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Turning the Tables

Mortality Tables Should Reflect Improving Mortality

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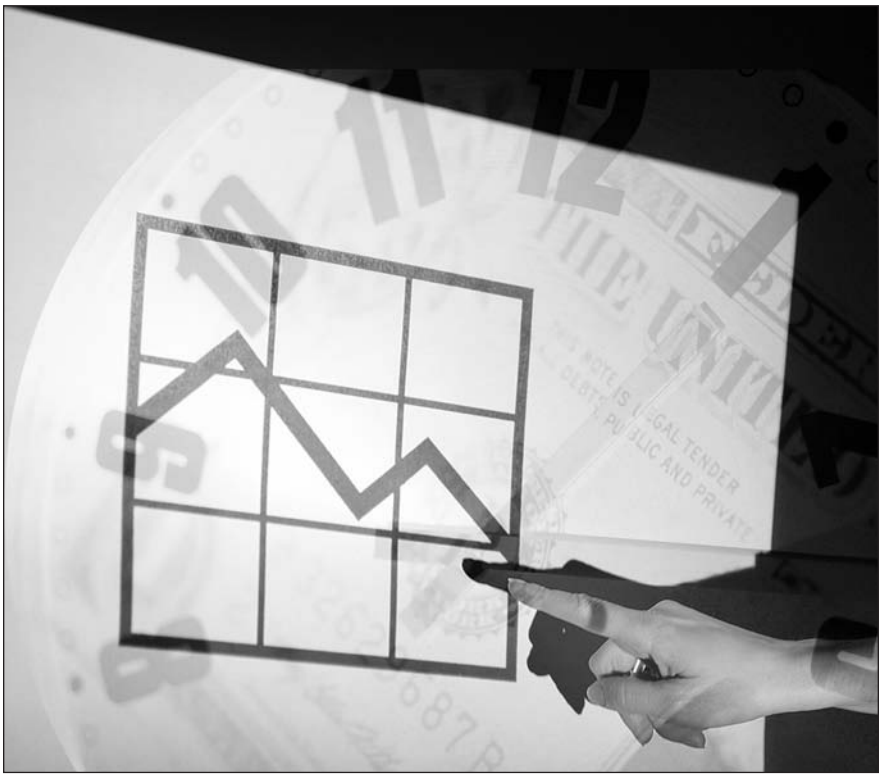

The Group Annuity Mortality table (GAM-83) is probably the most common table used by pension actuaries—75 percent of the plans in Watson Wyatt's "2003 Survey of Actuarial Assumptions and Funding" use GAM-83 for funding calculations. However, there are three more recently published tables that warrant consideration for use in pension valuations: UP-94, GAM-94 and RP-2000.

Which is the most appropriate table to use? Should actuaries be moving to these new tables, or does GAM-83 still represent a reasonable expectation for most plans? What are the consequences if plans don't use current mortality tables, and what options are open to actuaries?

The Tables

GAM-83. The GAM-83 table was constructed after a review of GAM-71 and insurer experience showed that GAM-71 was inadequate. When GAM-83 was developed, there wasn't sufficient credible data available to construct a new table, so the developers used the same annuitant mortality experience on which GAM-71 was based. This is mortality experience from 1964.

Researchers then reviewed U.S. population statistics to determine mortality improvements from 1966. They projected additional mortality improvements to 1983 based on 1966 trends, and added a 10 percent margin for conservatism (because experience can vary from insurer to insurer).

UP-94 & GAM-94. The UP-94 table is based on uninsured pensioner experience projected to 1994. It was developed by the Society of Actuaries to replace UP-84 after a study of 1985 mortality experience of 29 retirement systems found mortality rates were between 82 percent and 86 percent of those expected under UP-84.

Similarly, the GAM-94 table is based on group annuitant experience projected to 1994. This table was developed to replace GAM-83 after a study of 1986 annuitant experience showed steady declines in ratio of actual to expected (GAM-83) mortality, particularly for males.

During the development of the two tables, recent experience for uninsured pensioners was compared to recent experience for group annuitants and no significant mortality difference was detected. Researchers compared mortality rates at ages 66-95 for group annuitants, the Federal Civil Service Retirement System (CSRS), uninsured plans (24 private and one state) and the Railroad Retirement System.

Researchers found that the group annuitant and uninsured pensioner rates were quite similar (the Railroad Retirement System showed higher mortality rates). Thus, the same underlying data were used for both the GAM-94 and the UP-94 tables.

All rates were trended to 1994 based on CSRS experience and benefit weighted in construction of final tables. The final tables (UP-94 and GAM-94) were published with Projection Scale AA. Projection Scale AA was created for these tables and is based on a blend of the CSRS and *Actuarial Study No. 107* mortality reduction trends from 1977-93.

The only difference between the final UP-94 and the GAM-94 tables is that the GAM-94 table includes a 7 percent margin. GAM-94 was designed for insurance reserves, which need margins for deviations in blocks of business. For an insurance company, a 5 percent margin provides a 95 percent confidence level on 3,000-life block of business. The additional 2 percent margin was added to account for variations in white- and blue-collar, higher- and lower-income and geography. Also, according to the GAM-94 report, it was felt that an additional

margin was needed as tables are adopted by state insurance commissioners and aren't changed often thereafter.

RP-2000. The RP-2000 table is the only table based solely on retirement plan mortality experience. It was developed by the SOA specifically for current liability calculations. The Retirement Protection Act of 1994 (RPA 94) allowed the Secretary of Treasury to promulgate a new table for current liability purposes in 2000. The SOA conducted a study of uninsured pension plan mortality to ensure that the Treasury Department would have current information available when considering updating the table. As there was no current table based on uninsured pension data, (UP-94 was based partly on group annuity experience) a decision was made to conduct a separate study.

In the construction of the RP-2000 table, data were collected from private employers (those affected by current liability provisions) for plan years ending 1990 through 1994.

Rates were adjusted for mortality improvement from 1992 to 2000 using the data underlying Actuarial Study No. 110 and Federal CSRS data. The same scale AA that was published with the UP-94 and GAM-94 reports was published with the RP-2000 report. The committee felt that this scale was reasonably close to what was seen in Social Security trends and consistent with other groups. Although it felt minor adjustments could have been made, they weren't significant enough to justify a new scale.

How do these tables compare? Table 1 on page 20 shows the change in annuity values, deferred to age 65 (immediate if over age 65) for various ages.

There have been substantial improvements in male mortality since the publication of the GAM-83 table, particularly at the younger ages. Across the board, male annuity factors are higher under these new tables, except possibly at the very oldest ages.

Female mortality rates haven't decreased; they're slightly higher in the newer tables than in GAM-83. Partly, this is due to the 10 percent margin in GAM-83 (female mortality didn't improve as much as was expected). This also reflects that GAM-83 female mortality is based on relatively little actual experience.

What does this mean for the practicing actuary? Is the GAM-83 mortality table still a reasonable mortality table for use in valuation? When considering these questions, we must look to actuarial standards of practice for guidance.

Actuarial Standard of Practice No. 35 (ASOP 35)

ASOP 35 covers the *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. The ASOP gives very clear, specific guidance on the selection of mortality tables, as well as other demographic assumptions. Here's what ASOP 35 says (this limited excerpt in no way is intended to be a substitute for reading the ASOP yourself; go to www.actuarialstandards.org to get a full text of the ASOP):

"In selecting specific assumptions (paragraph 3.3.4) 'The actuary should select each demographic assumption from the appropriate assumption universe. In all cases, the actuary should consider the materiality of each assumption selected and the consequences of experience deviating significantly from the selected assumption.'"

The ASOP goes on to list measurement-specific factors the actuary should consider, such as the purpose and nature of the measurement, any features of the plan design that influence the assumption, plan experience and known factors that may affect future experience. In particular, it notes that:

- Each material demographic assumption is to be evaluated for reasonableness (paragraph 3.3.5), that is, whether it's "expected to appropriately model the contingency being measured." It should not be "anticipated to produce significant cumulative actuarial gains and losses over the measurement period."
- Each demographic assumption must be individually reasonable (paragraph 3.4).
- When looking at the mortality assumption, the actuary should consider "the likelihood and extent of mortality improvement in the future."

Quiz: *True or False*

Most, if not all, of the *youngest* annuitants whose mortality experience underlies the GAM-83 table have already died. Answer: *True.*

GAM-83 is based on group annuitant experience from 1964-1968. The youngest annuitants in the experience bracket were age 66 in 1964; if they were alive today, they would be age 107. We don't know for certain, but most of these annuitants are probably dead.

Unfair question? Consider this: The youngest annuitants used to build the UP-94 and GAM-94 tables were 65 in 1985. They'd be 85 today. It's likely that half of those youngest annuitants are still alive.

(continued on page 20)

Table 1– Unprojected Mortality

	Monthly Annuity Due, 5% interest Deferred Annuity to age 65 for ages less than 65 Immediate Annuity for ages 65 and greater				Change in annuity value from GAM-83 value at the same age		
	GAM-83	UP-94	GAM-94	RP-2000	UP-94	GAM-94	RP-2000
Male							
35	2.23	2.32	2.39	2.43	4.0%	7.0%	8.6%
45	3.68	3.83	3.94	3.99	3.9%	6.8%	8.4%
55	6.23	6.41	6.58	6.65	2.8%	5.6%	6.7%
65	11.14	11.38	11.61	11.60	2.1%	4.2%	4.1%
75	7.93	8.24	8.48	8.22	3.9%	7.0%	3.7%
85	5.18	5.29	5.51	5.04	2.2%	6.4%	-2.7%
Female							
35	2.82	2.75	2.81	2.69	-2.5%	-0.4%	-4.8%
45	4.63	4.52	4.61	4.41	-2.4%	-0.4%	-4.7%
55	7.66	7.48	7.62	7.31	-2.5%	-0.6%	-4.6%
65	13.02	12.78	12.98	12.54	-1.9%	-0.3%	-3.7%
75	9.67	9.57	9.80	9.34	-1.1%	1.4%	-3.4%
85	6.45	6.19	6.42	6.10	-4.0%	-0.4%	-5.4%

We'll come back to mortality projection later. Let's go back to the question of whether GAM-83 is an appropriate mortality table, based on the guidance provided by the ASOP 35.

First, in no way is anyone saying that GAM-83 is never an appropriate table. There are certainly circumstances in which GAM-83 will be the best choice based on the appropriate assumption universe. And there are probably circumstances in which other older, less conservative tables (GA-71, UP-84) are still appropriate.

Can it be argued that GAM-83 is the appropriate table for most plans? Consider what we know, 20 years after the publication of GAM-83:

- Male mortality has improved significantly, particularly at the younger ages;
- Female mortality has not improved as much when compared to GAM-83 before the 10 percent load.

Absolute mortality rates have changed and they've improved (or not improved) differently for males and females; and, for each gender, differently by age. In other words, GAM-83 probably doesn't represent, for most populations, the correct level of mortality, and even if projected, probably won't reflect the right pattern of mortality. We shouldn't be surprised; GAM-83 is based on mortality experience from the 1960s projected to 1983, based on mortality improvement trends from the 1960s and 1970s, with the addition of a 10 percent margin.

We recognize that GAM-83 is prescribed for the current liability calculation. And ASOP 35 notes that, when an assumption is prescribed, the actuary is obligated to use it for the purpose for which it was prescribed (paragraphs 2.6, 3.8).

But the ASOP doesn't say that, because a particular assumption is prescribed in one calculation, it therefore becomes the most appropriate assumption for all the other calculations. And for good reason. Consider the following example, using the prescribed mortality for current liability and a completely hypothetical situation:

"The Secretary of the Treasury, under due consultation with those elected officials who are desperate to find ways to offset the cost of Medicare Part D, decides that the 'Bubonic Plague Mortality Table, based on Italian experience in the 16th century' is the prescribed table for current liability calculations."

Can you state, in your professional opinion, that this table is now a reasonable table to use for your actuarial accrued liability, FAS 87 accrued benefit obligations (ABO) / projected benefit obligations (PBO), and any other calculation for which it's not prescribed?

"The following year, the Secretary of the Treasury, in an amazing Sybil-like turn of events, and after consultation with the Pension Benefit Guaranty Council, decides that the current liability mortality table should now be the 'Liberal Arts Professor with-an-increase-in-age-65-life-expectancy-to-age-127- Mortality Table.'"

Are you now also going to state, in your professional opinion, that this table ought to be used for actuarial accrued liability, FAS 87 ABO/PBO and any other calculation for which it isn't prescribed?

This is an exaggerated example, but drawn to make a point: We use prescribed assumptions when they're prescribed, sometimes criticizing under our breath those who prescribed them. But just because they've been prescribed in one circumstance doesn't make them the best assumption in another. It doesn't mean they aren't; but it doesn't mean they are.

To Project or Not to Project?

It's not a question; it's part of your assumptions. Mortality table construction has changed over the past 20 years. When the GAM-83 tables were created, computing systems were limited. Tables were built with substantial margins to allow not only for variation in experience, but also because programming in a new table took significant effort—static or generational projections were rare.

However, the construction of recent tables has reflected updates in our systems and our abilities to create individual projections. The three most recent tables reflect only mortality improvements through their creation dates: 1994 for UP-94 and GAM-94, 2000 for RP-2000). This is because their creators *expected* users to make explicit assumptions about mortality improvement. So every time actuaries use one of these tables, they must make an explicit decision about whether and how to project mortality improvements beyond the table date. In other words, by not projecting the table, the actuary has made the explicit decision *not* to assume any future mortality improvements beyond the date of the table's creation.

In a report, "Choosing between UP-94 & GAR-94 (group annuity reserving)," that coincided with the publication of the UP-94 and GAM-94 tables, the actuaries responsible for their creation recommended using mortality trend projection with the UP-94 table because mortality has been continually improving and will probably continue to do so.

Similarly, in its issuance of the RP-2000 report, the committee that developed the table said that given the long history of mortality improvement, pension valuations should take mortality improvement trends into account, preferably by using a generational table but, if not, by a comparable static projection.

And finally, a recent SOA study shows the effects of not taking mortality improvement into account. The paper examined, theoretically, what would happen to a sample plan's funded status, contributions and FAS 87 expense (among other measures) given known mortality improvements and different actuarial assumptions, which tracked or lagged actual mortality improvements to varying degrees.

The study, by David F. Kays, found that for assets to accumulate to a relatively level percentage of their "ideal," (assets sufficient to cover actual mortality improvement) the mortality assumption ought to be updated periodically, and at least projected to the valuation date by the appropriate mortality improvement scales. Tables that were projected beyond the valuation date did a better job of approximating a generational table—the ideal projection point would likely vary by plan population. However, "consistently using tables that are not current will eventually accumulate assets less than ideal."

But as we've already seen, in some cases the new factors showed higher mortality than existing tables. Is there really a need to project specific improvements onto the tables?

Note that none of these most recent tables (UP-94, GAM-94 and RP-2000) would be considered to reflect current mortality experience, unless we haven't had any improvement in mortality between their creation date and today. We have some evidence that mortality has improved over the past 10 years. If the tables are simply brought up to date—from their creation dates in 1994 and 2000, respectively, to 2005—the ratio of the differences in annuity factors between GAM-83 and the projected tables comes much closer together for females, and widens even more for males. And if full generational improvements are reflected, then the mortality differences are much wider. Table 2 on page 22 shows selected rates with improvement.

(continued on page 22)

Table 2 - Projected Mortality

	Monthly Annuity Due, 5% interest Deferred Annuity to age 65 for ages less than 65 Immediate Annuity for ages 65 and greater				Change in annuity value from GAM-83 value at the same age		
Male	GAM-83	UP-94 @ 2005	RP2000 @ 2005	RP2000 Generational	UP-94 @ 2005	RP2000 @ 2005	RP2000 Generational
35	2.23	2.45	2.48	2.81	9.9%	11.1%	26.0%
45	3.68	4.04	4.08	4.48	9.6%	10.8%	21.6%
55	6.23	6.73	6.79	7.19	8.0%	8.9%	15.4%
65	11.14	11.79	11.78	12.09	5.8%	5.7%	8.5%
75	7.93	8.58	8.37	8.53	8.2%	5.6%	7.5%
85	5.18	5.46	5.12	5.16	5.4%	-1.2%	-0.4%
Female	GAM-83	UP-94 @ 2005	RP2000 @ 2005	RP2000 Generational	UP-94 @ 2005	RP2000 @ 2005	RP2000 Generational
35	2.82	2.81	2.72	2.89	-0.5%	-3.8%	2.4%
45	4.63	4.60	4.45	4.66	-0.6%	-3.8%	0.7%
55	7.66	7.60	7.37	7.59	-0.9%	-3.8%	-0.9%
65	13.02	12.95	12.62	12.82	-0.5%	-3.1%	-1.5%
75	9.67	9.77	9.44	9.56	1.1%	-2.4%	-1.1%
85	6.45	6.31	6.15	6.19	-2.1%	-4.5%	-4.0%

Table 3

Life Expectancy	**GAM-83**	**RP-2000**	**RP-2000 @ 2025**	**RP-2000 Generational**
Male born 1940	81.7	82.6	84.2	83.9
Male born 1960	81.7	82.6	84.2	85.4
Male born 1980	81.7	82.6	84.2	86.7

So what should actuaries consider when projecting mortality? The committee that oversaw the UP-94 and GAM-94 tables recognized that many factors influence decisions to project mortality: "the actual population expected to retire under the plan, the interaction of assumptions, the relevance of various assumptions given alternate plan designs and the significance of a particular assumption given the overall level of precision in the liability model." The decision to project mortality trends explicitly or implicitly should be based on the actuary's judgment of how future trends interact with the actuarial model of the benefit plan. Sometimes, "a static table that includes an appropriate degree of mortality projection may be most consistent with the plan benefit and actuarial model."

Does this mean you're always required to project mortality, and more critically, are you required to use generational mortality? Not necessarily. Each population is different. That's where your actuarial professional judgment comes in.

Food for Thought

Let's assume a pension plan with a normal retirement age of 65, unreduced early retirement at 62, and early retirement reduction factors of 5 percent per year before age 62. (The benefit paid at age 55 is 65 percent of the normal retirement benefit). The actuary currently uses 1983 GAM mortality, retirement rates of 5 percent per year before age 62; 50 percent at age 62; 5 percent at 63 and 64; and 100 percent at age 65. The weighted average retirement age is 61.8.

Consider three changes to mortality: to RP-2000, to RP-2000 projected to 2025 and to RP-2000 generational, for each of three sample participants, age 65 (born 1940), 45 (born 1960) and 25 (born 1980).

Do these assumptions seem reasonable? Let's consider what the change in mortality does to life expectancy (see Table 3 on page 22).

Our sample plan, as many other plans, was designed to help move the war generation out of the work force to make way for the baby boomers. It has provided subsidized early-retirement benefits for anyone wishing to leave the workforce before age 62—subsidies worth as much as 30 percent at age 55. Our actuarial assumptions reflect that prior generations have, and future generations probably will, continue to take this early retirement subsidy.

A man who expects to live to 82 may reasonably be expected to retire at 62, particularly when there are generations of workers ready to take his job. But is it reasonable to expect that someone born in 1980, who, with improved mortality would have a life expectancy of 87, to also retire at age 62? If improvements in life expectancy also bring improvements in health at older ages, might our disability rates at older ages (e.g., age 50 plus) also decrease?

When projecting mortality, all things must be considered in balance: If mortality improves, what will happen to disability rates? Will retirement ages increase as people work longer, either out of necessity or desire? It's not all that simple. You need to use your actuarial professional judgment.

This article is a slight abbreviation of the full text, which can be found at *www.contingencies.org*. ◆

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