Summary of Findings from
Session 13 – Mortality Improvement: Will it continue in the future or will trends reverse?
SOA 2008 Life Spring Meeting – Quebec City

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There are no crystal balls to predict the future, but there are many techniques used by
Futurists to envision and access possible future events and scenarios. A large portion of
Session 13, "Mortality Improvement: Will it continue in the future or will trends
reverse?" at the recent SOA Life Spring Meeting in Quebec City, explored mortality
improvement using two different futurism techniques. The purpose of this report is to
explain the techniques used and publish the results developed in this session. Readers
should feel free to use the results as they see fit, but must realize that the results are based
on expert opinions using futurism techniques and are not based on any statistical data.

I want to thank all those who attended for their active participation and involvement in
the session! If any of the participants notice any errors or misinterpretations of your
work, please contact me at al_klein@aigag.com and I will incorporate your changes into
a future version of this report.

Being a joint meeting with the CIA, the IAA and the CAS, there were a number of
different countries represented. So I asked the audience to answer all questions based on
the country where they currently work.

We had 82 participants in the audience. Two of these individuals came in after the
determination of country origin, but participated in the rest of the polling. Of the 80 in
the audience when the country participation poll was taken, the breakdown by country
was as follows:

- US – 56
- Canada – 13
- Other countries – 11

The first futurism technique utilized in the session was the Delphi method. With this
method, you find a group of experts and ask them their opinion on a particular topic.
There are multiple rounds, anonymous responses are shared and the group generally
comes to some consensus on the topic. Due to a lack of time, we could not do multiple
rounds. Also, I tried to keep the anonymity by asking the participants to pre-think their
answers and not to be influenced if they saw a mass of hands go up. Unfortunately, we
were not able to use the electronic polling devices and had to count hands! Due to this,
we took some shortcuts as you will see below.

The goals for the Delphi exercise were to determine the average annual future morality
improvement for a newly issued life insurance product and an annuity for males aged 35
and 65 over the next 10 years and years 11-20. The choices were (a) < 0%, (b) 0% to

0.5%, (c) > 0.5% to 1% and (d) > 1%. Then, we wanted to determine what events over the next 20 years could significantly impact this assumption.

The following is a summary of the results to the first set of questions related to mortality improvement for life insurance:

Delphi Method – Mortality Improvement for Life Insurance							
	Years 1-10				Years 11-20		
	Male Iss Age 35		Male Iss Age 65		Male Iss Age 35		Male Iss Age 65
Improvement	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
(a) < 0%	1	1%	4	5%	2	2%	See explanatory paragraph directly below
(b) 0% to 0.5%	32	39%	23	28%	52	63%	
(c) >0.5% to 1%	34	41%	36	44%	21	26%	
(d) > 1%	15	18%	19	23%	7	9%	

For the male issue age 65 years 11-20 mortality improvement assumptions (which are not filled in numerically above), three individuals indicated they would use a higher mortality improvement assumption than for issue age 35 and three indicated they would use a lower assumption. The other 76 individuals would predict the same mortality improvement assumption for issue age 65 years 11-20 as they predicted for issue age 35 years 11-20.

The consensus appears to be that there will be a mortality improvement of 0-1% over years 1-10 for both issue ages 35 and 65, with a slight leaning toward >0.5-1%. There was a slight increase in assumption for issue age 65 compared to issue age 35. For years 11-20, the consensus level of mortality improvement for both issue ages 35 and 65 appears to be 0-0.5%.

To also understand this drop in assumption between years 1-10 and 11-20, I asked how many changed their assumption from years 1-10 to 11-20. Four (5%) indicated they increased their assumption for years 11-20, 65 (79%) indicated they decreased their assumption and 13 (16%) indicated they kept their assumption the same between the two periods.

To determine expected mortality improvement for annuities, only general polling was done asking participants to indicate their expectation of annuitant mortality improvement with respect to life insurance mortality improvement. With respect to differences in assumptions between life insurance and annuities, for years 1-10, 8 (10%) indicated that their life insurance assumption would be higher than that for annuities, 49 (60%) indicated that it would be lower than that for annuities and 25 (30%) indicated that they would use the same assumption for both life insurance and annuities.

The second part of the Delphi exercise was to identify possible events that could take place over the next 20 years that would significantly impact the mortality improvement assumption, either positively or negatively. While there are many other possible events, the following is the list we came up with in our very limited time:

- Discovery of anti-obesity drug (that works!)
- Discovery of anti-aging drug (that works!)
- Major change to health and wellness programs
- Major war
- Implementation of universal healthcare (in the US)
- Fast food menu regulation
- A resistant strain of illness or disease
- Change in immigration policies
- Reduction / termination of Medicare (in the US)
- Cancer cure

The second exercise involved several futurism techniques:

- Environmental Scanning – Look at the current state of events and all related peripheral events to help determine what the future might hold

- Trend Impact Analysis – Identify future events that cause discontinuities and then determine their probability of occurrence, the length of time from the event to the first impact (and the amount of impact), the time from first impact to maximum impact (and the amount of impact) and the time from the maximum impact to the level state (and the amount of impact)

- Cross Impact Analysis – Similar to Trend Impact Analysis, but used when the events are interdependent

- Scenarios – Create a set of plausible scenarios, usually a realistic optimistic and a realistic pessimistic scenario and then several other scenarios to be used to better understand how the future may play out, rather than to try to predict the future

For a more detailed explanation of these and other futurism techniques, I recommend an article entitled "Applied Futurism as an Introduction for Actuaries" by Alan Mills, FSA and Peter Bishop, PhD. This article can be found on the SOA website at www.soa.org/files/pdf/applied_futurism.pdf.

The goals for this exercise were to take a general topic and to determine 3-5 scenarios that could happen over the next 20 years related to this topic, their probability of occurrence and the extent to which these scenarios would impact mortality improvement over time. For this last point, I was looking for the number of years after occurrence before an impact would be felt and then either the average annual change over the 20 years following impact or how the improvements might be expected to emerge over time. For example, there may be a period of time after which a change occurs before the impact is felt, then another period of time in which the effect of the change grows to a maximum impact and finally a period of time where the impact declines to a steady state.

For this exercise, the audience was broken into 13 groups, each with their own topic. There were 13 round tables in the room so this was a natural break. I gave the audience 10-15 minutes to work on this exercise. Due to the limited amount of time, many of the groups did not get a chance to complete each element of the assignment. The omissions are shown as blanks in the following tables. I encourage the reader to consider how he or she would fill in the missing numbers.

Each group shared one scenario with the whole audience as an example of the work they did. I collected all of the work done and am publishing the results below. In alphabetical order, the topics and results of the thinking of each group are as follows:

I. Climate change – This group focused on global warming, looking at the impact of an increase in temperature of 2, 5 and 10 degrees Celsius. The impact of the increased temperature over 20 years was estimated as follows:

Impact of Global Warming on Future Mortality Improvement			
Increase in Temperature (Celsius)	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
+ 2 degrees	60%	10-15 years	- 0.5%
+ 5 degrees	30%	8-10 years	- 1.0%
+ 10 degrees	10%	3-5 years	- 1.5%

Since the percentages add to 100%, it appears the group tried to provide the likely scenarios should global warming occur. Alternatively, they may have thought it was a certainty that global warming will occur and that these were the most likely scenarios.

II. Demographics – This group developed three possible scenarios. The first was that the immigration process would begin to include a much tougher health check. The second was that there would be an increase in the percentage of women among the insured population. The third scenario was a reinstatement of the military draft. The following estimates were developed for these three scenarios:

Impact of Demographics on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Tougher immigration standards on health	5%	20 years	+ 0.1%
2. Increase in women in insured pop.	75%	10 years	+ 0.5%
3. Reinstated draft	2.5%	Immediate	- 1.0%

III. Economy – This group focused on the average growth of GDP over the next 20 years and presented six possible scenarios. They calculated the expected change in impact on future mortality improvement, based on the information in the table below, as a negative 0.055%.

Impact of Growth in GDP on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
+ 5% (Robust)	2.5%		+ 1%
+ 3%	50%		+ 0%
+ 1%	36%		+ 0%
- 1%	10%		- 0.5%
- 3%	1%		- 1.5%
- 5%	0.5%		- 3%

IV. Genetics – This group developed four scenarios. The scenarios were stem cell regeneration of organs, disease resistant cells, gene selection at conception to screen out health risks and hybrid foods. The probability of occurrence and impact on mortality improvement are shown below.

Impact of Genetics on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Stem cell regeneration of organs	50%	Immediate	> + 1%
2. Disease resistant cells	< 2%		
3. Gene selection at conception	0%		
4. Hybrid foods	95%		Close to 0%

V. Globalization – This group developed five scenarios based on an increased globalization. The first was an increased standard of living. The second was that pandemics might spread faster. The third was an increase in immigration. The fourth was advancements in healthcare in third world markets. The fifth scenario was an increased sharing of information, improving knowledge. The estimate of occurrence and general impact on mortality improvement are shown below. It was noted that all of these changes would be gradual and the impact on future mortality improvement wound be small.

Impact of Increased Globalization on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Increased standard of living	High		+
2. Faster spread of pandemic	Medium		–
3. Increased immigration			
4. Advancements in healthcare in 3rd world markets	Medium		+
5. Increased sharing of info / knowledge			+

VI. Healthcare – This group worked on two scenarios. The first was a shortage of healthcare providers, including nurses and doctors. The second was the Medicare crisis and possible insolvency. The impact on future mortality improvement is shown below.

Impact of Increased Healthcare on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Shortage of providers	100%		- 3.6%
2. Medicare crisis / insolvency	100%		Slight negative impact

VII. Labor market – This group focused on the availability and affordability of healthcare in different employment scenarios and the impact on overall mortality. The scenarios and impacts are summarized below.

Impact of Labor Market and Health Coverage on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Full employment / Health coverage available through employer			Improved
2. Full employment / Employers abandon health coverage			Worse
3. Full employment / Healthcare less affordable due to accelerated inflation			Worse
4. Full Employment / Need for more nurses, etc. and aging population			Worse
5. High unemployment / Less healthcare			Worse

VIII. Medical advances – This group focused on two scenarios. The first was that breast cancer was cured. Here, the group indicated that it would have a low impact on male mortality, but would have a high probability of occurring in the next 20 years. The second scenario was an improvement in genetic screening and disease prediction. The group indicated there would be delayed mortality improvement in this scenario.

IX. Natural disasters – This group identified three potential scenarios: an earthquake in California, widespread flooding (e.g., from a tsunami) and a meteor strike in New York. I like the creativity of this group! But seriously, if there is a lesson to be learned in all of this, it is to think up unusual, but plausible scenarios and determine their impact on your business. Those who are better prepared are more likely to come out of these events in better shape. This should be a normal part of most companies risk management process.

The probability of these events and their potential impacts on future mortality improvement are shown below.

Impact of Natural Disasters on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Earthquake in CA	5%	Immediate	- 0 to 3%
2. Widespread flooding (tsunami)	2%	Full impact within 5 years	Small
3. Meteor strike in NY	< 1%	Immediate	- 0 to 2%

X. Pandemic – This group developed four scenarios. The first was that a small third world country contracts something like the bird flu and it spreads throughout the world. The second was an illness transported via food (e.g., the tomato salmonella scare). The third scenario was to have no pandemic in the next 20 years. And the fourth was the AIDS virus becoming airborne. The probabilities of these scenarios are shown below.

Impact of Pandemics on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Spread of bird flu	20-30%		
2. Illness transported via food	< 3%		
3. No pandemic	15%		
4. AIDS virus becomes airborne	< 5%		

XI. Politics – This group developed nine scenarios:

1. Resource hoarding
2. Medical care allocation (plus or minus)
3. Change in China's one-child policy
4. R&D is not tax deductible
5. Trade barriers (add or reduce)
6. Tort reform (good or bad)
7. Tax policy changes
8. Healthcare benefits reduced

9. Long term pressure for universal healthcare or other programs

This group felt that the changes would be gradual, they would generally be negative and range between 0 and negative 0.5%, they would peak at five years after occurrence and eventually grade to a 0% change.

XII. Regulatory – I'm not sure I would like the results of many of the scenarios this group came up with, but I do think they were also very creative! This group developed 11 scenarios. They were:

1. FDA goes ballistic and doesn't provide any new drug approvals
2. FDA provides indiscriminate drug approvals
3. No change in the FDA approval process
4. Can't ask for gender when underwriting life insurance
5. Can't use DNA information for life underwriting plus DNA profiling becomes cheap and easily accessible
6. Global regulation for all drugs
7. Smoking bans
8. Required health action on diet
9. Changes allowed in advertising
10. Hospital and physician access for all
11. Change in the formulas for healthcare reimbursement by outcome

This group developed the impact for their first three scenarios:

Impact of Regulatory Changes on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. FDA – No new approvals	30%	5+ year impact after 5 years	- 0.0025%, then status quo
2. FDA – Current approach	60%		
3. FDA – Indiscriminate approvals	10%		

<u>XIII. Safety</u> – This group developed four scenarios. The first scenario was deregulation (e.g., in the workplace). The second was more regulation (e.g., drug testing). The third was technological advances (e.g., car or airline transportation). The fourth was on handgun availability (i.e., it becomes easier). The probabilities and impacts developed by this group are shown below.

Impact of Safety on Future Mortality Improvement			
Scenario	Probability of Occurrence	Number of Years Before Impact is Felt	Impact on Mortality Improvement
1. Deregulation	80%		Long term
2. Increased regulation	80%		Long term
3. Technological advances	100%		Long term
4. Handgun availability	20%		Short term

I mentioned at the session and will mention it here that I recently heard about a program in Scandinavia where I believe they are attempting to build rubber-type guards on highways so that cars bounce off rather than crashing. This would certainly have an interesting impact on mortality.

I want to conclude by again thanking the audience for their active participation. Without it, I would not be able to provide you with these thoughtful considerations when trying to determine future mortality improvement.

I enjoyed the session and believe the participants did as well. I hope that you, the reader, are able to use this report in some way, either to help you better predict future mortality improvement or as an idea for using futurism techniques to solve another of your issues!