

Actuaries Club of the Southwest

Austin, TX

November 7, 2013

Mortality Improvement or Not



AI Klein, FSA, MAAA

Agenda

- Recent changes in Causes of Death
 - Suicide
 - Other changes
- Mortality improvement
 - What have we seen?
 - Traditional approaches to predicting future improvement
 - Another approach to predicting future mortality
 - Conclusion and summary

Note: Some slides are provided for your information and will not be covered except for a brief mention in the presentation.

Goals of presentation

- Provide some data and information you likely haven't seen
 - Cause of death
 - Mortality improvement
- Primary focus of presentation will be to provide ideas for better predicting future mortality, with a concentration on what is happening today that will likely impact future mortality
- My hope is that at the end of the presentation, if you are not better at predicting future mortality, you will have at least learned how to live longer and healthier!

Recent Changes in Causes of Death

Sources of Cause of Death Data

Population data

- National Center for Health Statistics (NCHS), National Vital Statistics
 - Information produced by National Center for Injury Prevention and Control, Centers for Disease Control and Prevention

Insured data

- MIMSA II (the second Milliman Industry Mortality Study and Analysis)
 - Comprehensive industry mortality, lapse, and cause of death study
 - Study years 2000-2011
 - 37 participants
 - \$63.7 trillion of exposure and 2.7 million deaths

10 Leading Causes of Death in US, 1981-2009

Ages 20-39

National Center for Health Statistics

10 Leading Causes of Death, United States, All races, Both sexes

Ages 20-39			
Rank	1981-1989	1990-1998	2000-2009
1	Unintentional Injury	Unintentional Injury	Unintentional Injury
2	Homicide	HIV	Suicide
3	Suicide	Homicide	Homicide
4	Malignant Neoplasms	Suicide	Malignant Neoplasms
5	Heart Disease	Malignant Neoplasms	Heart Disease
6	HIV	Heart Disease	HIV
7	Liver Disease	Liver Disease	Diabetes
8	Cerebrovascular	Cerebrovascular	Cerebrovascular
9	Pneumonia & Influenza	Diabetes	Liver Disease
10	Diabetes	Pneumonia & Influenza	Congenital Anomalies

3 Leading Causes of Suicide and Unintentional Injury Ages 20-39

National Center for Health Statistics 3 Leading Causes of Death, United States, All races, Both sexes			
Suicide - Ages 20-39			
Rank	1981-1989	1990-1998	2000-2009
1	Firearm 56.2%	Firearm 55.6%	Firearm 46.6%
2	Poisoning 20.1%	Suffocation 19.9%	Suffocation 29.8%
3	Suffocation 16.3%	Poisoning 16.8%	Poisoning 15.4%
National Center for Health Statistics 3 Leading Causes of Death, United States, All races, Both sexes			
Unintentional Injury - Ages 20-39			
Rank	1981-1989	1990-1998	2000-2009
1	MV Traffic 63.2%	MV Traffic 60.1%	MV Traffic 51.6%
2	Poinsoning 8.6%	Poinsoning 14.8%	Poinsoning 30.0%
3	Drowning 6.3%	Drowning 5.0%	Drowning 3.1%

10 Leading Causes of Death in US, 1981-2009

Ages 40-59

National Center for Health Statistics

10 Leading Causes of Death, United States, All races, Both sexes

Ages 40-59			
Rank	1981-1989	1990-1998	2000-2009
1	Malignant Neoplasms	Malignant Neoplasms	Malignant Neoplasms
2	Heart Disease	Heart Disease	Heart Disease
3	Unintentional Injury	Unintentional Injury	Unintentional Injury
4	Cerebrovascular	HIV	Liver Disease
5	Liver Disease	Cerebrovascular	Suicide
6	Suicide	Liver Disease	Cerebrovascular
7	Respiratory Disease	Suicide	Diabetes
8	Diabetes	Diabetes	Respiratory Disease
9	Homicide	Respiratory Disease	HIV
10	Pneumonia & Influenza	Homicide	Septicemia

3 Leading Causes of Suicide and Unintentional Injury Ages 40-59

National Center for Health Statistics

3 Leading Causes of Death, United States, All races, Both sexes

Suicide - Ages 40-59			
Rank	1981-1989	1990-1998	2000-2009
1	Firearm 57.3%	Firearm 55.4%	Firearm 48.6%
2	Poisoning 24.3%	Poisoning 23.5%	Poisoning 23.8%
3	Suffocation 11.2%	Suffocation 13.2%	Suffocation 19.2%

National Center for Health Statistics

3 Leading Causes of Death, United States, All races, Both sexes

Unintentional Injury - Ages 40-59			
Rank	1981-1989	1990-1998	2000-2009
1	MV Traffic 48.0%	MV Traffic 46.0%	Poisoning 36.8%
2	Fall 7.8%	Poisoning 16.9%	MV Traffic 35.3%
3	Poisoning 7.4%	Fall 7.0%	Fall 6.9%

10 Leading Causes of Death in US, 1981-2009

Ages 60+

National Center for Health Statistics

10 Leading Causes of Death, United States, All races, Both sexes

Ages 60+			
Rank	1981-1989	1990-1998	2000-2009
1	Heart Disease	Heart Disease	Heart Disease
2	Malignant Neoplasms	Malignant Neoplasms	Malignant Neoplasms
3	Cerebrovascular	Cerebrovascular	Cerebrovascular
4	Respiratory Disease	Respiratory Disease	Respiratory Disease
5	Pneumonia & Influenza	Pneumonia & Influenza	Alzheimer's Disease
6	Diabetes	Diabetes	Diabetes
7	Unintentional Injury	Unintentional Injury	Pneumonia & Influenza
8	Atherosclerosis	Nephritis	Unintentional Injury
9	Nephritis	Alzheimer's Disease	Nephritis
10	Liver Disease	Septicemia	Septicemia

MIMSA II Causes of Death, All Ages Percentage of Total Known Causes

MIMSA II - Cause of Death by Study Year, All ages				
Cause of Death	Study Year			
	2002	2005	2008	2011
Cardiovascular	31.8%	30.4%	28.1%	25.7%
Cancer	25.9%	27.1%	25.2%	26.0%
Respiratory	10.5%	11.1%	11.1%	9.3%
Mental and Nervous	4.1%	5.2%	6.1%	8.2%
Stroke	4.6%	4.2%	3.7%	3.1%
Infectious Disease	1.7%	2.1%	2.5%	1.6%
Diabetes and Metabolic Disease	1.5%	1.4%	2.0%	1.2%
Motor Vehicle Accidents	1.4%	1.3%	1.1%	1.0%
Other Accidents	2.0%	2.2%	2.4%	2.4%
Suicide	1.2%	1.2%	1.4%	1.6%
Homicide	0.3%	0.3%	0.3%	0.3%
Other	15.0%	13.5%	16.1%	19.6%
Total	100.0%	100.0%	100.0%	100.0%

MIMSA II, Suicide Cause of Death, All Ages Rate of Death per 1,000

MIMSA II - Death Rates per 1,000 for Suicides								
	Study Year							
	2002	2005	2006	2007	2008	2009	2010	2011
Total	0.07	0.08	0.07	0.08	0.09	0.09	0.10	0.08
Male	0.10	0.11	0.11	0.11	0.13	0.14	0.15	0.12
Female	0.03	0.03	0.03	0.02	0.03	0.04	0.03	0.03
Nonsmoker	0.06	0.06	0.06	0.06	0.08	0.09	0.09	0.08
Smoker	0.10	0.14	0.14	0.14	0.19	0.18	0.20	0.15
Attained Ages 0-29	0.04	0.05	0.05	0.05	0.04	0.05	0.06	0.05
Attained Ages 30-59	0.07	0.07	0.07	0.07	0.09	0.10	0.10	0.08
Attained Ages 60 +	0.09	0.10	0.09	0.09	0.10	0.11	0.11	0.10
< \$100,000	0.08	0.09	0.08	0.08	0.09	0.09	0.10	0.09
\$100,000 - \$999,999	0.06	0.06	0.06	0.07	0.09	0.09	0.09	0.08
\$1,000,000 +	0.09	0.08	0.08	0.09	0.12	0.13	0.14	0.10

Mortality Improvement

Three recent studies on mortality improvement from the Society of Actuaries

- “Literature Review and Assessment of Mortality Improvement Rates in the U.S. Population: Past Experience and Future Long-Term Trends” by Ernst & Young, LLP, August 2013
 - <http://www.soa.org/Research/Experience-Study/Pension/research-2013-lit-review.aspx>
- Please refer to original source for full understanding of results

Mortality improvement by cause of death

Average Annual Mortality Improvement by Cause of Death (1979-2007), Source: Office of the Chief Actuary (2012)

Cause of Death	Male	Female
Cardiovascular disease	2.49%	2.14%
Violence (including accidents)	0.84%	0.20%
Cancer	0.64%	0.16%
Respiratory diseases	-0.06%	-2.27%
Others	-0.85%	-1.57%

Three recent studies on mortality improvement from the Society of Actuaries (cont'd)

- “Report of the Society of Actuaries Mortality Improvement Survey Subcommittee” by the Mortality and Underwriting Survey Committee, March 2012
 - Separate reports for annuities, life insurance, and reinsurer assumptions
 - Life: <http://www.soa.org/Research/Experience-Study/Bus-Practice-Surveys/research-mort-imp-life-direct.aspx>
 - Annuities: <http://www.soa.org/Research/Experience-Study/Bus-Practice-Surveys/research-mort-annuity-survey.aspx>
 - Reinsurer: <http://www.soa.org/Research/Experience-Study/Bus-Practice-Surveys/research-mort-imp-life-rein.aspx>
- Please refer to original sources for full understanding of results

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	Duration			US	Duration		
39 co.	1	11	21	39 co.	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	Duration			US	Duration		
70 co.	1	11	21	70 co.	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

Three recent studies on mortality improvement from the Society of Actuaries (cont'd)

- “Global Mortality Improvement Experience and Projection Techniques” by Towers Watson, June 2011
 - <http://www.soa.org/research/research-projects/life-insurance/research-global-mortality-improve.aspx>
- Please refer to original source for full understanding of results

Mort. improvement assumptions and projections

Average Annual Mortality Improvements by Cause of Death (1979

Source: Office of the Chief Actuary (2012)

	Male		Female	
Cardiovascular Dise	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	

Sources of mortality data

- Centers for Disease Control and Prevention
 - US life tables
 - www.cdc.gov/nchs/products/life_tables
- Social Security
 - US population life tables and projections
 - www.socialsecurity.gov/OACT/STATS/index.html
- Society of Actuaries Table Manager
 - Life and population data from 40 countries
 - www.soa.org
- World Health Organization
 - Civil registration systems from 130 countries
 - www.who.int/en/
- 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 from 67 countries
 - www.lifetable.de

Mortality Improvement – Traditional Approach Considerations

- Generational vs. durational (future) mortality improvement
- Population vs. insurance
- Generally project past experience, projection methods:
 - Actuarial
 - Extrapolation
 - Predictive modeling
 - Relational
 - Cause-specific
 - Disease-specific
- Other considerations – variance by age, gender, etc.

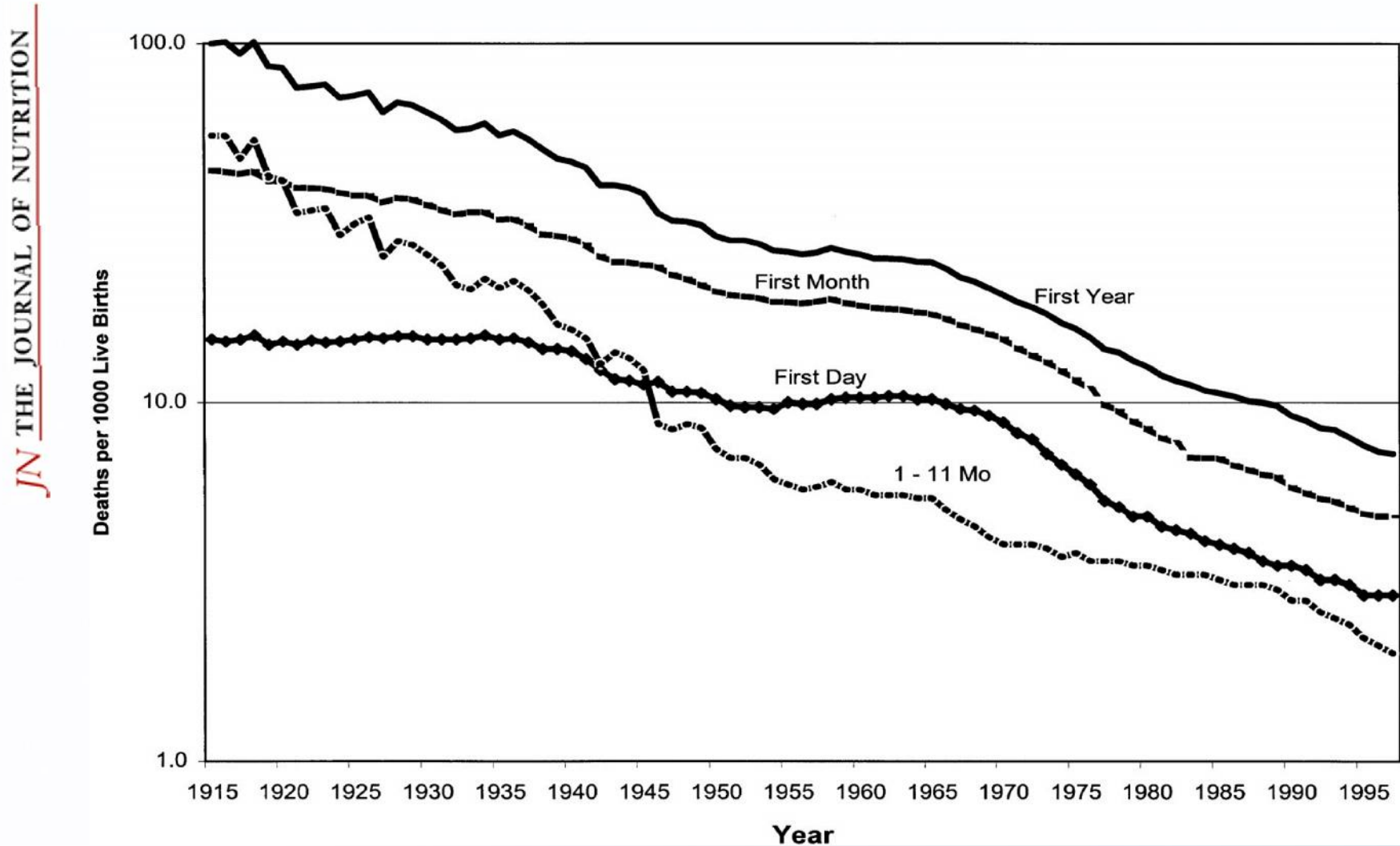
Techniques for projecting future mortality

- Cairns-Blake-Dowd
- Currie Age-Period Cohort
- Delphi study
- Environmental scanning
- GLM (Generalized linear models)
- Gompertz
- Heat map
- Heligman-Pollard
- Hunt-Blake
- Lee-Carter
- Lorenz Curve and Gini Index
- Makeham
- Perks/Kannisto
- Poisson log-bilinear
- P-Spline
- Renshaw-Haberman
- Weibull

Mortality improvement – Non-traditional Approach Considerations

- Look at past, current, and future events that will impact mortality
- Determine probability and impact each will have on future mortality improvement and interrelationships between the events
- Use this information to project future (durational) mortality improvement
- Examples of past improvements in mortality:
 - Decreases in infant mortality rates
 - Decreases in motor vehicle deaths
 - Reduction in smoking
- Will these continue into the future?

Infant mortality, by age at death, 1915–1997, USA.



Wegman M E J. Nutr. 2001;131:401S-408S

Thoughts on Infant Mortality Rates

- Will downward trend continue or level off?
- Has biggest impact on mortality improvement
 - If more infants live, they may each add about 80 years to life expectancy

US Traffic Fatalities

Motor Vehicle Traffic Fatal Crashes and Fatality Rates

Year	Fatal Crashes	Fatalities per 100,000 Licensed Drivers
1996	37,494	23.43
2001	37,862	22.06
2006	38,648	21.06
2008	34,172	17.96
2010	30,296	15.71
2011	29,757	15.28

Source: National Highway Traffic Safety Administration

Thoughts on Changes Related to Motor Vehicles

▪ Positives

- Increased awareness of not drinking and driving
- Crackdown on seatbelt use
- More time behind the wheel and practice for new drivers before they are allowed their driver's license
- New safety features:
 - Air bags
 - Lane departure warnings
 - Blind spot indicator
 - Reverse backup sensors
 - Automatic braking

▪ Negatives

- Texting while driving
- Increase in speed limits

Smoking

- MIMSA II results showed smoker to nonsmoker ratios ranging from 155% to 320%, depending on age and duration

Smoking Prevalence Among U.S. Adults, 1955-2010			
Year	Overall Population	Males	Females
1955	N/A	56.9%	28.4%
1965	42.4%	51.9%	33.9%
1970	37.4%	44.1%	31.5%
1980	33.2%	37.6%	29.3%
1990	25.5%	28.4%	22.8%
2000	23.3%	25.7%	21.0%
2002	22.5%	25.2%	20.0%
2003	21.6%	24.1%	19.2%
2004	20.9%	23.4%	18.5%
2007	20.8%	23.9%	18.0%
2010	19.3%	21.5%	17.3%

Source: U.S. Centers for Disease Control and Prevention

Thoughts on Reduction in Smoking

- Will reduction in prevalence of smokers continue?
- Are teenagers beginning to smoke more?
 - Are the anti-smoking campaigns as prevalent as they were several decades ago?
- Will economic stress lead to more smoking (or drinking!)?

Mortality improvement – Non-traditional Approach

Considerations (cont'd)

- Current and future events that will impact mortality, questions to ask:
 - Will everyone benefit from the advance or only a segment of the population?
 - For those that could benefit, will they learn about it?
 - If they learn about it, will they implement it?
 - What is the cost? Is it affordable?
 - What are the possible risks/side-effects associated with the advancement?
 - For those that implement it, how long will it take for the improvements to become effective?
- Examples of current and future events
 - We all know about “medical advances” and “natural disasters” so I will try to touch on things you may not be aware of
 - But quantification is beyond the scope of this presentation

Mortality improvement – Not

- First the bad news ...

Increasing mortality

■ US Women

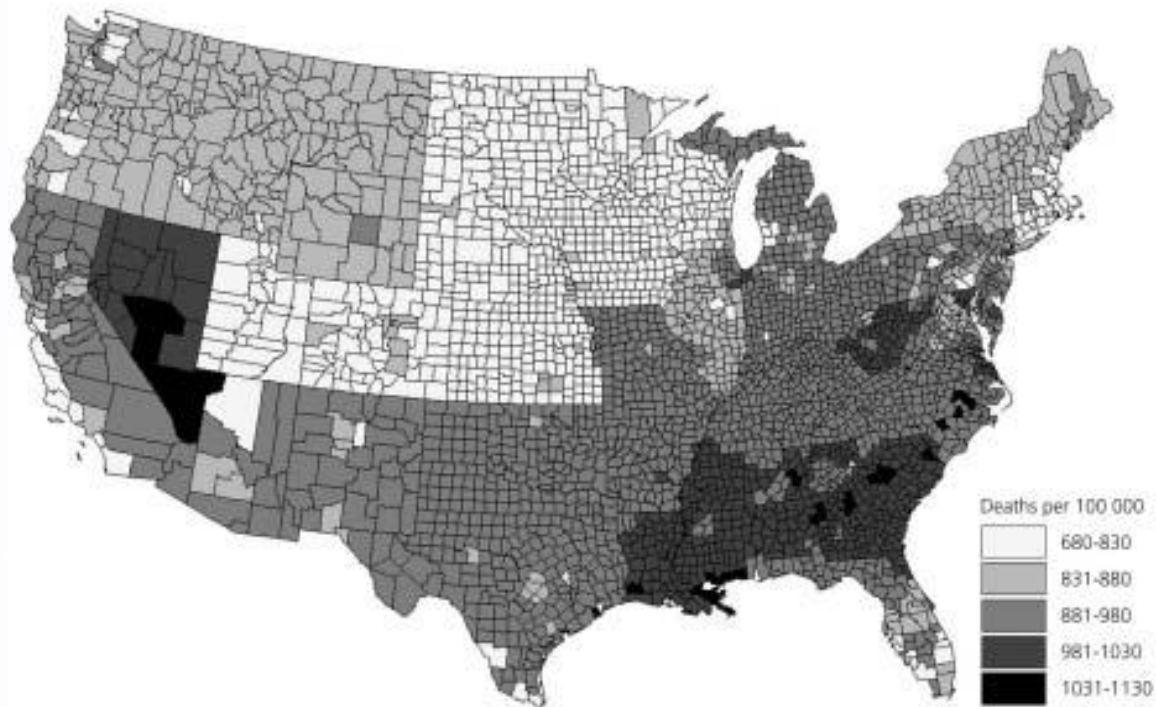
- “A new study offers more compelling evidence that life expectancy for some U.S. women is actually falling, a disturbing trend that experts can’t explain. The latest research found that women age 75 and younger are dying at higher rates than previous years in nearly half of the nation’s counties—many of them rural and in the South and West. Curiously, for men, life expectancy has held steady or improved in nearly all counties... The phenomenon of some women losing ground appears to have begun in the late 1980s, though studies have begun to spotlight it only in the last few years... The study, released Monday by the journal *Health Affairs*, found declining life expectancy for women in about 43 percent of the nation’s counties... found that nationwide, the rate of women dying younger than would be expected fell from 324 to 318 deaths per 100,000. But in 1,344 counties, the average premature death rate rose, from 317 to about 333 per 100,000. Death rates rose for men in only about 100 counties.”

- *Fox News / Associated Press*, March 5, 2013

United States

Age- and sex-adjusted mortality rates, 1990-1992

Fig. 1. Mortality rate adjusted by age and sex composition



Source: *Death rate variation in US subpopulations*,
<http://www.scielosp.org/pdf/bwho/v80n1/v80n1a04.pdf>

Caveat / Warning

- I am an actuary, not a doctor or nutritionist
- I do a lot of research and discover things many doctors don't know about or refuse to accept due to conflicts with traditional training
- Before following any of the “advice” I am about to provide, consult your own medical/other professional

Food

- Foods that are bad for you that you may not know about
 - Processed foods
 - Fried foods
 - White rice, bread
 - Pasta
 - Potatoes
 - Soda
 - Refined and fake sugars

Food

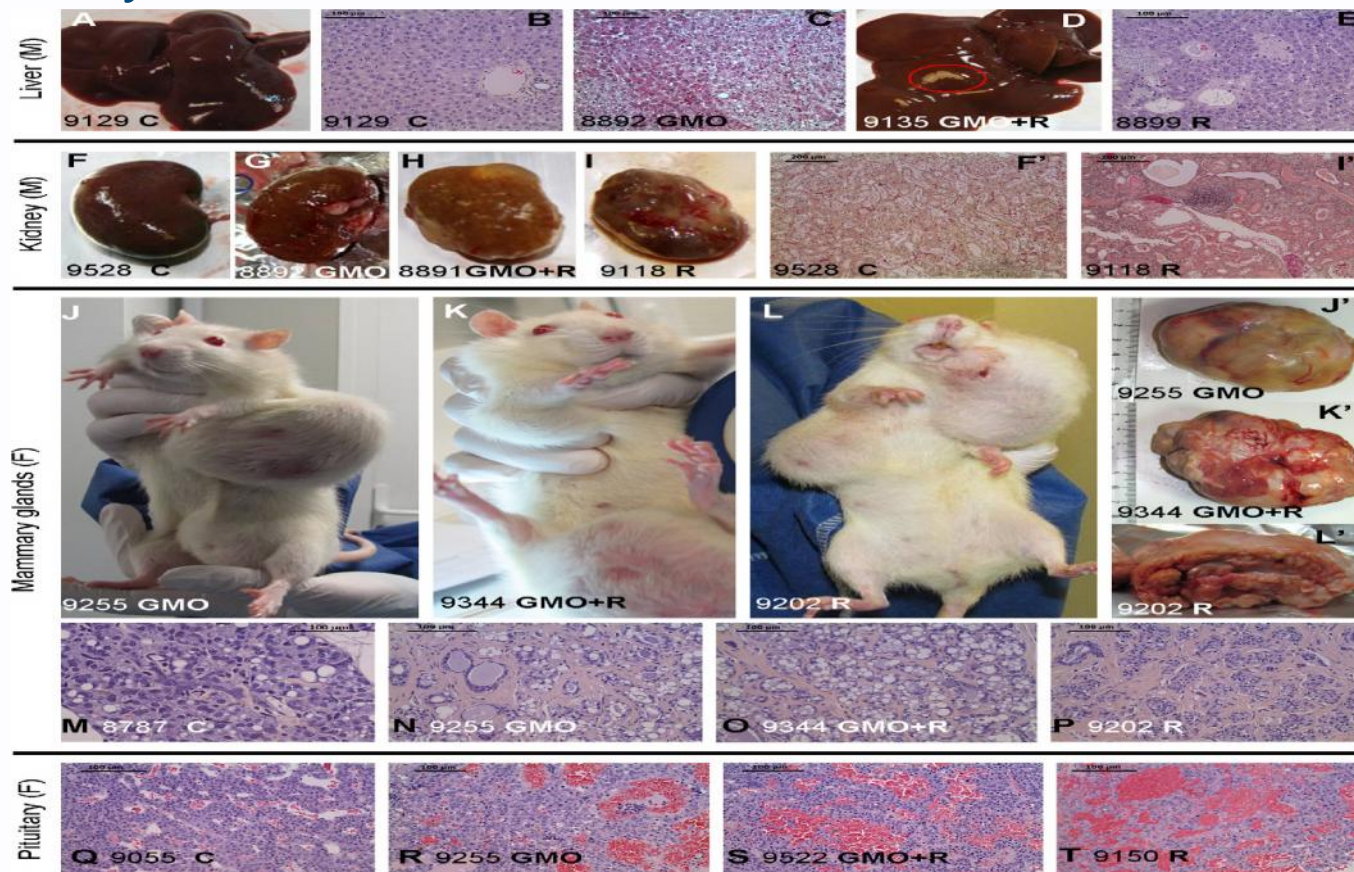
- Do we have control over what we eat?
 - “Experts in the food industry have found additional, sneakier ways to increase what they call the ‘craveability’ of food products. They’ve learned how to combine ingredients, including chemical enhancers (such as artificial sweeteners, hickory smoke flavor and cheese flavorings) to create a complex series of flavors and textures that magnify the sensory appeal. As soon as that fleeting taste and oral stimulation fade, you reach for more. Can’t a person use willpower to resist such foods? Not necessarily. What’s really happening is that their brain circuitry has been ‘hijacked’ .”
 - *Bottom Line Health*, November 2009

Drinks with chemicals

- “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”
 - *Consumer Reports*, January 2012

Exposure to chemicals

- Genetically modified corn



- Séralini, G.-E., et al. Long-term Toxicity of a Roundup Herbicide and a Roundup-tolerant Genetically Modified Maize. *Food and Chemical Toxicology*, 2012, <http://dx.doi.org/10.1016/j.fct.2012.08.005>

Exposure to chemicals (cont'd)

- Parkinson's
 - “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

Exposure to chemicals (cont'd)

- Hand sanitizer
 - Triclosan is widely used to prevent bacterial contamination. It's the active ingredient not only in hand sanitizer but in widely used antibacterial soaps. It shows up in toys, clothes, kitchenware, deodorants, toothpastes, mouthwashes, cleaning supplies and many other products. In short, it's everywhere. Some of the possible health problems linked to triclosan include heart problems, hormone imbalances, and even early puberty in children. But the biggest worry is a possible link between triclosan and the development of drug-resistant bacteria. Once again, our overuse of a compound that can kill bacteria is slowly rendering the compound useless, leaving us less equipped to fight superbugs over the long run.”

- *Heath Edge*, April 21, 2013

Exposure to chemicals (cont'd)

- Suntan lotion

- “Why in the world would sunscreen manufacturers need to have a huge lobby working in Washington, making big donations to congressman, PAC’s, and non-profit organizations? My research suggests it’s so that they can keep their bogus claims of product safety in front of you, and scare you into slathering on more of their product... When you wear sunscreen, you inhibit your body’s ability to produce vitamin D – a process that’s triggered by sunlight on your skin. Low vitamin D levels are associated with nearly every age-related disease you can think of... heart disease... cancer... arthritis... dementia and Alzheimer’s... You’ve been told over and over again that you need to avoid sun exposure and wear sunscreen whenever you go outside on a sunny day. You’ve been promised that doing so will help protect you from skin cancer. The facts are very revealing: (1) Studies show that zinc oxide – a common ingredient in sunscreens – becomes unstable when exposed to light and may damage skin cells leading to an increased risk of skin cancer. (2) Despite a steady rise in the use of sunscreen, skin cancer rates have gone up over the past thirty years. Sun avoidance has become so ingrained that nearly two thirds of Americans aren’t getting enough vitamin D! To boost your vitamin D levels, you need sun exposure. Two or three times a week, spend 15 minutes if you’re fair-skinned, or up to an hour if you have a darker complexion, in full sun without sunscreen.”

Exposure to chemicals and hormones

- Early puberty
 - “Almost one-quarter of African-American girls have reached a stage of breast development marking the onset of puberty by age 7, as have almost 15% of Hispanic girls and more than 10% of white girls. These percentages are significantly higher than in 1997, when a landmark study first reported that girls were beginning puberty much younger than they had in the mid-20th century. There are numerous potential explanations. Chief among them is the increase in average weight among children. Factors may include a Western diet that is increasingly high in sugar and fat, declining physical activity rates in children and exposure to chemicals in the environment that act on hormones called endocrine disruptors. Kids today are exposed to plastic much more than they were 10 or 20 years ago. Early maturation in a large population of girls may also affect future breast cancer rates.”

- *Chicago Tribune*, August 9, 2010

More on children

- Obesity

- “The decrease in children’s regular physical activity, combined with an abundance of fast, cheap, super-sized high-calorie foods, has created an obesity epidemic and raised the incidence of additional risk factors for heart disease—high blood pressure, high cholesterol and diabetes—even before they reach adulthood. In fact, ailments that were once diagnosed only in adults are now showing up in adolescents and older teens.”
 - www.time.com/adsections, Weighing America’s Future

A Silent Killer

- Chronic inflammation
 - “Inflammation (or lack thereof) is one indicator of how efficiently and precisely our immune system is functioning. There are two categories of inflammation: acute and chronic. Acute inflammation is the body’s healthy response to injury and infection. It consists of several parts: pain, heat, redness, and swelling... But chronic inflammation is a totally different matter. Chronic inflammation starts off as acute, but the elimination of the pathogen or irritant never takes place. The repair process also never takes place. This can occur for several reasons. The body might not have the right raw materials to repair the problem; the onslaught of pathogens doesn’t stop; we keep feeding the body foods that cause irritation (for instance, too many pro-inflammatory omega-3 oils); or the immune system begins to attack healthy tissue, as it does in many autoimmune diseases. With chronic inflammation, the immune response never shuts off. The constant production of immune cells is not only draining to the body, but when tissues are under constant attack, it results in permanent damage... Chronic inflammation has been directly linked to diseases like cancer, heart disease, stroke, arthritis, nerve degeneration, diabetes, metabolic syndrome, sarcopenia, kidney and lung destruction, autoimmune diseases, high blood pressure, sleep apnea, inflammatory bowel disease, asthma, Alzheimer’s, fibromyalgia, chronic fatigue syndrome, and dozens of other common and life-threatening health problems...”

Continued on next slide

A Silent Killer (cont'd)

Continued from previous slide

- “Conventional medicine and the pharmaceutical industry continue to capitalize on these findings. Pharmaceutical companies produce inflammation blockers and anti-inflammatory drugs... These drugs include ... aspirin, and NSAIDs to more sophisticated drugs that block nerve receptors in the body. The focus isn't to reduce the actual cause of the inflammation, but instead to block its effects. For the most part, these medications block the ongoing repair process, which, in turn, reduces the swelling and pain. But this blocking process just creates a vicious cycle of increased inflammation that requires even more immune suppression. From a business standpoint, it's actually far more profitable to ... just keep treating the symptoms. A good example of this is statins. Studies have suggested that any reductions in cardiovascular events related to statins may be due more to their anti-inflammatory effects than cholesterol lowering... thanks to a solid body of research, we know what's [causing it]... Visceral (belly) fat ... cells produce numerous hormones and chemical messengers that trigger inflammation throughout the body... To get rid of excess fat cells, you need to cut simple carbohydrates out of your diet... it's almost impossible to permanently strip excess fat from the body without some form of exercise... In addition ... take supplements such as conjugated linoleic acid (CLA), creatinine, green tea extract, pinolenic acid, saffron extract (Satiereal), and why protein, all of which help to promote lean muscle development... Your mouth – another source of inflammation. Cut out sugar [to] control harmful bacteria... Oral probiotics also control harmful bacteria... Oral probiotics are different than intestinal probiotics... most people tend to overlook cleaning their toothbrush.”

Drugs

■ Statins - Example 1

- “The lipid hypothesis—the consumption of saturated fat causes heart disease. This infamous hypothesis was proposed by Ancel Keys in 1953 based on statistics of consumption of saturated fat in six countries. Keys neglected to disclose that he had selected six countries out of a total of 22 whose data were available to him. His misuse of the data was exposed by Yerushalmy and Hilleboe in 1957 when they published the graph of the full data set. When the full data is used, the biological gradient disappears—as does the strength of the association. The lipid hypothesis was consequently modified so the dietary cholesterol became the villain instead of saturated fat. Many years of research followed but Ancel Keys finally admitted in 1997 that ‘There’s no connection whatsoever between cholesterol in food and cholesterol in blood. And we’ve known all along. Cholesterol in the diet doesn’t matter unless you happen to be a chicken or rabbit.’ ... In fact, many people with heart disease have low levels of cholesterol. In the January 2009 edition of *American Heart Journal* it was reported that, of the 136,905 people admitted to 541 hospitals in the United States with heart attack whose lipid levels were recorded, nearly 75% had ‘normal’ LDL cholesterol levels, which is below 130 mg/dl... What is the use of being saved from heart disease only to die from some other cause? Even worse, higher cholesterol levels appear to be protective against cancer in the longer term and statins have significant and probably under-reported side-effects... I will continue to enjoy a full English breakfast, shorn of the guilt that this may affect the health of my heart. At my age (50+), and free of heart disease with a cholesterol level higher than the recommended level, I am quite happy not to increase the five-year probability of avoiding a heart attack from 98.2% to 98.8% by taking a statin for five years. The probability that I will avoid the nasty side effects is 100%.”

Drugs (cont'd)

■ Statins - Example 2

- “Statin use increases the risk of diabetes in some women by almost 80 percent! Data was analyzed from the Women’s Health Institute, a long-term survey of more than 153,000 postmenopausal women aged 50-79 years... The drugs being taken included all the big ones: simvastatin (Zocor), lovastatin (Altacor, Altoprev, Mevacor), pravastatin (Pravachol), fluvastatin (Lescol), and atorvastatin (Lipitor). Overall, the risk of diabetes associated with statin therapy was an astonishing 48 percent! The biggest jumps were seen in white (49 percent), Hispanic (57 percent), and Asian women (78 percent). Those numbers are shocking. But here’s an even bigger stunner: The study found that women with the lowest body mass index had a higher risk of diabetes compared with obese women... It is not understood exactly how statin drugs cause diabetes. Based on the research, they may alter glucose metabolism of the liver or muscles... previous studies have also shown that statin use also increases the risk of diabetes in men... the mainstream media hyped up the 2008 Jupiter trial involving statin drugs, praising the ability of the statin drug known as rosuvastatin (Crestor) to reduce the risk for heart attack and stroke in people who had normal cholesterol and high levels of C-reactive protein. (Never mind that, in reality, only one person out of 120 actually would benefit from the drug.)”

- *Health Revelations, 2012*

Drugs (cont'd)

- Statins - Example 3

Cholesterol Group	N	Exp_Yrs Sum	Deaths Sum	2001 VBT Expected	Deaths/ 2001 VBT A/E	Standardized A/E	Cox HR
059-140	987	13,385	156	58.4	267%	155%	155%
141-160	1,836	25,515	281	148.0	190%	110%	113%
161-180	2,675	36,256	518	248.6	208%	121%	120%
181-200	3,171	42,873	686	397.7	172%	100%	100%
201-220	2,884	38,366	750	451.3	166%	96%	95%
221-250	3,158	40,813	979	573.3	171%	99%	96%
251-275	1,288	16,360	452	256.3	176%	102%	99%
276-300	659	8,309	254	142.4	178%	103%	101%
301-325	248	3,038	95	52.1	182%	106%	103%
326-UP	188	2,286	86	37.5	229%	133%	130%

- The Similarities Between Life Table Analysis and Multivariate Cox Models by Doug Ingle, *On the Risk*, March 2013

Drugs (cont'd)

■ Liver drug

- “You might be surprised to know that the leading cause of **acute liver failure** in the United States is not *alcohol* abuse nor *viral* hepatitis. The number one reason Americans suffer acute **liver** failure is a **drug** the **FDA** has allowed to be sold for decades *after* its lethal toxicities were known. Acetaminophen’s deadly effects extend beyond the liver. Regular users of acetaminophen [Tylenol] may double their risk of *kidney cancer*.”
 - *Life Extension*, July 2010

■ Folic acid

- “Recently accumulating research has found that supplemental folic acid may actually accelerate cognitive decline in some older individuals. It’s also being linked to increased risk of colon and rectal cancers, increased risk of childhood asthma born to folic-acid supplemented mothers, and accelerated growth of pre-existing cancers. Unfortunately, not only journalists, but even medical professionals haven’t figured out that folic acid is not the same as the naturally occurring vitamin folate.”
 - 49 • *Nutrition & Healing*, June 2010

Drugs (cont'd)

- Prostate cancer drugs

- “...having an enlarged prostate, a condition known as benign prostatic hyperplasia (BPH), is so common that there are currently millions of men taking prescription drugs to treat the problem... Unfortunately, it turns out that those millions of men may be unknowingly trading their bothersome prostate symptoms for something much, much worse. Shockingly, research has now revealed that BPH drugs increase your risk of developing an aggressive form of prostate cancer!... These medications include Proscar (finasteride), Avodart (dutasteride), and Jalyn (dutasteride and tamsulosin). This warning also extends to the popular medication Propecia used for male pattern hair loss.”

- *Health Revelations*, March 2013

Drugs (cont'd)

■ Diabetes drugs

- “One in every three. That’s the shocking rate of diabetics who are at grave risk. And they don’t even know it. But it’s not diabetes that increases their risk. Ironically, it’s their medication. And it’s potentially deadly. Injectable insulin has extended countless lives of type 1 diabetics. But a new study shows that it can produce the exact opposite result for type 2 patients. Researchers looked at long-term medical records of more than 84,000 type 2 diabetics. Compared to using metformin, (1) Insulin use increased risk of a major cardiac event, cancer, or early death by 80% and (2) Insulin use nearly doubled heart attack risk, and more than doubled neuropathy risk. Patients who took metformin and insulin together were still at greater risk of major cardiac event, cancer, or early death. But the risk was lower than when taking just insulin alone. In type 1 diabetes, patients can’t produce their own insulin. In type 2 they can. So for these patients, an insulin injection is like a battering ram. Insulin is pumped up to such excess that it forces sugar into the cells.”

- *HSI eAlert, October 17, 2013*

Drugs (cont'd)

- Prescription drugs
 - “Prescribed drugs can take toll on drivers. Impairment potential a concern for millions on medication, study says.”
 - *Chicago Tribune*, August 18, 2013

Infections

- Carbapenem-resistant enterobacteriaceae (CRE) Infection
 - “CRE infections are most commonly seen in people with exposure to healthcare settings like hospitals and long-term care facilities, such as skilled nursing facilities, and long-term acute care hospitals. In healthcare settings, CRE infections occur among sick patients who are receiving treatment for other conditions. Patients whose care requires devices like ventilators (breathing machines), urinary (bladder) catheters, or intravenous (vein) catheters, and patients who are taking long courses of certain antibiotics are among those at risk for CRE infections. Some CRE bacteria have become resistant to almost all available antibiotics and can be deadly—one report cites they can contribute to death in up to 50% of patients who become infected.”
 - *Centers for Disease Control and Prevention*, March 5, 2013

Natural disasters

- Climate change

- “More American children are getting asthma and allergies, and more seniors are suffering heat stroke. Food and utility prices are rising. Flooding is overrunning bridges, swamping subways and closing airport runways. People are losing jobs in drought-related factory closings. Cataclysmic storms are wiping out sprawling neighborhoods. Towns are sinking... these scenes are already playing out somewhere in the United States, and they’re expected to get worse in the years ahead... So wet regions will be wetter, causing flash flooding. Dry ones will get drier, resulting in drought. Heat, of course, is another consequence. So a heat wave that used to occur once every 100 years now happens every five years... While Norfolk is second only to New Orleans for sea-level rise, partly because its land is naturally sinking, other coastal US cities – Boston; Charleston, SC; Miami; New York; Seattle; San Francisco; Tampa – are vulnerable too.”

- *USA Today Weekend*, March 1-3, 2013

Natural disasters (cont'd)

■ Volcano under Yellowstone – Example 1

- “A super volcano is the most destructive force on this planet... Not all super volcanoes have been found, but one of the largest is in Yellowstone Park, USA. Scientists searching for the caldera in the park could not see it because it was so huge - only when satellite images were taken did the scale of the caldera become apparent - the whole park, 85 km by 45 km, is one massive reservoir of magma... When will it next erupt? Scientists have discovered that the ground in Yellowstone is 74 cm higher than in was in 1923 —indicating a massive swelling underneath the park... The volcano erupts with a near-clockwork cycle of every 600,000 years. The last eruption was more than 640,000 years ago – we are overdue ... What would be the effect of an eruption? Immediately before the eruption, there would be large earthquakes in the Yellowstone region. The ground would swell further with most of Yellowstone being uplifted. One earthquake would finally break the layer of rock that holds the magma in—and all the pressure ... would be unleashed in a cataclysmic event. Magma would be flung ... into the atmosphere. Within a thousand kilometers, virtually all life would be killed by falling ash, lava flows and the sheer explosive force of the eruption. Volcanic ash would coat places as far away as Iowa and the Gulf of Mexico... lava would ... coat the whole of the USA with a layer 5 inches thick... It would be the loudest noise heard by man for 75,000 years, the time of the last super volcano eruption. Within minutes of the eruption tens of thousands would be dead. The long-term effects would be even more devastating... ash ... could block out light from the sun, making global temperatures plummet. This is called a nuclear winter... the world's plant life would be killed by the ash and drop in temperature. Also, virtually the entire of the grain harvest of the Great Plains would disappear in hours ... Similar effects around the world would cause massive food shortages. If the temperatures plummet by the 21 degrees they did after the Sumatra eruption the Yellowstone super volcano eruption could truly be an extinction level event. ”

- <http://rense.com/general31/overdue.htm>

Natural disasters (cont'd)

- Volcano under Yellowstone – Example 2

- “It is also known that one end of Yellowstone Lake is 100 feet higher than it used to be and flooding the land at the other end and killing the trees. Trees in various parts of the park are dying because their roots are cooking from the heat under the ground. Water is now boiling along the trails. If there is an eruption, we would need at least a year’s worth of supplies because no food could be grown, farm lands would be useless, temperatures would drop by as much as 15 degrees. Within 3 months, the entire world would be covered by clouds. Millions of people would die—most within the surrounding 100 miles. 600 miles from the caldera is not safe at all. FEMA could not handle this big an event. The U.S. economy would come to a halt. Grocery stores would empty out, airlines, trains, buses, and roads would stop.”

- <http://www.earmountainview.com/yellowstone/yellowstone.htm>

Mortality improvement

- And now the good news ...

Food

- Foods that are good for you that you may not know about
 - Eggs
 - Butter
 - Saturated fat
 - Whole milk
 - Cherries
 - Cinnamon
 - Curcumin
 - Nuts, especially walnuts and macademia nuts
 - Olive and macademia nut oils
 - Sauerkraut
 - Wine
 - Chocolate

Foods that can help protect against cancer

- Cayenne pepper
- Fermented foods
- Fruits (citrus)
- Pomegranate
- Tea (green, white, oolong)
- Tomato
- Turmeric
- Vegetables (cruciferous)

Eating right

- 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

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

Foods that are telomere friendly (from *The Immortality Edge*)

- Almonds
- Apples
- Avocados
- Beans
- Beets
- Blueberries
- Broccoli
- Cabbage
- Eggs
- Garlic
- Grapefruit
- Kale
- Meat
- Olive Oil
- Oranges
- Sea vegetables
- Sweet potatoes
- Tea
- Tomatos
- Wild salmon

How to live longer

- *The Immortality Edge* by Michael Fossel, Greta Blackburn, Dave Woynarowski
- Goal is to improve length of telomeres, four things are recommended:
 - Supplements
 - Many are recommended, including omega-3 fish oil
 - Exercise
 - Aerobic and anaerobic exercise, stretching, and short bursts of heavy exercise
 - Stress reduction
 - Meditation
 - Diet
 - Paleolithic diet

How to live longer (cont'd)

- *The Blue Zones* by Dan Buettner
 - Move naturally – Be active without having to think about it
 - Hara hachi bu
 - Avoid meat and processed foods
 - Drink red wine
 - Have a purpose
 - Take time to relieve stress
 - Participate in a spiritual community
 - Make family a priority
 - Surround yourself with those who share the same values

Nutrient

- Astaxanthin
 - Red pigment molecule that is a member of carotenoid family
 - Found in microalgae
- What can astaxanthin do?
 - Prevent cancer
 - Protect against cardiovascular disease
 - Help manage diabetes by improving insulin sensitivity
 - Boost immune system
 - Slow brain aging
 - Protect against eye diseases
 - Protect and rejuvenate skin

Research

- Flu prevention

- “This could be the key that keeps you from ever coming down with the flu again. Researchers believe they’ve finally uncovered the real secret to flu prevention... A few years ago, researchers found that people were much less likely to get hit with the flu if they had high levels of certain immune cells. These cells are called CD8 T... low vitamin D levels are linked with low levels of CD8 T cells. Vitamin D also has what’s known as an ‘immune-modulating’ effect on CD8 T. In a 2010 trial, 1,200 IU of vitamin D3 daily throughout the flu season nearly cut the number of flu cases in half... You’ll get more than eight times that much in just 15 minutes of direct sun exposure... But if the flu season temperatures in your neighborhood hover around freezing, then you’ll need to supplement with D3.”

- *HSI eAlert*, October 16, 2013

Research (cont'd)

- Intestinal flora
 - “At long last, in just the past few years, the importance of proper intestinal flora and probiotics are getting the attention they deserve. Research is confirming the *direct* connection between a disruption of gut flora and everything from heart and blood sugar issues to mental health problems... When you treat the whole person instead of just treating a disease or symptom, an imbalance in the intestinal tract stands out like an elephant in the room.”
- *Alternatives*, February 2013

Research (cont'd)

- Reprogrammed cells
 - “In a powerful demonstration of reprogrammed cells’ potential to treat human disease and injury, scientists at the University of Wisconsin at Madison turned a rhesus monkey’s skin cells into early brain cells, then implanted them successfully in the monkey’s brain. The experiment, published Thursday in the journal *Cell Reports*, worked so well that the reprogrammed cells grafted onto the brain appeared indistinguishable from the cells already there... possibility that doctors might someday replace the neurons lost to Parkinson’s or the cells damaged in spinal cord injuries... they mark an important moment in the discussion of what has been called personalized medicine—the idea that a patient’s own cells can be used to treat a broad spectrum of ailments.”

Research (cont'd)

- Increased lifespan
 - “By suppressing a gene involved in metabolism and energy balance, researchers extended the average lifespan of a group of mice by about 20 percent – thought to be one of the longest lifespan increases ever observed in mice. This is the equivalent of extending the average human lifespan by 16 years, from 79 to 95 years old, the U.S. National Institute of Health researchers said. Although the study revealed that this gene, known as mTOR, does not affect every tissue and organ the same way, the researchers said their findings could help scientists develop new therapies for aging-related diseases – such as Alzheimer’s – that target specific organs.”
- *U.S National Heart, Lung, and Blood Institute*, news release, August 29, 2013

Other research

- Early cancer detection
 - ONCOblot
- Calorie restriction – Work by Luigi Fontana
 - Testing in mice and human not same
 - IGF-1 gene impacted by calorie restriction
 - Exercise is limited
 - Immune functions and bone density improve
 - Metabolic improvements?
- Longevity enzyme – Work by David Sinclair
 - Resveratrol appears to activate protein that promotes health and longevity
 - Sirtuins, particularly SIRT1
- Ongoing genetic research
 - Discovery of genes associated with longevity, health conditions, drug resistance

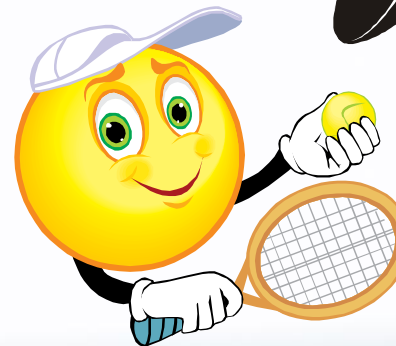
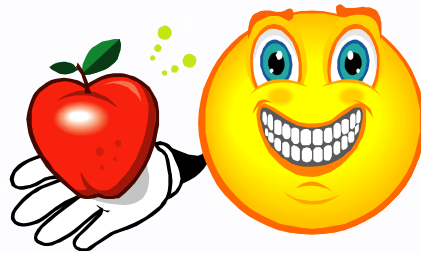
Final tips

- Do:
 - Give blood
 - Laugh
- Don't:
 - Avoid fats
 - Take an aspirin a day

Conclusion and summary

- Two distinct groups of people:
 - Those that know how to take care of themselves
 - Those that don't
- How to care of yourself (**PLEASE**):
 - **P** – Purpose: Have a Purpose in life
 - If you don't know where you are going, you will never get there!
 - **L** – Love: Love your family and friends - All you need is love!
 - **E** – Eat: Be aware of what you Eat
 - An apple a day keeps the doctor away!
 - **A** – Active: Be Active - Use it or lose it!
 - **S** – Screenings: Get periodic health Screenings - Better safe than sorry!
 - **E** – Enjoy: Avoid stress, laugh, and Enjoy life! - Don't worry, be happy!
- I hope you all live long, healthy and prosperous lives!

QUESTIONS? PLEASE!



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 performing 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 and vice-Chair of 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.
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