

# **Living to 100 Symposium**

Presentation by Faye Albert

Southeast Actuaries Conference  
November 2014



# Thanks to those who assisted me

The Living to 100 Symposia were wide-ranging meetings. I got help organizing these remarks from others who both worked on the symposia and publicized them. I would like to acknowledge:

- Jennifer Haid
- Tim Harris
- Anna Rappaport
- Ronora Stryker



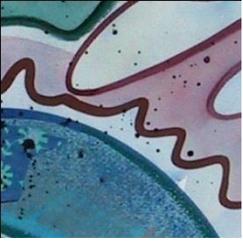
# Setting the Stage: History

- Five “Living to 100” symposia to date
- Initial focus –
  - Estimating high age mortality
  - Data; little data, and unknown reliability of data
- Added focus later
  - implications of long life
- Today – same issues but a history of about 150 papers, and growing recognition of pervasive impact of longer lives
- Summary paper - provides overview of papers from 2002 – 2011 conferences, the first four symposia



# Current Environment

- Multi-disciplinary and multi-national participants
- A lot of discussion – meetings include 120-150 people with a lot of opportunity for interaction
- Social Security actuaries – provide insight into projections used by in U.S., Canada, and the U.K.
  - differences in mortality and projections by country
- Combination of theory and application
- Controversies
  - About future improvements
  - About underlying drivers of improvement



# Literature review based on material at first four Living to 100 symposia

- Overview of
  - technical material related to data sources,
  - validation techniques and methods used by practitioners to develop mortality estimates for present and future periods, and
  - a summary of the discussions regarding business, policy and social implications of increasing longevity
  
- <http://www.soa.org/Research/Research-Projects/Life-Insurance/soa-living-100.aspx>

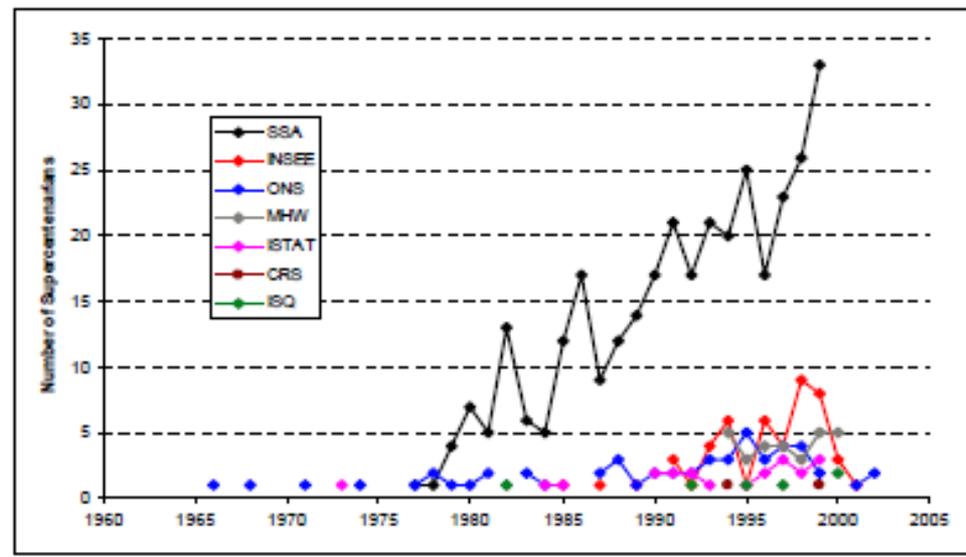


# We are living longer

- Around the globe people are living longer: there is evidence that the rate of improvement is different between men and women, and between people of different races, geographies and social statuses; however, we are all living longer.

Number of Persons Having Reached 110 Years of Age by Year

*(International Database on Longevity, March 2004, Persons Deceased at Age 11 and Over)*

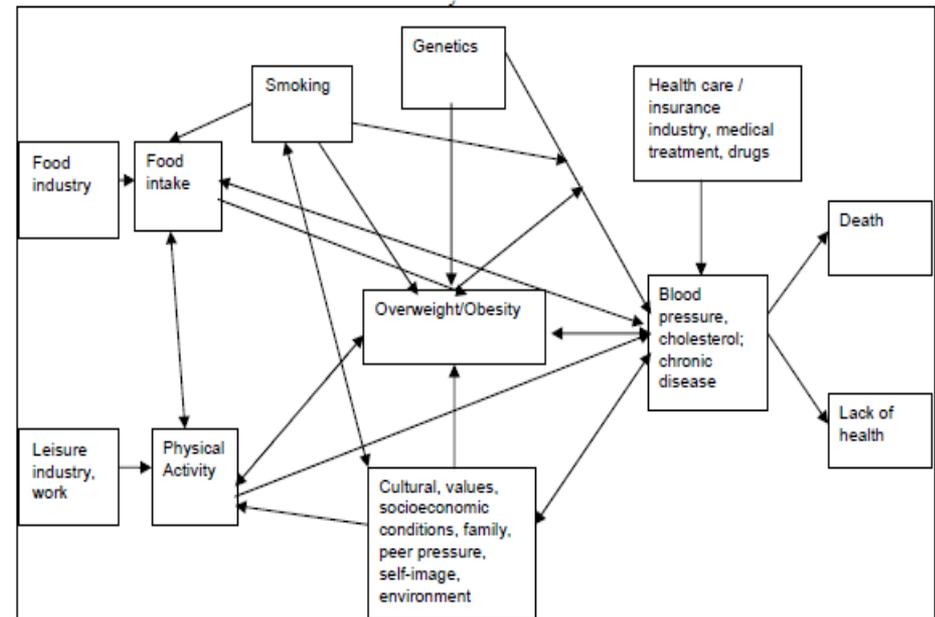


# Our understanding is growing

- We are starting to understand what factors have a material effect on our expected lifetime.
- However, there are gaps in our knowledge of older age mortality:
  - Data at older ages is sparse and of varying quality.
  - There are open questions related both to the rate of improvement and the ultimate age at which it is appropriate to assume a mortality table should end.

## Relations between Key Health Factors

*(Human Behavior: An Impediment to the Future Mortality Improvement: A Focus on Obesity and Related Matters)*





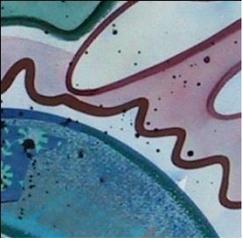
# We are working on our tools

- In many regions, there is limited consensus on the appropriate base mortality rates and improvement factors that should be used to value life-contingent liabilities, and on the models that should be used to forecast those rates into the future.
- We need to build the tools to become comfortable with the wide variances that can be produced by our projection models; techniques in use include:
  - stress testing,
  - scenario testing,
  - risk heat maps, and
  - screening systems.



# We are all affected

- As our lifetime increases, there are broad socioeconomic implications for our governments, social institutions, businesses :
  - Our personal and social safety nets will be forced to adapt.
  - As we grow older we must work with our governments and employers to identify the terms on which we leave the workforce.



# We agree on many things...

- Data is sparse and data from different sources is difficult to compare; in addition, calibrating to different time periods leads to significantly different results
- The effects of current and recent medical advancements should be reflected, but major future developments (such as a cure for cancer) are difficult to predict and model
- Demographic shifts are increasing social insurance burdens worldwide, so pay-as-you-go programs are becoming harder to maintain
- Employers are reducing their roles, reducing benefits, shifting to defined-contribution plans and; therefore, post-retirement income responsibilities are increasingly falling onto the individual rather than onto the government or employer
- The age at benefit entitlement and how people retire are very important issues across many societies
- Finding ways for individuals to continue effectively in the workforce is important from a societal and individual perspective



## **... but there is more work to do**

- How can the profession improve data collection for insured and annuitant populations?
- How can the profession acquire data segmented by cause of death, and what are some strategies for resolving privacy and confidentiality concerns?
- Where should actuaries add rigor to data scrubbing/analysis processes, or to predictive modeling or any other component?
- Which graduation methods are most appropriate for older ages?
- How can companies mitigate risks associated with major technological advances in medicine? What are some ways to model these risks?
- How will our social safety nets need to be altered in order to meet our changing demographic profiles?
- What can we learn from each other?



# Longevity Topics

- Increasing life expectancy
- Projecting longevity
- Country specific topics
- Influence of genetics/heredity
- Developments in medicine and how they might change the outlook
- Scientific theories about aging
- Extreme longevity claims, including observations on individual case studies



# Social implications

- Is there an end in sight?
- How individuals can respond to longer life
  - Working to later ages and working in retirement
  - Housing for older persons
- Implications for Social insurance system
- Implications for Healthcare delivery systems
  - Long term care
- Implications/opportunities for business



# Limits on human life expectancy

- Debate: Are there limits on increases in human longevity?
  - Life expectancy vs. life span
  - Are there fixed limits on life span regardless of biotechnology and health care?
  - Can medication or genetic modification eliminate the limits on life span?



# Key data: Life Expectancies for the U.S.

	Males - 0	Females - 0	Males - 65	Female - 65
1935	59.4	63.3	11.9	13.2
2010	75.4	80.0	16.6	19.2
2050 Projection	79.5	83.6	18.9	21.4



# Life Expectancy and Health

<b>Male Expectancy</b>	<b>Age 75</b>	<b>Age 80</b>	<b>Age 85</b>
Life Expectancy	14.84	11.47	8.32
Healthy Period	10.52	7.93	5.59
Assisted Living	2.72	2.11	1.45
Skilled Nursing	1.60	1.43	1.28
<b>Female Expectancy</b>			
Life Expectancy	16.24	12.61	9.12
Healthy Period	10.55	7.97	5.59
Assisted Living	2.80	2.24	1.66
Skilled Nursing	2.89	2.40	1.87



# **Life Expectancy by Gender from Early Times to the Present - Expected Additional Years of Life Measured From Age 20**

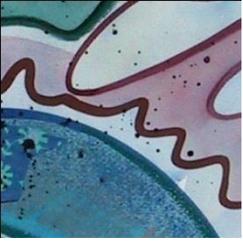
<b>Era</b>	<b>Male</b>	<b>Female</b>	<b>Source</b>
Neolithic Period (4000 BC)	21.0	14.0	Acsadi
Roman Empire	20.6	14.5	Hishinuma
Medieval (1200 )	29.8	25.4	Hishinuma
1700s	28.0	28.4	Deprez
Current (2003)	55.8	60.8	US CDC/NHI



# **2014 Living to 100 Symposium**

## **January 8-10 2014, Orlando**

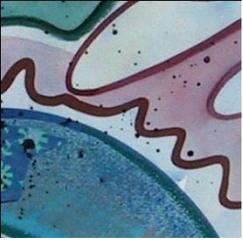
- The 5<sup>th</sup> International Symposium on Longevity
- Representatives from 15 countries attended
- Papers presented by medical doctors, demographers, actuaries, and researchers
- SOA was joined by many other sponsors: actuarial and non-actuarial



# Jay Olshansky

**bio-demographer and author**

- His research includes estimates of the upper limits to human longevity; forecasts of the size, survival, and age structure of the population; and the pursuit of the scientific means to retard aging in peoples.
- During the last 30 years, Dr. Olshansky has been working with colleagues in the biological sciences to develop the modern "biodemographic paradigm" of mortality – an effort to understand the biological nature of the survival and dying out processes of living organisms.
- Anticipates limits to future increases in life expectancy



# Leonard Hayflick

## Recognized authority on aging

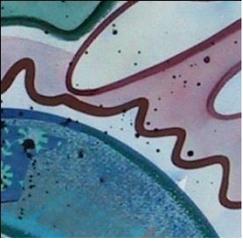
- Sex differences in the mortality rates are well established. In the human population of developed countries where infectious diseases are not significant causes of death, the penalty for maleness is that almost every important disease has a higher mortality rate in males than in females” (Hayflick 1982)
- Source of the “Hayflick limit”. 1961 paper published with Paul Moorhead establishing that normal human cells are able to divide only 40-60 times.



# **Tim Harris suggested**

## **Years Lost due to Adverse Lifestyle Choices**

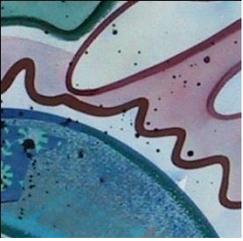
<b>Choice</b>	<b>Loss in Years</b>
Smoking	7
Obesity	4 to 8
Inactivity	4
Eating meat	2
Unmarried	10
Lack of education	3



# Outlook at the Oldest Ages

## Nir Barzilai

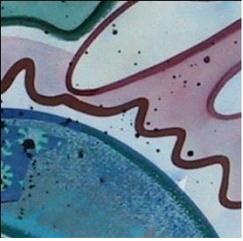
- Studies on families with centenarians.
- These have provided genetic and biological insights on the protection against aging.
- Point is not how to die at an older age, but how to stay healthy longer.
- If you survive one disease you get the next disease, unless you can delay aging.
- We all intuitively know that people age at different rates
- Studied people 100 years old, because we're assuming that for most of them aging has been slowed down.



# Anthony Atala

## Grow new organs

- *Anthony Atala asks, "Can we grow organs instead of transplanting them?" His lab at the Wake Forest Institute for Regenerative Medicine is doing just that — engineering over 30 tissues and whole organs.*
- Regenerative medicine has been called the "next evolution of medical treatments," by the U.S. Department of Health and Human Services. With its potential to heal, this new field of science is expected to revolutionize health care.
- *"We believe regenerative medicine promises to be one of the most pervasive influences on public health in the modern era." - Anthony Atala, MD, Director*



## Atala - continued

- Surgeon Anthony Atala demonstrates an early-stage experiment that could someday solve the organ-donor problem
- A 3D printer uses living cells to output a transplantable kidney. Using similar technology, Dr. Atala's young patient Luke Massella received an engineered bladder 10 years ago; we meet him via an onstage video.
- Anthony Atala's state-of-the-art lab grows human organs -- from muscles to blood vessels to bladders, and more. At TEDMED, he shows footage of his bio-engineers working with some of its sci-fi gizmos, including an oven-like bioreactor (preheat to 98.6 F) and a machine that "prints" human tissues.



# **James Vaupel, Ph.D., of Max Planck Institute for Demographic Research in Germany**

- Discussed the past trend; 2.5 years of life expectancy at birth are gained per decade.
- Suggests the plasticity of longevity; the human life span is not fixed, but is a function of life expectancy and population size.
- Because of attention to mortality improvements at the end of the lifespan, there has been more research into supercentenarians as a population subset.



# **Tom Bakos, FSA, MAAA, of Genecast Predictive Systems LLC**

- Noted the connections between genetics, disease and longevity.
- Discussed advancements with genetic markers, and how intervention and therapeutic strategies can mitigate the life-threatening nature of certain diseases.
- These developments help address the aging process to increase longevity.



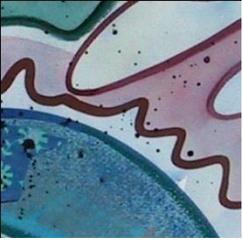
## **Jonathan B. Forman, J.D., of the University of Oklahoma**

- Discussed working longer and annuitizing retirement savings, to provide incomes for the oldest of the old.
- While social insurance programs are already in place, there are critical questions that need to be resolved to help the oldest of the old.
- How much will the government require the oldest old to save earlier in their lives?
- How much will the government redistribute to benefit the oldest old?”



# Sam Gutterman

- Coordinated with the Social Security actuaries who compared and contrasted mortality information in the United States, Canada and France.
- Focused on increased mortality because of increasing obesity. Problem of increasing overweight is most alarming in the United States, although the trend appears in many countries.



# **Aubrey de Grey, Ph.D., of SENS Research Foundation**

- Discussed ways to undo aging.
- Compared the work done rebuilding cars that stand the test of time to the possible future enhancements to help humans live longer.
- Over time, people aged 70 may be able to add 30 plus years to their timeline.
- He emphasized the need to change how and why research is conducted on aging instead of the pathology of aging



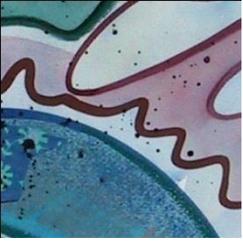
# **Gerontologist Sandra Timmerman, Ed.D**

- Discussed the need for incorporating a fifth life stage, “the encore years,” focusing on the time period between adulthood and retirement (1. childhood, 2. adolescence, 3. adulthood and 5. retirement).
- To address when individuals work during retirement in some part, including when they take on a new career path.
- Retirement is well known as a transitional stage and is no longer a cliff.



## **Anna Rappaport, FSA, MAAA, Chair of SOA's Committee on Post-Retirement Needs and Risks**

- Made call for action from the presenters and attendees to think about how to address the many risks and challenges from living longer.
- The symposium itself is a rare moment when such a mix of academics, physicians and researchers from various professions come together to contemplate and share not only the challenges but also the solutions needed for the impending future.



# History of mortality improvement

- Early on – big changes in infant and early childhood mortality
- First half of the 20<sup>th</sup> century
  - Major changes in public health and sanitation
  - Antibiotics and ability to deal with infectious disease
  - Very large reductions in mortality at younger ages
- Second half of the 20<sup>th</sup> century
  - Mortality rates at younger ages were low
  - Big improvements in mortality later in life
  - Big changes in life spans, heavily driven by middle and later year mortality – heavily influenced by improvement in cardiovascular disease control
  - Improvements offset by more chronic illness and cancer



# Medicine and Health

- New technologies allowing regeneration of body parts
- Many more replacements of worn out parts
- Major advances in cardiovascular disease
- Lot of cancer, but improvements in treatment, custom drugs
- Lot of improvement in pharmaceuticals
- Big increase in obesity
- Big decline in smoking in US, but varies by country
- Shifting age mix increases demand for medical services

**Bottom line: Pay attention to technology if you want to know where things were going**



**Questions?**