM Basic Table with Projection Scale AA as the primary basis for expected deaths.

A/E ratios provide simple reference values for comparison of mortality experience data with established mortality tables. The exact reference values are quantitatively significant only to the extent that underlying exposure is similar for the current experience data. The United States and Canadian populations, workforces, and annuitant populations have undergone significant demographic changes since the experience data was originally obtained to construct the 1983 GAM and 1994 GAR tables. In addition, as noted earlier, data reported in this study were derived primarily from blended populations of active workers and retirees (however, blending was not significant at the older ages). Interpretations of data in terms of the A/E ratios that follow should nevertheless be adopted only with these factors taken into consideration.

3.2 MORTALITY IMPROVEMENT TABS

There are two tabs for illustrating mortality improvement – one By Lives and one By Income. The values for annual mortality improvement contained in the table in the Executive Summary of this report come from these tabs. Results can be displayed differentiating by sex or on a combined basis. Annual rates of mortality improvement discussed below use the log-linear regression slope of the results using the 1994 GAM Basic with Projection table as the expected basis. For convenience, the arithmetic average of the mortality improvement is calculated and shown in the pivot tables as well on these tabs.

The mortality improvement factors provide an indication of how closely Projection Scale AA reflects the actual annual improvement in mortality. These factors show rates of improvement in actual mortality relative to improvement in the expected mortality basis. Factors that are positive indicate that actual mortality is improving faster than assumed by Projection Scale AA. Factors that are negative indicate that actual mortality is improving at a slower rate than assumed by Projection Scale AA.

- *By Lives*

  For both males and females, overall mortality improved 0.3% slower than Scale AA during 2015-2018. For 2007-2014, males improved by 1.8% and females improved by 2.3% relative to Scale AA. By age group during 2015-2018, males exhibited slightly faster mortality improvement than Scale AA above age 80, but generally slower mortality improvement for age groups below 80. Among age groups with a significant sample for females, only the 70-74 age group experienced faster mortality improvement than that projected by Scale AA.

- *By Income*

  For males and females combined, overall mortality improved 0.3% slower than Scale AA during 2015-2018 compared to 0.9% faster during 2007-2014. Female mortality improvement in aggregate was almost exactly the same as that projected by Scale AA, while male mortality improvement during 2015-2018 was

0.2% slower. Mortality improvement by both lives and income in the group annuity data for 2015-2018 was higher by 0.1% than for the same period in the U.S. population.

3.3 SEX TABS

There are two tabs for analyzing summary statistics by sex. The first sex tab, Summary – Sex & Exp Yr, contains two pivot tables, one for each year of the study period By Lives and another By Income. The second sex tab, Att Age & Sex, likewise has two pivot tables, one for attained age groups By Lives and another for attained age groups By Income. Exposures, actual deaths and A/E ratios are shown on each tab.

- Experience Years

  The two pivot tables on this tab are displayed sequentially with By Lives appearing first and By Income appearing second. Individual experience years are shown separately.

  - *By Lives*

    The percentage of life-years exposed by sex evened out slightly compared to the Prior Study; the experience was 52% male in the 2015-2018 data compared to 55% in the 2011-2014 data. As shown in the table below, the average A/E ratios in the first four years are consistent with those in the later four years and the difference between female and male A/E ratios is consistent between periods.

    Table 3.1
    AVERAGE A/E RATIOS BY STUDY PERIOD AND SEX, LIVES BASIS

Sex	2011-2014	2015-2018
Females	101.7%	104.9%
Males	99.7%	102.3%

    A/E ratios experienced an aggregate increase compared to the Prior Study for both sexes on a Lives basis. The increase in A/E ratios on an additive basis was slightly greater for females than for males.

  - *By Income*

    Table 3.2
    AVERAGE A/E RATIOS BY STUDY PERIOD AND SEX, AMOUNT BASIS

Sex	2011-2014	2015-2018
Females	101.7%	102.7%
Males	92.8%	94.5%

    Patterns and trends By Income are comparable to those By Lives, though the increase in A/E ratios is smaller for both sexes By Income than By Lives. Data that have A/E ratios lower By Income than those on a By Lives basis suggests individuals with higher incomes are experiencing increased longevity. In aggregate, A/E ratios By Income are approximately 8% lower than those By Lives; this is predominantly driven by male experience.

    While the proportion of exposures on a By Lives basis is relatively equal, with 52% male and 48% female, the proportion of exposures on a By Income basis is skewed towards males; males account

for 62% of the exposures and females only account for 38%. The difference in exposures By Income is indicative of the pervasiveness of male-female income disparity.

- Attained Age Group

As noted above, the two pivot tables on this tab are displayed side-by-side with By Lives on the left and By Income on the right. Results are shown for all four years of the study period combined. Results for an individual experience year or group of experience years can be obtained by changing the Experience Year field of the pivot table.

  - *By Lives*

    A/E ratios for ages below 65 are noticeably higher than other age groups, presumably reflective of early retirement for health reasons. However, these results should be interpreted with caution due to the modest amount of exposure in these groups. A/E ratios for ages 70 and over are fairly consistent and generally between 101% and 106%. Between ages 55-74, male A/E ratios By Lives are higher than their female counterparts. For all age groups 75-79 and older, female A/E ratios are higher than male A/E ratios.

  - *By Income*

Figure 3.1
AVERAGE A/E RATIOS BY AGE GROUP AND SEX

The spread between A/E ratios By Lives and By Income for males is greater than that for females, except at the very oldest ages. For both sexes, A/E ratios By Income are lower than their By Lives counterparts for all age groups between 65 and 94, with the gap between them narrowing at the oldest ages.

A/E ratios decline sharply from the 60-64 age group to the 65-69 age group. One possible explanation would be that in the 60-64 age group, there are more retirements due to health reasons. In the development of the more recent Pri-2012 tables, this effect was observed in the

underlying data. Figure 3.2 shows the A/E ratios by age group and sex using Pri-2012 and MP-2020 as the expected basis. The patterns by age group for each combination of basis and sex are smoother. Another contributing factor is that the GAM 1994 table was developed as a blend of experience for active and retired persons between the ages of 51 and 65, whereas the Pri-2012 expected basis in this study used only retiree experience at all ages.

Figure 3.2

AVERAGE A/E RATIOS BY AGE GROUP AND SEX USING PRI-2012 AND MP-2020 EXPECTED BASIS

3.4 INCOME GROUP TAB

The Income Group tab shows the experience grouped according to the amount of annual income each annuitant receives based on attained age groupings. The dollar amounts shown may not be representative of the total income from all sources for any given annuitant but still provide some insight into the variation of results across different amounts of income.

Figure 3.3

INCOME WEIGHTED A/E RATIOS BY AGE AND INCOME GROUP -- MALES

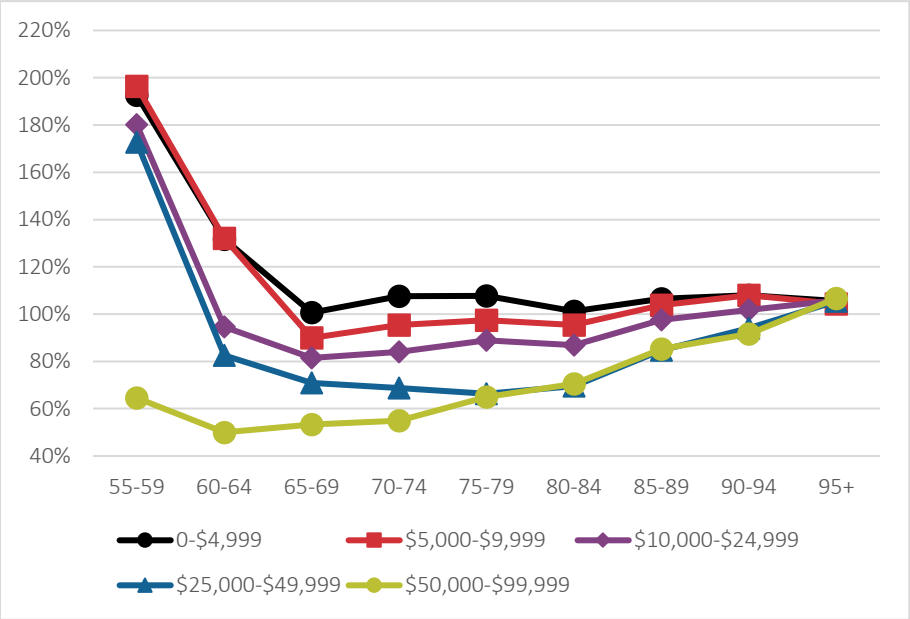


Figure 3.3 shows:

- Generally, for males of all age groups, higher A/E ratios for lower income groups and lower A/E ratios for higher income groups.
- For males, differences in A/E by income group are wider for lower ages and narrower for higher ages.

Figure 3.4

INCOME WEIGHTED A/E RATIOS BY AGE AND INCOME GROUP -- FEMALES

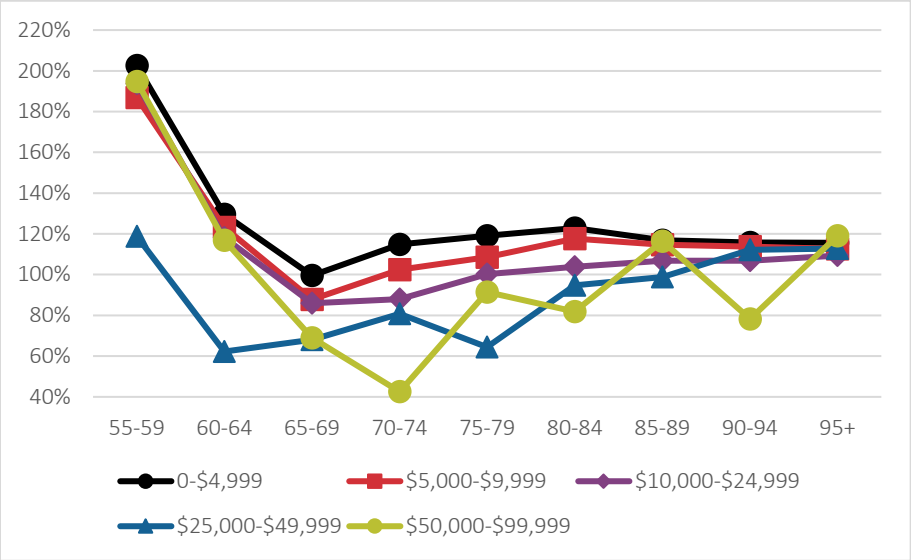


Figure 3.4 shows:

- Similar to males, for females of all age groups, there are higher A/E ratios for lower income groups and lower A/E ratios for higher income groups.
- As with males, female differences in A/E by income group are wider for lower ages and narrower for higher ages.
- The A/E ratios for the $50,000-$99,999 annual income group were volatile by age, likely due to limited credibility as indicated by the low death counts in this income group for females, as shown in Figure 3.5 below.

Figure 3.5

ACTUAL DEATHS BY AGE AND INCOME GROUP -- MALES

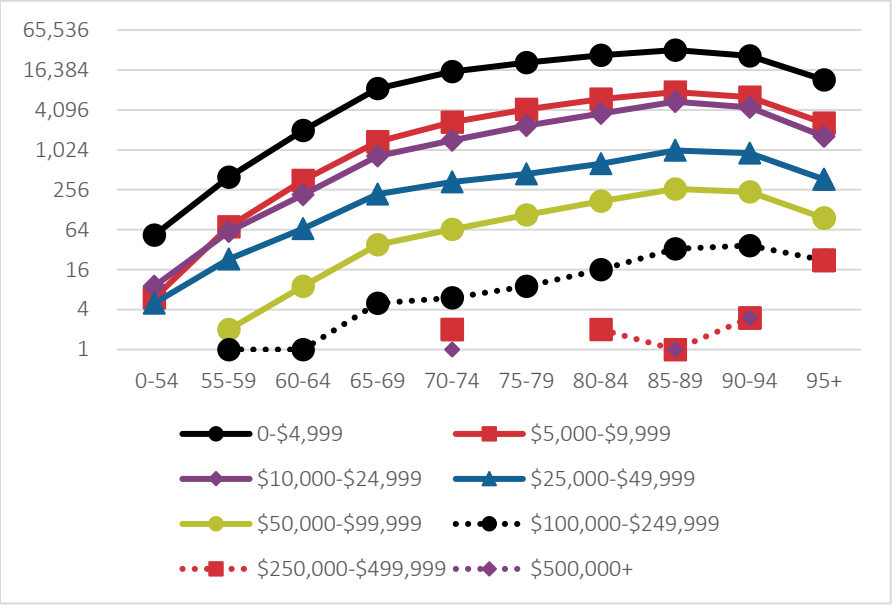


Figure 3.5 shows:

- For males, there were a small amount of deaths in the 0-54 age group, which limits the credibility of A/E ratios by income for this age group and sex. For this reason, this age group was excluded when presenting A/E ratios by income in Figure 3.3.
- For income groups of $100,000 per year or more, there were a small amount of deaths, which limits the credibility of A/E ratios by age group for these income groups. For this reason, these income groups were excluded when presenting A/E ratios by age for males.

Figure 3.6
ACTUAL DEATHS BY AGE AND INCOME GROUP – FEMALES

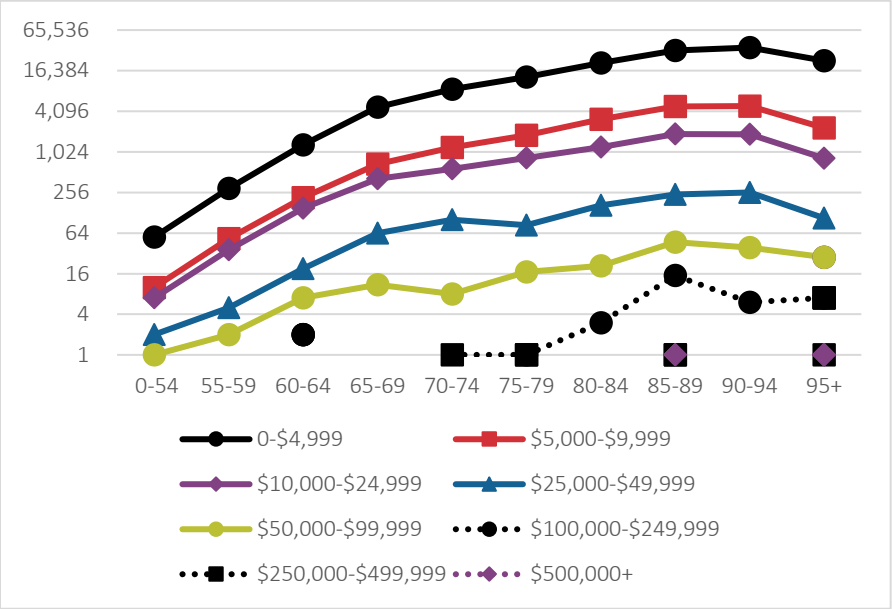


Figure 3.6 shows:

- For females (as with males), there were a small amount of deaths in the 0-54 age group, which limits the credibility of A/E ratios by income for this age group. For this reason, this age group was excluded when presenting A/E ratios by income in Figure 3.4.
- For income groups of $100,000 per year or more, there were a small amount of deaths, which limits the credibility of A/E ratios by age group for these income groups. For this reason, these income groups were excluded when presenting A/E ratios by age for females (as with males).
- The $50,000-$99,999 income group also had a limited amount of deaths for females. Although the A/E ratios by age group for this income group are presented for females in Figure 3.3, the relatively low amount of deaths means that the credibility of A/E ratios by age for this income group are quite limited.

3.5 RETIREMENT CLASS TABS

There are two tabs for analyzing statistics by Retirement Class. The first Retirement Class tab presents the data by Attained Age Grouping, while the second tab presents data by Income Group. The first of these tabs shows retirement age decisions. Health-related conditions and corporate downsizing can influence retirement decisions. The second tab captures the impact of income on an annuitant's decision to retire. Results within each retirement class are generally consistent with the overall pattern of A/E ratios declining as income increases as highlighted earlier in the discussion of the Income Group tab results. The category "Unknown" includes experience submitted without specification of retirement date status, as well as data for which a retirement date is not applicable; for example, data where retirement date information is either not provided or not retained for takeover plans or benefit payments to a surviving spouse.

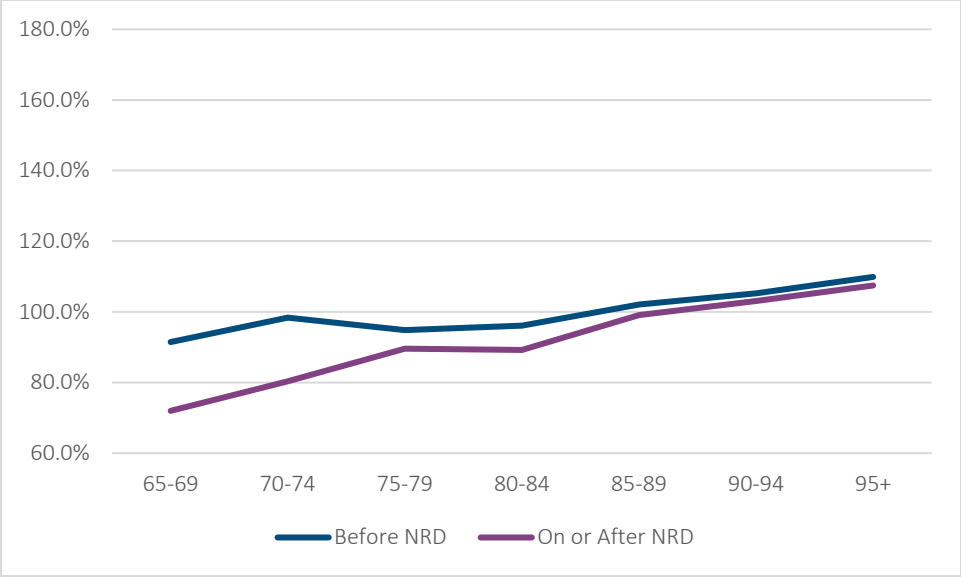
Early retirements are a combination of voluntary and involuntary (i.e., non-elective) retirements. The voluntary retirements may be the result of personal/health reasons, existing subsidies or enhanced subsidies that might accompany an elective downsizing.

- *By Attained Age Group*

By Income, 31% retired early, 19% retired on or after the normal retirement date (NRD), and the remaining 50% were in the "Other" category. Overall, those who retired early show an A/E ratio of 100.4% compared to 95.6% for those who retired on or after their retirement date. These ratios indicate that those who retired early show higher mortality than those who retired on or after their normal retirement date.

Figure 3.7 illustrates how A/E ratios by Retirement Class differ by age group. The difference between total "Before NRD" and "On/After NRD" A/E ratios decreases as attained age increases. This suggests that the effect of early retirement decisions due to the annuitant being in poor health wears off as age increases and time passes.

Figure 3.7
MORTALITY A/E RATIOS BY ATTAINED AGE GROUP AND RETIREMENT CLASS



- *By Income Group*

Those in higher income groups were more likely to retire on/after the normal retirement date and those in the lower income groups were more likely to be classified as "Other." Those in the highest income categories were likely to have more service, which led to more income and, therefore, were more likely to work until the NRD. Also, those in the highest income categories might have had the financial wherewithal to delay commencing benefits until on or after the NRD. Finally, surviving spouse benefits are often less than primary benefits, which makes the surviving spouse "other" category more likely to be in lower income classifications. However, this is true only to the extent that surviving spouses make up the bulk of the data in the "other" category rather than annuitants with an unknown retirement date[4].

[4] Many blocks of business do not track retirement date.

Table 3.3
RETIREMENT CLASS EXPOSURE BREAKDOWN BY INCOME GROUP

Retirement Class	$0 - $4,999	$5,000 - $99,999	$100,000 - $999,999
Before NRD	26%	34%	27%
On/After NRD	19%	18%	30%
Other	55%	48%	43%
Total	**100%**	**100%**	**100%**

For income groups below $50,000, the Before NRD group A/E shows an excess in the 0%-10% range over the On/After NRD group that does not vary significantly by income group. However, for income groups $50,000 and above, A/E ratios are lower for the Before NRD group.

3.6 CERTAIN OPTION TABS

There are two tabs for analyzing the data by the benefit option selected upon retirement. Participants may have an option to receive their benefit in the form of a single life annuity or in other actuarially equivalent forms of payment. Accordingly, the data is split as Life-Only, Life & Certain Period, Cash Refund, and Unknown. Note that each of these categories contains both single life and joint-and-survivor annuities; the breakdown only reflects the different certain options elected. Individuals who elected lump sum payments, if said option was available in their plan, are not part of the study data.

- A Life-Only annuity provides for a monthly benefit for the lifetime of a pensioner or a pensioner with a contingent annuitant. Income ceases at death of the pensioner or after the death of both the pensioner and the co-annuitant in the case of a joint-and-survivor annuity. Payments are not guaranteed up to a certain dollar amount or specified number of payment years.

- A Life & Certain Period annuity pays benefits to the end of a specified amount of time, called the "certain" period, or the life of the annuitant, whichever is later. Hence a stream of payments will be remitted to a beneficiary in the event the plan participant dies before the "certain" term ends.

- A Cash Refund annuity has a provision which stipulates that, if the annuitant passes away before the annuity payments received equal the contributions made, the plan will pay the difference to a beneficiary. This option is typically associated with employee contributions.

- The "Unknown" category includes all annuity types that do not fall into one of the other categories. This category includes Temporary Life annuities, in which payments cease upon the death of the annuitant or upon the expiration of a period of time, whichever comes first.

The data by Certain Option must be interpreted with care as Life-Only Annuities represent 88% of the exposure By Income. Many pension plans use the Life Only option for unmarried participants. Some companies may report a Life & Certain Period annuity as Life Only after the certain period has expired. Likewise, a Cash Refund annuity may be reported as Life Only after the specified amount has been paid out. Surviving spouses may be classified as Life Only. Healthier lives may be selecting the benefit option with the highest monthly payments, namely a Life Only annuity. Married couples may elect a life-only annuity and then buy life insurance to protect their spouse, or they may choose a Survivor benefit option instead.

- *By Attained Age Group*

  For males, the 119.7% A/E ratio for the Life and Certain Period exceeds the 96.8% for Life Only and 96.7% for Cash Refund benefits. Unhealthier lives appear to be valuing the death benefit guarantees provided by the certain period. However, since the Life and Certain Period only represents 4.7% of the exposure, this

experience may not be credible. The spread between the Life and Certain Period A/E ratios and the Life Only A/E ratios are more pronounced at the younger annuitant ages, perhaps because these ages are closest to the time of election of the Life and Certain Period annuity.

- *By Income Group*

  For males and females, higher A/E ratios are observed by income group for Life & Period Certain than Life Only annuities. There were not enough exposures at higher income groups to discern a particular effect by income group.

3.7 SURVIVOR OPTION TABS

There are two tabs for analyzing data by survivor option selected. Survivor benefits allow a spouse or designated beneficiary to receive all or part of a vested retirement benefit. The single life benefit pays the highest monthly benefit to the participant only. Election of a joint-and-survivor benefit means the monthly benefits will be lower as the payments are no longer based on the participant's lifetime alone, but rather guarantees a steady stream of income for two lifetimes – the participant and his/her spouse. Per U.S. Law, a 50% joint-and-survivor benefit is mandated for married couples unless spousal consent is obtained. Other common percentages for joint-and-survivor annuities are 66.7% and 75%. The tables include an Unknown category, which could indicate that either the survivor option or the joint continuation percent were uncertain.

Table 3.4 shows the A/E ratios for each survivor option and the distribution of the total population, the population excluding unknown and the known J&S options.

Table 3.4
A/E RATIOS AND PERCENTAGE OF EXPOSURE BY SURVIVOR OPTION

	Single Life	1% - 50% J&S	51% - 75% J&S	76% - 100% J&S	Unknown
A/E Ratio	102.0%	83.4%	86.5%	91.0%	99.5%
% of Exposure	41%	16%	4%	10%	28%
% Exposure (Excl. Unknown)	57%	23%	6%	14%	N/A
J&S Choices	N/A	53%	13%	34%	N/A

Exposure in the Unknown category decreased to 28% in the current study from 43% in the Prior Study. Most annuitants still selected Single Life. The distribution within the joint life options shifted slightly towards the 1% - 50% category compared to the Prior Study, and the 51% - 75% group has the least exposure in the current study.

For all the joint options, total A/E ratios are below 100% for males and females. This result is consistent with other studies indicating greater longevity for married individuals. For example, work done at Duke University Medical Center in the U.S. that was published in 2013 found that single individuals and those without a consistent partner during middle age had an increased likelihood of early mortality.[5]

- *By Attained Age Group*

  Consistent with other tabs that display data by attained ages, A/E ratios are quite high at ages below 59, indicative of those with impaired health opting to retire early. For Single Life, A/E ratios are less than 100% between ages 65-84. Because the ratios for the Single Life option begin to increase starting at age 70,

[5] Siegler IC, et al. (2012). Consistency and Timing of Marital Transitions and Survival During Midlife: The Role of Personality and Health Risk Behaviors. Annals of Behavioral Medicine; DOI 10.1007/s12160-012-9457-3.

approaching 100% in the 75-79 bracket, and becoming greater than 100% at ages 85 and up, the data further supports the belief that greater longevity exists for married lives, that is, those selecting a joint-and-survivor option experience better mortality.

- *By Income Group*

  Consistent with every other income grouping tab, when the survivor option data is segregated into income groupings, the A/E ratios decline as the income grouping rises. The A/E ratio was above 100% for only Single Life options with income less than $10,000, with the exception of the highest income categories in which there was little exposure. A/E ratios were less than 100% for all Joint Life options and Single Life options in income brackets greater than $10,000 with significant exposure.

  Similar to the Prior Study, 25% of exposures fall under a Joint-and-Survivor option for incomes under $10,000 compared with 36% of incomes of at least $10,000. For lower income levels, the reduction in benefits under a Joint-and-Survivor option, compared to the higher benefits of a Life Only option, may be too great to select. Additionally, there may be a correlation between income and marital status, which results in higher Joint-and-Survivor option election rates at higher income levels.

3.8 GUARANTEED AND NON-GUARANTEED TABS

There are two tabs for analyzing data by guaranteed status. Guaranteed business includes single premium closeout business, which is usually non-participating, as well as some types of participating business. Single premium closeout business encompasses terminal funding, which occurs when a company purchases annuities to provide benefits earned under a qualified defined benefit pension plan. Single premium closeout also includes the purchase of annuities for accounting purposes in which a business entity wishes to curtail the pension liability of certain participant groups. Note that contracts with an immediate guarantee feature are considered as guaranteed by some insurers but as non-guaranteed by others.

There are two additional notes with respect to the data presented on these bases. Some contributors provide only guaranteed data to the experience study and do not monitor non-guaranteed mortality as reserves are not affected by the non-guaranteed block. Other insurers track the information, but may not be as diligent about confirming survivorship for non-guaranteed benefits as the insurer has no obligation to do so.

For the period 2015-2018, about 56% of the exposures By Income were guaranteed business, which is lower than that observed in the Prior Study (68%). The A/E ratio for all guaranteed annuitants was 97.1% and is slightly higher than that for the Prior Study, which was 95.9%. The A/E ratio for non-guaranteed annuitants, 101.2%, was lower than the 104.6% shown in the Prior Study.

- *By Attained Age Group*

  Consistent with other tabs that display data on an attained age grouping basis, A/E ratios are quite high at ages less than 60, indicative of those with impaired health opting to retire early. For guaranteed exposure, the A/E ratios fall below 100% between ages 65 and 89. Roughly 82% of the guaranteed exposure By Income is concentrated between attained ages 65-89, while about 79% of the non-guaranteed exposure By Income is concentrated at a slightly lower grouping of attained ages, namely ages 60-79.

  Similar to previous studies, guaranteed mortality results are lower than non-guaranteed A/E results. This indicates that pension plans have transferred risk on liabilities with higher longevity than the liabilities that they've chosen to retain.

  Male A/E ratios for guaranteed annuitants averaged 94.2% overall compared to 98.9% for non-guaranteed annuitants. Male A/E ratios for guaranteed annuitant ages 0-74 are similar to A/E ratios for non-guaranteed annuitants; however, the A/E ratios for guaranteed annuitants ages 75 and over are consistently lower (6%

to 18%) than the non-guaranteed A/E ratios. In the Prior Study, the male guaranteed A/E ratios were likewise lower than the non-guaranteed for ages 65 and over.

Female A/E ratios for guaranteed annuitants averaged 102.3% overall compared to 105.4% for non-guaranteed annuitants. Female A/E ratios for guaranteed annuitant ages 0-74 are higher than the A/E ratios for non-guaranteed annuitants; however, the A/E ratios for guaranteed annuitants are lower for ages 75 and over. These results are consistent with the Prior Study.

- *By Income Group*

  Consistent with every other income grouping tab, a similar pattern By Income is exhibited by the guaranteed and non-guaranteed splits of the data; specifically, the A/E ratios decline as the income grouping rises and the combined A/E ratios fall below 100% beginning with the $10,000-$24,999 income grouping.

  The guaranteed A/E ratios for income amounts below $100,000 are 3% - 14% less (arithmetically) by income band than those of the non-guaranteed A/E ratios. Guaranteed By Income exposure is heavily concentrated (81%) in incomes less than $25,000, while only 61% of the non-guaranteed exposure has incomes less than $25,000.

3.9 DURATION GROUPING TABS

There are two tabs for analyzing the data by duration: one by attained age groupings and one by income groupings. The results on these tabs are subject to limitations. Duration is intended to be measured as years since retirement. However, significant portions of these liabilities were in payment status prior to being purchased from the insurance company involved (for example, terminal funding arrangements for defined benefit plans). In these cases, the annuity commencement date was likely to have been coded as the purchase date of the group annuity contract rather than the original retirement date of the annuitant.

- *By Attained Age Group*
  - Duration 0-1

    Overall for duration 0-1, the A/E ratio is 97.2%, which is fairly close to the 96.5% of the Prior Study covering 2011-2014. However, for attained ages less than 60, the A/E ratios of the initial year are quite high. Therefore, it is still likely true that younger participants are retiring early due to disability or health issues. It is probable that skewing of the A/E ratios for duration 0-1 is occurring due to the concentration of purchased liabilities. That is, those listed as being in duration 0-1 are, in fact, not in their first duration following retirement but rather their first year since being converted to a terminal funding arrangement. As noted above, the data cannot be separated by retirement date and purchase date to confirm or deny this conjecture.

  - Durations 2-5

    The overall A/E ratio for durations 2-5 is 93.3% and is lower than the Prior Study's value of 94.9%. Like the Prior Study, the high A/E ratios for attained ages below 60 persist for durations 2-5. Again, it is likely younger participants are retiring early due to disability or health issues.

  - Durations 6-10

    The overall A/E ratio for durations 6-10 is 93.2%. Consistent with the Prior Study, this duration grouping shows the lowest overall ratio, though it is very close to that for Durations 2-5

- Ultimate (11+)

  The overall A/E ratio is 99.1%

By Income Group

Consistent with every other income grouping tab, a similar pattern By Income is exhibited by the duration groupings. Specifically, the A/E ratios decline as the income grouping rises and the combined A/E ratios fall below 100% beginning with the $10,000-$24,999 income grouping. Duration grouping hence does not appear to be a significant factor when looking at the data by income grouping.

Section 4: Acknowledgements

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