LIVING TO 100 SYMPOSIUM*

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Increased Longevity and the Challenge of Determining q_x at Extreme Ages—Part 1

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This is a transcript of Allen Klein's discussion of the two papers presented in Session 1 of the Symposium. In his discussion, Mr. Klein presented preliminary results of a U.S. industry wide older age mortality study. Since the Symposium, Mr. Klein has notified the SOA that study results have been revised and in some cases are substantially different than that presented at the Symposium. Thus, individuals are discouraged from utilizing the study figures presented.

The older age mortality study is currently being finalized. For more information about the study, contact Mr. Klein at al.klein@towersperrin.com

MR. ALLEN M. KLEIN: In addition to providing comments on the two papers presented, I also plan to provide the preliminary results of an industry-wide older age mortality study that I recently conducted on behalf of Tillinghast.

Beginning with the Hustead paper, I believe that the decision on how to end the mortality table, as well as how to develop mortality tables in general, really comes down to three basic issues:

- What data is available,
- What is the purpose of the table to be created, and
- If there are any changes that need to be made to the data, either due to the nature of the original data itself or due to changes in future expectations.

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The data that is available can come from the general population, insured or pension experience, a medical study, etc. I think the most important issue is whether the data is credible. What is done with the data depends on the purpose of the table to be created.

For life insurance valuation, for example, smoothness is the most important consideration in order to avoid anomalies when setting reserves. When looking at an experience table, fit is more important. You want the table to be very close to the experience. There are exceptions to this. If you have a couple of large claims, for example, you may smooth them into the data or you may actually ignore them. Both retirement projections and annuities would fall somewhere in between, using a combination of smoothness and fit.

Let's look at the credibility of the data. Starting with population mortality data, the accuracy of the census is important. You need to make sure that the canvassing was done properly. Was it done face-to-face? By telephone? Was it complete? Were follow-ups made? In terms of reporting, the question is whether it was done accurately. Was it verified? The elderly have a tendency to overstate their age. If you are going to use social security death records, you also need to be aware of the timing of the reporting on the deaths.

In terms of insured mortality data, there are a number of differences among companies, such as size, target market and distribution channel, for example, captive agency, broker, direct response or Internet. You are going to have different mortality results from each of these.

There are differences by product features. For example, if someone has preferred criteria that is more lenient with cholesterol, you will probably have a different overall mortality level than other companies who don't offer this. Life insurance and annuities have different morality results. On the life side, term/permanent and medically underwritten/simplified issue will have different results. Deferred and payout annuities will also have different mortality results.

In terms of pension and retirement mortality, whether the data comes from individual companies or an aggregation of companies makes a difference. Whether the database is primarily made up of white, blue or gray collar individuals will also have an impact. Demographics such as urban versus rural and level of income also come into play.

In terms of medical studies, you need to make sure that an appropriate population was used. What kind of testing was done? Was there a control group? Was there appropriate follow-up? Typically, medical studies have short observation periods. If you are looking to use this mortality data for a longer term assumption, this may not be appropriate.
The paper mentions that the "insurers often gain substantial publicity by handing a check for the full amount of life insurance to insurers who had 'outlived the mortality table.'" This rarely

happens today, as companies have developed riders that extend the maturity beyond 95 or 100 to avoid the large tax liability that the insured would incur.

Also, the paper explains that there are four methods of ending a mortality table and then counts the number of recently developed tables that were ended using each of the described methods. This is misleading, as many of the tables were related to one another. I'm also not sure that it is relevant, as I believe that the more important issue is the underlying purpose of the table and the actual experience used to create it.

I was involved with the development of the 2001 CSO table. I will use that as an example for ending the mortality table. Our discussions centered on two main points. First, we wanted an omega that was out far enough to cover all lives. Second, we considered not having an omega, but we were concerned with how the calculations would come out for a valuation table. We felt that we needed to zero out all of the lives at some point, just for practical reasons. We ended up choosing 121 as the ultimate age. Since this is a valuation table, we needed to smooth results and ended up using the blended method that is described in the paper.

Let's move on to the Dugan, et. al. paper. The authors did a nice job of creating models that fit the data well.

They asked a good question as to whether the trends will continue into the future. Potential changes must be considered when trying to predict the future. Some of the changes will take place more gradually, like lifestyle changes. An increase or decrease in the number of people who smoke, or exercise, will show very gradual changes in mortality over time. The same holds true for changes in public health and safety. Here are a couple of examples of this, one good and one bad. There have been some recent developments with automobile safety, including one that allows the car to sense when you are about to have an accident. It can apply the brake for you. This is a positive change. On the negative side, there has been an increase in environmental pollution. Demographics and the aging of the population will also bring about gradual changes in mortality. We are aging here in the U.S., while other countries are actually getting younger due to tremendous birth rates.

There are also changes that are discontinuous and potentially have a larger impact. First, let's look at potential improvement. We will see advancements against cardiovascular disease and cancer, which should have a more dramatic impact when they happen. There are also anti-aging advances and research on genetics, although there may be some setbacks before we see major improvements from these.

There will also be mortality deterioration. In recognition of our friends from Southeast Asia, I moved natural disasters up to the first item. In addition, epidemics, terrorist activities and

obesity will lead to deterioration. Obesity is becoming a major problem in the U.S. and elsewhere as well.

There is an upper limit today on life expectancy. The maximum lifespan is about 125 years. We can only push life expectancy up to a certain point, but certainly not beyond the maximum lifespan of people. There is ongoing research on expanding life span, and there have been some breakthroughs on a cellular level. There is other research that I am aware of on worms and mice. It may prove beneficial in the long run, but there have been no breakthroughs yet. It's probably going to be some time before we have a breakthrough.

There was a question in the paper that I would like to address. Will life expectancy improve more in Japan or the U.S.? Let's first consider some data. In 1960, life expectancy at birth of males was actually greater in the U.S. than in Japan. I don't know what happened between the 1960s and 1970s to reverse that trend. After some time in the 1960s, the life expectancy in Japan grew; it was and still is greater than that in the U.S. It is also the one of the longest in the world today. Data for other countries also shows similar high life expectancy. Again, higher than that in the U.S. Females have similar results.

Let me try to answer the question. In the near term, I believe that whatever the Japanese are doing right will continue to keep their life expectancy ahead of that in the U.S. Long-term, however, the U.S. and other populations will probably catch up at least partially, if not completely.

Is this difference in life expectancy due to diet, lifestyle, the environment, genetics or something else? There was an article in the August 30, 2004 *Time* magazine entitled "How to Live to Be 100." It was repeated again in the February 2005 issue of *Life Extension* magazine. The article said that Okinawans, who have a very low rate of heart disease, cancer and stroke, have diets low in salt and fat and high in fruits and vegetables. Nothing surprising there, but what they found was that the Okinawans have the highest intake of soy of any population on earth. They consume 60 to 120 grams of soy daily. This compares to 30 to 50 grams for the average Japanese and virtually zero for Americans. Raymond Rodriguez, the head of the center of "Excellence in Nutritional Genomics" at the University of California, Davis, has done some research that shows that soy affects genes that suppress tumor growth.

I would like to discuss the preliminary results of the Tillinghast Older Age Mortality Study. We had 40 companies contribute data, of which I am presenting the results of 33. We are still working with the other seven. We requested data for years 2000 through 2002, ages 50 and higher. The study has $4.1 trillion of in-force, representing 27 million records. It includes $10.1 billion in death claims and over 200,000 deaths.

The results are being compared to the Society of Actuaries 2001 Valuation Basic Table (2001 VBT), which we felt would provide a good comparison. It is based on SOA 1990 –1995 experience, brought forward with conservative mortality improvements to 2001. The report will be available for sale sometime in the second quarter of this year.

Overall, mortality was considerably less than the 2001 VBT, at 41 percent. This was true for both males and females. Male mortality was actually less than female mortality in certain places, namely durations one to thirteen and ultimate ages above 90. The results by select ages and ultimate durations were looked at independently.

Mortality for both male and female nonsmokers was 37 percent of the 2001 VBT. Male smoker mortality was 49 percent and female smoker mortality was 54percent. Smoker mortality was about three times that of nonsmoker mortality.

We created a number of breakdowns by size and, not surprisingly, the mortality decreased with an increase in size. However, that was not true for female smokers, where exactly the opposite relationship occurred.

With respect to underwriting type, the combined medical and paramedical nonsmoker business was 32 percent of the 2001 VBT. Smoker nonmedical business was 54 percent, but there was not a lot of data here. The same holds true for simplified issue and guaranteed issue; there was not a lot of data. Those results were 74 percent and 45 percent, respectively, of the 2001 VBT. In terms of the preferred class, this had very good results—27 percent for males and 25 percent for females. The trends showed a slight increase year by year in the three years that we looked at.

Finally, since this symposium deals with older ages, we looked more closely at the older ages in the study. We were only able to observe the ultimate duration data, as we have not created an attained age table yet. We found that the maximum mortality rate was reached at ultimate age 98, and the mortality rate declined after that, reaching the ultimate age 85 levels at ultimate age 103. This result is not logical, and there is not enough data here to support it. However, I decided to present it because I believe that this result could imply that there is a slowing of the death rate at the older ages.