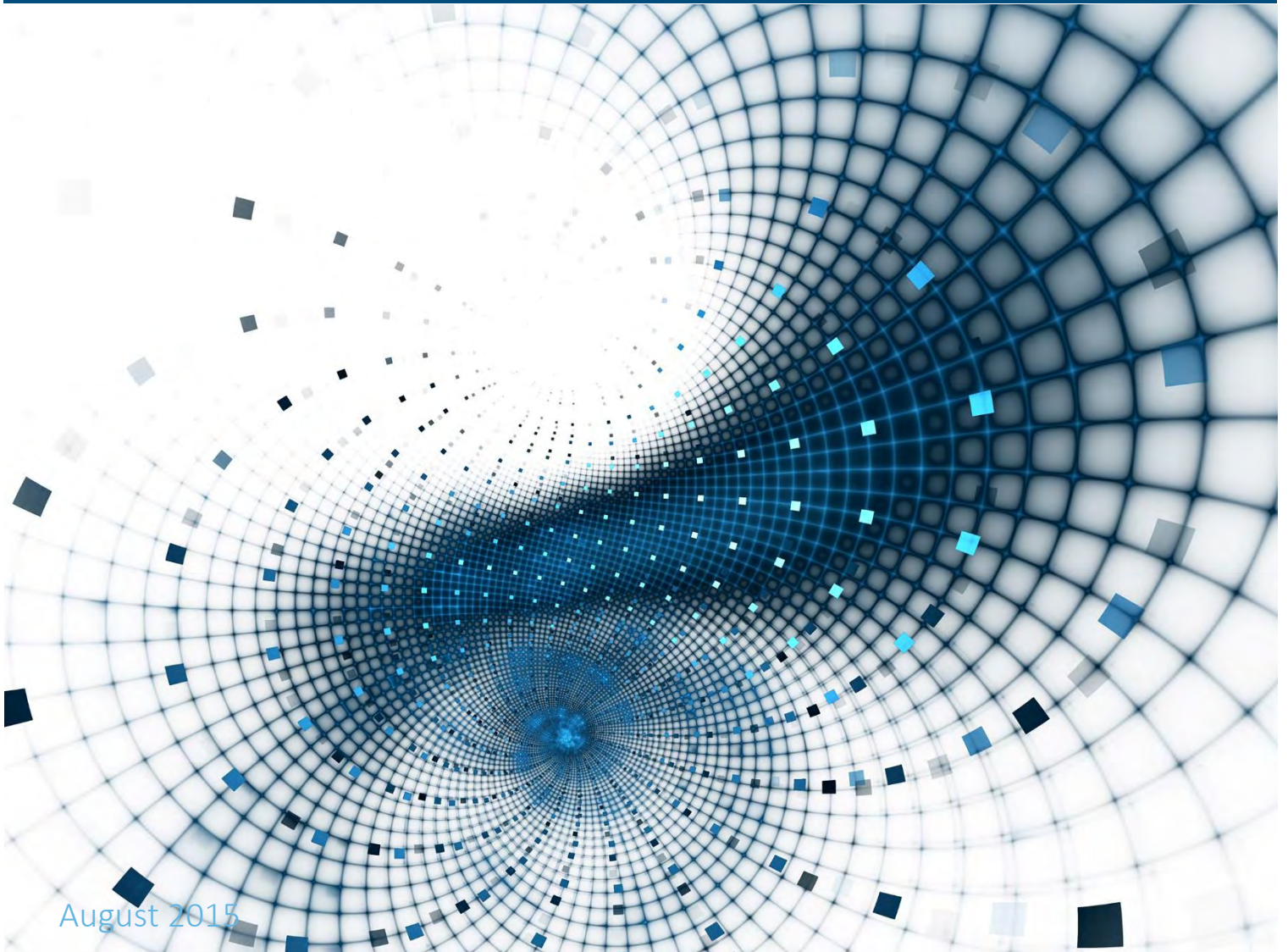




SOCIETY OF
ACTUARIES



2011-2014 Group Annuity Mortality Experience Report



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2011-2014 Group Annuity Mortality Experience Report

AUTHOR Group Annuity Experience Committee

Caveat and Disclaimer

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Uses, Reliances and Limitations

The primary purposes of this study are to:

1. Compare emerging group annuity experience to various established mortality bases
2. Help to provide a credible basis for actuaries to assess mortality in group annuity business where mortality tables in existence and associated mortality improvement scales may not be representative of this distinct population
3. Allow actuaries to observe industry-wide trends in group annuity mortality against which to compare their own company's experience

In developing this report, the SOA relied upon data and information supplied by the participating company contributors. For each contributor this information includes, but is not limited to, the data submission for mortality experience and the responses to follow-up questions.

Section 1: Overview

The Group Annuity Experience Committee of the Society of Actuaries (SOA) has performed biennial mortality studies of insurance company annuity experience under group pension contracts issued primarily in the United States. This experience is predominantly based on retired lives, which include 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 collects, validates, and summarizes the data for this report. Consistent with the 2007 - 2010 Group Annuity Experience Report (hereafter referred to as the “Prior Study”), a database application was employed enabling access to more granular groupings. Eight insurance companies and a committee of volunteers, who are listed at the end of this report, supported this effort.

The following table summarizes mortality trends over 2011 – 2014 and mortality improvement trends over 2007-2014¹. Actual-to-Expected (A/E) ratios and Annual Mortality Improvement rates by Expected Basis are as follows:

Expected Basis	Actual-to-Expected Ratios (2011 – 2014)		Annual Mortality Improvement ² (2007 – 2014)	
	By Lives	By Income	By Lives	By Income
1983 GAM	91.7%	80.9%	2.4%	1.1%
1994 GAM Basic with Projection	104.8%	95.3%	2.0%	0.9%
1994 GAR	112.7%	102.4%	2.0%	0.9%
RP-2014 Projected with MP-2015 to Experience Year	109.6%	100.8%	1.1%	0.1%
RP-2014 Projected with MP-2015 to Study Midpoint	109.7%	100.8%	1.5%	0.5%

As shown by the mortality improvement results By Income, these A/E ratios have dropped 4.8%³ from 86.2% in 2007 to 81.4% in 2014 based on the (un-projected) 1983 GAM table, which represents a 1.1% average annual mortality improvement rate.

Using the 1994 GAM Basic with Projection, the A/E ratio By Income was at 100.2% in 2007 and 96.1% in 2014. Annual mortality improvement was 0.9% faster than Scale AA over the eight-year period.

These rates of improvement are similar to the 1.1% average overall improvement and 0.7% average improvement relative to projection Scale AA for the 2003-2010 period shown in the Prior Study. Though these annual averages are similar for the two periods, year-by-year mortality improvement has generally been more stable and closer to zero for the new 2011-2014 period than during the prior decade. This observation is consistent with other SOA research into U.S. mortality improvement.

¹ There were two (of nine) contributors to the 2007-2010 dataset that did not contribute to the 2011-2014 dataset. There is one contributor (of eight) to the 2011-2014 dataset that did not contribute to the 2007-2010 dataset.

² Results for mortality improvement are based on the loglinear regression of results over the eight-year period. Results using Arithmetic Average Improvement are also available in the Excel worksheet on the “MortImp” tabs.

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

In 2014, the SOA released the RP-2014 Mortality Tables for measuring pension plan obligations and Scale MP-2014 for mortality improvement. The following year, the SOA published Scale MP-2015 as an update to Scale MP-2014 with an additional two years of historical data. The above table now includes two A/E ratios using RP-2014 projected with MP-2015 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-2015 to project the RP-2014 base rates to the midpoint of the 2011-2014 study period.

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):	2011, 2012, 2013, 2014
Experience Periods (2):	2011-2012, 2013-2014
Gender:	Male, Female
Attained Age Groups:	0-54, 55-59, 60-64, . . . , 90-94, 95+
Annual Income Groups:	<u>\$0-4,999</u> , <u>\$5,000-9,999</u> , <u>\$10,000-24,999</u> , <u>\$25,000-49,999</u> , <u>\$50,000-99,999</u> , <u>\$100,000-249,999</u> , <u>\$250,000-499,999</u> , <u>\$500,000+</u>
Retirement Class:	Before Normal Retirement Date, on or after NRD, Other (Unknown Retirement Date)
Certain Option:	Life-Only, Life & Certain Period, Cash Refund, Unknown (includes Temporary Life Annuities)
Survivor Option:	0% (Single Life), 1-50% (Joint & Survivor), 51-75% (Joint & Survivor), 76-100% (Joint & Survivor), Unknown Joint Status
Guarantee Status:	Guaranteed, Non-Guaranteed
Duration:	0-1 years, 2-5 years, 6-10 years, Ultimate (11+)

To ensure the deaths are reliable, the data reflects 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 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 trustee/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 RP-2014 Mortality Tables projected with Mortality Improvement Scale MP-2015. All of 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 is projected to 2002. This version of 94 GAR, "IRS 1994 GAR" is not present in the data.

The table below shows the seven mortality bases that are available in the data.

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
RP-2014	N/A	MP-2015	Year of Experience
RP-2014	N/A	MP-2015	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 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 population, workforce, and annuitant population 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 was 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 on page 1 of this report come from these tabs. Results can be displayed differentiating by gender 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 males and females combined, overall mortality improved 2.0% faster than Scale AA during 2007-2014 compared to the 0.3% mortality improvement seen during 2003-2010. Males improved by 1.8% and females improved by 2.3% relative to Scale AA. The rates of improvement peak in the 65-69 age group and generally decrease by attained age thereafter.

- **By Income**

For males and females combined, overall mortality improved by 0.9% faster than Scale AA during 2007-2014 compared to 0.7% during 2003-2010. Males declined by 0.9% and females improved by 1.3% relative to Scale AA. The rates of improvement generally decrease by attained age after ages 70-74.

3.3 Gender Tabs

There are two tabs for analyzing summary statistics by gender. The first gender tab, *Summary – Gender & Exp Yr*, contains two pivot tables, one for each year of the study period By Lives and another By Income. The second gender tab, *Att Age & Gender*, likewise has two pivot tables, one for attained age groups By Lives and another pivot table 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 distribution of exposures By Lives by gender remained roughly the same proportion compared to 2007-2010; that is, 55% male and 45% female. As shown in the table below, the average A/E ratios in the first four years is consistent with those in the later four years and the difference between female and male A/E ratios is consistent between periods.

Average A/E ratios	2007-10	2011-14
Females	113.4%	101.7%
Males	108.4%	99.7%

Similar to the prior study, both males and females showed a general trend towards lower A/E ratios over time, which indicates faster mortality improvement than Scale AA for each gender. During the 2011-2014 period, A/E ratios were highest during 2011 for both males (102.4%) and females (104.0%). A/E ratios declined for both genders from 2011-2013 before increasing from 2013-2014.

- ***By Income***

Patterns and trends By Income are comparable to those By Lives. Data that has A/E ratios By Income lower 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 10% lower than those By Lives; this is almost completely driven by male experience. For females, this impact is only about 2/3 that of males. The average difference in 2011 – 2014 is less than that in 2007 – 2010, but this may represent the different blocks of experience.

While the proportion of exposures on a By Lives basis is relatively equal, with 55% male and 45% female, the proportion of exposures on a By Income basis is skewed dramatically towards males; on average males account for 67% and females only 33%. The significant difference in exposures By Income is indicative the pervasiveness of male-female income disparity and is further discussed under the Income Group tab portion of the report.

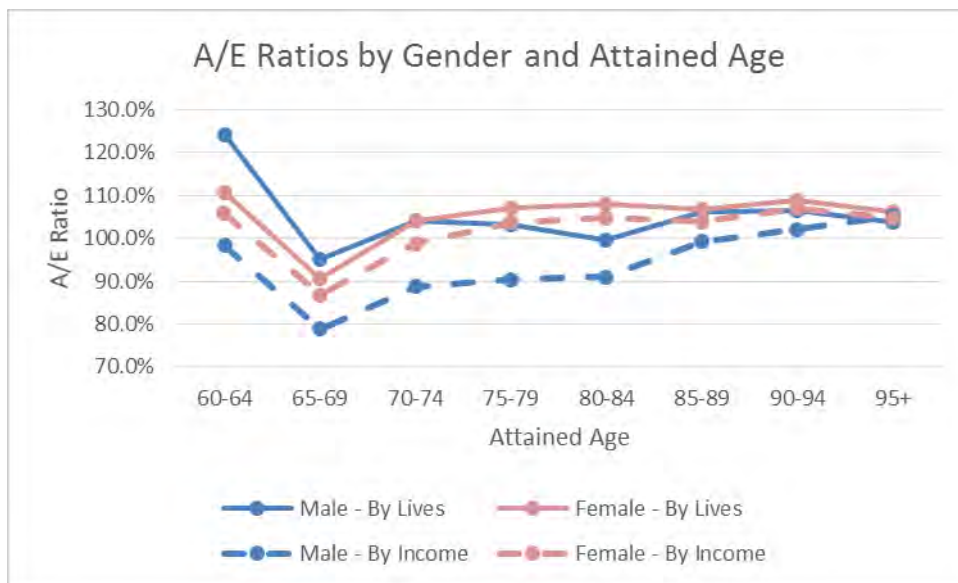
- **Attained Age Group**

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 eight 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 70-95+ are fairly consistent and generally are between 100% and 110%. Between the ages of 55-69, male A/E ratios By Lives are higher than their female counterparts. The A/E ratios are almost equal between the two genders in the 70-74 age group. For all age groups 75-79 and older, female A/E ratios are higher than male A/E ratios.

○ *By Income*



Results By Income show a different pattern between the two genders than the results By Lives. Female A/E ratios By Income are higher than male A/E ratios at every age group except 95+. For both males and females, A/E ratios generally increase with attained age after the 65-69 age bracket.

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 provides some insight into the variation of results across different amounts of income.

As shown in the table below, the overall results show a consistent and marked pattern of declining A/E ratios as income amounts increase. The highest A/E ratio occurs for the lowest income group. The A/E ratios then decline for a given attained age grouping, as the dollar range of the income grouping rises. The same pattern occurs at almost every age group where there is a sufficient amount of exposure.

A/E Ratios by Income Group							
		\$0-4,999	\$5,000-9,999	\$10,000-24,999	\$25,000-49,999	\$50,000 +	Total
Males	A/E Ratio	105.4%	99.1%	91.7%	83.1%	71.5%	92.8%
	% of Total Male Exposure ⁴	22.8%	20.1%	29.7%	16.6%	10.8%	100.0%
Females	A/E Ratio	108.4%	102.5%	95.2%	84.8%	87.1%	101.7%
	% of Total Female Exposure	37.6%	24.0%	25.5%	9.1%	3.7%	100.0%
Percent Female⁵	% of Exposure	44.8%	36.9%	29.7%	21.3%	14.4%	32.9%
Total	A/E Ratio	106.8%	100.2%	92.5%	83.3%	73.1%	95.3%
	% of Total Exposure	27.7%	21.4%	28.3%	14.1%	8.5%	100.0%

Of the exposures above \$100,000, the bulk, 78%, is concentrated between ages 60 and 84. This data appears consistent with a salary-linkage element common to pension plans.

The pattern of declining A/E ratios as income amounts increase persists when looking at the data by gender. However, the percentage of exposures that females comprise relative to each income group’s total is shown to steadily decline from 45% at the \$0-\$4,999 income group down to roughly 14% at each of the income groups at \$50,000 and above. The decline in exposures as income groupings rise underscores the male-female income disparity, or “gender earnings gap” statistic tracked by the United States Census Bureau in conjunction with population surveys.

⁴ Male and female exposure percentages are By Income

⁵ Percentage of exposure within each respective income group that is made up of females

3.5 Retirement Class Tabs

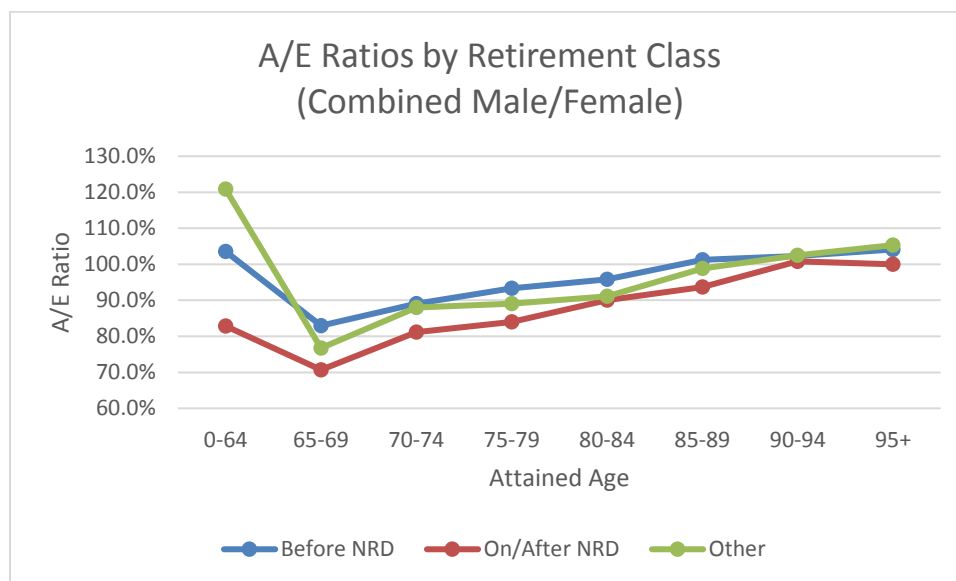
There are two tabs for analyzing statistics by Retirement Class. The first Retirement Class tab presents the data by Attained Age Grouping while the second tab presents data by Income Group. The first of these tabs shows retirement age decisions. Health-related conditions and corporate down-sizing can 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 “Other” includes experience submitted without specification of retirement date status as well as data for which a retirement date is not applicable; for example, 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, 32% retired early, 15% retired on or after the normal retirement date (NRD), and the remaining 53% were in the “Other” category. Overall, those who retired early show an A/E ratio of 97.1% compared to 92.6% for those who retired on or after their retirement date. These ratios indicate that those who retire early show higher mortality than those who retire on or after their normal retirement date.

As illustrated by the chart below, the difference between total “Before NRD” and “On/After NRD” A/E ratios decreases as attained age increases. This suggests that potential anti-selection for those taking benefits on or after their normal retirement date wears off as age increases and time passes.



The A/E ratio for the 53% whose normal retirement age is unspecified is 95.3%. This is equal to the overall A/E ratio of 95.3%, which suggests this group is similar to the aggregate of the Before NRD and NRD & After groups.

• **By Income Group**

Those in higher income groups are more likely to retire on/after the normal retirement date and those in the lower income groups are more likely to be classified as “Other”. Those in the highest income categories are likely to have more service, which leads to more income, and therefore are more likely to work until the NRD. Also, those in the highest income categories may have the financial wherewithal to delay turning on 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.

Retirement Class by Income Group			
	\$0-4,999	\$5,000-99,999	\$100,000-999,999
Before NRD	26%	34%	27%
On/After NRD	15%	15%	30%
Other	59%	51%	43%
Total	100%	100%	100%

The excess of A/E ratios for “Before NRD” relative to “On/After NRD” is in the 0%-10% range for all income groups with enough deaths to be credible. This excess does not seem to vary significantly by income group. Therefore, the anti-selection effect of a person choosing to retire before their normal retirement date does not seem to vary largely by income.

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 2nd death of a 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 specified amount of time, called the “certain” period, and 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 71% of the exposure. 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. There are numerous possibilities for why the Life Only option predominates. A better understanding of why the Life Only option constitutes such a large portion of the exposures would enable more accurate interpretation.

- **By Attained Age Group**

For males, the 103.7% A/E ratio for the Life and Certain Period exceeds the 95.7% for Life Only and 90.6% 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 5.6% of the exposure, this experience may not be credible. For females, the A/E ratios are similar for all three options, though they are highest for the Life Only option, which may be explained by the small sample of female experience for the Cash Refund and Life and Certain Period options. Male A/E ratios fall below 100% for attained ages between 60 and 84 for both the Life Only option and Cash Refund option.

- **By Income Group**

For males and females, we generally observe higher A/E ratios by income group for Life & Period Certain than Life Only annuities. For females, this pattern persists up to the 25,000-49,999 income group, after which the sample size becomes fairly small.

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 (“J&S”) 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. The results of that category look similar to the results of the J&S options, so it is presumed that the majority of the exposure elected J&S forms.

The following table 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.

	Single Life	1% -50% J&S	51%-75% J&S	76%-100% J&S	Unknown
A/E Ratio	101.1%	84.0%	85.9%	85.0%	93.8%
% of Exposure	38.1%	8.9%	2.8%	6.8%	43.4%
% Exposure (Excl. Unknown)	67.3%	15.8%	4.9%	12.1%	n/a
J&S Choices	n/a	48.2%	14.9%	36.9%	n/a

Exposure in the Unknown category increased to 43% in the current study from 22% in the prior study. Most annuitants still select Single Life most often. However, the distribution within the joint life options has shifted to more exposure in the 1%-50% and 76%-100% categories 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.⁶

- **By Attained Age Group**

Consistent with other tabs that display data by attained ages, A/E ratios are quite high at ages less than 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, 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% only for Single Life options with income less than \$10,000, which represents 35% of the 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, 29% of exposures fall under a Joint and Survivor option for incomes under \$10,000 compared with 43% 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 2011-2014, about 68% of the exposures By Income are guaranteed business, which is reasonably consistent with 2007-2010. The A/E ratio for all guaranteed annuitants is 95.9% and is slightly lower than that of the Prior Study which was 98.3%. However, the A/E ratio for non-guaranteed annuitants, 104.6%, is consistent with the 104.1% of the Prior Study.

⁶ 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.

The proportion of female exposures has similarly increased from the Prior Study for guaranteed and non-guaranteed business:

	Guaranteed	Non-Guaranteed
Females, 2007-2010	27.7%	33.2%
Females, 2011-2014	31.4%	37.7%

- **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 generally 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 77% of the non-guaranteed exposure By Income are concentrated at a slightly lower grouping of attained ages, namely ages 60-79.

Similar to prior 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 fall below 100% at ages 65-89 and average 93.6% overall. In the Prior Study, the male A/E ratios were likewise below 100% for these attained age groupings. On a non-guaranteed basis, male A/E ratios average 102.4% overall and are above 100% except for ages 60-74 and 95+. In the Prior Study, male A/E ratios were below 100% for attained ages 60-74.

Female A/E ratios for guaranteed annuitants average 101.8% overall and fall below 100% only at ages 65-74 and 85-89. On a non-guaranteed basis, female A/E ratios fall below 100% also only at ages 60-74 and average 109.4% overall.

- **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 9.5% to 21.5% less by income band than those of the non-guaranteed A/E ratios, suggesting that pension plans are selecting to transfer longevity risk on lives with the best longevity and retain mortality risk where mortality rates are high. Guaranteed By Income exposure is concentrated in incomes less than \$25,000, while only 64% of the non-guaranteed exposure has incomes less than \$25,000. On a non-guaranteed basis, females did show an increase in the proportion of exposure (By Income) falling in income groupings \$10,000-and-above between the 2007-2010 and 2011-2014 studies. In the former, the percentage was 53%, and for the 2011-2014 period, 57% of women fell into the \$10,000-and-above income groupings.

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 is likely to be 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 96.5%, well below the 102.6% of the Prior Study covering 2007-2010. However for attained ages less than 60, the A/E ratios of the initial year are quite high. Hence 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. As food for thought though, in the prior study, attained ages less than 60 accounted for 21% of the total duration 0-1 exposures while for the 2011-2014 period, the grouping accounts for only 7%. Any interpretation of the overall A/E ratio must be tempered by the significant difference in submissions between the two study periods.

- ***Durations 2-5***

The overall A/E ratio for durations 2-5 is 94.9% and is higher than the prior study's value of 91.7%. Like the Prior Study, the high A/E ratios for attained ages below 60 persist for durations 2-5. Similar to the data for duration 0-1, the percentage of exposure comprised of attained ages below 60 has significantly decreased (16.5% for 2007-2010 and 6.4% for 2011-2014). 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 87.5%. Consistent with the prior study, this duration grouping shows the lowest overall ratio.

- ***Ultimate (11+)***

The overall A/E ratio is 96.4%.

- **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

Special thanks to the contributing companies, the Society of Actuaries, and the members of the Committee for their valuable work in bringing this new report to fruition. We hope you find it and the accompanying pivot tables to be useful.

Contributing Companies for the 2011-2014 Study Period

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Mutual of Omaha	New York Life	Pacific Life
Principal Financial	Prudential	

Society of Actuaries

Jack Luff	Patrick Nolan	Erika Schulty
Shawn Lan		

Respectfully submitted by the GAEC Committee:

Beth Baker	Marie Choquette	Deborah Faltin
Zachary Granovetter	Kristin Gustafson (Chair)	Meredith Henriques
Christina Lee	Diane Lloyd	Michelle Rosel
George Silos		