



SOCIETY OF ACTUARIES

**A World of Mortality Issues and Insights Seminar
May 23, 2012**

Session 7 – Mortality Improvement

Presenter

Allen M. Klein, FSA, MAAA (IAA MWG)

Society of Actuaries Seminar

A World of Mortality
Issues and Insights

Mortality Improvement



Al Klein
May 23, 2012



Agenda

- Goals of presentation
- Mortality improvement considerations
- Techniques for projecting mortality improvement
- Mortality data sources
- The future – What could go wrong?
- The future – What could go right?
- Mortality improvement assumptions from two sources

Goals of Presentation

- Provide ideas and sources for determining mortality improvement assumptions
- Show why there may be differences between short and long term projections
- Provide different perspective on mortality improvement
- Focus on things you may not know about that are already happening and look at what might happen in the future
- Keep your focus on the brain rather than stomach

3

Mortality improvement considerations (Traditional)

- Population vs. insurance
- Relevance and credibility of source of data
- Generational vs. durational improvement
- Differences by age, gender and smoking status
- Demographic considerations
- Projection techniques
 - Actuarial
 - Extrapolation
 - Predictive modeling
 - Relational
 - Cause-specific
 - Disease-specific

4

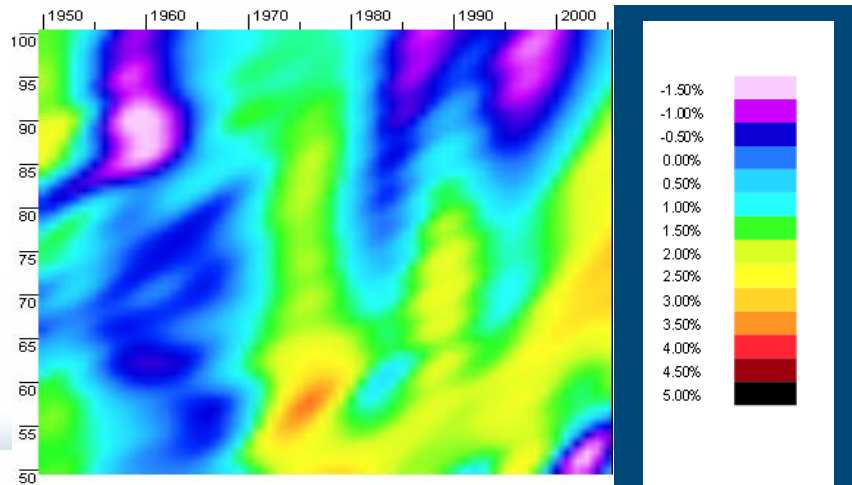
Techniques for projecting mortality improvement

- Cairns-Blake-Dowd
- Currie Age-Period Cohort
- Delphi study
- Environmental scanning
- GLM (Generalized linear models)
- Gompertz
- **Heat map** – Thank you to Aon Hewitt for the next slide
- Heligman-Pollard
- Lee-Carter – Japan, Italy, Sweden, US
- Lorenz Curve and Gini Index
- Makeham - Sweden
- Perks/Kannisto
- Poisson log-bilinear - Slovenia
- P-Spline
- Renshaw-Haberman
- Weibull

5

Current Mortality Projection Techniques

- Improvements, based on SSA male mortality rates
- Ages 50 – 100; calendar years 1950 – 2005



6

Sources of mortality data

- Center for Disease Control
 - US life tables
 - www.cdc.gov/nchs/products/life_tables
- Continuous Mortality Investigations Library
 - UK life, annuity, pension, income protection, critical illness
 - www.actuaries.org.uk/mortality
- Human Mortality Database
 - Population data from 37 countries
 - www.mortality.org
- Human Life-table Database
 - Population life tables
 - www.lifetable.de
- Social Security
 - Population life tables and projections
 - www.socialsecurity.gov/OA-CT/STATS/index.html
- Society of Actuaries Table Manager
 - Life and population data from multiple countries
 - www.soa.org
- World Health Organization
 - Civil registration systems from 130 countries
 - www.who.int/en/

7

Sources of Mortality (cont'd)

- Population
 - Australia – Bureau of Statistics Australia
 - Canada – Statistics Canada
 - Italy – National Statistics Institute
 - UK – Office of National Statistics
- Insured
 - Australia – Institute of Actuaries Australia
 - Austria – Actuarial Association of Austria
 - Germany – German Institute of Actuaries
 - India – Indian Institute of Actuaries

8

Mortality improvement considerations (Non-Traditional)

- Building a forward-looking model
- Ask:
 - What caused the past improvement?
 - Has it already been reflected or will it continue into future?
- Examples of past reduction in mortality:
 - Reduction in smoking
 - Decreases in deaths at birth
 - Safety improvements (e.g., reduction in speed limit)
- Medical advances
 - How long will it take for them to become effective?
 - Will everyone benefit or only the wealthy?

9

The future – Mortality deterioration

- Natural disaster
- War
- Terrorist attack
- Pandemic, epidemic
- Obesity, Diabetes
- Availability and affordability of medical care
- Exposure to chemicals and hormones

10

Exposure to chemicals and hormones

▪ Drinks

- Toxic metal stays in water – A cancer causing substance, found at levels much higher than a California health standard, slips past city's treatment system
 - *Chicago Tribune*, August 7, 2011
- “Higher lead levels found in city water – US EPA sampling casts doubt on test methods that have consistently put Chicago in the clear”
 - *Chicago Tribune*, January 31, 2012
- “Why You May Be Drinking Soda That Contains a Dangerous Flame Retardant Banned in Europe and Japan”
 - *Environmental Health News*, January 2, 2012
- Arsenic in your juice – How much is too much? Federal limits don't exist

¹¹ • *Consumer Reports*, January 2012

Exposure to chemicals and hormones (cont'd)

▪ Puberty

- More girls are starting puberty at 8. What are the causes and risks?
 - *Time*, October 31, 2011

▪ Chemicals

- Parkinson's Alley – Recent studies have found statistical links between pesticide use and an outbreak of Parkinson's disease in California farm towns. Researchers even know which chemicals are the likely culprits. What's the government doing about it? Not much.
 - *Sierra*, January/February 2012

12

The future – Mortality improvement

- Medical Advances
- Anti-aging research
- Stay active – mentally, physically, socially
- Know what is really good for you
- Healthy lifestyles – Diet, exercise

13

Recent headlines

- “Gene linked to immune system may cause Parkinson’s disease”
– *Chicago Tribune*, August 16, 2010
- “Cancer and Diabetes: Lifestyle and Connections”
– www.aicr.org
- “Diabetes and Dementia”
– *Time*, September 6, 2010
- “Scientists find startling new links between Alzheimer’s disease and Down Syndrome”
– *Alzheimer’s Disease Research Review*, Summer, 2010
- “Diabetes and Hypertension: Linked to Glaucoma?”
– *National Glaucoma Research Report*, Winter 2012
- “Do Glaucoma, Erectile Dysfunction Have a Common Cause?”
– *Medscape Medical News*, February 7, 2012

14

Eating Right

- Recent study of over 120,000 people for 20 years
- Some gained weight and some lost weight
- Foods most responsible:
 - Potato chips: 1.69 pound gain
 - Potatoes: 1.28 pound gain
 - Sugar-sweetened beverages: 1.00 pound gain
 - Vegetables: 0.22 pound loss
 - Whole grains: 0.37 pound loss
 - Fruits: 0.49 pound loss
 - Nuts: 0.57 pound loss
 - Yogurt: 0.82 pound loss

▪ Source: *Alternatives*, September 2011

15

Don't want to eat right – There is still help!

- Eat sauerkraut with your hotdog
 - May stop nitrates from converting to carcinogens
- Eat grapes after a high fat meal
 - Prevents some of the negative effects of triglycerides from meal
- Drink red wine with steak
 - Can cut down body's absorption of toxins that lead to heart disease
- Eat rosemary after pizza (or any high-carb food)
 - Reduces harmful chemicals that increase risk of cancer and heart disease by 60%
- Have vinegar after a high carb meal
 - Can prevent spikes in blood sugar
- Eat dark chocolate after salty foods
 - Can lower blood pressure in as little as two hours

▪ Source: *Healthy Style*, July/August 2010

16

The future – What you might not know

DO

- Give blood
- Laugh
- From the Blue Zones
 - Be active
 - Family is important
 - Have a purpose in life
 - Drink red wine

- References can be provided upon request

DON'T

- Take an aspirin a day
- Avoid fats

OTHER ITEMS

- Suntan lotion
- Statins
- FDA

17

What mortality improvement assumption should be used?

- Depends on your own circumstances, but:
- My opinion is that we will see two groups moving forward:
 - Those who don't take care of themselves will see their expected mortality deteriorate from today's levels
 - Those who know how to take care of themselves (and do so) will not only continue have mortality improvement, but may see it at rates beyond today's levels of improvement

18

What mortality improvement assumption should be used? (Part 2)

- Two recent studies from the Society of Actuaries
- “Report of the Society of Actuaries Mortality Improvement Survey Subcommittee” by the Mortality and Underwriting Survey Committee, March 2012
 - Separate reports for annuities and life insurance
 - Another report on reinsurer assumptions, not used here
- “Global Mortality Improvement Experience and Projection Techniques” by Towers Watson, June 2011
- Please refer to original sources for full understanding of numbers shown

19

Mortality improvement assumptions

Mortality Improvement Survey - March 2012, Percentage Improvement											
Annuity - Male Age 65						Annuity - Female Age 65					
Canada			Duration			Canada			Duration		
9 co.	1	11	21	9 co.	1	11	21				
Minimum	1.00	1.00	0.70	Minimum	0.50	0.12	0.50				
Mean	1.54	1.37	0.94	Mean	0.95	0.78	0.77				
Maximum	2.19	2.10	1.05	Maximum	1.50	1.30	0.94				
US						US					
39 co.			Duration			39 co.			Duration		
1	11	21	1	11	21						
Minimum	0.50	0.00	0.00	Minimum	0.25	0.00	0.00				
Mean	1.35	1.17	0.83	Mean	0.93	0.81	0.64				
Maximum	2.10	2.10	1.75	Maximum	1.75	1.75	1.56				
Life - Male Prfd NT Age 65						Life - Female Prfd NT Age 65					
Canada			Duration			Canada			Duration		
14 co.	1	11	21	14 co.	1	11	21				
Minimum	0.00	0.00	0.00	Minimum	0.00	0.00	0.00				
Mean	1.08	0.76	0.25	Mean	0.90	0.76	0.25				
Maximum	2.50	1.50	1.00	Maximum	2.00	1.50	1.00				
US						US					
70 co.			Duration			70 co.			Duration		
1	11	21	1	11	21						
Minimum	0.00	0.00	-0.40	Minimum	0.00	0.00	-0.40				
Mean	0.78	0.68	0.20	Mean	0.57	0.47	0.15				
Maximum	1.50	1.50	1.10	Maximum	1.50	1.00	1.00				

20

Mort. improvement assumptions and projections

Global Mortality Improvement - June 2011, % Improvement			
Estimate from Human Mort Database 2000-2007, Ages 65-85			
	Male		Female
Australia	1.70		1.60
Canada	1.70		1.40
UK	1.80		1.60
US	1.50		1.40
Estimate from Human Mort Database 2000-2007, Ages 65-74			
	Male		Female
Australia	4.70		3.10
Canada	3.00		1.20
Hungary	2.50		2.00
Israel	3.20 (2000-2008)		3.60 (2000-2008)
UK	3.60 (2000-2009)		3.00 (2000-2009)
US	2.50		2.00
Best Estimate of US Mort Improvement 2011-2025, Ages 65-74			
	Male		Female
US population	1.50		1.00
Individual Life NS	2.00		1.50
Individual Annuity	1.50		1.00

21

The End

- Here's to more accurate projections and a good lunch!
- Eat right, be healthy and lead a long life!

22

Bio – Al Klein, FSA, MAAA

- Al is a consulting actuary with Milliman's Lake Forest / Chicago office. He joined the firm in 2009.
 - Al's primary responsibilities include industry experience studies and helping clients with life and annuity product development and reinsurance related issues. His expertise includes mortality and underwriting related issues, including older age, simplified issue and preferred.
 - Prior to joining Milliman, Al most recently worked for a large stock life insurance company where he was responsible for experience studies across all lines of business. He has also worked for other life insurance companies, a reinsurer and consultant, where he has been responsible for strategic planning, product development and traditional reinsurance aspects of the business.
 - Al is a frequent speaker at industry meetings and is currently involved with a number of industry activities, including:
 - SOA representative for the Mortality Working Group (MWG) of the International Actuarial Association
 - MWG Underwriting Sub-group chair – goal is to study underwriting done around the world
 - SOA Mortality and Underwriting Survey Committee
 - Joint American Academy of Actuaries (AAA) / Society of Actuaries (SOA) Preferred Mortality Oversight Group
 - Joint AAA / SOA Underwriting Criteria Team
 - 2014 SOA Valuation Basic Table (VBT) Older Age Subgroup
 - SOA Longevity Game Development Team
 - Longer Life Foundation Advisory Board
 - Al received a Bachelor of Science degree in Actuarial Science and Finance from the University of Illinois, Urbana.
- Contact information: (312) 499-5731, al.klein@milliman.com