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# SOA PENSION MORTALITY STUDY: EXPOSURE DRAFTS RELEASED

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2009. The objectives of the study were the following:

- Propose an updated set of mortality assumptions that would supersede both the UP-94 and RP-2000 base tables;
- Provide new insights into the composition of gender-specific pension mortality by factors such as type of employment (e.g., collar), salary/benefit amount, health status (i.e., healthy or disabled), and duration since event; and
- Develop an updated mortality projection scale (and associated methodology) that reflects actual historic mortality improvement trends as well as anticipated future levels of increased longevity.

The chart on page 19 presents a summary of the key phases of the project.

## RP-2014 TABLES

RPEC received raw data from 120 private plans and three very large public plans. After an extensive processing and validation process, RPEC developed a final dataset that reflected the mortality experience of 38 (mostly large) uninsured private pension plans.

RPEC first projected the raw mortality rates from their central year (2006) to 2014 using the Scale MP-2014 mortality improvement rates. Those projected rates were then graduated using Whittaker-Henderson-Lowrie methodology, and subsequently extended to extreme (very old or very young) ages using a variety of standard actuarial techniques.

The final result was a set of 11 gender-specific amount-weighted tables with base year of 2014:

- Employee Tables (ages 18 through 80)
  - Total (all nondisabled data)
  - Blue Collar
  - White Collar
  - Bottom Quartile (based on salary)
  - Top Quartile (based on salary)

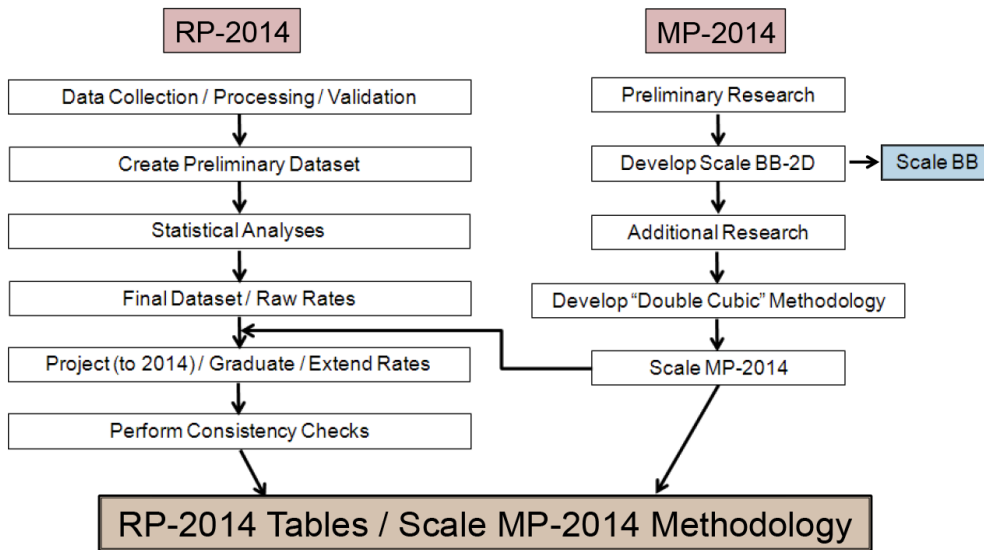
**O**n Feb. 4, 2014 the SOA released in exposure draft form two research reports that were recently completed by its Retirement Plans Experience Committee (RPEC):

- The RP-2014 Mortality Tables report, which includes 11 new sets of updated gender-specific tables of 2014 mortality rates based on the experience of approximately 10.5 million life-years (and over 220,000 deaths) of participants in uninsured private retirement programs in the United States, and
- The Mortality Improvement Scale MP-2014 report, which presents a new two-dimensional method for the projection of future mortality rates.

These two papers represent the SOA's first comprehensive reexamination of U.S. pension-related mortality assumptions in over a decade and the culmination of a Pension Mortality Study begun by RPEC in late

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- Healthy Annuitant (Healthy Retiree and Beneficiary combined) Tables (ages 50 through 120)
  - Total (all nondisabled data)
  - Blue Collar
  - White Collar
  - Bottom Quartile (based on benefit amount)
  - Top Quartile (based on benefit amount)
- Disabled Retiree Table (ages 18 through 120)

For completeness, the committee also developed gender-specific juvenile rates covering ages 0 through 17.

### MORTALITY IMPROVEMENT SCALE MP-2014

With the exception of certain remaining statutory requirements, Scale MP-2014 is intended to immediately supersede both Scale AA<sup>1</sup>, which was released in 1995, and the interim Scale BB, which was released in

2012. As anticipated by RPEC in its Scale BB Report, the new Scale MP-2014 is two-dimensional, with gender-specific mortality improvement expressed as a function of both age and calendar year. Alternatively, the new gender-specific rates can be thought of in terms of age and year of birth, a basis that provides more insight into the methodology used to construct the individual Scale MP-2014 rates.

The conceptual framework for Scale MP-2014 is similar to that used to develop the two-dimensional mortality improvement rates upon which Scale BB was based (denoted Scale BB-2D). In particular, both scales were patterned after the Mortality Projections model developed over the past decade by the Continuous Mortality Investigation (CMI) group within the Institute and Faculty of Actuaries in the United Kingdom. The key concepts underpinning that CMI model include:

- Near-term mortality improvement rates should be based on recent experience;
- Long-term mortality improvement rates

- should be based on expert opinion; and
- Near-term mortality improvement rates should blend smoothly into the assumed long-term rates over an appropriate transition period.

While RPEC believes that the above conceptual framework for the construction of mortality improvement scales is sound, the committee has come to the conclusion that certain technical aspects of the CMI methodology are more complex than are necessary for most pension-related applications in the United States. As a result, the Scale MP-2014 methodology incorporates a number of computational techniques that are intended to be simpler and more transparent than those used in the CMI model, but without compromising that model's conceptual soundness; see subsection 3.5 of that report for details. This new methodology has the additional benefit of being relatively easy to refresh, enhancing the prospects for more frequent updates to U.S. mortality improvement scales.

The development of credible mortality improvement rates requires the analysis of large quantities of consistent data over long periods of time, two requirements that are difficult to achieve when data for pension mortality studies are collected infrequently and from many different sources. As a consequence, RPEC based the starting historical array for Scale MP-2014 on the most recent Social Security mortality dataset (through calendar year 2009) supplied by the Social Security Administration.

The model's single most important assumption is the long-term rate of future mortality improvement in the United States. Scale MP-2014 is based on an assumed long-term rate of 1.0 percent per annum through age 85, and reflects a modest gradient between ages 85 and 95 before decreasing linearly to

zero at age 115. The rationale for RPEC's long-term rate assumption is described in subsection 3.3 of the MP-2014 report.

## ESTIMATED FINANCIAL IMPACT

Most current pension-related applications in the United States involve projection of RP-2000 (or possibly UP-94) base mortality rates using either Scale AA or Scale BB. RPEC believes that it will be considerably more meaningful for users to assess the combined effects of adopting RP-2014 Tables projected with Scale MP-2014, rather than trying to isolate the impact of adopting one without the other. The financial impact of the combined change is expected to vary quite substantially based on the starting mortality assumptions; for example, the impact of switching from a static projection using Scale AA will typically be much more significant than the impact of switching from a generational projection using Scale BB-2D.

The following table presents a comparison of 2014 monthly deferred-to-age-62 annuity due values (at an annual interest rate of 6.0 percent) based on a number of different sets of base mortality rates and generational projection scales, along with the corresponding percentage increases of moving to RP-2014 base rates projected generationally with Scale MP-2014. (For purposes of this table, RP-2014 Employee rates were used for ages through 61, and RP-2014 Healthy Annuitant rates were used at ages 62 and older.)

For example, moving from a mortality basis of RP-2000 (projected generationally with Scale AA) to RP-2014 (projected generationally with Scale MP-2014) would increase the 2014 female age-75 monthly life annuity value by approximately 8.1 percent.

## RPEC RECOMMENDATIONS

- RPEC recommends that all pension actuaries in the United States carefully review the findings presented in the two exposure drafts.

- Subject to standard materiality criteria (including Actuarial Standard of Practice No. 35) and the user's specific knowledge of the covered group, RPEC recommends that the measurement of U.S. private retirement plan obligations be based on the appropriate RP-2014 table projected generationally for calendar years after 2014 using Scale MP-2014 mortality improvement rates. (The projection of mortality improvement beyond 2014 also applies to disabled lives.)
- RPEC recommends that the individual characteristics and experience of the covered group be considered in the selection of an appropriate set of base mortality rates. While statistical analyses summarized in this report continue to confirm that both collar and amount quartile are statistically significant indicators of differences in base mortality rates for nondisabled lives, RPEC believes that the use of collar-based tables will generally be more practical than the use of amount-based tables.
- RPEC recommends that users who wish to develop Combined Healthy tables are encouraged to blend appropriately selected RP-2014 Employee and Healthy Retiree tables using plan-specific retirement rate assumptions.

RPEC is currently in the process of reviewing public comments on the two exposure drafts,<sup>2</sup> and anticipates that final reports will be released by the SOA prior to Sept. 30, 2014. ■

## THE NEW SCALE MP-2014 IS TWO-DIMENSIONAL, WITH GENDER-SPECIFIC MORTALITY IMPROVEMENT EXPRESSED AS A FUNCTION OF BOTH AGE AND CALENDAR YEAR OF BIRTH.

Base Rates Proj. Scale		Monthly Deferred-to-62 Annuity Due Values; Generational @ 2014					Percentage Change of Moving to RP-2014 (with MP-2014) from:			
		UP-94 AA	RP-2000 AA	RP-2000 BB	RP-2000 BB-2D	RP-2014 MP-2014	UP-94 AA	RP-2000 AA	RP-2000 BB	RP-2000 BB-2D
Age										
Males	25	1.3944	1.4029	1.4135	1.4115	<b>1.4379</b>	3.1%	<b>2.5%</b>	1.7%	1.9%
	35	2.4577	2.4688	2.4881	2.4880	<b>2.5363</b>	3.2%	<b>2.7%</b>	1.9%	1.9%
	45	4.3316	4.3569	4.3963	4.4012	<b>4.4770</b>	3.4%	<b>2.8%</b>	1.8%	1.7%
	55	7.6981	7.7400	7.8408	7.8739	<b>7.9755</b>	3.6%	<b>3.0%</b>	1.7%	1.3%
	65	11.0033	10.9891	11.2209	11.3199	<b>11.4735</b>	4.3%	<b>4.4%</b>	2.3%	1.4%
	75	8.0551	7.8708	8.2088	8.3367	<b>8.6994</b>	8.0%	<b>10.5%</b>	6.0%	4.4%
	85	4.9888	4.6687	5.0048	5.0992	<b>5.4797</b>	9.8%	<b>17.4%</b>	9.5%	7.5%
Females	25	1.4336	1.4060	1.4816	1.4904	<b>1.5195</b>	6.0%	<b>8.1%</b>	2.6%	2.0%
	35	2.5465	2.4931	2.6145	2.6299	<b>2.6853</b>	5.5%	<b>7.7%</b>	2.7%	2.1%
	45	4.5337	4.4340	4.6264	4.6534	<b>4.7497</b>	4.8%	<b>7.1%</b>	2.7%	2.1%
	55	8.1245	7.9541	8.2532	8.3155	<b>8.4544</b>	4.1%	<b>6.3%</b>	2.4%	1.7%
	65	11.7294	11.4644	11.8344	11.9486	<b>12.0932</b>	3.1%	<b>5.5%</b>	2.2%	1.2%
	75	8.9849	8.6971	9.0650	9.1654	<b>9.3995</b>	4.6%	<b>8.1%</b>	3.7%	2.6%
	85	5.7375	5.5923	5.9525	6.0148	<b>6.1785</b>	7.7%	<b>10.5%</b>	3.8%	2.7%

### ENDNOTES

- <sup>1</sup> Scale MP-2014 replaces Scale AA for pension-related purposes only. The use of Scale AA in connection with statutory group annuity requirements is not affected by this report.
- <sup>2</sup> The SOA is soliciting feedback from potential users of the proposed pension mortality assumptions. Comments on the two Exposure Drafts should be sent to Erika Schulty at [eschulty@soa.org](mailto:eschulty@soa.org) no later than May 31, 2014.