

Session 4B: Mortality Analysis and Trends Q&A

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**Presented at the Living to 100 Symposium
Orlando, Fla.**

January 5-7, 2011

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Tom Levy: So I've listened to Bob and Nick and Douglas yesterday and this session as a practicing actuary with a need to put real values on retirement and retiree health plans. All I can conclude is that I have a problem for every solution. I'm not sure whether any of these people or the ones who spoke yesterday can help those of us who actually must have a solution decide whether we want to use 3 percent or 1 percent or what for projecting future mortality. It's helpful to know that projections from the data of the tables that we have published to today are off-track. That they are in effect saying that the mortality tables from Scale AA to today are not going to be reflective of today's mortality and give us some clue as to what adjustments we might want to make with regard to that, but we also have the issue of 2010 to 2030 and the range of possibilities that we've got is too wide for a practicing actuary to really apply and any further help we can get I would love.

Joseph Lu: Thank you very much for the questions. They are twofold - base mortality and improvement in mortality assumption. Regarding base mortality, you may want to know if the current mortality rates which have been adjusted from previous life tables using some mortality improvement rates are correct for current use. Partially, this has been addressed through the Payout Annuity Valuation Task Force by looking at the most recent data available contributed by insurance companies. They have derived a life table to reflect the most recent experience. Regarding future improvement in mortality, the task force has a tentative proposal with mortality improvement rates assumed to be something between the SSA's middle and the high projection scenarios. So there are tentative solutions out there for improvement in mortality, if you need a set of reasonable assumptions. I observe that the environment in the United Kingdom is different from the North America. In the UK, it is more principle-based, and actuaries in different companies are encouraged to come up with their own assumptions. Having worked in this environment, I naturally hope for more good quality data to be made available so that actuaries do good analyses and develop better models for mortality projection.

Tom Levy: It's obviously a help if one looks at the various alternatives you gave that in effect build in the fact that mortality improvement has been in the last decade significantly better than in the previous decade. Obviously that's very different from what the task force is proposing. You're right. There is safety in taking somebody else's factors, the ones that we saw yesterday from the task force and that may be where we have to go.

Bill Dreher: I have questions for Vincent. I'm familiar with the life settlement business in two dimensions. I monitor the performance of certain hedge funds, some of which are investors in life settlements, and I also know and have been approached by a number of insurance marketing firms who are soliciting customers for life settlement transactions. This market has two quite distinct components. One is selling to a third party a mature policy taken out for business and personal reasons some time ago. The policy owner is making an independent decision to sell his or her property. The other sector of the life settlement marketing business is composed of policies that are currently acquired with the encouragement of a marketer. These transactions often include cash payments to the applicants, who apply for the policies with the intention that they will be sold to an investor two or more years after being issued. Are your data separated between those two sources of origination of the life settlement?

Vincent Granieri: Sure, appreciate the question. The answer to that is no, they are not. But, it is possible in our analysis to see that emerging trend and what really happened was in 2004 is when it became something that began all sorts of stories of unscrupulous types hanging around senior tennis tournaments and offering BMWs in exchange for insurance policies, and I'm sure some of that happened to some degree. One of the things that also happened was in 2008, that was recognized by folks like us who are doing life settlement underwriting and you may or may not have heard that mortality tables were changed and preferred underwriting was introduced. The effect of that was to shut down, to a very large degree, that practice, which we don't agree with. This is what they call "stranger-oriented life insurance policies." But as I said, it wasn't excluded from my data but at the same time given the primary research was done for

this in early 2008 is where we took the cutoff. We didn't see a huge impact, if you will, because those policies would have relatively short durations in the data.

Bill Dreher: So it remains an open issue then as to whether there might, over time, be a meaningful difference in the behavior of those two populations?

Vincent Granieri: No, there's no doubt in my mind that there is a difference, and the only question in my mind is: how soon after was that identified? In our company, we changed underwriting to reflect what we call "preferred underwriting" in the life settlement market in early 2005 and have identified what we call a "vigorous lifestyle," vigorous for age. In other words, somebody who's 65 years old and is walking the golf course three days a week, you don't get any credit for that. Somebody who is 95 years old, on the other hand, who is walking the golf course three times a week would be considered vigorous for age so that was identified with varying speed by the various independent underwriters. Right now I can tell you that somebody who has been identified as lifestyle A or someone with the family history of longevity and things like that, their experience is markedly better survival than the other folks.

Bill Dreher: As a follow-up question, I have noticed what appears to be considerable drop in the supply of third party capital seeking to buy the life settlement policies of the second type. Do you have an opinion on how the data you've developed would be useful for forecasting the future of the life settlement business?

Vincent Granieri: Sure. In fact, that was my other claim to notoriety. When we changed the mortality tables and extended life expectancies in late 2008, some attribute the worldwide credit collapse to that very act. Truly just like in mortgages or any other financial instrument it seems that people were holding onto their capital and that happened as well in the life settlement business as evidence by calculated ROIs on policies going from somewhere around 8 or 10 percent to 15, 20, 25 percent. Thankfully for the sake of my own happy, healthy retirement the market seems to have turned just as always over time. The risk-adjusted returns became so high

that capital became more plentiful although knocking on wood we're very early in that turnaround process and part of it frankly is due to the inability to have enough data to properly assign the mortality and that's what really was the genesis of our whole research project is how do we accelerate that? I'm too old to wait 25 more years for the mortality to play itself out. We've got to come up with an answer.

Kevin Hydock: My question is mainly targeted for you, Joseph. In dealing with projecting mortality improvement going forward, how do you best determine how many years of data to look at going back so that you can have credible data but also capture emerging experience and did you experiment with other amounts of years? And then additionally, by using a shorter period of time and looking at specific ages, do you believe you could have accidentally captured a cohort effect in addition to mortality improvement and did you look at that in your data as well? Thank you.

Joseph Lu: With regards to number of years of data, the time series rule of thumb for ratio of number of years of data to projection is 3:1, but I have observed 3:2 or more. And, yes, using these models if you use a different period of data you may get different results. This is one of the oddities of the model, presenting us with the risk that the model is wrong – model risk. If you use different number of years such as reducing 30 years of data to 20 years you can get very different results.

These are the consequences of projection methods. The whole idea is to project past data into the future. Suppose there is any structural change in the data, for example, a period of slow mortality improvement followed by one of high mortality improvement. If you use a longer period of data, some of the models will have the feature of smoothing these structural changes out and project the average mortality trend going forward. If you were to use a shorter period of data, the more recent data with higher mortality improvement in our example, will be projected forward. So, there is a need for judgment in assessing the right period to be used for projection. And in some ways that is the strength as well as the weakness of this type of method. If your question is 'Given the past, what can we expect going forward in the next five to 10 years?' then

this type of models will answer that question arguably well. But if you don't believe that the history will repeat into the future, then the model would not be useful. For example, you may think that smoking has been a driver of the mortality improvement in the past, but going forward the drop in the prevalence of smoking is not going to be as much anymore. You may think that there will be a subpopulation of hardcore smokers that would never give up. So projection models that I have shown here would not be useful. We would need a model that takes account of the drivers of mortality improvements.

I prefer a model that I could divide future projection into the shorter (10 years) and longer period. In the shorter period, I will have more confidence with this type of model in projecting past trend. If mortality improvement has been about 3 percent in the past, why would it fall to half a percent over the next three years for example?

But for longer period, I would prefer a model that captures potential changes in risk factors, intervention and behavior in the population. For longer period, we need a more sophisticated model that captures any potential structural change.

A good model will also give us a level of certainty or uncertainty about events in the future. It would give us a best estimate and assess potential scenarios that can happen in the future that changes these forecasts. These features will be useful to our work of estimating future scenarios with their uncertainties, so we can estimate the financial consequences of risks attaching to annuities.

So that's my view of extrapolative models such as Lee-Carter and P-Spline, they have strengths and limitations. We need other models to complement them.

Paul Sweeting: You've already probably answered one question I was going to ask which was about the use of aggregate models such as the Lee-Carter model rather than modeling different causes of death separately and then adding them back together or at least looking at the effect of your aggregate models on what will need to happen to different causes of death for that to occur. Looking back at the U.K. experience, you do see that much of the past improvement has been reduction in death from circulatory diseases. For the aggregate rates of mortality to continue you'd have to completely wipe out coronary heart disease and half the cancer deaths in

about the next 10 or 15 years which just isn't realistic. So I was wondering the extent to which it looks like the model has partly answered that question.

I do also have a question for Nadine though. The p-spline models that you used, did you use the same smoothing parameters and not spacings for all different countries and how sensitive were the results to changes in those parameters? Did it make much difference particularly at the endpoints? I was wondering whether the parameterization caused that big uptake in the U.S. female death.

Nadine Ouellette: Thank you for these questions. Regarding the smoothing parameters, we did not use the same ones for all countries studied. Usually, smaller size populations require stronger smoothing because mortality rates tend to show greater variation due to random noise. The country- and sex-specific smoothing parameters in our study were selected according to the Bayesian Information Criterion. This criterion suits our purpose better than the Akaike Information Criterion because it penalizes model complexity more heavily. About the position of B-splines knots along the age and year dimensions however, we used equally spaced knots for all countries.

In the case of the United States, the population size is very large and therefore, mortality rates do not require strong smoothing. The selected smoothing parameters were thus not large, but still not the smallest one neither, perhaps because of lower data quality at higher ages in this country.

We did perform sensitivity analysis in this study and found that the modal age at death was in fact quite robust to the choice of the smoothing parameters; important changes in the smoothing parameters did not lead to important changes in our modal ages at death estimates, which is certainly reassuring.

Joseph Lu: Yes, thank you for the questions about cause of death. I agree with you that

we need to use different models to look at the changes and you mentioned in the United Kingdom. A large part of historical mortality improvements (70 to 80 percent) in the UK can be attributed to a reduction in circulatory diseases. In the United States, I've done some work and see that in the United States the contribution of circulatory diseases to the mortality improvement is even larger than in the United Kingdom. In the United Kingdom there have been some reduction in cancer as well. In the United States, the reduction of mortality as a result of cancer hasn't gone down a lot. (U.S. lung cancer deaths has reduced but others have increased to cancel each other out.) So as you plot total cancer deaths from 1980 to 2005, for example, you see it is quite level, it hasn't gone down, but for circulatory diseases you can see that it's gone down a lot. It's almost like a nosedive. So I think one will have to ask the question of how far can this go. Is there a maximum level of decline or can it reach zero? (It can't go negative otherwise it would mean the resurrection of the dead.) And we have to ask once this decline has happened are there other causes to follow suit as well. I think cause of death is a useful analysis to have. I understand that some of the SSA projection uses this type of model and derived mortality projection from them.

Will Mitchell: I have a question for Vincent. It looks like the data for life settlements includes both substandard and standard rated lives. I was curious if you look at the Medicare data can you see whether it has proportionally more or less substandard versus the life settlement data? Then also has the mix for life settlements changed over time? Is there more substandard or less substandard or of the substandard you have, is it more highly rated today than in the past?

Vincent Granieri: Sure. The second question first: the life settlement data. What did happen again in 2004 with the introduction of healthier lives is you saw that composition change to the point where we saw in the order of 15-20 percent of lives we would consider to be better than standard mortality, preferred we define simply as any mortality multiplier less than one in our database and now that trend has reversed itself to a degree with the extension of the mortality tables at younger ages that made it economically not a feasible transaction so at the youngest ages and I usually have to make a qualifier, I guess here, since we're talking about living to 100,

everyone knows that a 60-year-old is young. But that market has dried up for the 60- to 70-year-olds, and so you see those preferred lives going to near zero whereas at the upper ages we have maintained that 15 to 20 percent of the folks are what we would consider to be preferred lives.

Vincent Granieri: Sure, I'm sorry. He wanted to know if there was any way for us to compare the percentage of substandard in life settlement data based vis-à-vis Medicare and I have not done this, first of all, but if we accept the definition that a condition exists with one inpatient or two outpatients, we would then be able to look at the percentage impairments and in fact, in the paper you will see prevalence of conditions between the life settlement population and the Medicare population and the only caveat I would lend to that is in the Medicare database we have to pay special attention to situation where the doctor is or is not compensated. A doctor does not generally get compensated for calling somebody obese, so you don't see a lot of obesity identified in the Medicare data whereas in our database we calculate BMI based on the information in the medical files we receive so our data looks a lot like the data you've seen over the last few days with respect to obesity whereas Medicare does it for that reason. So adjusting for those conditions where the doctor has no incentive to identify, yes, you can see the prevalence of certain conditions, Medicare versus our own database and I should make a comment with respect to Eric's last comment which was, we'd love to have actual transactions identified and that is the third piece of selection and as third party underwriters we're not generally privy to that information although that is something that we have requested of our clients that if we could identify that actually sent over their policies we'll have an even better basis for that analysis.