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2011 Living to 100 Symposium—A Product Development Attendee's Notes

By Douglas Doll

I had not attended prior Living to 100 Symposiums, but the meeting content always looked interesting, so I accepted an opportunity to speak at a session at this year's symposium last January in Orlando. This article is based on my notes from sessions that I attended, with a focus on possible applicability to life and annuity product mortality assumptions. I did not attend all sessions, because some time slots had concurrent sessions, and I missed the final morning.

Overview

This is the fourth version of this symposium, which has been held every three years. The main sponsor is the SOA research committees and sections including the Product Development Section, but many organizations support this event. In fact, there were about 50 other actuarial and other organizations from around the world involved. The participating organizations help promote the event while sponsors help fund it. The Platinum sponsors this year were Milliman, Hannover Life Re and The Actuarial Foundation. Other sponsors included Munich Re, SCOR, Swiss Re, Gen Re and Optimum Re. Numerous funding sponsors means high quality breakfasts and breaks (one with ice cream!).

There were just more than 150 attendees—a mix of academics and actuaries. The actuaries included a number of pension actuaries. There were a lot of attendees from reinsurers. And, there were many countries represented.

Most of the sessions are based on pre-submitted research papers, with authors presenting the papers and then someone discussing the papers/presentation. There were also some sessions with presentations not associated with papers.

Handouts and Papers

The following links take you to: 1) Monographs of papers and discussions, and 2) The presentation slides.

http://livingto100.soa.org/monographs.aspx

http://livingto100.soa.org/sym-presentations.aspx

A few sponsors had displays with interesting literature. Here are two articles I think are worth quoting from:

1) A Swiss Re article "Ageing & Longevity," dated March 2009 [see *www.swissre.com/library,* and search for risk dialogue magazine compendium], has a good summary of current state of longevity views and research into aging. I quote liberally:
   - "Criticisms of demographers by other demographers generally consist of accusations that trends observed in the recent past have been extrapolated unjustifiably into the future."
   - "Pessimists postulate that human life cannot be extended beyond a soft limit (120-125 years). Optimists state that contrary to general expectation, human life expectancy has not bumped into a ceiling but continues to increase by about two years per decade. [I note that life expectancy and life span limits are two different things, and you can continue to improve life expectancy without increasing the limit. However, at some point you bump up against the maximum life span which is called "compression of mortality".]"
   - "Most pessimistic demographers come from the United States. … Prominent U.S. demographers predict that life expectancy … will level off or decline … as a result of obesity. … Another important factor … might be a widening gradient of socio-economic status. …"
   - "The optimistic camp of demographers, mostly from Europe, are critics of the continuing belief in imminent limits of life expectancy. … If current life expectancy were close to a maximum, then the increase … should be slowing, which is not the case. … The question remains whether biological sciences can free us from upper limits of human lifespan.
   - (After describing several research areas with potential to reduce aging) "There is no scientific reason against a possible cure for ageing, similar to what we try to do for cancer and chronic disease. However our current understanding of basic ageing mechanisms is still incomplete and makes it impossible to know whether indefinite postponement of ageing is feasible."

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2) A position paper from the CRO Forum on Longevity. [See www.croforum.org/publication/eri_longevity.] This succinctly states the limited lifespan vs. non-limited lifespan arguments, and concludes that, "there remains, nonetheless, significant uncertainty on mortality on shorter timeframes which will affect current pensioner populations." The bulk of this paper describes mortality modeling techniques and risk mitigation solutions. Regarding recent efforts to create longevity hedges, it says: "Defined benefit pension plans, insurers, and prospective capital markets investors in all markets currently have substantially differing views on future mortality improvement trends … current capital markets models of longevity risk tend to incorporate spreads which are considerably higher than the levels at which insurers are carrying solvency capital. As a result, there has been a general failure for longevity risk transactions to clear in capital markets."

General Session I: "Recent Advances in Slowing Aging in Mammals and What This Means for Humans"

Steven Austad described testing different diet and drug affects on animals (mostly mice). He noted that restricted calorie diets have lengthened life spans of rats, but that this is not practical for humans. However, there is a group of people that practice this, the Calorie Restriction Organization. More promising is a drug called rapamycin, an immunosuppressant drug that is already being used on humans for certain cancer and transplant treatments, and which has significantly increased mouse life spans. Next test for this is on monkeys. He predicted a medical impact from this or other drugs on human aging as soon as 10 years.

Concurrent Session 1B: Mortality Compression

Mortality compression is what we life actuaries generally refer to as the "squaring" of the survival curve. The probability of surviving to, say, age 80 or 90, continues to increase and is becoming quite high, but the survival curve then drops off rapidly thereafter. A lot of this session was devoted to discussing additional measurements for mortality and the dispersal of mortality. Actuaries are familiar with life expectancy, but other measurements discussed included the modal age at death, standard deviation of age at death above the mode, the Lorenz Curve and the Gini Index. Based on applying these measures to different countries' mortality statistics, they concluded that, yes, mortality compression is occurring. I don't see how these measures are directly applicable for product development. In the Q&A for another session, an audience member lamented that too many of the speakers used these statistical measurements or even just used life expectancy, whereas using mortality ratios or differences in mortality rates would be a lot more useful/illuminating. I agree with this comment.

Concurrent Session 2A: Effects of Obesity and Other Controllable Factors on Survival

One paper concluded that active elderly have lower mortality—not unexpected. Sam Gutterman's paper gives a nice overview of the obesity trend in the United States and potential impact. There was also a paper on impact of obesity on the long-term care population.

Conclusions on obesity:

- Current obesity in elderly (over age 65) is associated with large increases in diabetes, but substantial decreases in mortality (increased resources of body to fight attacks).
- Obesity at age 50 is associated with large increases in diabetes and disability, but non-significant increases in mortality among elderly.
- It remains to be seen what effect childhood obesity will have on mortality.
- Of course, there is obesity (BMI>30) and there is extreme obesity (which is a small part of total, but growing rapidly).

As an aside, the SOA just came out with a research paper on obesity:
http://www.soa.org/research/research-projects/life-insurance/research-obesity-relation-mortality.aspx
This paper seems to show consistently higher mortality for obesity, except for merely overweight persons over age 60.

Concurrent Session 3A: Comparison of U.S., U.K. and Canadian Annuity Mortality Tables and Studies

This is the session for which I was one of the speakers. It wasn't really a comparison. The three speakers talked about annuity mortality tables in their own countries. I talked about the Academy of Actuaries' development of a new 2012 individual payout annuity basic and valuation table, which was recommended to the NAIC at their March meeting. The basic 2012 table was derived from the SOA's 2000–2004 individual payout annuity experience study, projected to 2012. A future improvement scale was developed, based primarily on historical population improvement rates. The tentative name for this is Scale G2, since it replaces Scale G used to develop the 2000 table (50 percent of Scale G was used for females). A comparison of Scale G2 to Scale G and to Scale AA (used for group annuities) is shown below:

Sex/Age	Annual Improvement Rates		
Male	Scale G2	Scale G	Scale AA
45	1.0%	1.8%	1.3%
55	1.3%	1.6%	1.9%
65	1.5%	1.6%	1.4%
75	1.5%	1.2%	1.4%
85	1.1%	1.2%	0.7%
95	0.4%	1.0%	0.2%
Female		50% G	
45	1.0%	1.0%	1.6%
55	1.2%	0.9%	0.8%
65	1.3%	0.9%	0.5%
75	1.3%	0.8%	0.8%
85	1.0%	0.8%	0.6%
95	0.4%	0.6%	0.2%

Bob Howard and Nick Dumbreck spoke about annuity tables, with a focus on mortality improvement rates, for Canada and the U.K., respectively.

General Session II—The New Retirement: Phased Retirement and Phases of Retirement—Adopting to Longer Lives and Different Support Systems

This was an informal session, mostly about changes in working as you get older.

General Session III—Slowing the Aging Process

This had three different presentations:

- Rob Brown, Andrew MacKenzie and Steven Prus researched various determinates of loss of good health in Canada. Interesting items include: above age 65, never married and divorced persons had better results than married persons (this is reversed at younger ages). The same pattern held for those with low vs. high social support (but lower social involvement at higher ages had higher risk). And, regular alcohol drinkers had the lowest risk at all ages. (Sounds good for me. Suggestion: next year, serve red wine instead of ice cream at the break.)

- Leonard Hayflick gave his views on why we are unlikely to be able to slow aging—one being the aging process is inherent in our genes. We can increase life expectancy up to a limit, but the limit is unchanged. He then went on to argue that slowing aging would not be a good thing, anyway. He noted that we actually are spending quite little on researching the aging process. Factoid: half of the National Institute on Aging (NIA) budget is spent on studying Alzheimer's disease, the resolution of which would add only 19 days to life expectancy.

- Jay Olshansky spoke about a paper that is now under review, so was not yet available to attendees. The title is "Two Americas at the Dawn of the Aging Society: Health Disparities, Race and Education." He noted that there are large differences in health between those with some college and those with less but that this difference goes to zero at high attained ages. I will be interested in seeing this when it comes out, as it may help in developing mortality assumptions at high ages.

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General Session IV—Predictors of Exceptional Longevity

Some results of research on centenarians:

- Centenarians in Quebec: both siblings and spouses of centenarians live longer than the general population. Siblings living longer suggests an effect of genetics and/or childhood environment on longevity. Spouses living longer suggests an effect of adult environment on longevity.

- Early life predictors of exceptional longevity in the United States: study of centenarians' families suggests that having a younger mother increases longevity, and being born in September or November increases your longevity.

- Increasing genetic contribution to exceptional longevity with increasing age: Genetic research among centenarians has indicated a correlation with certain "good" genes. This correlation is stronger with super-centenarians (those who have obtained age 110).

Concurrent Session 4B: Mortality Analysis and Trends

- Mortality Improvement in the United States: Analysis, Projections and Extreme Scenarios. Joseph Lu used population data for 1995–2006 and different modeling techniques. He concluded that Projection Scale AA is inadequate overall, i.e., his projected improvement rates in some cases are significantly larger than Scale AA rates. I think this is caused by the limited number of data years chosen. Some of his models apparently projected accelerated future improvement based on higher improvement rates in the 2000s vs. the 1990s.

"Genetic research among centenarians has indicated a correlation with certain "good" genes. …"

- Recent Adult Mortality Trends in Canada, the United States and Other Low Mortality Countries. To me, the most interesting part of this presentation by Nadine Ouellette was the discussion about smoothing mortality with P-Splines. The charts before and after smoothing were quite impressive, especially 3-D maps of improvement by time and by age. The results of the smoothing applied to the data concentrated on modal age at death and standard deviation above the mode, which are two statistics that do not readily translate to product development mortality assumptions.

- Mortality Experience of Three Populations. This paper includes life settlement mortality experience. Vincent Granieri, of 21st Services, studied three population groups: 1) Medicare recipients, 2) 21st Services' database of 77,000 life settlements, and 3) 2008 VBT mortality table.

  - He limited the study to lives age 70+, so that they could identify five years of medical records from the Medicare recipients (which begin at age 65).
  - I think the settlement data included both impaired and standard lives.
  - Survival curves were calculated. For this purpose, both the Medicare data and the 2008 VBT mortality were converted to match the age and gender mix of the life settlement data.
  - There is a huge difference in mortality in the early years. Eyeballing the graph, during the first three years, the settlement mortality is nearly 200 percent of 2008 VBT and the Medicare mortality is more than 300 percent of 2008 VBT. Of course, the 2008 VBT table represents fully underwritten select mortality.
  - After six years, the differences in mortality are very much less, and after eight years the differences are almost zero.
  - He also divided the Medicare data into 10 groups based on income levels of zip codes. Defining "life expectancy" as time to 30 percent deaths, the difference in months between income levels decreases as attained age increases - does this mean that the correlation of mortality with income wears off at older ages? However, it

appears to me that the ratios of life expectancies between income levels remain similar as attained age increases.
- He concludes that some of the difference between settlement mortality and Medicare mortality is wealth effect and the rest is antiselection. He also concludes that 2008 VBT mortality is representative of settlement mortality for durations 10+.

General Session V—Factors Affecting Mortality

- Is Raising the Age of Eligibility Fair to All? This question regards whether raising the starting age of social security is actuarially fair to all, where the presenter defines "actuarially fair" as equal percentage change in value of benefits. He compared values using New Zealand mortality for Maori and non-Maori groups.

- Patterns of Aging-Related Changes on the Way to 100: An Approach to Studying Aging, Mortality and Longevity from Longitudinal Data. Longitudinal data is data captured over a long period of time, such as the Framingham study, which has been following a group of lives over 50 years. The main point of this paper is that worthwhile information about mortality can be captured by looking at characteristics such as blood pressure over time, in addition to snapshots at single points in time, which is what today's underwriting does.

As previously noted, there were a number of sessions that I did not attend

A few sessions whose papers may be of interest to product development actuaries are as follows:

Concurrent Session 1A: Long-Term Care. One of the papers, "The Relationship between Cognitive Impairment and Mortality Rates among Long-Term Care Insurance Applicants" could be of interest for both long-term care and life insurance mortality assumption setting.

Concurrent Session 2B: Mortality Modeling 1—Modified Lee-Carter Methods; and Concurrent Session 3B: Mortality Modeling II—Other Methods. These two sessions covered different models for projecting future mortality improvement rates. They typically parameterize using historical data, and so assume continuation of past patterns, which is a critical assumption. (Another critical factor being which years' historical data is used.)

Concurrent Session 5B: Mortality Measurement. One presentation addresses issues with data for measuring mortality rates above age 100. Another discussed credibility issues with data, and smoothing results among different ages. The third also addressed mortality above ages 100 and suggested methods for deriving the underlying curve. Papers one and two both addressed the oddity that U.S. mortality rates flatten out above age 100—the argument is that this is due to errors in age reporting.

Summary

Work remains to translate results from academic studies into mortality metrics that are easily usable by product development actuaries. Product development actuaries must be aware of the leading research as it does have implications into the pricing assumptions, so this research should be further analyzed. The industry should seek to discover more about mortality improvement differences by socioeconomic class, as this has obvious implications for insurance products.

My main takeaway from the symposium is that the debate continues as to whether there is a significant chance of finding a way, over the near- or medium-term, to slow the aging process. I lean towards the speaker who said we can continue to mitigate the **effects** of aging, but aging will continue nevertheless, with the inevitable result of major organ failure. But, many speakers disagreed with him. Regardless, while we may not change the aging process, I expect to see continued decrease in mortality rates. □